

**United States Department of the Interior
Bureau of Land Management**

**Draft Resource Management Plan
Supplemental Environmental Impact Statement
Colorado River Valley Field Office and Grand Junction Field Office**

Upper Colorado River District Office
2815 H Road
Grand Junction, Colorado 81506

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United States Department of the Interior
BUREAU OF LAND MANAGEMENT



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In Reply Refer To:

Dear Reader:

The draft supplemental Environmental Impact Statement (EIS) for the Colorado River Valley Field Office (CRVFO) and Grand Junction Field Office (GJFO) Resource Management Plans (RMP)/Final EISs is available for your review and comment. The Bureau of Land Management (BLM) prepared this supplemental EIS to comply with the settlement agreements in litigation of the CRVFO RMP (*Wilderness Workshop v. BLM*, 16-cv-01822) and subsequent oil and gas leasing in both field offices (*Wilderness Workshop v. BLM*, 18-cv-00987) as well as to revisit the GJFO RMP, as described in the BLM's motion for voluntary remand in litigation associated with the GJFO RMP (*Center for Biological Diversity v. BLM*, 19-cv-02869).

The planning area is identical to the combined planning areas for the CRVFO RMP/EIS and the GJFO RMP/EIS. Within the CRVFO portion of the supplemental EIS planning area, approximately 494,160 acres of BLM-administered surface lands and approximately 695,210 acres of BLM-administered federal fluid mineral estate are in Eagle, Garfield, Mesa, Pitkin, and Routt Counties in Colorado. Within the GJFO portion of the planning area, approximately 1,060,900 acres of BLM-administered surface lands and approximately 1,226,450 acres of BLM-administered federal fluid mineral estate are in Garfield, Mesa, Montrose, and Rio Blanco Counties in Colorado. The decision area is BLM-administered surface lands (BLM-administered lands) and the federal fluid mineral estate below BLM-administered lands, split-estate lands, and other federal lands (but not National Forest System lands).

The BLM encourages the public to provide information and comments pertaining to the analysis presented in this draft supplemental EIS. The BLM is particularly interested in feedback concerning the adequacy and accuracy of the new management alternatives and the analysis of environmental consequences.

The BLM will accept comments for 90 calendar days following the Environmental Protection Agency's publication of its Notice of Availability in the *Federal Register*. The BLM can best use your comments and resource information submissions if it receives them within the review period. Documents pertinent to this proposal may be examined online at <https://go.usa.gov/xtrgf>.

You may submit comments electronically on the project website: <https://go.usa.gov/xtrgf>; or you can mail or hand deliver comments to BLM Upper Colorado River District, Attn: Supplemental EIS, 2518 H Road, Grand Junction, CO 81506. To facilitate analysis of comments and information submitted, the BLM strongly encourages you to submit comments in an electronic format.

Your review and comments on the content of this document are critical to the success of this planning effort. If you wish to submit comments, the BLM requests that you make them as specific as possible. Comments will be more helpful if you include suggested changes, sources, or methods and reference a section or page number. The BLM will consider comments containing only opinions or preferences and will include them as part of the decision-making process; however, the BLM will not respond formally to those comments.

Before including your address, phone number, email address, or other personal identifying information in your comment, you should be aware that your entire comment – including your personal identifying information – may be made publicly available at any time. While you can ask us in your comment to withhold your personal identifying information from public review, we cannot guarantee that we will be able to do so.

Public meetings to provide an overview of the document and to respond to questions will be announced by local media and the project website at least 15 days in advance.

Thank you for your continued interest in the draft supplemental EIS. The BLM appreciates the information and suggestions you contribute to the planning process. For additional information or clarification of this document or planning process, please contact Stacey Colon at 970-244-3097 or email ucrd-seis@blm.gov.

Sincerely,

LARRY SANDOVAL Digitally signed by LARRY SANDOVAL
Date: 2023.07.28 12:21:29 -06'00'

(acting for) Greg Larson
Manager, Upper Colorado River District

Executive Summary

ES.1 INTRODUCTION

The Bureau of Land Management (BLM) prepared this supplemental environmental impact statement (EIS) for the 2014 Colorado River Valley Field Office (CRVFO) Resource Management Plan (RMP)/Final EIS and 2015 Grand Junction Field Office (GJFO) RMP/Final EIS. The BLM approved the RMPs and Records of Decision (RODs) for the CRVFO and GJFO in 2015.

This supplemental EIS has been written in response to a United States (US) District Court, District of Colorado, opinion and order (1:16-cv-01822-LTB) regarding the CRVFO RMP ROD and a subsequent settlement agreement. The court granted a partial remand without vacating the decisions contained in the EIS and ROD so that the BLM can address two deficiencies identified by the court: to examine a wider range of alternatives and to provide additional air quality analysis for the alternatives related to fluid mineral management.

This supplemental EIS has also been written in response to a court-approved voluntary remand of the GJFO ROD (1-19-cv-02869-REB) to allow the BLM to address the same deficiencies identified in the CRVFO case.

ES.2 PURPOSE AND NEED

The purpose of this supplemental EIS is to broaden the range of alternatives in the 2015 CRVFO and GJFO Approved RMPs with respect to the lands that are allocated as open or closed for oil and gas leasing. The purpose is also to provide additional air quality analysis for the fluid mineral management alternatives considered in the 2014 CRVFO Final EIS and the 2015 GJFO Final EIS and in this supplemental EIS.

The need for this supplemental EIS is to comply with the settlement agreements in litigation of the CRVFO RMP (*Wilderness Workshop v. BLM*, 16-cv-01822) and subsequent oil and gas leasing in both field offices (*Wilderness Workshop v. BLM*, 18-cv-00987). The need is also to revisit the GJFO RMP, as described in the BLM's motion for voluntary remand in litigation associated with the GJFO RMP (*Center for Biological Diversity v. BLM*, 19-cv-02869). The need is also to consider new information and to consider areas with tribal significance per the Tribal Consultations for Oil and Gas Leasing Handbook, Section 1.3.

ES.3 PLANNING AND DECISION AREAS

The planning area is identical to the combined planning areas for the CRVFO RMP/EIS and the GJFO RMP/EIS. Within the CRVFO portion of the supplemental EIS planning area, approximately 494,160 acres of BLM-administered surface lands and approximately 695,210 acres of BLM-administered federal fluid mineral estate are in Eagle, Garfield, Mesa, Pitkin, and Routt Counties in Colorado. Within the GJFO portion of the planning area, approximately 1,060,900 acres of BLM-administered surface lands and approximately 1,226,450 acres of BLM-administered federal fluid mineral estate are in Garfield, Mesa, Montrose, and Rio Blanco Counties in Colorado.

The decision area is BLM-administered surface acres (BLM-administered lands) and the federal fluid mineral estate below BLM-administered lands, split-estate lands, and other federal lands (but not National Forest System lands). See **Figure 1.8-1**, Planning Area, and **Figure 1.8-2**, Decision Area.

ES.4 SUMMARY OF PUBLIC INVOLVEMENT

ES.4.1 Scoping

Public scoping for this supplemental EIS began on June 23, 2022, with publication of the notice of intent (NOI) in the *Federal Register* (*Federal Register* Volume 87, No. 120, June 23, 2022). The NOI informed the public of the BLM's intent to prepare a supplemental EIS to the 2014 CRVFO Final EIS and the 2015 GJFO Final EIS in response to the court order and settlement agreement for the CRVFO and to the remand of the GJFO ROD.

The BLM held virtual public scoping meetings on July 12 and 13, 2022. The virtual meetings included a PowerPoint presentation describing the purpose of the supplemental EIS, the approach, a preliminary new alternative, and opportunities for public involvement.

During scoping, the BLM received 44 unique written submissions with 495 substantive comments. The BLM also received 760 form letters and two form letters with additional text. The largest number of comments were related to alternatives, fluid minerals, climate change, lands with wilderness characteristics, air quality, socioeconomics, environmental justice, and special designations.

ES.4.2 Tribal Consultation

On February 24, 2022, the BLM invited the tribes to be cooperating agencies and asked for comments during the scoping period. On April 12, 2022, the BLM sent letters to the three Ute tribes—Ute Mountain Ute Tribe, Southern Ute Tribe, and Ute Indian Tribe (Uintah and Ouray Reservation)—initiating government-to-government tribal consultation. Face-to-face consultation was conducted on April 19, 2022, and October 12, 2022.

ES.4.3 Cooperating Agencies

The BLM is the lead agency for the supplemental EIS. On February 24, 2022, the BLM wrote to 53 local governments, as well as State and federal agencies, inviting them to participate as cooperating agencies for the supplemental EIS. Twelve entities agreed to participate as cooperating agencies. The BLM is engaging with 12 cooperating agencies while producing this supplemental EIS. Cooperating agencies include six counties, two communities, two State agencies, and two federal agencies. The BLM has held cooperating agency meetings throughout the process thus far and will continue to meet with cooperating agencies throughout preparation of the final supplemental EIS.

ES.5 MANAGEMENT ALTERNATIVES

The BLM analyzed two new alternatives in this supplemental EIS; the BLM developed these alternatives in consultation with cooperating agencies and comments received from the public during the scoping period. The alternatives meet the purpose of and need for the supplemental EIS. The alternatives analyze areas open and closed to fluid mineral leasing. The alternatives will not reanalyze other potential decisions analyzed in the 2014 and 2015 Proposed RMPs/Final EISs.

Because this is a supplement to the 2014 CRVFO and 2015 GJFO Proposed RMPs/Final EISs, the lands allocated as open or closed to fluid mineral leasing analyzed in the Proposed RMPs/Final EISs (Alternatives A, B, C, and D) plus the two new alternatives developed to respond to the purpose and need (Alternatives E and F) presented in this supplemental EIS constitute the range of alternatives considered.

Alternative E would close the no-known, low, and medium oil and gas development potential areas to future fluid mineral leasing. Alternative E would also close the areas analyzed as closed to fluid mineral leasing under Alternative C of the 2014 CRVFO and 2015 GJFO Final EISs.

Alternative F would close the no-known, low, and medium oil and gas development potential areas to future fluid mineral leasing. Alternative F would also close the areas identified by the public for closure during scoping. Under Alternative F, closure to fluid mineral leasing would include areas closed under Alternative E and special designations, important bird areas, native trout crucial habitat, eligible wild and scenic river segments, areas of tribal significance, Colorado Natural Heritage Program potential conservation areas, managed wildlife emphasis areas, and an expanded area of critical environmental concern. Alternative F would also designate a wilderness study area. Alternative F would close the largest amount of area to future oil and gas leasing.

ES.6 IMPACTS

Impacts are generally similar to the impacts described in the 2014 and 2015 Final EISs, but they would occur over a smaller area for both new alternatives. Alternative F would result in impacts over the smallest area. The supplemental EIS analyzes impacts from combustion of oil and gas anticipated to be produced from the areas allocated as open to future oil and gas leasing.

ES.7 PREFERRED ALTERNATIVE

The BLM has identified Alternative E as the agency's preferred alternative. The BLM will develop the proposed alternative for the final supplemental EIS. The proposed alternative in the final EIS could be the preferred alternative presented in this draft supplemental EIS, or it may draw from a combination of components from all alternatives (Alternatives A, B, C, and D from the 2014 and 2015 Proposed RMPs/Final EISs and Alternatives E and F in this supplement).

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Chapter I. Introduction

I.1 INTRODUCTION

The Bureau of Land Management (BLM) prepared this supplemental environmental impact statement (EIS) for the 2014 Colorado River Valley Field Office (CRVFO) Resource Management Plan (RMP)/Final EIS and 2015 Grand Junction Field Office (GJFO) RMP/Final EIS. The BLM approved the RMPs and Records of Decision (RODs) for the CRVFO and GJFO in 2015.

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The need for this supplemental EIS is to comply with the settlement agreements in litigation of the CRVFO RMP (*Wilderness Workshop v. BLM*, 16-cv-01822) and subsequent oil and gas leasing in both field offices (*Wilderness Workshop v. BLM*, 18-cv-00987). The need is also to revisit the GJFO RMP, as described in the BLM's motion for voluntary remand in litigation associated with the GJFO RMP (*Center for Biological Diversity v. BLM*, 19-cv-02869). The need is also to consider new information and to consider areas with tribal significance per the Tribal Consultations for Oil and Gas Leasing Handbook, Section 1.3.

I.3 SUPPLEMENTAL ENVIRONMENTAL IMPACT STATEMENT

This supplemental EIS focuses on the two deficiencies found in the US District Court for Colorado opinion and order. The supplemental EIS considers alternative areas open and closed to future fluid mineral leasing. Other than areas open and closed to fluid mineral leasing, this supplemental EIS will not reanalyze other potential decisions, including fluid mineral stipulations, that were analyzed in the 2014 and 2015 Final EISs. This supplemental EIS also has additional air quality analysis for the four alternatives considered in the 2014 and 2015 Final EISs and for the new alternatives.

Decisions resulting from this supplemental EIS will not change existing rights or change existing fluid mineral leases. Each existing fluid mineral lease will continue under current lease terms unless the lease expires or is relinquished.

The analysis in this supplemental EIS, like the 2014 and 2015 Final EISs, is completed at the land use planning level of impact analysis. Fluid mineral leasing and development of federal mineral estate require

multiple stages of BLM environmental analysis and authorization. Environmental review under the National Environmental Policy Act (NEPA) is required for the specific action proposed at the leasing and development stages.

I.4 DESCRIPTION OF THE PLANNING AREA AND DECISION AREA

The planning area is identical to the combined planning areas for the CRVFO RMP/EIS and the GJFO RMP/EIS. Within the CRVFO portion of the supplemental EIS planning area, approximately 494,160 acres of BLM-administered surface lands and approximately 695,210 acres of BLM-administered federal fluid mineral estate are in Eagle, Garfield, Mesa, Pitkin, and Routt Counties in Colorado. Within the GJFO portion of the planning area, approximately 1,060,900 acres of BLM-administered surface lands and approximately 1,226,450 acres of BLM-administered federal fluid mineral estate are in Garfield, Mesa, Montrose, and Rio Blanco Counties in Colorado.

The decision area is BLM-administered surface lands (BLM-administered lands) and the federal fluid mineral estate below BLM-administered lands, split-estate lands, and other federal lands (but not National Forest System lands). The acres are not identical to overall acres presented in the RMPs because of improved geographic information system (GIS) mapping, land exchanges, boundary adjustments, and updated public lands surveys. See **Figure I.8-1**, Planning Area, and **Figure I.8-2**, Decision Area.

I.5 FLUID MINERAL LEASING AND DEVELOPMENT

The BLM's fluid mineral leasing program includes several steps. The BLM identifies areas available for leasing in a land use plan (which is the RMP), as well as lease stipulations to be applied. This supplemental EIS analyzes areas available or not available for leasing. This supplemental EIS does not analyze lease stipulations; lease stipulations analyzed in the 2014 and 2015 Proposed RMPs/Final EISs will remain.

While implementing the approved land use plan, the BLM completes an environmental analysis (for example, an environmental assessment) for areas nominated for leasing (prior to a lease sale). The BLM also completes an environmental analysis for geophysical exploration and development.

Federal fluid mineral development represents about 20 percent of the total development (federal mineral and private minerals) in the CRVFO and GJFO boundaries. Private leases are not affected by any of the alternatives in the Final EISs or the two new alternatives considered in this supplemental EIS.

I.5.1 Reasonable Foreseeable Development

The BLM has evaluated the reasonable foreseeable development (RFD) scenarios for the 2014 and 2015 Proposed RMPs/Final EISs. An RFD is a projection of anticipated oil and gas exploration and/or development activity. An important component of RFDs is the mapping of differing levels of oil and gas development potential across a planning area. The BLM determined the two RFDs remain valid. The RFDs are based on geology, which remains constant, and the RFDs considered both conventional and Mancos Shale development. Projections in the RFDs are based largely on unconstrained development. Development is influenced by several factors, including the cyclical trends of commodity price, technological challenges, development costs, and geopolitical influences; each of these is subject to sudden and large fluctuations and unanticipated and protracted trends.

Maps of oil and gas development potential areas in the CRVFO RFD show four categories (high, medium, low, and no known potential), while maps in the GJFO RFD show six categories by adding very high and

very low. This supplemental EIS combines the GJFO “very high” with “high” and the “very low” with “low,” resulting in only high, medium, low, and no known potential. See **Figure 1.8-3**, Oil and Gas Development Potential in the Decision Area.

I.6 PLANNING ISSUES, PLANNING CRITERIA, AND LEGISLATIVE CONSTRAINTS

I.6.1 Planning Issues

The BLM shared preliminary planning issues during scoping (see **Section 4.2** for scoping information). The planning issues are:

- What are the environmental consequences of downstream combustion of the oil and gas resources available for development?
- What are the economic and environmental justice (EJ) impacts associated with potentially changing the availability of lands for oil and gas leasing? What are the impacts on affected biological, physical, and heritage resources, and special designations?
- What are the impacts on resource uses?

I.6.2 Planning Criteria

Planning criteria are the standards developed to guide development of the supplemental EIS and to define the decision space. Planning criteria are based on applicable law, director guidance, coordination with other agencies, and public participation (43 Code of Federal Regulation [CFR] 1610.4-2). Planning criteria in this supplemental EIS are also in response to the District Court, District of Colorado, opinion and order, and subsequent settlement agreement.

Planning criteria are used to ensure the supplemental EIS is tailored to the identified issues and to avoid unnecessary data collection and analysis. They also help guide the development of alternatives.

The supplemental EIS uses the following planning criteria:

- Lands covered in the supplemental EIS will be federal lands where the BLM makes mineral leasing decisions and split-estate lands with federal minerals.
- Consistent with the court order and settlement agreement, the supplemental EIS alternatives will consider which lands are allocated as open or closed to federal fluid mineral leasing (“reasonable alternatives to oil and gas leasing”).
- Consistent with the court order and settlement agreement, the supplemental EIS will quantify and reanalyze the indirect effects of greenhouse gas (GHG) emissions from the combustion of oil and gas that could be produced in the planning area.
- The analysis will be consistent with the level of analysis in the approved plans and in accordance with BLM-wide standards and program guidance.
- The supplemental EIS will comply with relevant requirements of NEPA, including requirements for public notice and comment.
- To the extent practical, the BLM will consider tribal, state, and local plans that are germane in the development of land use plans for public lands and, specifically, decisions in this supplemental EIS.

1.6.3 Legislative Constraints

The BLM administers public lands within a framework of numerous laws. The most comprehensive of these is the Federal Land Policy and Management Act of 1976 (FLPMA). All BLM policies, procedures, and management actions must be consistent with FLPMA and the other laws that govern use of public lands. In FLPMA, Congress established the principle of “multiple-use” management; this is defined, in part, as “management of the public lands and their various resource values so that they are utilized in the combination that will best meet the present and future needs of the American people.”

This supplemental EIS incorporates by reference the planning criteria and legislative constraints from the 2014 and 2015 Proposed RMPs/Final EISs (BLM 2014, Section 1.6, Planning Criteria and Legislative Constraints, pages 1-13 through 1-14; BLM 2015a, Section 1.7, Legislative Constraints and Planning Criteria, pages 1-12 through 1-16).

1.7 RELATED PLANS

Per FLPMA, the BLM coordinates planning efforts with land use planning and management programs of Native American tribes, other federal agencies, and agencies of state and local governments. While States are authorized to furnish advice regarding plans for the public lands, the Secretary of the Interior is directed to develop land use plans consistent with state and local plans to the maximum extent found consistent with federal law and the purposes of FLPMA.

The BLM has considered plans of other federal, state, and local agencies that are relevant in the development of this supplemental EIS. Not all the alternatives considered are consistent with each plan. Another consistency review will occur when developing the proposed alternative and ROD.

1.8 ACRE CALCULATIONS

Acres shown in chapters 2 and 3 are approximate. The BLM rounded acre calculations to the nearest 100 acres.

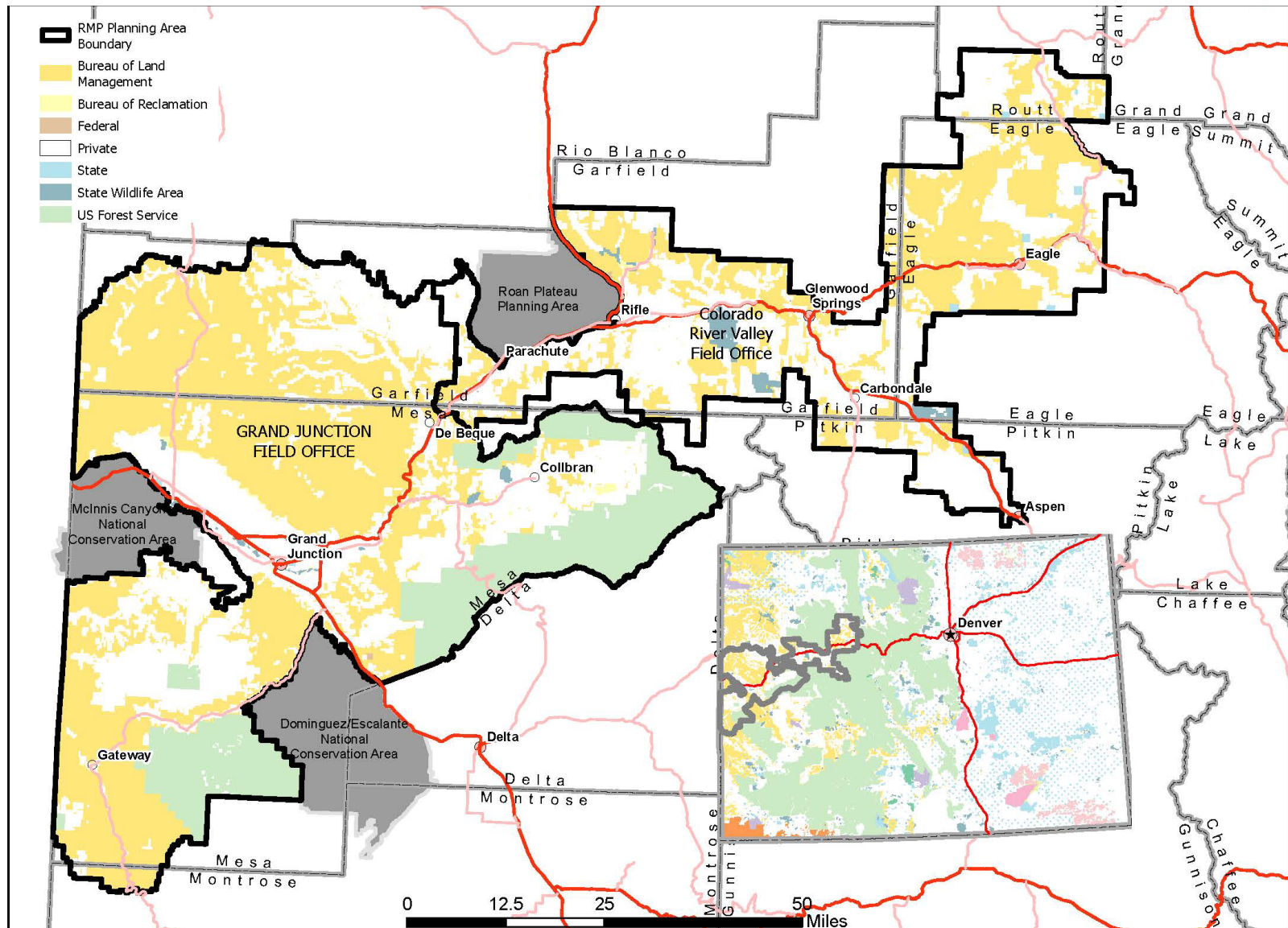


Figure I.8-1. Planning Area

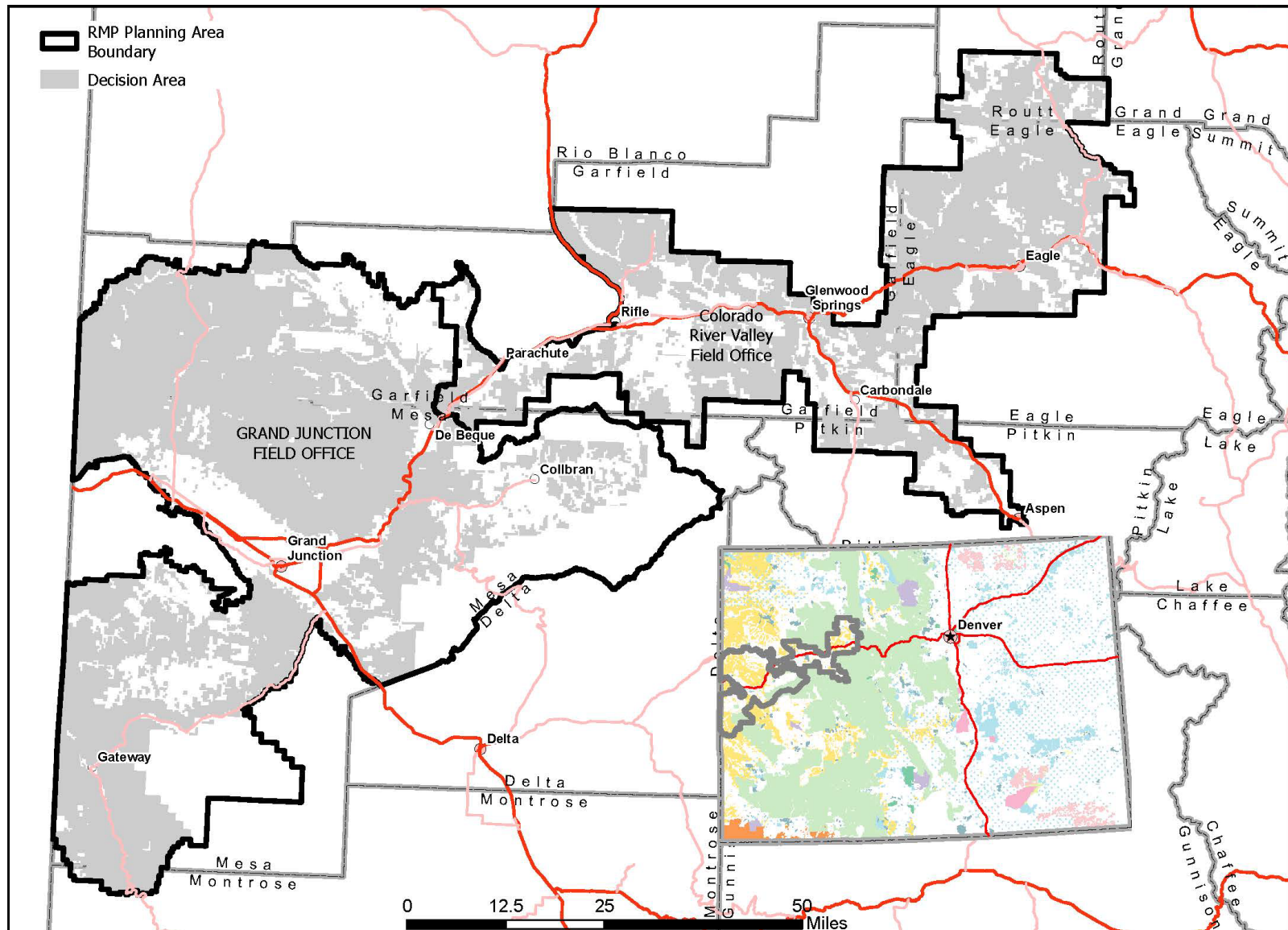


Figure I.8-2. Decision Area

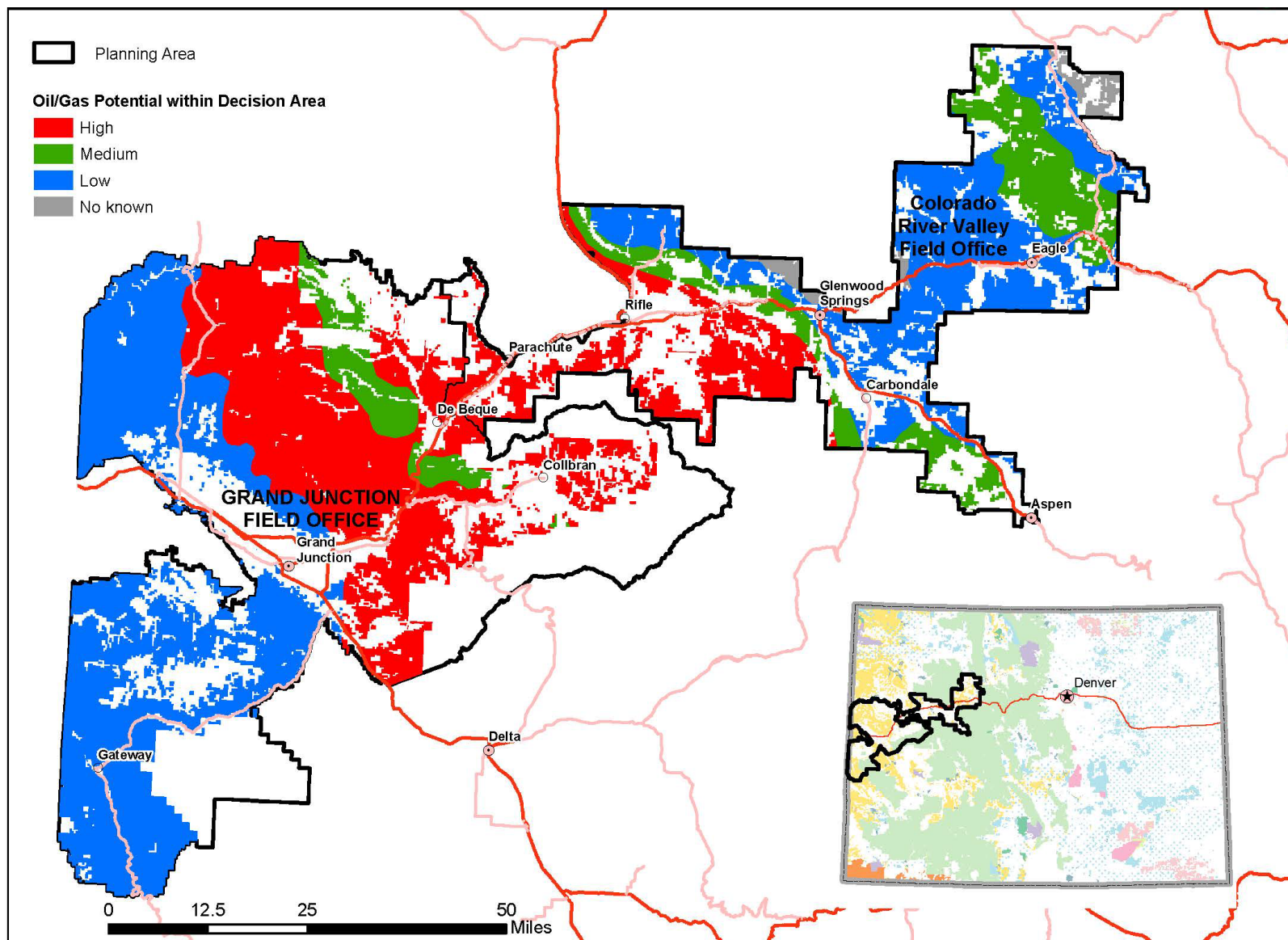


Figure I.8-3. Oil and Gas Development Potential in the Decision Area

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Chapter 2. Alternatives

2.1 INTRODUCTION

In this supplemental EIS, the BLM analyzed two new alternatives that were developed in consultation with cooperating agencies and comments received from the public during the scoping period. The supplemental EIS alternatives focus on fluid mineral leasing in response to the Federal District Court's order and the subsequent settlement agreement in *Wilderness Workshop v. BLM* (18-cv-00987).

The alternatives meet the purpose of and need for the supplemental EIS. The alternatives analyze areas open and closed to fluid mineral leasing. The alternatives will not reanalyze other potential decisions analyzed in the 2014 and 2015 Proposed RMPs/Final EISs.

2.2 ALTERNATIVES

2.2.1 Plaintiffs Merit Brief

Plaintiffs, in their merit brief, stated “it would have been entirely reasonable for BLM to consider an alternative eliminating oil and gas leasing in areas determined to have only moderate or low potential for oil and gas development.” The District Court for Colorado agreed with this statement and stated, “it seems a reasonable alternative would be to consider what else may be done with the low and medium-potential lands if they are not held open for leasing” (quoting *Rocky Mtn. Oil & Gas Ass'n v. Watt*, 696 F.2d 734, 738 n.4).

2.2.2 Big Game Corridors and Gunnison and Greater Sage-grouse RMP Amendments

The BLM is completing three separate RMP amendments for 1) big game corridors and other important habitat, 2) Gunnison Sage-grouse, and 3) Greater Sage-grouse. This supplemental EIS does not analyze fluid mineral leasing decisions for the specific purpose of the three RMP amendments. If this supplemental EIS is completed prior to the RMP amendments, the RMP amendments will amend the CRVFO and GJFO RMPs as appropriate. If any of the RMP amendments are approved prior to this supplemental EIS, those decisions will remain in effect, unless the supplemental EIS decision closes an area not closed by the RMP amendment decision.

2.2.3 Potential Land Use Planning Decision

The lands allocated as open or closed to fluid mineral leasing analyzed in the 2014 CRVFO Proposed RMP/Final EIS and the 2015 GJFO Proposed RMP/Final EIS (Alternatives A, B, C, and D), along with the new alternatives (E and F) presented in this supplemental EIS, constitute the range of alternatives considered. Alternative A (no action) from the 2014 and 2015 Proposed RMPs/Final EISs is considered the no-action alternative for this supplemental EIS. The alternatives from the 2014 CRVFO Proposed RMP/Final EIS and the 2015 GJFO Proposed RMP/Final EIS are incorporated by reference (BLM 2014, Alternatives, pages 2-33 through 2-146; BLM 2015a, Alternatives, pages 2-25 through 2-458).

The BLM considers all alternatives analyzed in this supplemental EIS to be reasonable. “Reasonable alternatives” means a range of alternatives that are technically and economically feasible and that meet the purpose of and need for the proposed action (40 CFR 1508.1(z)).

Table 2.3-1 (Summary Comparison of Alternatives for the CRVFO) and **Table 2.3-2** (Summary Comparison of Alternatives for the GJFO) in **Section 2.3** compare the range of alternatives, including the alternatives from the Final EISs (Alternatives A, B, C, and D) and the two new alternatives (E and F).

There would not be an amendment to the 2015 RODs. Rather, if lands allocated as open or closed to fluid mineral leasing change, the 2015 decisions regarding fluid mineral leasing would change, and the BLM would issue new RODs.

2.2.4 Alternative E

In consideration of the plaintiffs' merits brief, Alternative E considers, among other things, closing areas to future leasing based on no known, low, and medium oil and gas development potential. The goals and objective would be identical to the fluid minerals goals and objective stated in the two Proposed RMPs/Final EISs:

Goal: Provide opportunities for leasing, exploration, and development of fluid minerals using balanced multiple-use management to meet local and national energy needs (CRVFO).

Goal: Provide opportunities for environmentally responsible exploration and development of fluid mineral resources subject to appropriate BLM policies, laws, and regulations (GJFO).

Objective: Provide opportunities for orderly, economic, and environmentally sound exploration and development of oil and gas resources, using the best available technology (CRVFO and GJFO).

RFD documents developed for the 2015 RMPs identify areas with no known, low, medium, and high potential for oil and gas development (**Figure 1.8-3**).

Alternative E would close 568,300 acres in the CRVFO and 998,000 acres in the GJFO to future fluid mineral leasing. Alternative E would leave 143,000 acres in the CRVFO and 239,000 acres in the GJFO open to future fluid mineral leasing. Alternative E would close the no-known, low-, and medium-potential areas to future fluid mineral leasing. Also, Alternative E would close areas analyzed for closed to fluid mineral leasing under Alternative C of the 2014 CRVFO and 2015 GJFO Final EIS.

The high-potential areas would remain open for fluid mineral leasing, except for areas analyzed for closed to fluid mineral leasing under Alternative C of the Final EISs. See the alternative E column in **Table 2.3-1** (Summary Comparison of Alternatives for the CRVFO) and **Table 2.3-2** (Summary Comparison of Alternatives for the GJFO) for specific areas closed to future leasing. See **Figure 2.6-1**, Alternative E, Open and Closed to Fluid Mineral Leasing, for a visual representation of alternative E.

Alternative E would have the following exception to the closed to fluid mineral leasing: Leave geothermal resources open to leasing. Apply fluid mineral stipulations approved in the RMPs.

Alternative E would designate the potential areas of critical environmental concern (ACECs) that were analyzed as closed to leasing under Alternative C of the 2014 CRVFO Proposed RMP/Final EIS and 2015 GJFO Proposed RMP/Final EIS. ACEC management for the ACECs that would be closed to leasing would be as described under Alternative C of the CRVFO Proposed RMP/Final EIS and GJFO Proposed RMP/Final EIS. Alternative E would incorporate, by reference, Alternative C, Areas of Critical Environmental Concern, from the 2014 and 2015 Proposed RMPs/Final EISs (BLM 2014, Alternatives, Areas of Critical

Environmental Concern, pages 2-118 through 2-137; BLM 2015a, Alternatives, Areas of Critical Environmental Concern, pages 2-413 through 2-439). Material incorporated by reference is the management of each applicable ACEC.

Apart from fluid mineral leasing decisions, all existing management as described in the CRVFO and GJFO Approved RMPs, including applicable amendments, would remain in effect.

2.2.5 Alternative F

Alternative F is the alternative derived from public scoping comments.

The goals and objective would be identical to the goals and objective stated in the two Proposed RMPs/Final EISs:

Goal: Provide opportunities for leasing, exploration, and development of fluid minerals using balanced multiple-use management to meet local and national energy needs (CRVFO).

Goal: Provide opportunities for environmentally responsible exploration and development of fluid mineral resources subject to appropriate BLM policies, laws, and regulations (GJFO).

Objective: Facilitate orderly, economic, and environmentally sound exploration and development of oil and gas resources, using the best available technology (CRVFO and GJFO).

Alternative F would close 687,200 acres in the CRVFO and 1,157,000 acres in the GJFO to future fluid mineral leasing, and leave 24,100 acres in the CRVFO and 80,000 acres in the GJFO open to future fluid mineral leasing.

Alternative F would close the no-known, low-, and medium-potential areas to future fluid mineral leasing. Also, Alternative F would close the following to fluid mineral leasing:¹

- Areas analyzed as closed to fluid mineral leasing under Alternative C of the 2014 CRVFO and 2015 GJFO Final EIS (CRVFO, 130,000 acres; GJFO, 613,000 acres)
- The Baxter/Douglas Pass slump area and the Plateau Creek slump area (GJFO, 52,000 acres)
- Designated critical habitat for federally listed threatened and endangered species (CRVFO, 5,000 acres; GJFO, 30,000 acres)
- All inventoried lands that have wilderness characteristics (CRVFO, 101,000 acres; GJFO, 245,000 acres)
- All potential ACECs analyzed in the Proposed RMPs/Final EISs (CRVFO, 80,000 acres; GJFO, 165,000 acres)
- All special recreation management areas (SRMAs) designated in the RODs (CRVFO, 63,000 acres; GJFO, 87,000 acres)
- All designated extensive recreation management areas (ERMAs) (CRVFO, 41,000 acres; GJFO, 217,000 acres)

¹There is overlap of several areas in the list. Acres shown, if totaled, will exceed the total area that would be closed to fluid mineral leasing.

- Important bird areas: Colorado National Monument, Grand Valley riparian corridor, Rabbit Valley Recreation Management Area, and Unawep Seep Natural Area (GJFO, 15,800 acres)
- Native trout crucial habitat (CRVFO, 2,000 acres; GJFO, 800 acres)
- Dolores River corridor (GJFO, 213,200 acres)
- All eligible wild and scenic river (WSR) segments (CRVFO, 28,000 acres/56 miles; GJFO, 28,000 acres/85 miles)
- Areas of tribal significance (CRVFO, 5,000 acres; GJFO, 152,000 acres)
- Colorado Natural Heritage Program potential conservation areas with “outstanding biodiversity significance” (B1) and “very high biodiversity significance” (B2) (CRVFO, 29,000 acres; GJFO, 100,000 acres)
- Managed wildlife emphasis areas (GJFO, 150,000 acres)
- Two bighorn sheep production areas in high oil and gas development potential areas (along Plateau Creek northeast of Palisade; GJFO, 1,500 acres)
- Municipal watersheds and source water protection areas (**Table 2.3-2**; GJFO, 68,000 acres)
- Pyramid Rock ACEC expansion (GJFO, 14,100 acres)

Alternative F would have the following exception to closed to fluid mineral leasing: Leave geothermal resources open to leasing. Apply fluid mineral stipulations approved in the RMPs.

See the Alternative F column in **Table 2.3-1** (Summary Comparison of Alternatives for the CRVFO) and **Table 2.3-2** (Summary Comparison of Alternatives for the GJFO). See **Figure 2.6-2**, Alternative F, Open and Closed to Fluid Mineral Leasing, for a visual representation of Alternative F.

Alternative F would designate all potential ACECs analyzed under Alternative C of the 2014 CRVFO Proposed RMP/Final EIS and 2015 GJFO Proposed RMP/Final EIS. ACEC management would be as described under Alternative C of the CRVFO Proposed RMP/Final EIS and GJFO Proposed RMP/Final EIS, except Alternative F would replace fluid mineral stipulations with closed to fluid mineral leasing. Alternative F would incorporate by reference Alternative C, Areas of Critical Environmental Concern, from the 2014 and 2015 Proposed RMPs/Final EISs (BLM 2014, Alternatives, Areas of Critical Environmental Concern, pages 2-118 through 2-137; BLM 2015a, Alternatives, Areas of Critical Environmental Concern, pages 2-413 through 2-439). Material incorporated by reference is the management of each applicable ACEC.

Alternative F would designate a 14,100-acre expansion to the Pyramid Rock ACEC to preserve habitat for rare plant species and to protect paleontological and cultural resources. The expansion would be zone 2. Management within zone 2 would include:

- Limit travel to designated routes
- Issue no special recreation permits for competitive events
- Manage as a right-of-way (ROW) exclusion area (except allow for ROWs to existing oil and gas leases issued under the 1987 RMP without no surface occupancy [NSO] stipulations, including valid and existing rights for access to private property)
- Petition to the Secretary of the Interior for withdrawal from mineral entry

- Only allow vegetation treatments and wildlife habitat improvements that benefit and do not damage the identified relevant and important values for the ACEC
- Manage as closed to fluid mineral leasing
- Allowable use: STIPULATION NSO-12: ACECs
- Prohibit surface occupancy and surface-disturbing activities (refer to 2015 Proposed RMP Appendix B); standard exceptions apply (NSO stipulations in the GJFO apply to all activities)
- Manage as visual resource management (VRM) Class II (3,100 acres) and Class IV (11,000 acres) (identical to the current approved RMP)

Alternative F would designate areas found to possess wilderness characteristics in Castle Peak Addition lands with wilderness characteristics unit as a wilderness study area (WSA; 3,900 acres). The BLM would manage lands under BLM Manual 6330, Management of BLM Wilderness Study Areas, to maintain the area's suitability for preservation as wilderness. Management would include the following, among others: manage under VRM Class I objectives, prohibit motorized or mechanized travel, close to fluid mineral leasing, and apply stipulation CRVFO-NSO-29: Wilderness Study Areas, to prohibit surface occupancy and surface-disturbing activities in WSAs.

The BLM would determine the eligible WSR segments described under Alternative C of the 2014 CRVFO Proposed RMP/Final EIS and 2015 GJFO Proposed RMP/Final EIS as suitable for inclusion in the National Wild and Scenic River System (NWSRS). The BLM would assign interim protective management guidelines and the suitability classification determined in the CRVFO and GJFO Proposed RMP/Final EISs Alternative C. Alternative F would incorporate by reference Alternative C, Wild and Scenic Rivers, from the 2014 and 2015 Proposed RMPs/Final EISs (BLM 2014, Alternatives, Wild and Scenic Rivers, pages 2-140 through 2-141; BLM 2015a, Alternatives, Wild and Scenic Rivers, pages 2-448 through 2-450). Material incorporated by reference is the management guidelines and classification for each applicable segment.

The BLM would manage inventoried lands that have wilderness characteristics for the protection of their wilderness character. Management would be as described under Alternative C of the CRVFO Proposed RMP/Final EIS and GJFO Proposed RMP/Final EIS, except Alternative F would replace fluid mineral stipulations with closed to fluid mineral leasing. Alternative F would incorporate by reference Alternative C regarding lands with wilderness characteristics from the 2014 and 2015 Proposed RMPs/Final EISs (BLM 2014, Alternatives, Lands Proposed for the Protection of Wilderness Characteristics, pages 2-81 through 2-85; BLM 2015a, Alternatives, Lands with Wilderness Characteristics, pages 2-150 through 2-158). Material incorporated by reference is the management of lands with wilderness characteristics units.

2.3 SUMMARY COMPARISON OF ALTERNATIVES

Table 2.3-1 and **Table 2.3-2** summarize and compare alternative fluid mineral leasing decisions (open and closed to leasing) for the CRVFO and GJFO RMPs, respectively.

Table 2.3-1. Summary Comparison of Alternatives for the CRVFO

(No Action) Alternative A from the 2014 Proposed RMP/Final EIS	Alternative B (Became the Approved RMP)	Alternative C from the 2014 Proposed RMP/Final EIS	Alternative D from the 2014 Proposed RMP/Final EIS	Alternative E	Alternative F
Areas Closed to Fluid Mineral Leasing					
No similar action	No similar action	No similar action	No similar action	Oil and gas potential areas that are no-known, low, and medium potential	Oil and gas potential areas that are no-known, low, and medium potential
All WSAs	All WSAs	All WSAs	All WSAs	All WSAs	All WSAs
Lands within municipal boundaries	Lands within municipal boundaries	Lands within municipal boundaries	Lands within municipal boundaries	Lands within municipal boundaries	Lands within municipal boundaries
No similar action	SRMA: • Upper Colorado River	SRMA: • Upper Colorado River	SRMA: • Upper Colorado River	SRMA: • Upper Colorado River	SRMAs designated in the ROD: • Hardscrabble-East Eagle • King Mountain • Red Hill • The Crown • Upper Colorado River
No similar action	No similar action	No similar action	No similar action	No similar action	ERMAs designated in the ROD: • Bocco Mountain • Eagle River • Gypsum Hills • New Castle • Silt Mesa • Thompson Creek

(No Action) Alternative A from the 2014 Proposed RMP/Final EIS	Alternative B (Became the Approved RMP)	Alternative C from the 2014 Proposed RMP/Final EIS	Alternative D from the 2014 Proposed RMP/Final EIS	Alternative E	Alternative F
Thompson Creek Natural Environment Area (part of the ACEC)	ACECs: <ul style="list-style-type: none"> • Blue Hill • Bull Gulch • Deep Creek • Thompson Creek 	ACECs: <ul style="list-style-type: none"> • Blue Hill • Bull Gulch • Deep Creek • Greater Sage- grouse Habitat • Thompson Creek 	ACECs: <ul style="list-style-type: none"> • Blue Hill • Bull Gulch • Thompson Creek 	Same as Alternative C	ACECs: <ul style="list-style-type: none"> • Abrams Creek • Blue Hill • Bull Gulch • Colorado River Seeps • Deep Creek • Dotsero Crater • Glenwood Springs Debris Flow Hazard Zones • Grand Hogback • Greater Sage-grouse Habitat • Hardscrabble- East Eagle • Lyons Gulch • McCoy Fan Delta • Mount Logan Foothills • Sheep Creek Uplands • The Crown Ridge • Thompson Creek

(No Action) Alternative A from the 2014 Proposed RMP/Final EIS	Alternative B (Became the Approved RMP)	Alternative C from the 2014 Proposed RMP/Final EIS	Alternative D from the 2014 Proposed RMP/Final EIS	Alternative E	Alternative F
No similar action	Lands managed for wilderness characteristics: <ul style="list-style-type: none"> • Castle Peak Addition • Deep Creek • Flat Tops Addition • Pisgah Mountain • Thompson Creek 	Lands managed for wilderness characteristics: <ul style="list-style-type: none"> • Castle Peak Addition • Deep Creek • Flat Tops Addition • Grand Hogback • Pisgah Mountain • Thompson Creek 	No similar action	Same as Alternative C	<p>Inventoried lands the BLM documented to have wilderness characteristics:</p> <ul style="list-style-type: none"> • Castle Peak Addition • Deep Creek • East Fork • Flat Tops Addition • Grand Hogback • Pisgah Mountain • Northeast Cliffs • Thompson Creek <p>Citizens' inventory work (if the BLM documents these to have wilderness characteristics):</p> <ul style="list-style-type: none"> • Blowout Hill • Bull Gulch Contiguous • Hogback East • King Mountain • Lucky Gulch • Red Hill West <p>Other areas the BLM may document during inventory.</p>
No eligible or suitable NWSRS segments	<p>Deep Creek segments found suitable for inclusion in the NWSRS</p> <p>Two Colorado River segments found eligible for inclusion in the NWSRS</p>	13 stream segments found suitable for inclusion in the NWSRS	No eligible or suitable NWSRS segments	Same as Alternative C	Same as Alternative C
No similar action	All State wildlife areas (SWAs)	Same as Alternative B	No similar action	Same as Alternative B	Same as Alternative B

(No Action) Alternative A from the 2014 Proposed RMP/Final EIS	Alternative B (Became the Approved RMP)	Alternative C from the 2014 Proposed RMP/Final EIS	Alternative D from the 2014 Proposed RMP/Final EIS	Alternative E	Alternative F
No similar action	No similar action	No similar action	No similar action	No similar action	Designated critical habitat for threatened and endangered species
No similar action	No similar action	No similar action	No similar action	No similar action	Native trout crucial habitat
No similar action	No similar action	No similar action	No similar action	No similar action	Colorado Natural Heritage Program potential conservation areas with “outstanding biodiversity significance” (B1) and “very high biodiversity significance” (B2)

Table 2.3-2. Summary Comparison of Alternatives for the GJFO

(No Action) Alternative A from the 2015 Proposed RMP/Final EIS	Alternative B (Became the Approved RMP)	Alternative C from the 2015 Proposed RMP/Final EIS	Alternative D from the 2015 Proposed RMP/Final EIS	Alternative E	Alternative F
Areas Closed to Fluid Mineral Leasing					
No similar action	No similar action	No similar action	No similar action	Oil and gas potential areas that are no-known, low, and medium potential	Oil and gas potential areas that are no-known, low, and medium potential
All WSAs	All WSAs	All WSAs	All WSAs	All WSAs	All WSAs
No similar action	SRMAs: • Bangs • Dolores River Canyon • Palisade Rim	SRMAs: • Bangs • North Fruita Desert Recreation Management Zone I	No similar action	Same as Alternative C	SRMAs designated in the ROD: • Bangs • Dolores River Canyon • Grand Valley • North Fruita Desert • Palisade Rim
No similar action	No similar action	No similar action	No similar action	No similar action	ERMAs designated in the ROD: • Barrel Springs • Gateway • Grand Valley Shooting Ranges • Gunnison River Bluffs • Horse Mountain • North Desert

(No Action) Alternative A from the 2015 Proposed RMP/Final EIS	Alternative B (Became the Approved RMP)	Alternative C from the 2015 Proposed RMP/Final EIS	Alternative D from the 2015 Proposed RMP/Final EIS	Alternative E	Alternative F
ACEC: <ul style="list-style-type: none"> • Unaweep Seep 	ACECs: <ul style="list-style-type: none"> • Badger Wash • Dolores River Riparian • Juanita Arch • Rough Canyon • Sinbad Valley • The Palisade • Unaweep Seep 	ACECs: <ul style="list-style-type: none"> • Atwell Gulch (includes the split-estate) • Badger Wash • Dolores River Riparian • Glade Park–Pinyon Mesa (includes the split-estate) • John Brown Canyon • Juanita Arch • Mt. Garfield • Plateau Creek (the approximately 200 acres of split-estate) • Prairie Canyon • Pyramid Rock • Roan and Carr Creeks • Rough Canyon • Sinbad Valley • South Shale Ridge • The Palisade • Unaweep Seep 	ACEC: <ul style="list-style-type: none"> • Unaweep Seep 	Same as Alternative C	ACECs: <ul style="list-style-type: none"> • Atwell Gulch (includes the split-estate) • Badger Wash • Colorado River Riparian • Coon Creek • Dolores River Riparian • Glade Park–Pinyon Mesa (includes the split-estate) • Gunnison River Riparian • Hawxhurst Creek • Indian Creek • John Brown Canyon • Juanita Arch • Mt. Garfield • Nine-mile Hill Boulders • Plateau Creek (the approximately 200 acres of split-estate) • Prairie Canyon • Pyramid Rock • Pyramid Rock Expansion • Reeder Mesa • Roan and Carr Creeks • Rough Canyon • Sinbad Valley • South Shale Ridge • The Palisade • Unaweep Seep

(No Action) Alternative A from the 2015 Proposed RMP/Final EIS	Alternative B (Became the Approved RMP)	Alternative C from the 2015 Proposed RMP/Final EIS	Alternative D from the 2015 Proposed RMP/Final EIS	Alternative E	Alternative F
No similar action	Lands managed for wilderness characteristics: <ul style="list-style-type: none"> • Bangs • Maverick • Unaweep 	Lands managed for wilderness characteristics: <ul style="list-style-type: none"> • Bangs Canyon (includes the split-estate) • East Demaree Canyon • East Salt Creek • Hunter Canyon (includes the split-estate) • Kings Canyon • Lumsden Canyon • Maverick • South Shale Ridge • Spink Canyon • Spring Canyon • Unaweep • West Creek (adjacent) 	No similar action	Same as Alternative C	<p>Inventoried lands the BLM documented to have wilderness characteristics:</p> <ul style="list-style-type: none"> • Bangs Canyon (includes the split-estate) • Book Cliffs South • DeBeque Rim • Demaree South • East Demaree • East Salt Creek • Head of Main Canyon • Hunter Canyon (includes the split-estate) • Kings Canyon • Lumsden Canyon • Maverick • Pine Ridge • Redrock • South Shale Ridge • Spink Canyon • Spring Canyon • Unaweep • West Creek (adjacent) • Winter Flats <p>Citizens' inventory work (if the BLM documents these to have wilderness characteristics):</p> <ul style="list-style-type: none"> • Cone Mountain Canyons <p>Other areas the BLM may document during inventory.</p> <p>14 stream segments found eligible for inclusion in the NWSRS</p>
No similar action	No similar action	No similar action	No similar action	No similar action	14 stream segments found eligible for inclusion in the NWSRS

(No Action) Alternative A from the 2015 Proposed RMP/Final EIS	Alternative B (Became the Approved RMP)	Alternative C from the 2015 Proposed RMP/Final EIS	Alternative D from the 2015 Proposed RMP/Final EIS	Alternative E	Alternative F
No similar action	No similar action	Dolores River corridor	No similar action	Same as Alternative C	Dolores River corridor (as described under Alternative C plus remaining corridor)
No similar action	Gunnison Sage-grouse critical habitat	Occupied Gunnison and Greater Sage-grouse habitat	No similar action	Same as Alternative C	Same as Alternative C
No similar action	No similar action	Wildlife emphasis areas: <ul style="list-style-type: none"> • Beehive • Blue Mesa • Bull Hill • Casto • East Salt Creek • Indian Point • Prairie Canyon (includes the split-estate) • Rapid Creek • South Shale Ridge • Timber Ridge 	No similar action	Same as Alternative C	Wildlife emphasis areas: All areas identified for management in the ROD: <ul style="list-style-type: none"> • Beehive • Blue Mesa • Bull Hill • East Salt Creek • Glade Park • Prairie Canyon (includes the split-estate) • Rapid Creek • Sunnyside • Timber Ridge • Winter Flats
No similar action	No similar action	Little Book Cliffs Wild Horse Range (LBCWHR)	No similar action	Same as Alternative C	Same as Alternative C
No similar action	No similar action	SWAs: <ul style="list-style-type: none"> • Horsethief Canyon • Jerry Creek Reservoir • Plateau Creek 	No similar action	Same as Alternative C	Same as Alternative C
No similar action	No similar action	State parks: <ul style="list-style-type: none"> • Highline • Vega 	No similar action	Same as Alternative C	Same as Alternative C

(No Action) Alternative A from the 2015 Proposed RMP/Final EIS	Alternative B (Became the Approved RMP)	Alternative C from the 2015 Proposed RMP/Final EIS	Alternative D from the 2015 Proposed RMP/Final EIS	Alternative E	Alternative F
No similar action	Municipal watersheds: <ul style="list-style-type: none"> • Grand Junction • Palisade 	Municipal watersheds: <ul style="list-style-type: none"> • Grand Junction • Palisade • Jerry Creek • Mesa/Powderhorn source water protection area • Collbran source water protection area 	No similar action	Same as Alternative C	Municipal watersheds: <ul style="list-style-type: none"> • Grand Junction • Palisade • Jerry Creek • Mesa/Powderhorn source water protection area • Collbran source water protection area • Half-mile buffer to fluid mineral leasing, 5 miles upstream (within the GJFO boundaries) for four municipal water diversions on the Colorado and Gunnison River: Grand Junction, Clifton, Ute Water Conservation District, and De Beque
No similar action	Bureau of Reclamation (BOR) withdrawals where the surface estate is managed by the BLM	Same as Alternative B	Same as Alternative B	Same as Alternative B	Same as Alternative B
No similar action	BOR withdrawals where the surface is managed by the BOR	Same as Alternative B	Same as Alternative B	Same as Alternative B	Same as Alternative B
No similar action	No similar action	No similar action	No similar action	No similar action	WSRs: 14 stream segments found suitable for inclusion in the NWSRS, as identified in Proposed RMP Alternative C

(No Action) Alternative A from the 2015 Proposed RMP/Final EIS	Alternative B (Became the Approved RMP)	Alternative C from the 2015 Proposed RMP/Final EIS	Alternative D from the 2015 Proposed RMP/Final EIS	Alternative E	Alternative F
No similar action	No similar action	No similar action	No similar action	No similar action	Slump hazard areas as identified by the NSO in the ROD: <ul style="list-style-type: none"> • Baxter/Douglas Pass slump area • Plateau Creek slump area
No similar action	No similar action	No similar action	No similar action	No similar action	Designated critical habitat for threatened and endangered species
No similar action	No similar action	No similar action	No similar action	No similar action	Native trout crucial habitat
No similar action	No similar action	No similar action	No similar action	No similar action	Colorado Natural Heritage Program potential conservation areas with “outstanding biodiversity significance” (B1) and “very high biodiversity significance” (B2)
No similar action	No similar action	No similar action	No similar action	No similar action	Important bird areas: <ul style="list-style-type: none"> • Grand Valley Riparian Corridor • Colorado National Monument • Unaweeep Seep Natural Area • Rabbit Valley Recreation Management Area
No similar action	No similar action	No similar action	No similar action	No similar action	Two bighorn sheep production areas in high oil and gas potential areas along Plateau Creek northeast of Palisade

2.4 PREFERRED ALTERNATIVE

The BLM has identified Alternative E as the agency's preferred alternative. The BLM will develop the proposed alternative for the final supplemental EIS. The proposed alternative in the Final EIS could be the preferred alternative presented in this draft supplemental EIS, or it may draw from a combination of components from all alternatives (Alternatives A, B, C, and D from the 2014 and 2015 Proposed RMPs/Final EISs and Alternatives E and F in this supplement).

2.5 ALTERNATIVES CONSIDERED BUT ELIMINATED FROM FURTHER CONSIDERATION

2.5.1 Alternatives Received from Public Scoping

Individuals, organizations, counties, and federal agencies submitted comments during the public scoping period. Comments included recommended areas to analyze as closed to fluid mineral leasing. The BLM did not carry some recommended areas into Alternatives E or F, as described in **Table 2.5-1**, below.

Table 2.5-1. Public Scoping Areas Proposed for Fluid Mineral Lease Closure

Area Proposed for Fluid Mineral Lease Closure	BLM Rationale for Not Including the Area in an Alternative
No leasing anywhere (no-leasing alternative)	A no-leasing alternative would be very similar to Alternative F, which would close 95 percent of the decision area to future fluid mineral leasing. Also, much of the high-potential area currently has existing leases; not having the ability to consider leasing parts of the remaining area would hinder orderly development.
Close areas with sensitive soils (steep slopes and saline soils)	<p>Steep slopes are generally small areas. They are not consistent across the landscape, and they are difficult to map accurately. Slopes need to be verified in the field. The CRVFO and GJFO both have NSO stipulations for steep slopes.</p> <p>Saline soils, while many times covering large areas, also have sharp deviations on the edges, often jutting well into or out of a polygon, making these areas less feasible for no leasing. Also, much of the concern with saline soils is on slopes (moderate or steep), which need verification in the field. Much of the saline soil area is covered by other factors under Alternative F.</p>
Close wetlands, riparian areas, streams, stream crossings, and meadows	<p>Wetlands and riparian areas are generally small areas not feasible to map as no leasing; they need to be verified and mapped in the field. Intermittent and ephemeral streams are narrow, linear features that are hard to map accurately and need verification in the field.</p> <p>Stream crossings are too small to include as no leasing. The BLM can keep oil and gas wells away from streams and stream crossings during the application for permit to drill stage.</p> <p>Meadows are generally small and should be mapped in the field.</p> <p>The CRVFO and GJFO each have an NSO stipulation for a variety of waterbodies, wetlands, riparian areas, streams, and rivers that can be applied at the leasing stage.</p>

Area Proposed for Fluid Mineral Lease Closure	BLM Rationale for Not Including the Area in an Alternative
Close critical Gunnison Sage-grouse habitat within 4 miles of leks	The BLM is currently developing an EIS for RMP amendments for Gunnison Sage-grouse and Greater Sage-grouse.
Close occupied Greater Sage-grouse habitat within 4 miles of leks	Because the BLM has ongoing planning efforts comprehensively considering the management of Gunnison and Greater Sage-grouse, the BLM will consider appropriate management actions in those specific EISs, rather than in this supplemental EIS, to avoid conflicting decisions and to address management of those resources more comprehensively.
Close critical or occupied Gunnison Sage-grouse habitat	The BLM is currently developing an EIS for an RMP amendment for big game corridors and other important habitat.
Close high-priority habitats defined by Colorado Parks and Wildlife (CPW) as part of the recent Colorado Oil and Gas Conservation Commission (COGCC) rulemakings	Because the BLM has an ongoing planning effort comprehensively considering the management of big game and their corridors and habitat in relation to fluid mineral management, the BLM will consider appropriate management actions in that specific EIS, rather than in this supplemental EIS, to avoid conflicting decisions and to address management of those resources more comprehensively.
Close areas identified by the State of Colorado as containing important big game winter range and migration corridors in response to Secretarial Order 3362	The BLM is currently developing an EIS for an RMP amendment for big game corridors and other important habitat.
Close critical big game habitat: core areas, corridors, and critical winter range	Because the BLM has an ongoing planning effort comprehensively considering the management of big game and their corridors and habitat in relation to fluid mineral management, the BLM will consider appropriate management actions in that specific EIS, rather than in this supplemental EIS, to avoid conflicting decisions and to address management of those resources more comprehensively.
Close areas in Representative D. DeGette's Wilderness Bill, US House of Representatives (HR) 803	The areas proposed for wilderness in HR 803 are currently within the areas that would be closed to leasing under Alternatives E and F. These areas are also within the inventoried lands that have wilderness analyzed under Alternative F. Alternative F includes no leasing on all lands inventoried to have wilderness characteristics.
Designate new backcountry conservation areas	Backcountry conservation areas were not a BLM designation in 2015. The BLM began consideration and establishment of backcountry conservation areas in 2017. Since the BLM did not analyze backcountry conservation areas in the 2014 and 2015 Proposed RMPs/Final EISs, and because designating backcountry conservation areas is outside the scope of this supplemental EIS, backcountry conservation areas were eliminated from consideration in the alternatives.
Apply compensatory mitigation appropriate to offset development impacts resulting from existing and future oil and gas drilling	Building compensatory mitigation into alternatives does not meet the purpose of and need for this supplemental EIS. The CRVFO and GJFO will rely on the mitigation identified in the two RODs for their RMPs.

2.6 SUMMARY OF IMPACTS

The 2014 CRVFO and the 2015 GJFO Final EISs provide a comparison of effects of Alternatives A through D. Alternative E would close more area to future oil and gas leasing than Alternatives A, B, C, or D. Alternative F would close the most area. See **Table 2.6-1**, Acres Open and Closed to Future Oil and Gas Leasing by Alternative.

The CRVFO Proposed RMP/Final EIS assumes 5,318 wells could potentially be drilled over a 20-year period. The GJFO Proposed RMP/Final EIS assumes 3,940 wells could potentially be drilled over a 20-year period. The potential number of wells reduced (forgone) because of restrictions by alternative is shown in the following table. **Table 2.6-2** shows the total for the combined field offices over a 20-year period and the number per year.

Table 2.6-1. Acres Open and Closed to Future Oil and Gas Leasing by Alternative

Alternative	CRVFO		GJFO	
	Open	Closed	Open	Closed
A	682,600	28,700	1,138,900	96,700
B	617,700	93,600	993,300	242,300
C	568,000	143,300	614,400	621,200
D	655,000	56,300	1,131,300	104,300
E	143,000	568,300	239,000	998,000
F	24,200	687,100	87,100	1,149,900

Table 2.6-2. Potential Number of Wells Forgone over 20 Years and per Year

	Alternative					
	A	B	C	D	E	F
CRVFO	0	56	56	0	58	76
GJFO	0	3	369	5	541	703
Total	0	59	425	5	599	779
Per year	0	2.95	21.25	0.25	29.95	38.94

There would potentially be fewer impacts on resources, recreation, and special designations under Alternative E than under Alternatives A, B, C, or D since more area would be closed to future oil and gas leasing. Alternative F would have the fewest impacts for the same reason.

Alternatives E and F would have the greatest reduced annual economic effects because of forgone wells (**Appendix D**, Table D-2). Alternative F would have the greatest reduction.

Under Alternatives E and F, EJ populations could be impacted should there be a sudden decline in the availability of employment opportunities for workers in these communities; this could result in geographic displacement of the labor force needed to support oil and gas development. Consequently, disparate impacts on the 15 populations identified for Environmental Justice concern would be possible (see **Section 3.9.3**).

Populations living or working near drilling and development could be exposed to hazardous materials or be affected by local air quality. Best management practices (BMPs) applied at the site-specific level as stipulations to future development under any alternative could mitigate some impacts on affected populations.

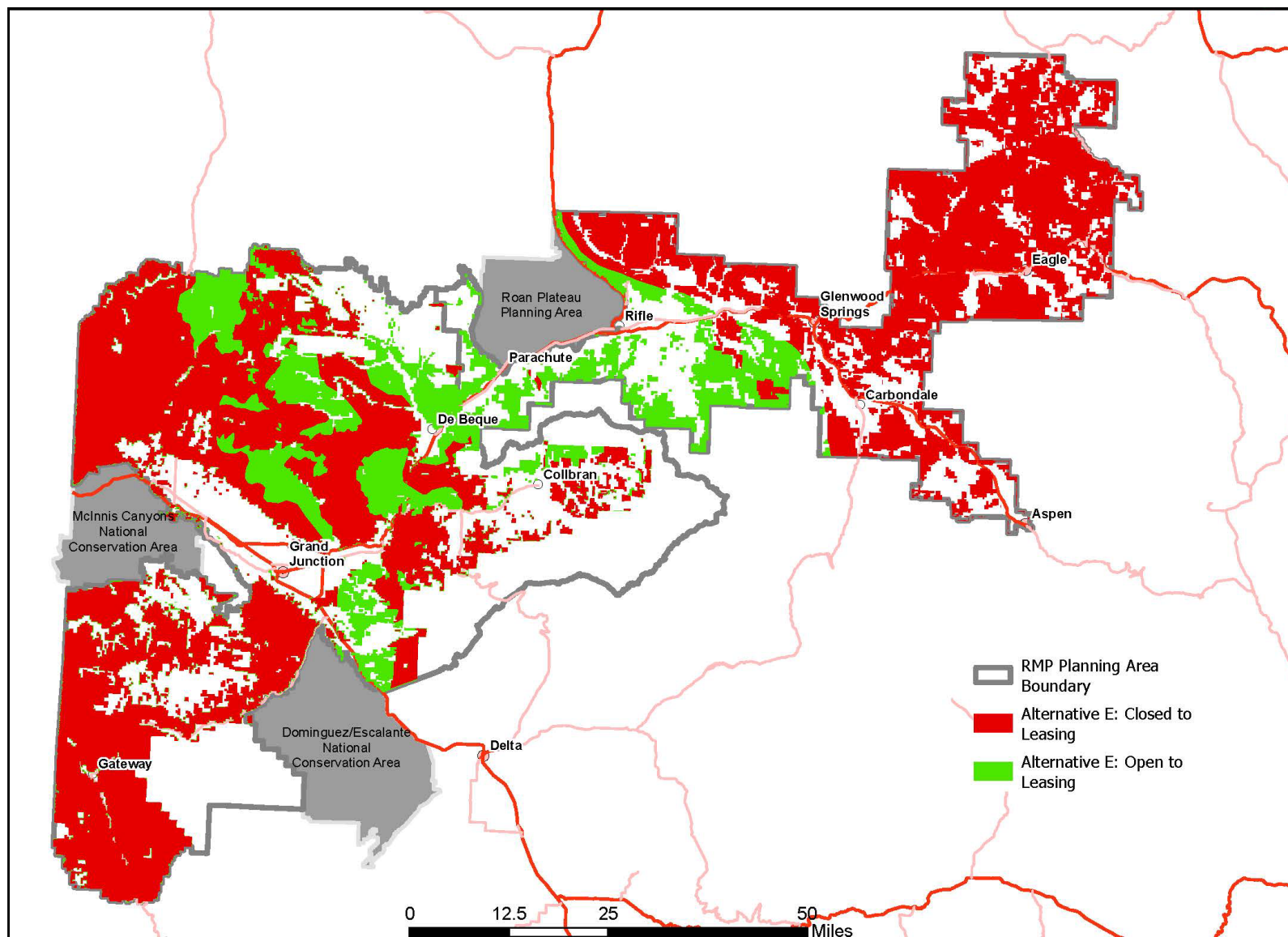


Figure 2.6-1. Alternative E, Open and Closed to Fluid Mineral Leasing

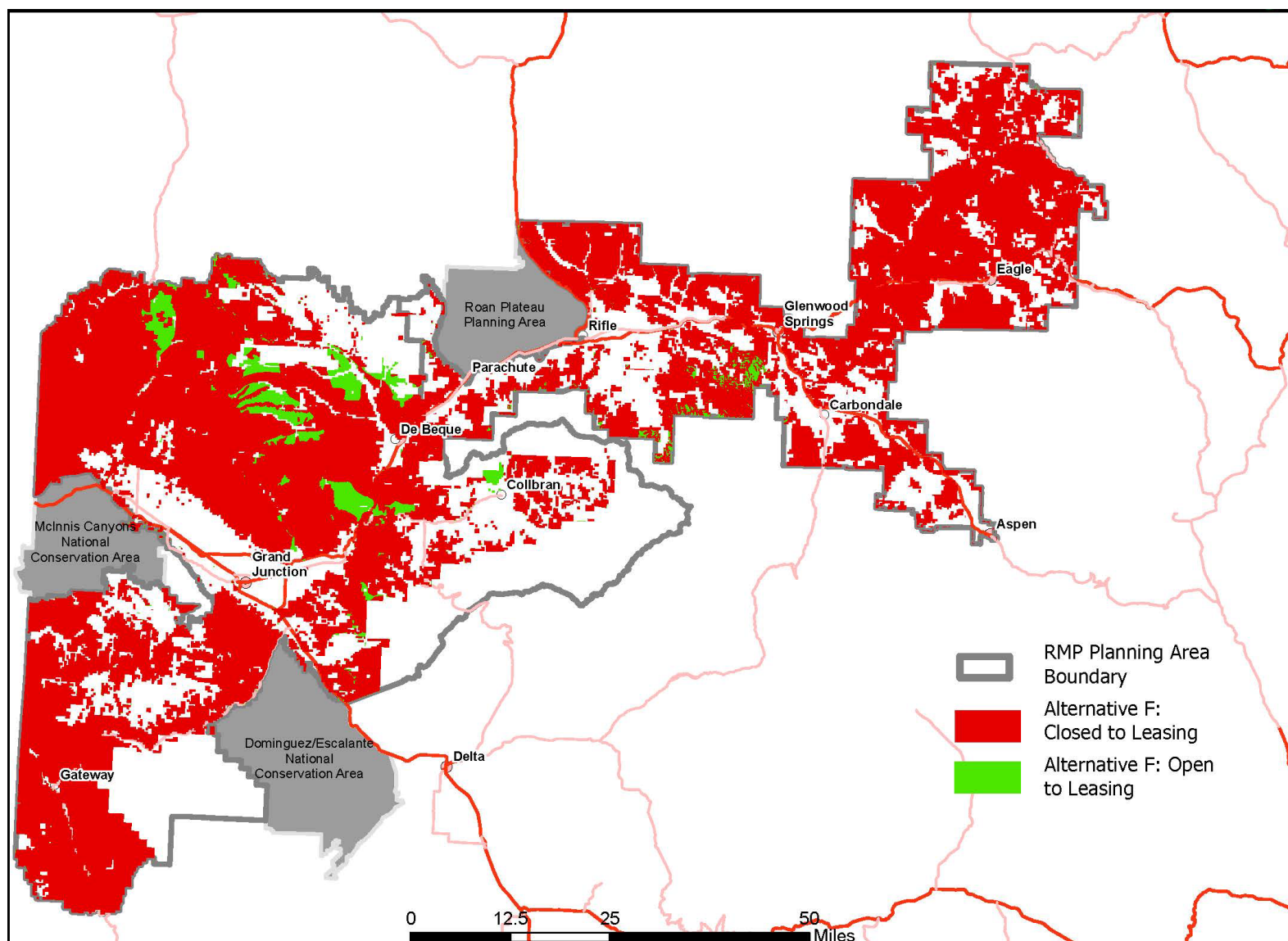


Figure 2.6-2. Alternative F, Open and Closed to Fluid Mineral Leasing

Chapter 3. Affected Environment and Environmental Consequences

3.1 INTRODUCTION

Chapter 3 describes the existing biological, physical, heritage, and socioeconomic characteristics of the planning or decision area, including human uses that could be affected. It also evaluates the impacts of implementing the proposed alternatives.

3.2 AFFECTED ENVIRONMENT

The 2014 CRVFO and 2015 GJFO Proposed RMPs/Final EISs describe the baseline conditions (BLM 2014, 2015a). Because the two Proposed RMPs/Final EISs describe the baseline conditions in detail, this supplemental EIS incorporates by reference those conditions and provides descriptions of those resources that have new or updated information. Incorporated material is cited in the following sections.

3.3 RESOURCES, RESOURCE USES, AND SPECIAL DESIGNATIONS ELIMINATED FROM FURTHER ANALYSIS

The BLM evaluated resources, resource uses, and special designations for issues and impacts that could affect a potential decision for the supplemental EIS. In many cases, the impacts would be identical to those described in the two Proposed RMPs/Final EISs but would occur over a smaller area roughly equal to the open area for Alternatives E or F. For certain resources, resource uses, and special designations, the BLM has not identified information that is new since the two Final EISs and that is relevant to the analysis of the resources, uses, and designations.

The BLM eliminated the resources, resource uses, and special designations in **Table 3.3-1** from further analysis. Information regarding the affected environment and impacts from the 2014 and 2015 Proposed RMPs/Final EISs is incorporated by reference.

Table 3.3-1. Resources, Resource Uses, and Special Designations Eliminated from Further Analysis

Resource, Resource Use, Special Designation	Incorporate by Reference from 2014 and 2015 Proposed RMPs/Final EISs	Reason Eliminated from Further Analysis
Paleontological Resources	<p><u>Affected Environment</u> 2014 CRVFO Proposed RMP/Final EIS (BLM 2014), Paleontological Resources, pages 3-114 through 3-118. 2015 GJFO Proposed RMP/Final EIS (BLM 2015a), Paleontological Resources, pages 3-139 through 3-144. <u>Direct and Indirect Impacts</u> 2014 CRVFO Proposed RMP/Final EIS (BLM 2014), Paleontological Resources, pages 4-381 through 4-384. 2015 GJFO Proposed RMP/Final EIS (BLM 2015a), Paleontological Resources, pages 4-252 through 4-263.</p>	<p>Impacts would be similar to those described in the two Proposed RMPs/Final EISs but would occur over a smaller area than under Alternatives A, B, C, and D. The BLM does not have new or updated information for the resource that would change the analysis.</p>
Wildland Fire Management	<p><u>Affected Environment</u> 2014 CRVFO Proposed RMP/Final EIS (BLM 2014), Wildland Fire Management, pages 3-125 through 3-129. 2015 GJFO Proposed RMP/Final EIS (BLM 2015a), Wildland Fire Management, pages 3-121 through 3-128. <u>Direct and Indirect Impacts</u> 2014 CRVFO Proposed RMP/Final EIS (BLM 2014), Wildland Fire Management, pages 4-402 through 4-419. 2015 GJFO Proposed RMP/Final EIS (BLM 2015a), Wildland Fire Management, pages 4-278 through 4-287.</p>	<p>Impacts would be similar to those described in the two Proposed RMPs/Final EISs but would occur over a smaller area than under Alternatives A, B, C, and D. The BLM does not have new or updated information for the resource that would change the analysis.</p>
Forestry	<p><u>Affected Environment</u> 2014 CRVFO Proposed RMP/Final EIS (BLM 2014), Forestry, pages 3-142 through 3-144. 2015 GJFO Proposed RMP/Final EIS (BLM 2015a), Forestry, pages 3-155 through 3-161. <u>Direct and Indirect Impacts</u> 2014 CRVFO Proposed RMP/Final EIS (BLM 2014), Forestry, pages 4-450 through 4-471. 2015 GJFO Proposed RMP/Final EIS (BLM 2015a), Forestry, pages 4-298 through 4-305.</p>	<p>Impacts would be similar to those described in the two Proposed RMPs/Final EISs but would occur over a smaller area than under Alternatives A, B, C, and D. The BLM does not have new or updated information for the resource that would change the analysis.</p>

3. Affected Environment and Environmental Consequences (Resources, Resource Uses, and Special Designations Eliminated from Further Analysis)

Resource, Resource Use, Special Designation	Incorporate by Reference from 2014 and 2015 Proposed RMPs/Final EISs	Reason Eliminated from Further Analysis
Livestock Grazing	<p><u>Affected Environment</u> 2014 CRVFO Proposed RMP/Final EIS (BLM 2014), Livestock Grazing, pages 3-145 through 3-148; Appendix I, Grazing Allotments. 2015 GJFO Proposed RMP/Final EIS (BLM 2015a), Livestock Grazing, pages 3-161 through 3-165; Appendix J, Allotments and Allotment Management.</p> <p><u>Direct and Indirect Impacts</u> 2014 CRVFO Proposed RMP/Final EIS (BLM 2014), Livestock Grazing, pages 4-472 through 4-483. 2015 GJFO Proposed RMP/Final EIS (BLM 2015a), Livestock Grazing, pages 4-305 through 4-321.</p>	<p>Impacts would be similar to those described in the two Proposed RMPs/Final EISs but would occur over a smaller area than under Alternatives A, B, C, and D. The BLM does not have new or updated information for the resource that would change the analysis.</p>
Cave and Karst Resources	<p><u>Affected Environment</u> 2014 CRVFO Proposed RMP/Final EIS (BLM 2014), Cave and Karst Resources, pages 3-140 through 3-141; Appendix D, Management and Setting prescriptions for caves.</p> <p><u>Direct and Indirect Impacts</u> 2014 CRVFO Proposed RMP/Final EIS (BLM 2014), Cave and Karst Resources, pages 4-443 through 4-449.</p>	<p>Cave and karst resources are either currently closed to leasing or have an NSO stipulation. Impacts would be similar to those described in the two Proposed RMPs/Final EISs but would occur over a smaller area than under Alternatives A, B, C, and D. The BLM does not have new or updated information for the resource that would change the analysis. The GJFO does not manage cave and karst resources.</p>
Comprehensive Trails and Travel Management	<p><u>Affected Environment</u> 2014 CRVFO Proposed RMP/Final EIS (BLM 2014), Comprehensive Trails and Travel Management, pages 3-159 through 3-166. 2015 GJFO Proposed RMP/Final EIS (BLM 2015a), Comprehensive Travel and Transportation Management, pages 3-197 through 3-206.</p> <p><u>Direct and Indirect Impacts</u> 2014 CRVFO Proposed RMP/Final EIS (BLM 2014), Comprehensive Trails and Travel Management, pages 4-538 through 4-553. Comprehensive Trails and Travel Management is analyzed within many other resources and uses in the 2015 GJFO Proposed RMP/Final EIS (BLM 2015a).</p>	<p>Planning-level decisions include areas open, closed, or limited to motorized uses as well as seasonal closures to motorized and mechanized uses. The BLM does not have new or updated information for the resource that would change the analysis. Impacts from potential oil and gas development would be similar to those described in the two Proposed RMPs/Final EISs but would occur over a smaller area than under Alternatives A, B, C, and D.</p>

Resource, Resource Use, Special Designation	Incorporate by Reference from 2014 and 2015 Proposed RMPs/Final EISs	Reason Eliminated from Further Analysis
Lands and Realty	<p><u>Affected Environment</u> 2014 CRVFO Proposed RMP/Final EIS (BLM 2014), Lands and Realty, pages 3-167 through 3-175. 2015 GJFO Proposed RMP/Final EIS (BLM 2015a), Lands and Realty, pages 3-207 through 3-215. <u>Direct and Indirect Impacts</u> 2014 CRVFO Proposed RMP/Final EIS (BLM 2014), Lands and Realty, page 4-554 through 4-570. 2015 GJFO Proposed RMP/Final EIS (BLM 2015a), Lands and Realty, pages 4-353 through 4-366.</p>	<p>Closing additional areas to fluid mineral leasing would decrease land use authorizations associated with fluid mineral development. Impacts would be similar to those described in the two Proposed RMPs/Final EISs but would occur over a smaller area than under Alternatives A, B, C, and D. The BLM does not have new or updated information for the resource that would change the analysis.</p>
National, State, and BLM Byways	<p><u>Affected Environment</u> 2014 CRVFO Proposed RMP/Final EIS (BLM 2014), National Trails and Scenic Byways, pages 3-205 through 3-206. 2015 GJFO Proposed RMP/Final EIS (BLM 2015a), National, State and BLM Byways, pages 3-230 through 3-233. <u>Direct and Indirect Impacts</u> 2014 CRVFO Proposed RMP/Final EIS (BLM 2014), National Trails and Scenic Byways, pages 4-741 through 4-751. 2015 GJFO Proposed RMP/Final EIS (BLM 2015a), National, State and BLM Byways, pages 4-436 through 4-440.</p>	<p>The BLM does not manage backcountry byways, national and state scenic byways, or BLM byways within the CRVFO decision area, although byways are within the visual landscape of the decision area. Two national scenic byways and one state scenic and historic byway cross through the GJFO decision area. Impacts would be similar to those described in the two Proposed RMPs/Final EISs but would occur over a smaller area than under Alternatives A, B, C, and D. The BLM does not have new or updated information for the resource that would change the analysis.</p>

3.4 ENVIRONMENTAL CONSEQUENCES METHODS AND ASSUMPTIONS

3.4.1 Analytical Assumptions

The BLM made several assumptions to facilitate the analysis of potential effects and to ensure the analysis adhered to the District Court’s order. The BLM incorporates by reference assumptions identified in the 2014 CRVFO and the 2015 GJFO Proposed RMPs/Final EISs (BLM 2014, Analytical Assumptions, page 4-14; BLM 2015a, Analytical Assumptions, pages 4-2 through 4-4). New assumptions, when applicable, are listed in the analysis. General assumptions that apply to all analyses are below.

- The District Court’s order and planning issues identified in **Chapter I** of this supplemental EIS provide the focus for the scope of effects.
- All resources, resource uses, special designations, support, and human element analyses use baseline data from the 2014 and 2015 Proposed RMPs/Final EISs and use updated information when identified.
- The BLM has evaluated updated or new information. Updated or new information that the BLM determined is not a significant change, or would not affect a decision, is not used for the analyses.

- When an alternative closes an area to fluid mineral leasing, development of nonfederal minerals may not change or may increase. Impacts on resources and uses on lands over federal fluid minerals may decrease, and impacts on lands over nonfederal minerals may change.
- Unless otherwise indicated, most impacts analyses assume a 20-year time horizon.

3.4.2 General Methodology for Analyzing Impacts

The BLM defined potential impacts or effects in terms of the type, context, duration, and intensity in the 2014 and 2015 Proposed RMPs/Final EISs. The BLM incorporates by reference the general methodology for analyzing impacts identified in the 2014 CRVFO and 2015 GJFO Proposed RMPs/Final EISs (BLM 2014, General Methodology for Analyzing Impacts, pages 4-2 and 4-3; BLM 2015a, General Methodology for Analyzing Impacts, pages 4-5 and 4-6).

3.4.3 Cumulative Impacts

Cumulative impacts are described at the end of each resource or resource use section. Cumulative impacts are the direct and indirect impacts on resources and resource uses from actions proposed in the alternatives, when they are added to other past, present, and reasonably foreseeable actions. This section incorporates by reference the cumulative impacts information described in the 2014 and 2015 Proposed RMPs/Final EISs (BLM 2014, Cumulative Impacts, pages 4-3 through 4-13; BLM 2015a, Cumulative Impacts, pages 4-7 through 4-15).

The BLM is analyzing impacts on big game, Gunnison Sage-grouse, and Greater Sage-grouse, and from solar projects. These analyses are associated with four RMP amendment projects. Impacts derived from the decisions made in those plans will add or reduce cumulative impacts associated with each resource, use, or designation in this supplemental EIS.

3.4.4 Summary of Previous Alternatives

The following discussions for the CRVFO and GJFO in **Sections 3.4 through 3.8** focus on impacts associated with lands open and closed to oil and gas leasing under the Proposed RMPs/Final EISs. While these are not the only impacts, this supplemental EIS compares the impacts of two new alternatives, Alternatives E and F. Both of which include additional fluid minerals closures. The discussions below provide background against which to evaluate the two newly proposed alternatives.

3.5 RESOURCES

3.5.1 Air Resources and Climate

Affected Environment

Air Quality, Greenhouse Gases, and Climate Change

This section incorporates by reference the affected environment for air resources and climate described in the 2014 and 2015 Proposed RMPs/Final EISs (BLM 2014, Air Quality, pages 3-2 through 3-11; and Climate, pages 3-12 through 3-20; BLM 2015a, Air, pages 3-2 through 3-19; and Climate, pages 3-20 through 3-24).

For the Final EISs' sections that are being incorporated, historical air pollutant concentration and climate data trends are up to year approximately 2012. To supplement these historical trends data, the sources listed below can be accessed to obtain similar data and information for years 2012 and beyond. Consistent with the discussion provided for the Proposed RMPs/Final EISs, the counties and areas within and adjacent

to the planning area continue to be in attainment of the national and state-level ambient air quality standards. In general, air quality (including that associated with hazardous air pollutants [HAPs]) and related values (visibility, etc.) continue to improve around the region. Recent trends show that oil and gas development and production (that is, emissions) rates continue to align with the BLM Colorado Air Resource Management Modeling Study (CARMMS) scenario, resulting in overall lower cumulative air quality-related concerns and lower federal oil and gas contributions to the cumulative air quality and related values.

- Air pollutant concentration data
 - US Environmental Protection Agency’s (EPA’s) Air Data website (EPA 2022a)
- Visibility monitoring and trend data
 - Interagency Monitoring of Protected Visual Environments website (Colorado State University 2022)
- Greenhouse gas (GHG) emissions and climate data
 - 2021 BLM Specialist Report on Annual Greenhouse Gas Emissions and Climate Trends (BLM 2022a), referred to as the BLM Annual GHG Report in this document
- Volatile organic compounds and HAPs trends data
 - Garfield County 2020 Air Quality Monitoring Report (Garfield County Public Health Department 2021)
- Colorado oil and gas statistics and air quality modeling study
 - BLM Colorado’s Comprehensive Air Resource Protection Protocol (CARPP; BLM 2015b)
 - BLM CARMMS (BLM 2017)
 - BLM Colorado Annual Air Resources Report, 2020 Report Year (BLM 2021a)

The Garfield County 2020 Air Quality Monitoring Report referenced above shows that ambient concentrations of volatile organic compounds and HAPs continued to decrease over the 2008 to 2020 reporting period. Likewise, light alkanes (primary components of raw natural gas) have also decreased over this period, strongly suggesting that ambient methane (the main component of raw natural gas) concentrations have also decreased at the Garfield County monitoring sites. In addition, a report recently prepared by Ramboll (2021) describes a substantial decrease in methane in northern Colorado since concentrations peaked in year 2013, despite the increases in oil and gas production that have occurred since 2013. This finding is corroborated by comparison with ground-based measurements, which also show significant decreases in methane (Ramboll 2021).

Additional discussion of climate change science and predicted impacts, as well as the reasonably foreseeable and cumulative GHG emissions associated with the BLM’s oil and gas actions, are included in the BLM Annual GHG Report (BLM 2022a).

Table 3.5-1 shows the total estimated GHG emissions from fossil fuels at the global, national, and state scales over the last 5 years of readily available data (data for year 2021 are not yet readily available). Emissions are shown in megatonnes (Mt; a megatonne is 1 million metric tons) per year of carbon dioxide equivalent (CO₂e). Chapter 3 of the BLM Annual GHG Report contains additional information on GHGs and an explanation of CO₂e. State and national energy-related carbon dioxide (CO₂) emissions include

Table 3.5-1. Global, National, and State GHG Emissions (2016 to 2020)

Scale	GHG Emissions (Mt CO ₂ e per year)				
	2016	2017	2018	2019	2020
Global	36,465.6	36,935.6	37,716.2	37,911.4	35,962.9
US	5,077.0	5,005.5	5,159.3	5,036.0	4,535.3
Colorado	102.8	103.2	104.3	106.3	104.4

Sources: BLM Annual GHG Report (2022a), Chapter 6, Table 6-1 (for global and US); Colorado Department of Public Health and Environment (CDPHE) 2021 GHG Report (2021a), Table 6-3 (for the state)

emissions from fossil fuel use across all sectors (residential, commercial, industrial, transportation, and electricity generation) and are released at the location where the fossil fuels are consumed. These baseline Colorado totals account for new oil and gas development and operations that began since the RODs were issued for the CRVFO and GJFO.

Additional information on current state, national, and global GHG emissions, as well as the methodology and parameters for estimating emissions from BLM fossil fuel authorizations and cumulative GHG emissions, is included in the online BLM Annual GHG Report (see Chapters 4, 5, and 6).

The continued increase of human-caused GHG emissions over the past 60 years has contributed to global climate change impacts. A discussion of past, current, and projected future climate change impacts is described in Chapters 8 and 9 of the BLM Annual GHG Report (2022a). These chapters describe currently observed climate impacts globally, nationally, and in each state, and present a range of projected impact scenarios depending on future GHG emission levels. These chapters are incorporated by reference in this analysis.

Nitrogen dioxide, ozone, and particulate matter continue to be the air pollutants (non-GHG) of greatest concern in and around the planning area. The EPA may lower the level of annual particulate matter of 2.5 microns or less in diameter in the near future and is currently reviewing studies regarding human exposure to ozone for potentially lowering the 8-hour ozone standard (EPA 2022b).

Direct and Indirect Impacts

This section incorporates by reference the direct and indirect sections (**Sections 4.2.1 and 4.2.2**) described in the 2014 and 2015 Proposed RMPs/Final EISs (BLM 2014, Air Quality, pages 4-17 through 4-45; and Climate Change, pages 4-46 through 4-58; BLM 2015a, Air and Climate Resources, pages 4-16 through 4-56). Both Final EISs included the BLM Colorado's CARPP and adaptive management strategy for completing detailed and refined air quality assessments for new projects and actions proposed under the plans. That approach has not changed for BLM Colorado air resources and is being further incorporated into this supplemental EIS. For this approach, the BLM continues to utilize an online emissions inventory tool and up-to-date air quality data, trends, and modeling studies to estimate impacts for new proposed actions, all while conducting analyses following the latest applicable guidance.

BLM Colorado (and other Rocky Mountain region states) are currently completing a regional air quality modeling study, evaluating potential impacts due to federal oil, gas, and coal emissions sources for years 2028 and 2032. The results of this study will supplement the BLM CARMMS (BLM 2017) that is currently used for oil and gas leasing and project-level assessments under the plans. Overall, it is expected that air quality concentrations and related values' changes around the region will continue to follow recent trend trajectories (see the affected environment) of continual improvement for the foreseeable future.

Greenhouse Gas Emissions

In addition to the data and information for the original Proposed RMPs/Final EISs that are incorporated for this supplemental EIS, the BLM has prepared a supplemental oil and gas GHG and climate change assessment that includes downstream and end-use emissions estimates based on up-to-date oil and gas production projections. This assessment is focused on a five-county area (Delta, Garfield, Gunnison, Mesa, and Rio Blanco Counties) in western Colorado that includes all areas within and adjacent to the CRVFO and GJFO planning area. The assessment also refines the focus and “zooms” into potential GHG emissions and climate change impacts for the two Colorado counties (Garfield and Mesa) that cover the geographical extents for the planning area. This assessment utilizes and builds upon the tools, report, and overall approach the BLM created or used to address GHGs emissions and climate change impacts for new oil and gas lease sales starting in 2022.

Three general phases of oil and gas would generate GHG emissions: 1) upstream well development (well site construction, well drilling, and well completion) and well production operations (extraction, separation, and gathering); 2) midstream (refining, processing, storage, and transport/distribution); and 3) end use (combustion or other uses) of the fuels produced. The following provides additional details for these phases:

- Upstream (direct): Well development emissions occur over a short period and include emissions from heavy equipment and vehicle exhaust, drill rig engines, completion equipment, venting and leakage, and well treatments, such as hydraulic fracturing. Production emissions may result from storage tank breathing and flashing, truck loading, pump engines, heaters and dehydrators, pneumatic instruments or controls, flaring, fugitives, and vehicle exhaust.
- Midstream (mostly indirect): Emissions occur from the transport, refining, processing, storage, transmission, and distribution of produced oil and gas.
- Upstream and midstream emissions are estimated by multiplying the projected production of oil and gas with emissions factors from the US National Energy Technology Laboratory life cycle analysis of US oil and natural gas (Cooney et al. 2016; NETL 2019). Additional information on emission factors can be found in the online BLM Annual GHG Report (Chapter 4, Tables 4-7 and 4-9; BLM 2022a). These factors account for methane leakage.
- For the purposes of this analysis, end-use and downstream (indirect) emissions are calculated assuming all produced oil and gas is combusted for energy use. End-use (downstream) emissions are estimated by multiplying the projected 2022 through 2050 production levels of oil and gas with emissions factors for combustion established by the EPA (Tables C-1 and C-2 to Subpart C of 40 CFR 98 [2013]). Additional information on emission factors can be found in Chapter 4 of the BLM Annual GHG Report (BLM 2022a).

Figure 3.5-1 and **Figure 3.5-2** show the percentage of the total CO₂e life cycle emissions factors associated with each phase (“well Extract” occurs upstream; “well Process” and “well Trans” occur primarily midstream; “well Comb” occurs downstream).

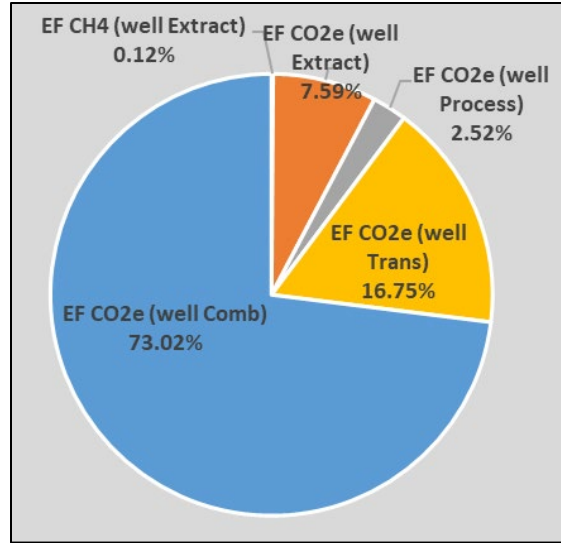


Figure 3.5-1. Total Natural Gas Emissions Factor Percentages by Life Cycle Phase

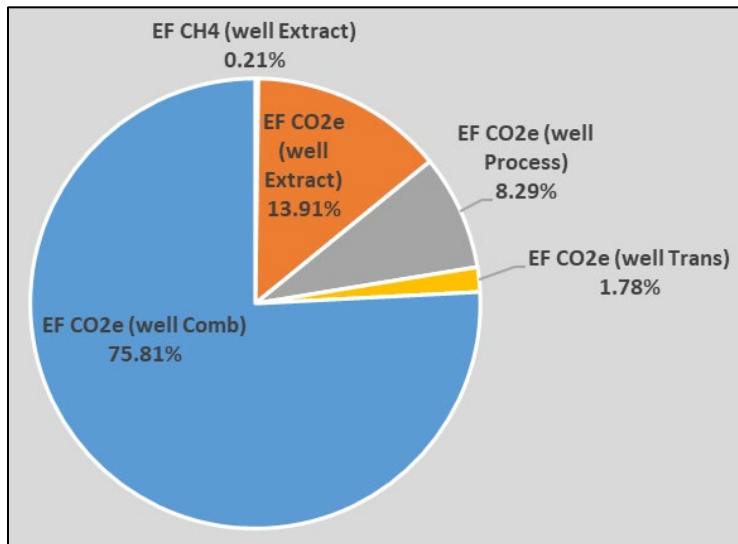


Figure 3.5-2. Total Oil Emissions Factor Percentages by Life Cycle Phase

For this five-county oil and gas GHG emissions assessment, the BLM used the US Energy Information Administration’s (EIA) 2022 Annual Energy Outlook (AEO) 2022 to 2050 oil and gas production projections for the AEO’s reference case, high oil and gas supply, and low oil and gas supply scenarios for the Rocky Mountain region to project total (federal plus nonfederal) and federal-only oil and gas production and emissions for the five-county area as well as for the Mesa and Garfield Counties’ focused study area (EIA 2022a). For describing the potential federal oil and gas GHG emissions levels specifically for each of the Proposed RMPs/Final EISs and supplemental EIS alternatives (A through F), it is reasonably assumed that the 2022 AEO high (high oil and gas supply), medium (reference case), and low (low oil and gas supply) oil and gas supply and emissions scenarios provide an adequately wide range of projected oil and gas production and emissions to cover the maximum and minimum levels that could be directly and indirectly associated with Alternatives A through F.

The year-to-year (relative to previous year) AEO oil and gas production growth factors for years 2022 to 2050 were used with the first year (2022) growth factor applied to year 2021 county-level production levels obtained from the COGCC and the US Department of the Interior (DOI), Office of Natural Resources Revenue (ONRR) databases (COGCC 2022; ONRR 2022). Year 2021 county-level production data from the ONRR were used to allocate oil and gas production to federal sources. All ONRR-labeled “mixed exploratory” production was assumed to be federal for estimating oil and gas production projections and emissions.

Figure 3.5-3 and **Figure 3.5-4** show the 2022 AEO year-to-year growth factors for the Rocky Mountain region that were applied for making future oil and gas projections for the five counties for natural gas and oil, respectively. As shown, the production growth factors for the AEO high oil and gas supply scenario for both oil and gas are at or above 1.0 throughout most of the period, indicating that production continues to grow year after year for this scenario. This is opposed to the AEO low oil and gas supply scenario, where oil and gas production continues to decline through the 2022 to 2050 period.

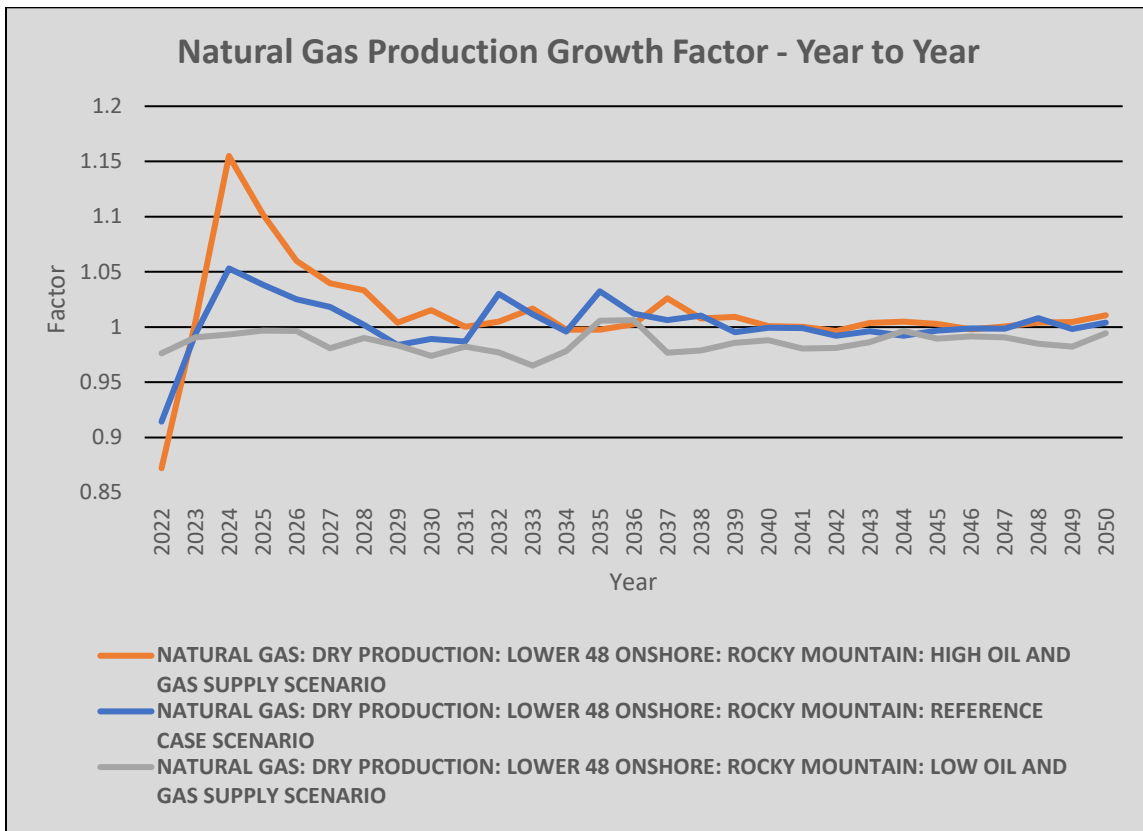


Figure 3.5-3. Natural Gas Production Growth Factor, 2022 to 2050

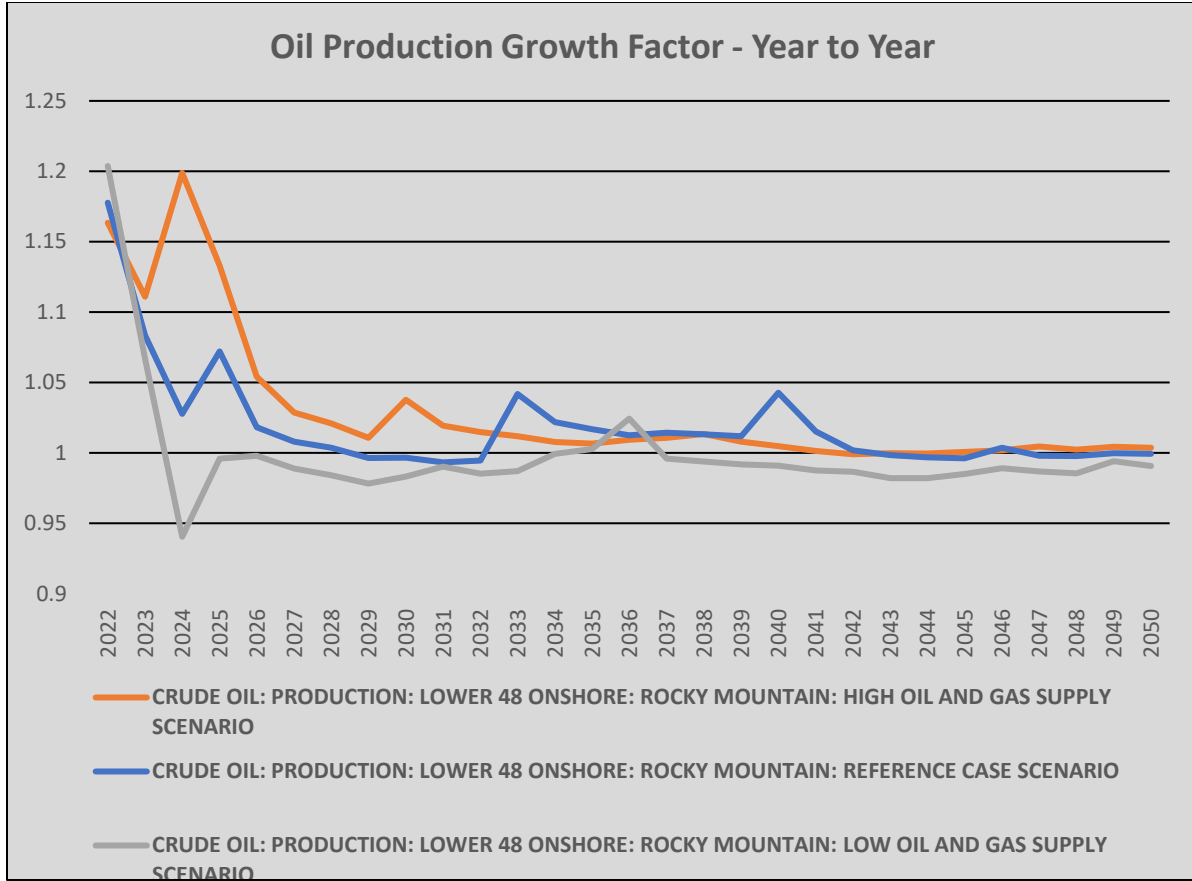


Figure 3.5-4. Oil Production Growth Factor, 2022 to 2050

Using the National Energy Technology Laboratory life cycle emissions factors and the projected production based on the 2022 AEO growth factors, 2022 to 2050 GHG emissions were estimated for the five-county area in western Colorado and the Mesa and Garfield Counties’ focused area. **Table 3.5-2** and **Table 3.5-3** provide the total 2022 to 2050 federal oil and gas CO₂e emissions estimates for the five-county and Mesa and Garfield Counties’ study areas for each of the AEO projected scenarios based on the Intergovernmental Panel on Climate Change (IPCC) Sixth Assessment Report (AR6) global warming potential (GWP) 20-year and 100-year values, respectively (IPCC 2021). The potential CO₂e emissions associated with natural gas constitute 91 to 93 percent (oil-related emissions are approximately 7 to 9 percent) of the total CO₂e emissions shown in **Table 3.5-2** and **Table 3.5-3**, respectively, as these areas are not known for high levels of oil production.

Table 3.5-2. Potential Federal Oil and Gas GHG Emissions of Study Area (2022 to 2050) with 20-year GWP Values

2022 AEO Scenario	County/Study Area	Total CO ₂ e (Mt)	CO ₂ (Mt)	Methane as CO ₂ e (Mt)	Nitrous Oxide as CO ₂ e (Mt)
Reference case	Five-County	736.91	596.66	139.46	0.78
	Mesa and Garfield Counties	506.28	405.60	100.18	0.49
High oil and gas supply	Five-County	914.53	741.38	172.17	0.98
	Mesa and Garfield Counties	625.78	501.55	123.62	0.61
Low oil and gas supply	Five-County	570.21	461.06	108.55	0.60
	Mesa and Garfield Counties	393.53	315.13	78.02	0.38

IPCC AR6 20-year GWP values: CO₂ = 1; methane = 82.5; nitrous oxide = 273

Table 3.5-3. Potential Federal Oil and Gas GHG Emissions of Study Area (2022 to 2050) with 100-year GWP Values

2022 AEO Scenario	County/Study Area	Total CO ₂ e (Mt)	CO ₂ (Mt)	Methane as CO ₂ e (Mt)	Nitrous Oxide as CO ₂ e (Mt)
Reference case	Five-County	647.82	596.66	50.38	0.78
	Mesa and Garfield Counties	442.28	405.60	36.19	0.49
High oil and gas supply	Five-County	804.55	741.38	62.19	0.98
	Mesa and Garfield Counties	546.81	501.55	44.65	0.61
Low oil and gas supply	Five-County	500.87	461.06	39.21	0.60
	Mesa and Garfield Counties	343.69	315.13	28.18	0.38

IPCC AR6 100-year GWP values: CO₂ = 1; methane = 29.8; nitrous oxide = 273

Section 5.3 of the BLM Annual GHG Report (BLM 2022a) provides total long-term US federal fossil fuel mineral emissions projections based on 2022 AEO scenarios. **Table 3.5-4**, **Table 3.5-5**, and **Table 3.5-6** provide for comparison of the Mesa and Garfield Counties' projected 2022 to 2050 federal emissions to these 2022 to 2050 total US federal emissions for the relevant 2022 AEO reference case, high oil and gas supply, and low oil and gas supply scenarios, respectively. In addition, projected 2022 to 2050 global fossil fuel emissions for the IPCC Shared Socioeconomic Pathway (SSP) 1-2.6 sustainable development scenario (IPCC 2021) are presented in the table for comparison. The SSPI-2.6 global emissions level as part of the IPCC's overall "low" projected global GHG emissions and climate change scenario is being used here as a global GHG emissions "budget" level. Comparisons of the total and cumulative US federal oil and gas emissions to global carbon "budget" levels can be found in Section 7.2 of the BLM Annual GHG Report (BLM 2022a).

Table 3.5-4. Potential Mesa and Garfield Counties Study Area Oil and Gas GHG Emissions Percentage of Cumulative Inventories, 2022 AEO Reference Case

Emissions Inventory ID	2022–2050 CO₂e (Mt) – 100-year GWP	Mesa and Garfield Federal Percentage of Cumulative Level – 2022 AEO Reference Case
Mesa and Garfield federal – 2022 AEO reference case	442	100%
Five-county total (federal and nonfederal) – 2022 AEO reference case	1,242	35.6%
US federal – 2022 AEO reference case	13,556	3.3%
IPCC SSP1-2.6 scenario - global *	851,298	0.05%

IPCC AR6 100-year GWP values: CO₂ = 1; methane = 29.8; nitrous oxide = 273

Note that the IPCC SSP1-2.6 scenario value shown is for global fossil fuel–related CO₂ emissions only. The IPCC SSP1-2.6 scenario fossil fuel–related CO₂e value would be larger, and the Mesa and Garfield federal percentage of this value would be lower if methane and nitrous oxide were factored into the 2022 to 2050 IPCC SSP1-2.6 scenario CO₂e emissions value.

Table 3.5-5. Potential Mesa and Garfield Counties Study Area Oil and Gas GHG Emissions Percentage of Cumulative Inventories, 2022 AEO High Oil and Gas Supply

Emissions Inventory ID	2022–2050 CO₂e (Mt) – 100-year GWP	Mesa and Garfield Federal Percentage of Cumulative Level – 2022 AEO High Oil and Gas Supply
Mesa and Garfield federal – 2022 AEO high oil and gas supply	547	100%
Five-county total (federal and nonfederal) – 2022 AEO high oil and gas supply	1,543	35.4%
US federal – 2022 AEO high oil and gas supply	16,791	3.3%
IPCC SSP1-2.6 scenario - global *	851,298	0.06%

IPCC AR6 100-year GWP values: CO₂ = 1; methane = 29.8; nitrous oxide = 273

Note that the SSP1-2.6 scenario value shown is for global fossil fuel–related CO₂ emissions only. The IPCC SSP1-2.6 scenario fossil fuel–related CO₂e value would be larger, and the Mesa and Garfield federal percentage of this value would be lower if methane and nitrous oxide were factored into the 2022 to 2050 IPCC SSP1-2.6 scenario CO₂e emissions value.

Table 3.5-6. Potential Mesa and Garfield Counties Study Area Oil and Gas GHG Emissions Percentage of Cumulative Inventories, 2022 AEO Low Oil and Gas Supply

Emissions Inventory ID	2022–2050 CO₂e (Mt) – 100-year GWP	Mesa and Garfield Federal Percentage of Cumulative Level – 2022 AEO Low Oil and Gas Supply
Mesa and Garfield federal – 2022 AEO low oil and gas supply	344	100%
Five-county total (federal and nonfederal) – 2022 AEO low oil and gas supply	960	35.8%
US federal – 2022 AEO low oil and gas supply	9,920	3.5%
IPCC SSP1-2.6 scenario - global *	851,298	0.04%

IPCC AR6 100-year GWP values: CO₂ = 1; methane = 29.8; nitrous oxide = 273

Note that the IPCC SSP1-2.6 scenario value shown is for global fossil fuel–related CO₂ emissions only. The IPCC SSP1-2.6 scenario fossil fuel–related CO₂e value would be larger, and the Mesa and Garfield federal percentage of this value would be lower if methane and nitrous oxide were factored into the 2022 to 2050 IPCC SSP1-2.6 scenario CO₂e emissions value.

As shown in the tables above, the Mesa and Garfield federal 2022 to 2050 oil- and gas-related CO₂e emissions percentages of the five-county study area total (federal plus nonfederal) and US federal total projected 2022 to 2050 oil and gas emissions are similar for each 2022 AEO scenario. This makes sense given the basis for the CO₂e emissions estimates are the same. This constant supply and demand corresponding relationship reasonably implies that the future oil and gas projection trajectory of Mesa and Garfield Counties' federal oil and gas will be like those for larger-scale markets (US, global, etc.). This means the future Mesa and Garfield Counties' federal oil and gas GHG emissions percentages will be similar and constant for all future scenarios for any specific larger scale (Colorado, Rocky Mountain region, US, and global).

Not reflected in the Mesa and Garfield Counties' federal oil and gas emissions estimates provided in the three tables above are all the emissions reductions that would be achieved following the scenarios for Colorado's GHG Pollution Reduction Roadmap (Colorado Energy Office 2021). The GHG Roadmap 2019 Action Scenario is the "business as usual" scenario that is based on laws, regulations, policies, and programs in place when the Colorado Department of Public Health and Environment (CDPHE) 2021 GHG Report (2021a) was developed. The projection shows that Colorado—with no additional legislation, regulation, or policy measures—would be on a path to reduce emissions by approximately 16 percent by 2025 and 25 percent by 2030. The GHG Roadmap Colorado House Bill 1261 scenario identifies sectoral changes and additional (beyond current) measures needed to reduce GHG emissions by 26 percent by 2025, 50 percent by 2030, and 90 percent by 2050.

In addition, the projected GHG emissions levels shown in the tables above do not reflect the emissions reductions as described for the scenarios in the International Energy Agency World Energy Outlook (WEO) 2021 (IEA 2021). The trends in the 2022 AEO-based growth factors shown in **Figure 3.5-3** and **Figure 3.5-4** are similar in behavior to the projected CO₂ emissions for the WEO 2021 "State Policies Scenario." The future projected trend lines for the WEO 2021 "Announced Pledges," "Sustainable Development," and "Net Zero" scenarios have similar trajectories as the Colorado 2021 Annual GHG Report's projected scenarios that would require additional legislation, regulation, and policy measures for Colorado GHG emissions reduction goals to be achieved. In addition, these are "gross" emissions levels with respect to overall global emissions levels; there was no assumption that any of the oil and gas development or production (that is, emissions) would occur or originate elsewhere should the future US federal oil and gas development and production not occur.

As described above, the end-use and downstream (indirect) emissions are calculated assuming all produced oil and gas is combusted for energy use. The reality is that about 7 percent of fossil fuels are consumed for non-combustion use in the US (EIA 2018). As described for the EIA study, natural gas is used as feedstock to make nitrogenous fertilizers and a range of chemical products, including ammonia, hydrogen, and methanol. Therefore, it is reasonable to conclude that the projected 2022 to 2050 federal emissions levels shown in the tables above are overestimates for the GHG emissions levels that will occur over the next 30 years, even if all other assumptions (projected production levels, emissions factors, etc.) used for the GHG calculations accurately represent future conditions. However, as described in the previous paragraph, these other assumptions are likely to change in the future as laws, regulations, policies, and programs take effect.

Further comparisons for the projected 2022 to 2050 Mesa and Garfield federal oil and gas emissions levels can be made with other projected US and global emissions levels, as described in Section 6.2 of the BLM

Annual GHG Report, including those associated with the International Energy Agency global International Energy Outlook (IEO) reference case scenario. As shown in the BLM Annual GHG Report, according to the IEO reference case projections, global energy-related CO₂ emissions are projected to increase by 0.6 percent per year through the 2020 to 2050 period from about 35 billion metric tons CO₂ in year 2020 to about 43 billion metric tons by year 2050 (EIA 2021). As described above for the 2022 AEO-based projections, these IEO-projected global emissions levels do not reflect the GHG emissions reductions as described for the WEO 2021-projected scenarios that would occur by incorporating relatively new laws, regulations, policies, and programs.

Social Cost of GHGs

The “social cost of carbon,” “social cost of nitrous oxide,” and “social cost of methane”—together, the “social cost of greenhouse gases” (SC-GHG)—are estimates of the monetized damages associated with incremental increases in GHG emissions each year.

On January 20, 2021, President Biden issued Executive Order (EO) 13990, Protecting Public Health and the Environment and Restoring Science to Tackle the Climate Crisis. Section 1 of EO 13990 establishes an administration policy to, among other things, listen to the science, improve public health, protect our environment, ensure access to clean air and water, reduce GHG emissions, and bolster resilience to the impacts of climate change. Section 2 of the EO calls for federal agencies to review existing regulations and policies issued between January 20, 2017, and January 20, 2021, for consistency with the policy articulated in the EO and to take appropriate action.

Consistent with EO 13990, in early 2021, the Council on Environmental Quality (CEQ) rescinded its 2019 Draft National Environmental Policy Act Guidance on Considering Greenhouse Gas Emissions and has begun to review for update its Final Guidance for Federal Departments and Agencies on Consideration of Greenhouse Gas Emissions and the Effects of Climate Change in National Environmental Policy Act Reviews, issued on August 5, 2016 (CEQ 2021). While CEQ works on updated guidance, it has instructed agencies to consider and use all tools and resources available to them in assessing GHG emissions and climate change effects, including the 2016 CEQ GHG Guidance.

Regarding the use of social cost of carbon or other monetized costs and benefits of GHGs, the 2016 GHG Guidance noted that the NEPA does not require monetizing costs and benefits. It also noted that “the weighing of the merits and drawbacks of the various alternatives need not be displayed using a monetary cost-benefit analysis and should not be when there are important qualitative considerations.”

Section 5 of EO 13990 emphasizes the importance of federal agencies capturing “the full costs of greenhouse gas emissions as accurately as possible, including by taking global damages into account.” It also established an Interagency Working Group on the SC-GHG (the “IWG”). In February 2021, the IWG published the Technical Support Document: Social Cost of Carbon, Methane, and Nitrous Oxide, Interim Estimates under EO 13990 (IWG 2021). This is an interim report that updated previous guidance from 2016. For Federal agencies, the best currently available estimates of the SC-GHG are the interim estimates of the social cost of carbon dioxide, methane, and nitrous oxide developed by the IWG on the SC-GHG. Select estimates are published in the IWG Technical Support Document and the complete set of annual estimates are available on the Office of Management and Budget’s website (IWG 2021). In January 2023, the CEQ issued the interim National Environmental Policy Act Guidance on Consideration of Greenhouse Gas Emissions and Climate Change, which recommended that agencies provide additional context for

GHG emissions, including through the use of the best available SC-GHG estimates, to translate climate impacts into the more accessible metric of dollars, allow decision makers and the public to make comparisons, help evaluate the significance of an action's climate change effects, and better understand the tradeoffs associated with an action and its alternatives (CEQ 2023).

In accordance with this direction, this subsection provides estimates of the monetary value of potential changes in GHG emissions. Such analysis should not be construed to mean a cost determination is necessary to address potential impacts of GHGs associated with specific alternatives. These numbers were monetized; however, they do not constitute a complete cost-benefit analysis, nor do the SC-GHG numbers present a direct comparison with other impacts analyzed in this document. For instance, the BLM's overall economic analysis for this supplemental EIS (see **Section 3.9.2**) does not monetize all the costs or benefits and does not include all revenue streams that could be associated with the alternatives. SC-GHG estimates are provided only as a useful measure of the benefits of GHG emissions reductions to inform agency decision-making.

For federal agencies, the best currently available estimates of the SC-GHGs are the interim estimates of the social cost of carbon dioxide, social cost of methane, and social cost of nitrous oxide developed by the IWG on the SC-GHGs. The complete set of annual estimates are available in the technical support document that can be found in the SC-GHG section of the Office of Management and Budget's Information and Regulatory Affairs Regulatory Matters website (IWG 2021).

The IWG's SC-GHG estimates are based on complex models describing how GHG emissions affect global temperatures, sea level rise, and other biophysical processes; how these changes affect society through, for example, agricultural, health, or other effects; and monetary estimates of the market and nonmarket values of these effects. One key parameter in the models is the discount rate, which is used to estimate the present value of the stream of future damages associated with emissions in a particular year. A higher discount rate assumes that future benefits or costs are more heavily discounted than benefits or costs occurring in the present (that is, future benefits or costs are a less significant factor in present-day decisions). The current set of interim estimates of the SC-GHGs use three different annual discount rates: 2.5 percent, 3 percent, and 5 percent (IWG 2021).

As expected with such a complex model, there are multiple sources of uncertainty inherent in the SC-GHG estimates. Some sources of uncertainty relate to physical effects of GHG emissions, human behavior, future population growth and economic changes, and potential adaptation (IWG 2021). To better understand and communicate the quantifiable uncertainty, the IWG method generates several thousand estimates of the social cost for a specific gas, emitted in a specific year, with a specific discount rate. These estimates create a frequency distribution based on different values for key uncertain climate model parameters. The shape and characteristics of that frequency distribution demonstrate the magnitude of uncertainty relative to the average or expected outcome.

To further address uncertainty, the IWG recommends reporting four SC-GHG estimates in any analysis. Three of the SC-GHG estimates reflect the average damages from the multiple simulations at each of the three discount rates. The fourth value represents higher-than-expected economic impacts from climate change. Specifically, it represents the 95th percentile of damages estimated, applying a 3 percent annual discount rate for future economic effects. This low probability, but high damage, scenario represents an upper bound of damages within the 3 percent discount rate model. The estimates below follow the IWG recommendations.

The future projected 2022 to 2050 federal oil- and gas-related emissions for Mesa and Garfield Counties for the 2022 AEO reference case, high oil and gas supply, and low oil and gas supply scenarios were used to estimate the SC-GHG. As described above, these emissions estimates do not account for any additional legislation, regulation, and policy that would be required to meet GHG emissions reduction goals; these estimates should be considered “gross” emissions levels with respect to global GHG emissions levels and budgets.

The following estimates in **Table 3.5-7** are calculated based on IWG estimates of social cost per metric ton of emissions for a given emissions year and the BLM’s estimates of emissions in each year. They are rounded to the nearest \$1,000. As described for the GHG emissions estimates shown earlier in this assessment, the potential CO₂e emissions associated with natural gas development and combustion constitute 91 to 93 percent (oil-related emissions constitute approximately 7 to 9 percent) of the total CO₂e emissions used for estimating the following SC-GHG values.

Table 3.5-7. SC-GHGs Associated with Potential Federal Oil and Gas Emissions of Mesa and Garfield Counties (2022 to 2050)

Scenario	Social Cost of GHGs (2020 dollars)			95th Percentile Value, 3% Discount Rate
	Average Value, 5% Discount Rate	Average Value, 3% Discount Rate	Average Value, 2.5% Discount Rate	
Total (direct and indirect) - 2022 AEO reference case	\$5,122,780,000	\$19,537,571,000	\$29,626,881,000	\$58,754,001,000
Total (direct and indirect) - 2022 AEO high oil and gas supply	\$6,268,828,000	\$24,025,138,000	\$36,466,764,000	\$72,290,518,000
Total (direct and indirect) - 2022 AEO low oil and gas supply	\$4,101,244,000	\$15,430,408,000	\$23,333,702,000	\$46,332,084,000

Although the potential GHG emissions and social costs levels are larger for the 2022 AEO high oil and gas scenario, the price (\$) per cubic foot or barrel is substantially lower for this scenario compared with price per unit production for the 2022 AEO low oil and gas supply scenario (EIA 2022a). Specifically, the natural gas prices for the 2022 AEO scenarios range from \$1.97 (2021 \$/million cubic foot [mcf]) for the high oil and gas supply scenario to \$7.08 (2021 \$/mcf) for the low oil and gas supply scenario. For oil, the prices range from \$55.19 (2021 \$/barrel [bbl]) for the high oil and gas supply scenario to \$103.77 (2021 \$/bbl) for the low oil and gas supply scenario. These wellhead costs are then passed down to the consumer/end-user.

As described earlier for the GHG emissions discussion, it was assumed that all produced oil and gas would be combusted; this further supports that the SC-GHG values shown above are overestimates. According to the EIA, approximately 7 percent of fossil fuels are consumed for non-combustion use in the US, and the dependency of these products can be significant. A recent *Time* article based on Vaclav Smil’s book *How the World Works* describes that four materials rank highest on the scale of necessity, forming the “four pillars of modern civilization”: cement, steel, plastics, and ammonia. Of these, ammonia was described to be the most important material because its synthesis is the basis of all nitrogen fertilizers;

without their applications, it would be impossible to feed, at current levels, nearly half of today's nearly 8 billion people worldwide (Smil 2022).

See **Section 3.9.2, Social and Economic Conditions**, in this supplemental EIS for more data and information related to the benefits, costs, and dependencies associated with the federal oil and gas development and production that could occur in Mesa and Garfield Counties over the life of the plans. For that section, values found in the "Modeled Impacts on Employment, Labor Income, and Value Added from Forgone Fluid Mineral Development and Production" subsection can be compared with the estimated SC-GHG values shown in the table above for assessing some of the potential benefits versus costs. The reader should keep in mind that the estimated SC-GHG values shown above are 2022 to 2050 aggregate totals, whereas most of the forgone economic effects values shown in the Social and Economic Conditions section are on an annual (per year) basis.

Climate Change

Several peer-reviewed publications in the past decade found that the global average temperature change is roughly proportional to the total quantity of CO₂e emissions over a wide range of potential scenarios (Matthews et al. 2009). As shown in **Table 3.5-7**, Mesa and Garfield Counties' federal oil- and gas-related 2022 to 2050 GHG emissions for the AEO 2022 high oil and gas supply scenario would hypothetically constitute approximately 0.06 percent of the global 2022 to 2050 fossil fuel CO₂ emissions for the IPCC SSP1-2.6 sustainable development scenario. As described earlier, the projected federal oil and gas emissions presented in this assessment would be overestimates when comparing with emissions for the IPCC SSP1-2.6 sustainable development scenario; this is because they do not account for the additional legislation, regulation, and policy measures that would be needed to align with the IPCC SSP1-2.6 sustainable development scenario trajectory pathway. Therefore, the actual contribution to climate (global average temperature) change associated with federal oil and gas would likely be lower than described here for any future mitigated trajectory path scenario due to additional measures' effects. The future oil and gas production trajectory that Mesa and Garfield Counties' federal oil and gas follows will be like those for larger-scale markets (US, global, etc.).

In addition to comparing GHG emissions with cumulative levels, a global climate change model (the Model for the Assessment of Greenhouse Gas Induced Climate Change [MAGICC]) is used to describe potential climate (temperature) changes that could be attributed to GHG emissions associated with future US federal oil and gas development and operations (Climate Resource 2022). The MAGICC has been used extensively by the IPCC for key scientific publications, including the Global Warming of 1.5° C Special Report. For assessing the potential climate (temperature) changes associated with the future total US federal oil and gas program, the MAGICC model was run for the total projected cumulative US federal oil and gas GHG emissions following the 2019 AEO reference case scenario. Using the MAGICC, it was determined that all projected US federal oil- and gas-related emissions through year 2050 following the 2019 AEO reference case would constitute approximately 1 percent of the lower carbon budget temperature target of 1.5-degree Celsius change.

Section 7.3 of the BLM Annual GHG Report provides more information regarding the MAGICC modeling for the cumulative US federal oil and gas scenario (BLM 2022a). The MAGICC-predicted results represent "gross" global average temperature effects. This implies there would not be any offset of oil and gas development and production (that is, emissions) elsewhere, should the future US federal oil and gas

development and production not occur. However, future supply and demand, laws, and policy will influence the level of global (including US federal) GHG emissions that ultimately do occur.

Alternatives E and F

Air Quality and Related Values (non-GHGs)

The BLM CARPP (2015b) and associated adaptive management strategy was incorporated in both original Proposed RMPs/Final EISs. The BLM will continue to implement this overall process/strategy over the life of the plans to continuously evaluate the impacts of resource decisions on air quality in the planning area. Ongoing air resources management will be composed of ongoing reviews of assumptions, background air quality, advances in technology, potential impacts evaluated for submitted proposals, current air quality modeling, and future air quality modeling efforts.

For assessing the potential air quality impacts for new proposed Colorado federal oil and gas projects, the BLM utilizes the online emissions inventory tool and the latest version of CARMMS (BLM 2017), along with near-field modeling tools based on the American Meteorological Society/Environmental Protection Agency Regulatory Model (AERMOD). Oil and gas operators complete surveys for the emissions inventory tool based on project-specific information (drill rig horsepower, etc.), and potential emissions are calculated. The BLM then conducts refined-level impacts analyses using these emissions.

Annual oil and gas development for each field office is routinely compiled and used for assessing the oil and gas future trend trajectory modeled in Colorado or regional modeling studies that best matches current trends. BLM Rocky Mountain region states are currently completing a modeling study projecting potential impacts for future years 2028 and 2032. The results for this study are expected in spring 2023. This regional modeling study will be used for future oil and gas project-level assessments under the plans in addition to the CARMMS.

For describing the potential impacts on air quality and related values (visibility, etc.) specifically for the additional Alternatives E and F not analyzed in the original Proposed RMPs/Final EISs, potential criteria (and precursor) pollutants and HAP emissions levels for Alternatives E and F would fall within the range of potential emissions levels analyzed in the Proposed RMPs/Final EISs for the original alternatives. Similar to how the 2022 AEO scenarios are used to “bound” potential federal oil and gas development/production and GHG emissions levels for all the alternatives (original and new), the BLM CARMMS high, medium, and low modeling scenarios are used for describing the maximum and minimum potential field office and cumulative-level air quality and related values impacts that could occur across all Proposed RMPs/Final EISs and supplemental EIS alternatives.

See Sections 4.2.1 and 4.2.2 of the CRVFO Proposed RMP/Final EIS and Section 4.3.1 of the GJFO Proposed RMP/Final EIS; these also describe the potential impacts on air quality and related values that could be associated with Alternatives E and F. The ongoing BLM Regional Modeling Study will also be used to describe potential air quality impacts for new proposed oil and gas projects’ environmental assessments conducted under the life of the plans.

For conducting future project-level analyses under the plans, project-specific emissions inventories will be developed using operator-provided data and information when details about a proposed action are known, including exact physical location. Those refined project-level air quality and related values analyses will be conducted considering EJ and any local disadvantaged communities.

The BLM CARMMS and Regional Modeling Study include cumulative air quality impact analyses that account for the indirect downstream effects of non-GHG air pollutants due to projected future federal oil and gas end use and combustion. As described for these BLM modeling studies, in general, air quality and related value impacts as a result of future direct (upstream/midstream) and indirect (midstream/downstream) federal oil and gas development, operations, and production are expected to improve throughout the region at locations where federal oil and gas is produced and used (combusted, etc.), including in disadvantaged communities.

GHGs and Climate Change

As described for the Colorado GHG Emissions Reduction Roadmap and the WEO 2021, legislation, regulation, and policy will be required to reduce GHG emissions and achieve statutory goals. These GHG emission reductions would occur primarily because of oil and gas demand decreases, although cleaner and more efficient technology will also allow for future GHG emissions reductions (Colorado 2021; IEA 2021). According to the roadmap and WEO 2021, until any additional legislation, regulation, and policy are put into place (state or US-wide), significant decreases in oil and gas demand (that is, emissions) will likely not occur because these actions are required to significantly influence overall energy demand.

The WEO 2021 describes that global oil and gas demand will continue to increase through year 2030 for the “State Policies Scenario” and be similar to year 2020 levels for the “Announced Pledges Scenario” in year 2030; it is only the WEO 2021 “Net Zero” scenario where global oil and gas demand declines; however, that would not occur until year 2026 and would require additional legislation, regulation, and policy not yet scoped (pledged, etc.) (IEA 2021).

Colorado has some of the strictest oil and gas regulations in the US and world. CDPHE Regulations 3 and 7 for oil and gas have been updated numerous times over the past 10 years to enhance emissions control and reporting requirements for upstream and midstream operational emissions sources, including storage tanks, pneumatics, well completion practices, natural gas venting and flaring, and monitoring (CDPHE 2022a). Since most states and countries around the world do not have as many oil and gas regulations as Colorado that reduce field-level emissions, on a per unit oil and gas production (per cubic foot, per barrel, etc.) basis, it is reasonable to assume that upstream and midstream (field-level) emissions are lower in Colorado than in most other locations worldwide. Hypothetically, if a percentage of global oil and gas demand is going to be met regardless of where the supply is produced, it is reasonable to argue that the overall global GHG emissions (mainly those associated with upstream and midstream emissions) would be lower by allowing the oil and gas development and production to occur in states and countries with additional regulations, such as Colorado (COGA 2020).

Mitigation

While oil and gas well development and production operation emissions occur on federal leases (direct) and the BLM has authority over these activities, most midstream and end-use emissions (indirect) typically occur off the lease where the BLM has no authority. As shown in the GHG emissions factors pie charts (**Figure 3.5-1** and **Figure 3.5-2**), the majority (more than 80 percent) of the GHG emissions (and similarly for other air pollutants) occur with midstream and end-use/downstream sources that the BLM has no authority over; local, state, and other federal agencies have jurisdiction over these emissions sources. Local, state, and other federal agencies also have authority on the upstream oil and gas emissions sources.

CDPHE Regulations 3 and 7 and COGCC requirements for upstream and midstream oil and gas leave little feasible emissions controls to be required by the BLM. Recent 2022 updates for CDPHE Regulation 7 focus on oil and gas operations and activities in disproportionately impacted communities. In these communities, leak detection and repair occur more often, additional unloading controls are required, combustion device testing is expedited and is more frequent, pigging and blowdown requirements are enhanced, and more (CDPHE 2022a). These additional control measures enforced in disproportionately impacted communities reduce local volatile organic compound (precursor to ozone), HAP, and methane concentrations.

Undue and unnecessary degradation means the impacts are greater than those that would normally be expected from an activity being accomplished in compliance with current standards and regulations and based on sound practices, including use of the best reasonably available technology. The BLM also requires all new federal oil and gas projects to comply with state and federal standards and regulations. Colorado has some of the strictest standards and regulations in the world, suggesting that compliance with these state-specific terms would further reduce any relative and potential undue and unnecessary degradation. It is reasonable to conclude that some level of mitigation or a reduction in overall global GHG emissions could occur by allowing oil and gas development and operations to occur in states with additional regulations, such as Colorado, assuming that oil and gas production occurs from somewhere to meet demand (COGA 2020).

As described and modeled for the impacts discussion using MAGICC, the projected Mesa and Garfield Counties' federal oil- and gas-related 2022 to 2050 GHG emissions would have negligible impacts on climate (temperature) change.

Based on all the information presented in this air quality, GHG, and potential climate change impacts section, no additional emissions mitigation beyond that required by state and federal regulations is warranted.

3.5.2 Soils

Affected Environment

This section incorporates by reference the affected environment described in the 2014 and 2015 Proposed RMPs/Final EISs (BLM 2014, Soils, pages 3-21 through 3-24; BLM 2015a, Soils, pages 3-41 through 3-45). A summary as it relates to the decisions for this supplemental EIS is included below.

CRVFO

Soil resources provide the foundation for wildlife and vegetation, sustain healthy and productive rangelands and forest, and safeguard water and air quality. Livestock grazing, prime farmlands, wildlife habitat, fisheries, recreation, water quality, and forestry depend on the presence of suitable, quality soils for their sustainable existence; therefore, soil attributes and conditions are important to BLM management decisions. Soil resources within the CRVFO, especially in erodible soil areas, have the potential to be affected by the surface-disturbing activities associated with oil and gas development. The potential for conserving the soil resource depends on the specific soil types and how the resource is managed.

Biological soil crusts are present. Biological soil crusts integrate through the top few millimeters of soil, coalescing loose particles together and forming a matrix that stabilizes and protects soil surfaces from erosive forces. Biological soil crusts have only recently been recognized as having a major influence on

terrestrial ecosystems. They function as living mulch by retaining soil moisture and discouraging annual weed growth (BLM 2001). Biological crusts are well adapted to severe growing conditions, but they are extremely susceptible to physical disturbances, including those associated with oil and gas development.

Soil surveys from the Natural Resources Conservation Service (NRCS) are referenced when making land management decisions. Soils surveys describe the specific properties of soils in a certain area and show the location of each kind of soil on detailed maps. NRCS soil surveys are important for classifying hydrologic soil groups and the depth to the confining layer. The four hydrologic soil groups inform runoff potential of a particular area, and the depth to the confining layer has implications for runoff potential.

Saline soils are found throughout Colorado. These salts originate from the natural weathering of minerals or from fossil salt deposits left from ancient seabeds. Salts accumulate in the soil of arid climates as irrigation water or groundwater seepage evaporates, leaving minerals behind. Saline soils tend to inhibit seed germination and plant growth and ultimately lead to erosion and difficult site reclamation once the soil surface is disturbed. Another serious concern with the erosion of saline soils is the transport of saline sediment to the Colorado River, impacting the water quality of the river.

Within the CRVFO, saline soils were identified by having parent geology of Mancos Shale and NRCS-defined saline soil types. Areas with slopes greater than 30 percent are very likely to have erodible soils. The locations of previous mass wasting are considered to be areas with erodible soils due to past behavior and the slow process of soil formation in these areas.

The CRVFO also contains areas where mass wasting, debris flows, or landslides have occurred in the geologic past and within historical times. These are areas where slopes saturated with water become detached and move downhill. The Glenwood Springs Debris Flow Hazard Zone ACEC includes several areas with steep slopes, sparse vegetation cover, and unstable geologic conditions that are prone to mass wasting processes.

Soil compaction is a complex process that depends on the nature of the loading and moisture content of the soil, as well as characteristics such as particle size, organic matter content, structure, and percentage of coarse fragments. Soil compaction occurs in response to pressure exerted by surface-disturbing activities, such as those associated with oil and gas development. Compacted soil allows less water to infiltrate, resulting in increased volume and velocity of surface runoff. The overland flow has greater energy to detach and transport soil particles, resulting in increased soil erosion. Time limitations and seasonal road closures are often necessary to protect soil loss during saturated conditions. Soil erosion is especially problematic when it introduces saline sediment to waterways, as it degrades water quality.

GJFO

Many resources and resources uses, including livestock grazing, wildlife habitat, wild horse habitat, riparian habitat, special status species, fisheries, recreation, water quality, roads, and forestry, depend on suitable soils. Therefore, soil attributes and conditions are important to RMP management decisions (BLM 2009a).

When making land management decisions based on soil-related hazards or limitations, the GJFO evaluates soil surveys available from the NRCS. Each soil survey describes the specific properties of soils in the area surveyed and shows the location of each kind of soil on detailed maps. The BLM evaluates soil map units to make management decisions that would likely affect soils. Some soils have a very high runoff potential and erosion hazard rating.

Biological (or cryptobiotic) soil crusts are composed of highly specialized communities of cyanobacteria, mosses, and lichens. Invasive exotic plants generally decrease the biological crust cover in most ecosystems (Belnap et al. 2001). Biological soil crusts can also inhibit erosion.

Erosion is a continuing natural process that can be accelerated by surface-disturbing activities, such as those associated with oil and gas development. Factors that influence soil erosion include soil texture, structure, length and percent of slope, slope stability, vegetation cover, and rainfall or wind intensity. Soils most susceptible to erosion by wind or water are typified by bare or sparse vegetation cover, incohesive soil particles with low infiltration rates, and moderate to steep slopes. The potential for soil erosion increases with increasing slope.

Approximately 347,800 acres exceed a 30 percent slope within the decision area. Steep slopes are concentrated adjacent to stream courses, particularly in the northern portion of the decision area and around the edge of the Grand Mesa in the southern portion of the decision area. Within the decision area, 481,600 acres are mapped as fragile, which includes 54,500 acres of slumping soils. Most fragile and slumping soils occur in the northern portion of the decision area, along the rise up to the Roan Plateau to the north. Slumping soils also occur in the Plateau Valley area and slopes of the Grand Mesa.

Soil compaction is the process by which soil pore air space is reduced in size because of physical pressure exerted on the soil surface. It can be caused by surface-disturbing activities, including oil and gas development. Soil compaction reduces infiltration, permeability, and gaseous and nutrient exchange rates of the soil. As a result, the ability to receive water is reduced, leading to an overall reduction in the soil's moisture-holding capacity. Compaction decreases infiltration and increases runoff and the hazard of water erosion.

Direct and Indirect Impacts

This section presents the impacts on soils from the management actions of other resources and resource uses discussed in **Chapter 2**. This section incorporates by reference the methods, assumptions, and impacts for Alternatives A, B, C, and D described in the 2014 and 2015 RMPs/Final EISs (BLM 2014, Soils, pages 4-59 through 4-79; BLM 2015a, Soils, pages 4-56 through 4-86). The methods and assumptions also apply to Alternatives E and F. A summary as it relates to fluid minerals is included below.

CRVFO and GJFO

Direct and indirect impacts of land uses on soil resources are generally best mitigated by avoiding or minimizing the impact, to the degree practicable, with stipulations (for example, NSO, controlled surface use [CSU], and timing limitation [TL] stipulations). Impacts that cannot be avoided would at least be minimized by the application of BMPs or conditions of approval (COAs).

Surface-disturbing activities increase erosion and sediment loads in streams, reduce productivity and soil organic matter, damage biological soil crusts, and reduce permeability and infiltration; they also may contaminate soils. Soils are susceptible to impacts from surface disturbance and compaction, which can lead to decreased permeability, accelerated erosion, soil loss, and reduced productivity. Management actions involving ground-disturbing activities, reducing vegetation diversity and cover, trampling and compacting soils, and removing soil organic matter contribute to adverse impacts. The greatest impacts on soil resources come from activities on fragile soils, steep slopes, or geologically unstable locations.

Mixing of soil horizons can also result from surface-disturbing activities and may result in the loss of the A horizon, which is the top layer of the soil horizon or the topsoil. Mixing of topsoil and subsoil and the loss of the A horizon remove surface cover for erosion control and organic matter inputs for nutrient recycling. The result is decreased soil productivity in the long term, inhibiting revegetation, decreasing soil reclamation potential, and increasing suitability for noxious and invasive species.

Anticipated impacts on soil resources would occur from surface disturbances associated with natural disturbances and land uses such as minerals and energy development.

Chemicals, including some hazardous chemicals, are used and produced by oil and gas exploration and production (EPA 2004; URS Group 2006; Geoffrey 2010). Oil and gas waste management practices have the potential to contaminate soils. Long-term impacts depend on the volume and toxicity of the spilled materials or fluids. Contamination of soils could cause long-term reduction in site productivity, resulting in increased erosion and potential sediment and contaminant delivery to nearby waterways during runoff. Use, storage, and transportation of fluids have the possibility of spills that could migrate to surface or groundwater. Fluid released from drilling and hydraulic fracturing operations are a major public concern within the CRVFO and GJFO areas.

Alternatives A, B, C, and D

CRVFO

Alternative A considered a moderate level of oil and gas development with the least stringent stipulations and the most acres open to leasing; however, it would permit less surface disturbance than Alternative D. Impacts under Alternative B would be similar to those under Alternative A, but slightly fewer acres of land with high potential for oil and gas would be open to leasing. Under Alternative C, more acres would be closed to fluid minerals leasing and slightly more acres would be protected by NSO or CSU stipulations than under Alternatives A or B. Impacts under Alternative D would be similar to those under Alternative A but with more development and fewer protective measures. Under Alternative D, a high percentage of the decision area would be open to fluid minerals leasing and would account for a substantial increase in infrastructure and disturbed acres.

GJFO

Alternative A would have the most area open for fluid mineral leasing with the fewest stipulations. Impacts under Alternative B would be similar to those under Alternative A, but slightly fewer acres of land with high potential for oil and gas would be open to leasing. Alternative B would have an NSO stipulation for steep slopes, another NSO stipulation for the Baxter/Douglas Pass slump area and Plateau Creek slump area, and a CSU stipulation for Mancos Shale and saline soils. Under Alternative C, more acres would be closed to fluid minerals leasing, and more acres would be protected by NSO or CSU stipulations than under Alternatives A or B. Impacts under Alternative D would be similar to those under Alternative A but with fewer protective measures. Under this alternative, a high percentage of the decision area would be open to fluid minerals leasing.

Alternative E

CRVFO and GJFO

Under Alternative E, fluid mineral impacts on soil resources would be similar to those described under Alternative C. This is because the same ACECs, SRMAs, lands managed for wilderness characteristics, and

other identified areas would be closed to leasing, and other protections would continue. However, under Alternative E, a greater area would be closed to fluid mineral leasing than under Alternative C.

A decrease in leasable acres would reduce impacts on soil resources. With less fluid mineral leasing, fewer roads, pads, and pipeline corridors would be built. This would reduce soil compaction, soil mixing, areas of impervious surfaces, biological crust damage, stormwater runoff, and erosion. With fewer surface-disturbing activities and less surface occupancy, water infiltration rates and vegetation cover would not decrease. Additionally, with less fluid mineral development, the risk of impacting soil resources with unintentional releases of hazardous materials would decrease.

Alternative F

CRVFO and GJFO

Under Alternative F, impacts on soil resources would be similar to those described under Alternative C, although additional ACECs, SRMAs, municipal watersheds, lands managed for wilderness characteristics, and other identified areas would be closed to leasing. Also, other protections would continue. Under Alternative F, many additional areas would be considered for no leasing. The Baxter/Douglas Pass slump area and Plateau Creek slump area would have no future leasing in the GJFO, protecting these fragile soils from mass movement. The Baxter/Douglas Pass slump area and Plateau Creek slump area currently have an NSO stipulation to protect the areas. Approximately half of the Baxter/Douglas Pass and Plateau Creek slump areas are in the high oil and gas development potential area (25,000 acres), and the remainder (27,000 acres) are in the low- and medium-potential area.

Alternative F is the most restrictive alternative and would have the most protection for soils. A decrease in leasable acres would reduce impacts on soil resources. With less mineral leasing, fewer roads, pads, and pipeline corridors would be built. This would reduce soil compaction, soil mixing, areas of impervious surfaces, biological crust damage, stormwater runoff, and erosion. With fewer surface-disturbing activities and less surface occupancy, water infiltration rates and vegetation cover would also increase due to the reduction of compaction of soil resources. Additionally, with less oil and gas development, the risk of impacting soil resources with unintentional releases of hazardous materials would decrease.

Cumulative Impacts

Cumulative impacts are described in the 2014 and 2015 Proposed RMPs/Final EISs (BLM 2014, Soils, pages 4-78 through 4-79; BLM 2015a, Soils, pages 4-85 through 4-86). A summary as it relates to the decisions for this supplemental EIS is included below.

CRVFO and GJFO

The cumulative impacts assessment area as it relates to soil resources would be the CRVFO and GJFO boundary and would include all federal, State, private, and other lands within this boundary. Reasonably foreseeable future actions include oil and gas exploration and development activities, which could have adverse impacts on soil resources, as described above.

Oil and gas development on federal, State, private, and other lands within and adjacent to the decision area could continue to increase. Oil and gas wells on non-BLM-administered lands are expected to increase at a similar or greater rate than BLM wells. Many BLM activities, such as oil and gas access roads and pipelines, cross multiple landownerships and therefore would affect neighboring lands. Therefore,

erosional processes and soil loss could be initiated on neighboring lands then deposited on BLM-administered land or vice versa.

Recent drought and potential climate change that could result in more frequent future droughts could decrease vegetation cover, increasing the potential for soil erosion, desertification, and fugitive dust production. Furthermore, increased fugitive dust production could elevate the severity of dust-on-snow events; these would trigger earlier melt-out and earlier peak streamflows, increasing water consumption through transpiration and evaporative processes. Climate change and dust-on-snow events may cause runoff to occur earlier and with higher intensity. As a result, soil moisture in areas reliant on snowmelt or flooding would be depleted earlier in the season, stressing vegetation. These additional stresses to vegetation communities could contribute toward vegetation loss and establishment of less desirable species.

The cumulative impacts on soil resource under Alternatives E and F would be similar to those under Alternative C. However, oil- and gas-related surface-disturbing activities and surface occupancy would be less under Alternatives E and F since these alternatives close a larger area to future fluid mineral leasing. Therefore, Alternatives E and F would provide more protection for soil resources than other alternatives.

3.5.3 Water Resources

Affected Environment

Groundwater

The following analysis of groundwater for the CRVFO and GJFO is taken from the previous text described in the 2014 and 2015 Proposed RMPs/Final EISs (BLM 2014, Groundwater, pages 3-30 through 3-34; BLM 2015a, Groundwater, pages 3-54 through 3-56). A summary is below.

CRVFO

Groundwater in the CRVFO region is recharged via snowpack in higher elevations (EPA 2004). Recharge to groundwater aquifers flows from these upland areas to discharge zones near streams. These discharge areas are typically found along the Colorado River and its tributaries (USGS 1995).

The most productive groundwater sources are east of the Grand Hogback in the Eagle Basin and along the Colorado River and its tributaries. Most wells are generally shallow, with depths less than 120 feet. The Eagle Valley Evaporite underlies groundwater sources of the Eagle River Valley and can produce high concentrations of total dissolved solids. Areas near hot springs, such as Dotsero and Glenwood Springs, can also produce water with higher concentrations of total dissolved solids.

The lower Green River and Wasatch Formations contain alluvial and bedrock aquifers. The unconsolidated alluvial aquifers are the most productive in the region (EPA 2004). The most important bedrock aquifers are the saturated members of the Uinta Formation and Parachute Creek Member of the Green River Formation in the upper and lower Piceance Basin aquifer system (EPA 2004).

Generally, well depths are less than 200 feet, and typical water levels range from 50 to 100 feet. Water quality in these systems can vary and is affected by return flow quality, mineral content and weathering, ion exchange with surrounding minerals, and organic loading from fertilizer and pesticide leaching.

GJFO

Groundwater contributes less than 2 percent of the total water resource in the GJFO, comprised of all surface (lakes, rivers, and reservoirs) and groundwater (Topper et al. 2003). The groundwater component of the water resource in the Mesa County/Piceance/Colorado River area mostly serves agricultural and irrigation requirements. Primary sources of groundwater in the planning area are the alluvial aquifer systems associated with the Colorado, Gunnison, and Dolores Rivers. Bedrock aquifers of the Piceance Basin account for a minor proportion of water use (Topper et al. 2003). As in the CRVFO area, groundwater is primarily recharged through snowmelt in higher elevations and streamflow in upper drainages.

The Plateau Valley contains alluvial deposits that serve as an important water source for domestic and municipal uses. Alluvial groundwater occurs in unconsolidated deposits formed along drainage courses. These aquifers can yield sufficient water for domestic and stock water uses, and as irrigation water in some locations. Groundwater in these locations is largely unconfined, with some confinement occurring in smaller, localized areas. Most water supply wells in the southern portion of the Piceance Basin are completed in the alluvial aquifers associated with the Colorado and Gunnison River tributaries (Topper et al. 2003).

The principal bedrock aquifers of the upper and lower Piceance Basin aquifer systems are saturated members of the Uinta Formation and Parachute Creek Member of the Green River Formation. This system is largely confined except along outcrops at the basin edge. Other freshwater supply comes from the deeper Entrada and Wingate sandstones, with lesser amounts from the Salt Wash member of the Morrison Formation. Groundwater wells from these sources often must be drilled deeper than 1,000 feet, and they often contain high amounts of salts and dissolved solids (Heath 1984).

Surface Water

This section incorporates by reference the affected environment described in the 2014 and 2015 Proposed RMPs/Final EISs (BLM 2014, Water Resources, pages 3-25 through 3-34; BLM 2015a, Water Resources, pages 3-45 through 3-60). New information and a summary as it relates to the decisions for this supplemental EIS are included below.

CRVFO

The planning area lies entirely within the upper Colorado River watershed. The three major rivers that flow through the CRVFO planning area are the Colorado, Roaring Fork, and Eagle. Other smaller rivers in the planning area include the Piney River, which is a tributary to the Colorado River, and the Frying Pan River, which is a tributary to the Roaring Fork River (BLM 2007a). The rivers and streams in the planning area all flow into the Colorado River or its tributaries.

Municipal watersheds and public water supplies (drinking water source areas) were identified as those areas that the State of Colorado has determined to be a “public water system.” Public water supplies within the CRVFO planning area include the municipalities/towns of De Beque, Battlement Mesa, Parachute, Rifle, Silt, New Castle, Glenwood Springs, and Gypsum. Additionally, several community groups and homeowners’ associations within the planning area have initiated or nearly completed source water protection plans. This list will evolve over time, but currently includes the subdivisions of Canyon Creek, Mitchell Cooper, Eagle Springs, and Talbott. The list of source water protection areas will increase in the future, as other towns complete their source water protection plans.

Ground-disturbing activities, such as those associated with oil and gas development, can increase sediment yield and other pollutant loads carried in stormwater to rivers and streams. Increased stream discharge, alteration of peak flow timing, and modification of a stream's normal sediment loads can occur from increases of impervious surfaces and disturbances (that is, roads and pads) near drainages. The increase in flow rates and sediment loads can modify stream channel morphology and degrade water quality.

The cumulative effects of removing fresh water may stress water resources, such as springs or drinking water sources, where recharge is limited. Water use for domestic and other needs are expected to increase significantly in the future.

GJFO

Surface water is the primary source of fresh water, with groundwater only accounting for approximately 2 percent of water uses in the planning area (Topper et al. 2003). Surface water and surface water quality are also intertwined with other natural resources and GJFO management actions; surface water and surface water quality are the focus of this section.

The GJFO lies within the Upper Colorado River Basin in western Colorado. Within the planning area, the Colorado River includes four major subbasins. From east to west, these include Roan Creek, Plateau Creek, Gunnison River, and the Dolores River.

Municipal watersheds and source water protection areas have been identified in the planning area. Source water protection areas that provide drinking water to local towns and communities were delineated by the State of Colorado as required by the Safe Drinking Water Act amendments of 1996. Source water assessments have been completed for Grand Junction, Palisade, Collbran, De Beque, and Clifton. Assessments have also been completed for smaller municipalities, resorts, homeowner associations, and ski areas. Smaller systems and private potable water sources are tapped throughout the planning area (CDPHE 2000, 2009).

While there are many perennial rivers and streams within the planning area, most streams are intermittent or ephemeral, flowing seasonally or from storm events, respectively. Among other functions, healthy ephemeral and intermittent streams move water, nutrients, and sediment through the watershed; provide landscape hydrologic connections; dissipate stream energy during high flows to reduce erosion and improve water quality; provide groundwater recharge and discharge; maintain floodplains; and store and cycle nutrients. In addition, they provide wildlife habitat and migration corridors and support vegetation communities to help stabilize stream banks.

CRVFO and GJFO

The quality of water flowing through BLM-administered lands is regulated by the State of Colorado under authority from the EPA under the Clean Water Act of 1977 and the Safe Drinking Water Act. Section 303(d) of the Clean Water Act requires that states submit to the EPA a list of those waters for which technology-based effluent limitations and other required controls are not stringent enough to implement water quality standards. Colorado State Regulation #93, Colorado's Section 303(d) List of Impaired Waters and Monitoring and Evaluation List, fulfills that requirement and identifies waterbodies where there is reason to suspect water quality problems (CDPHE 2021b). In addition, the CDPHE issues an Integrated Water Quality Monitoring and Assessment 305(b) Report, which identifies water quality conditions for Colorado (CDPHE 2022b). Where stream segments are suspected of having water quality

problems, but existing data are inadequate to make a determination, segments are placed on Colorado’s Monitoring and Evaluation List until more data become available.

The list of waterbodies in the planning area on the Section 303(d) list or the Monitoring and Evaluation List is regularly updated. An updated list from 2021 is available. The updated list of impaired waterbodies in the CRVFO planning area is found in **Appendix B**. The updated list of impaired waterbodies in the GJFO planning area is found in **Appendix C**.

Since the 2015 Final EIS, new information pertaining to water quality conditions within the planning area is available from data collected using the BLM’s National Aquatic Monitoring Framework (Technical Reference 1735-1). Based on the mechanisms of potential impacts from oil and gas development, including infrastructure, water quality indicators, such as fine sediment, specific conductance, and freshwater macroinvertebrates, are expected to yield the most immediate and strongest signals.

The BLM used lotic assessment, inventory, and monitoring (AIM) data to characterize conditions of water quality across the CRVFO and GJFO. Water quality data from AIM assessments were collected using Technical Reference 1735-2, Version 1 and 2 (AIM National Aquatic Monitoring Framework: Field Protocol for Wadeable Lotic Systems; Technical Reference 1735-2). In total, 67 sites were sampled across the CRVFO planning area between 2013 and 2022. For the GJFO, 55 sites were sampled between 2013 and 2022.

Data in **Table 3.5-8** show both the number and overall percentage of sites that have minimal, moderate, and major departure from expected natural conditions for fine sediment, specific conductance, and freshwater macroinvertebrates in the CRVFO. Data in **Table 3.5-9** show the same information for the GJFO.

Table 3.5-8. Water Quality Conditions within the CRVFO from Lotic AIM Assessments

Indicator	Departure		
	Minimal (number of sites and %)	Moderate (number of sites and %)	Major (number of sites and %)
Fine sediment	52 (78%)	—	15 (22%)
Specific conductance (microsiemens per centimeter)	17 (35%)	7 (14%)	25 (51%)
Macroinvertebrate multi-metric index (MMI) ¹	43 (77%)	5 (9%)	8 (14%)

¹An MMI model compares observed macroinvertebrate communities in a stream or river with expected macroinvertebrate communities in the absence of human-caused disturbances.

Table 3.5-9. Water Quality Conditions within the GJFO from Lotic AIM Assessments

Indicator	Departure		
	Minimal (number of sites and %)	Moderate (number of sites and %)	Major (number of sites and %)
Fine sediment	30 (59%)	—	21 (41%)
Specific conductance (microsiemens per centimeter)	23 (55%)	32 (67%)	16 (38%)
Macroinvertebrate multi-metric index (MMI)	32 (67%)	5 (10%)	11 (23%)

Although 67 sites have been sampled across the CRVFO and 55 sites have been sampled across the GJFO, some sites have missing values for the indicators listed in the table. Reasons for missing data include, but are not limited to, partial data collection and errors. The first number listed in each departure category is the number of sites for each specific indicator that are either in minimal, moderate, or major departure from the reference condition. The second number in parentheses is the percentage of sites for each specific indicator that are in either minimal, moderate, or major departure from the reference condition.

The BLM compared the data collected using the AIM strategy with benchmark values to assess whether indicators are departing from reference conditions and therefore meeting or not meeting Colorado's Land Health Standards and BLM management objectives. The benchmark values and approaches associated with each indicator can be found in the table in **Appendix C**. These benchmarks, along with their approaches, were selected by subject matter experts from the BLM in Colorado, the BLM National Operations Center, and aquatic ecologists from the National Aquatic Monitoring Center at Utah State University.

Established water quality standards benchmarks in CDPHE's Regulation 31 (The Basic Standards and Methodologies for Surface Water) were compared against lotic AIM indicators, when available (CDPHE 2021c). However, when CDPHE policy does not have established benchmarks, other benchmark approaches were used, such as regional reference conditions, published literature values, and best professional judgement (Miller et al., in publishing). Benchmarks for specific conductance were established using methods in Olsen and Hawkins (2012). The methods in Olsen and Hawkins (2012) use models to predict solute concentrations, with known levels of accuracy and precision, at the reach scale in the absence of human-caused impacts using natural environmental gradients (BLM Technical Reference 1735-3 and Hawkins et al. 2010). Human-influenced activities that increase erosion, such as oil and gas infrastructure, can increase ions in surface water resources that lead to elevated specific conductance levels.

CDPHE uses an MMI approach to assess aquatic life-use attainment for three different biotypes (that is, mountains, transition, and plains and xeric) throughout Colorado. An MMI model compares observed macroinvertebrate communities in a stream or river with expected macroinvertebrate communities in the absence of human-caused disturbances. This MMI score is used to show if there has been a deviation from predicted macroinvertebrate communities at a site and potential stressors, if present. An MMI is made up of several indices, such as richness, composition, and pollution tolerance. MMI scores have a standardized range between 0 and 100. Higher scores represent a biological community closer to the reference condition, while lower scores are indicative of a more degraded biological community. Macroinvertebrates are commonly used in assessing water quality due to the feasibility of collecting samples and because different taxa respond to different types and quantities of pollutants.

Lotic AIM data show that water quality conditions across the planning area are in generally good condition. Fine sediment is the most pervasive indicator, especially in the GJFO where 41 percent of sampled sites do not meet CDPHE's fine sediment threshold. Elevated fine sediment is also a concern within the CRVFO with 22 percent of sites that do not meet CDPHE's fine sediment threshold.

Elevated specific conductance is the most pervasive water quality indicator within the planning areas with 51 percent and 38 percent of sites showing major departure from predicted natural conditions in the CRVFO and GJFO, respectively. Only 35 percent of sites within the CRVFO show a minimal departure from predicted natural conditions for specific conductance. Water quality data collected using AIM methodologies reflect water quality conditions at a single location at a single point in time. These point-

in-time measurements are used to identify potential water quality impairments in a system and help determine whether additional monitoring is needed to assess specific water quality exceedances. These water quality data do not meet CDPHE 303(d) listing requirements.

Chemicals, including some hazardous chemicals, are used and produced by oil and gas exploration and production (EPA 2004; URS Group 2006; Geoffrey 2010). Oil and gas waste management practices have the potential to contaminate soils and water. Long-term impacts depend on the volume and toxicity of the spilled materials or fluids. Contamination of soils could cause long-term reduction in site productivity, resulting in increased erosion and potential sediment and contaminant delivery to nearby waterways during runoff. Use, storage, and transportation of fluids have the possibility of spills that could migrate to surface or groundwater. Fluid released from drilling and hydraulic fracturing operations is a major public concern within the CRVFO.

Water availability for multiple-use management and the functioning of healthy riparian and upland systems is crucial for managing BLM-administered lands. Many aspects of oil and gas development require the use of water, including drilling, cementing, and completion activities; dust abatement on roads and pads; and hydrostatic pipeline testing. In an effort to quantify water depletions in the Colorado River for federally listed fish, the US Fish and Wildlife Service (USFWS) issued a programmatic biological opinion (PBO) that assumes 25.1 acre-feet of water are depleted per horizontal well (18 percent of projected wells), and 2.5 acre-feet are depleted per non-horizontal well (82 percent of projected wells) within the CRVFO planning area (USFWS 2017).

Surface occupancy and surface-disturbing activities, such as those associated with oil and gas development, that occur in and in areas adjacent to rivers, streams, or waterbodies may also affect water quality. Riparian areas have been defined for the purpose of this management plan to aid in the classification of localized areas and to protect water quality. These areas exhibit vegetation or physical characteristics reflective of permanent surface or subsurface water influence. Riparian areas can be defined for lentic ecosystems with standing water, such as lakes and ponds, and lotic ecosystems with flowing water, such as rivers and streams.

Direct and Indirect Impacts

This section presents the impacts on water resources from the management actions of other resources and resource uses discussed in **Chapter 2**. This section incorporates by reference the methods, assumptions, and impacts for Alternatives A, B, C, and D described in the 2014 and 2015 RMPs/Final EISs (BLM 2014, Water Resources, pages 4-80 through 4-109; BLM 2015a, Water Resources, pages 4-86 through 4-114). The methods and assumptions also apply to Alternatives E and F. A summary as it relates to fluid minerals is included below.

Groundwater and Surface Water

Alternatives A, B, C, and D

CRVFO

Areas closed to leasing vary under Final EIS Alternatives A through D.

Alternative A would be the least protective of groundwater resources, as more areas would be open for leasing and less protective of groundwater resources. There would be an NSO stipulation for major river

corridors and another for two municipal watersheds, which would limit or prevent surface-disturbing activities protecting shallow aquifers and surface waters from contamination.

Alternative B would provide more protections for public water supplies and municipal watersheds than Alternative A. Alternative B would include groundwater studies to identify important recharge zones and to characterize groundwater movement and surface interaction. There would be an NSO stipulation within 1,000 feet to either side of the water supply stream and 5 miles upstream of the intake of a classified municipal water supply. There would also be an NSO stipulation for perennial streams and other waterbodies, including riparian areas and wetlands (328 feet from the outer edge) and major river corridors.

Under Alternative C, management decisions limiting surface-disturbing activities would benefit groundwater resources, as less surface disturbance would result in less potential to impact shallow groundwater aquifers during drilling activities. Alternative C would apply NSO and CSU stipulations to protect groundwater resources and would protect the resources more effectively than Alternative A. NSO stipulations would include designated municipal watershed areas and major river corridors. Generally, areas closed to development or subject to NSO stipulations would experience little or no surface disturbance from fluid minerals development. Additionally, BMPs, COAs, and specific mitigation measures identified during project implementation-level planning would prevent or reduce impacts on water resources.

Under Alternative D, anticipated development would be similar to development under Alternative B but with fewer stipulations among various resources. This alternative would be the least restrictive to fluid mineral development. With this alternative, more areas would be open to leasing, leading to increased surface disturbance and potential impacts on shallow groundwater.

GJFO

Areas closed to leasing vary under Final EIS Alternatives A through D.

Alternative A would be the least protective of groundwater resources, as more areas would be open for leasing and less protective of groundwater resources. Alternative A would have an NSO stipulation of the Grand Junction municipal watershed. Fluid mineral development would not be limited near domestic water wells or water intake zones.

Under Alternative B, the Grand Junction and Palisade municipal watersheds would be closed to future fluid mineral leasing. Compared with Alternative A, special protective measures under Alternative B would result in fewer impacts on water resources in municipal watersheds from fluid minerals activities. Oil and gas operations near domestic water supplies using a groundwater well or spring would be restricted, and appropriate design features or COAs would be developed to avoid contaminating water resources. There would also be an NSO stipulation for streams and riparian areas. Within Water Intake Zone 3, restricting the storage and use of hazardous chemicals, requiring green completions and green hydraulic fracturing fluids, and restricting oil and gas pits would protect water resources from the use of hazardous chemicals that could infiltrate or percolate into domestic and municipal water resources if a spill or other accident were to occur.

Alternative C would include additional actions for protecting groundwater quality compared with Alternatives A and B, and would close a larger area to fluid mineral leasing than Alternatives A and B. The

Grand Junction and Palisade municipal watersheds, Collbran and Mesa/Powderhorn source water protection areas, and the Jerry Creek watershed would be closed to future fluid mineral leasing. The Water Intake Zone 3 would also be closed. Oil and gas operations near domestic water supplies using a groundwater well or spring would be restricted, and appropriate design features or COAs would be developed. There would also be an NSO stipulation for streams and riparian areas.

Alternative D would include the addition of greater buffer widths and NSO stipulations near hydrologic features compared with Alternative A. Less area would be open to leasing than under Alternative A, but more area would be opened compared with Alternatives B and C. Fluid mineral well bores and storage and use of hazardous chemicals would not be limited near domestic water wells or in Water Intake Zone 3.

Alternative E

CRVFO and GJFO

Under Alternative E, future mineral leasing would apply to a smaller area than under Alternatives A through D. This would benefit groundwater resources because less surface disturbance would result in less potential to impact shallow groundwater aquifers during drilling activities. Alternative E would protect the groundwater resource more effectively than Alternative A and Alternative C.

Like Alternative C, within the GJFO, Alternative E would close the Grand Junction and Palisade municipal watersheds, Collbran and Mesa/Powderhorn source water protection areas, the Jerry Creek watershed, and areas within Water Intake Zone 3 to future leasing. Within the watersheds, source water protection areas, and Intake Zone 3, 63,400 acres would be in the high oil and gas development potential area and 800 acres would be in the no, low, and medium potential areas.

With less area available for fluid mineral leasing, fewer roads, pads, and pipeline corridors would be built, decreasing the amount of surface water runoff compared with Alternatives A through D. This would also decrease the amount of sediment and other pollutant loads into surface water (and therefore turbidity). Reduced runoff would also decrease the risk of increased stream discharge, alteration of stream morphology, and alteration of peak flow timing.

With less area available for mineral leasing under Alternative E, the risk of contamination of surface water and drinking water from oil and gas waste management practices, and unintended releases of hazardous materials, would decrease. With fewer surface-disturbing activities, there would be a decrease in fugitive dust, which would decrease the risk of earlier melt-out, earlier peak streamflows, and water consumption through transpiration and evaporative processes.

Under Alternative E, fewer wells would be drilled; therefore, less water would be used for drilling, which would reduce freshwater depletions.

Approved NSO and CSU stipulations to protect groundwater resources would continue to apply to areas where leasing would be allowed.

Alternative F

CRVFO and GJFO

Under Alternative F, no future fluid mineral leasing would apply to a larger area than under Alternatives A–E. This would benefit groundwater resources because less surface disturbance would result in less potential to impact shallow groundwater aquifers during drilling activities.

Alternative F is the most restrictive alternative. With the greatest area closed to mineral fluid leasing, Alternative F would provide the greatest reduction of impacts on surface water resources. With less mineral leasing, fewer roads, pads, and pipeline corridors would be built, decreasing the amount of surface water runoff. This would also decrease the amount of sediment and other pollutant loads into surface water (and therefore turbidity). Reduced runoff would also decrease the risk of increased stream discharge, alteration of stream morphology, and alteration of peak flow timing.

In the GJFO, Alternative F would close the Grand Junction and Palisade municipal watersheds, Collbran and Mesa/Powderhorn source water protection areas, the Jerry Creek watershed, and areas within Water Intake Zone 3 to future leasing. In the GJFO, Alternative F would also close a half-mile buffer to fluid mineral leasing, 5 miles upstream (within the GJFO boundaries) for four municipal water diversions on the Colorado and Gunnison Rivers. Closing these areas to leasing would decrease the risk of introducing sediment, chemicals, and other pollutants to municipalities' drinking water and provide protections for the drinking water of four municipalities (Grand Junction, Clifton, Ute Water Conservation District, and De Beque).

Closing additional areas under Alternative F would reduce the impacts on the Grand Junction and Palisade municipal watersheds, Collbran and Mesa/Powderhorn source water protection areas, the Jerry Creek watershed, and areas within Water Intake Zone 3. Within the watersheds, source water protection areas, and Water Intake Zone 3, 63,400 acres would be in the high oil and gas development potential area, and 800 acres would be in the no, low, and medium potential areas. Within the half-mile buffer, 5 miles upstream of the four municipal water diversions on the Colorado and Gunnison Rivers, 1,600 acres would be in the high oil and gas development potential area, and 2,600 acres would be in the no, low, and medium potential areas.

With less area available for mineral leasing under Alternative F, the risk of contamination of surface water and drinking water from oil and gas waste management practices, and unintended releases of hazardous materials, would decrease.

With fewer surface-disturbing activities, there would be a decrease in fugitive dust, which would decrease the risk of earlier melt-out, earlier peak streamflows, and water consumption through transpiration and evaporative processes.

Approved NSO and CSU stipulations to protect groundwater resources would continue to apply to areas where leasing would be allowed.

Cumulative Impacts

Cumulative impacts would be similar to those described in the 2014 and 2015 Proposed RMPs/Final EISs (BLM 2014, Water Resources, pages 4-108 through 4-109; BLM 2015a, Water Resources, pages 4-111 through 4-114). A summary as it relates to the decisions for this supplemental EIS is included below.

CRVFO and GJFO

The cumulative impacts assessment area for water resources would be the CRVFO and GJFO boundary and would include all federal, State, private, and other lands within this boundary. Reasonably foreseeable future actions include oil and gas exploration and development activities, which could have adverse impacts on water resources.

Potential cumulative impacts on water resources would result from surface disturbances and vegetation loss near waterways that could lead to an increase in runoff and sediment and contaminant delivery. Activities that could impact water resources include oil and gas exploration and development. These activities would create surface disturbances by removing vegetation cover, displacing and compacting soils, and altering soil structure and chemistry. The result, until rehabilitation, is exposed surfaces that increase runoff rates and erosion and deliver sediment and contaminants to nearby waterways. Sedimentation in waterways can cause changes in the water chemistry as well as geomorphic adjustments that could have negative effects on stream function.

Reasonably foreseeable oil and gas development on federal, State, private, and other lands within and adjacent to the planning area could have an effect on water resources without proper mitigation, BMPs, and comprehensive planning.

Water depletions from the Colorado River basin for drilling, cementing, dust abatement, and hydrostatic pipeline testing may decrease overall flow patterns and the volumes of springs and seeps, streams, and rivers throughout the CRVFO and GJFO. Decreased flow often compounds existing water quality impairments and may lead to reduced water quality elsewhere. Many resource values, such as aquatic and wildlife habitat, recreation, and grazing, depend on consistently good water quantity and quality. Soil and water contamination (via spills, leaks, or compromised downhole well infrastructure) also contribute to overall impacts on water sources.

3.5.4 Vegetation

Affected Environment

This section incorporates by reference the affected environment described in the 2014 and 2015 Proposed RMPs/Final EISs (BLM 2014, Vegetation, pages 3-35 through 3-53; BLM 2015a, Vegetation, pages 3-60 through 3-82). A summary as it relates to the decisions for this supplemental EIS is included below.

Plant Communities

CRVFO

Ten general plant communities are within the CRVFO decision area; the largest is pinyon-juniper woodlands. Limited new information is available regarding upland vegetation and plant communities relative to the Final EIS analysis data. Both short-term and long-term monitoring on grazing allotments have been conducted. Ecological site reference data has also been collected. New vegetation data for short-term monitoring include utilization studies and multiple indicators monitoring on active grazing allotments. Long-term monitoring is accomplished through land health assessments (LHAs) on active grazing allotments, and collection of ecological site reference data is done through AIM.

Several new LHAs have been completed since 2014 and are reflected in **Table 3.5-10**. This table compares BLM-administered acres meeting and not meeting land health standards. Updated LHAs have been conducted in the Roaring Fork Valley, Eagle County, Routt County, and the western portions of Garfield County since 2014. A total of 490,835 acres were monitored in 2014, and 487,666 acres were monitored in 2021. Overall, a higher percentage of acres are meeting BLM upland land health standards compared with 2014. Of note, the category of “Meeting with Problems” is no longer used in LHAs, as indicated by N/A in the table below.

Table 3.5-10. Comparison of CRVFO Land Health Assessments (2014 and 2021)

Rating	Meeting Standards		Meeting with Problems*		Not Meeting (Current management a significant factor)		Not Meeting (Causes other than current management)	
	2014	2021	2014	2021	2014	2021	2014	2021
Acres surveyed	280,414	347,665	172,675	N/A	7,022	114,046	30,724	25,955
Percentage of surveyed area	57.1%	71.3%	35.2%	N/A	1.4%	23.4%	6.3%	5.3%

N/A = Not applicable (category no longer used)

The CRVFO has made recent changes in livestock management, including changing some historical cattle allotments to sheep and using virtual fences to protect sensitive riparian areas and maintain allotment boundaries. As a result, more acres will likely meet land health standards in coming years.

GJFO

Fourteen general plant communities are within the GJFO decision area; the largest is pinyon-juniper woodlands. Limited new information is available regarding upland vegetation and plant communities relative to the Final EIS analysis data. Yearly short-term monitoring on grazing allotments has been conducted, as well as long-term land health studies. Several new LHAs are in progress, and a few have been completed since 2015; these are reflected in **Table 3.5-11**. This table compares BLM-administered acres meeting and not meeting upland land health standards. Updated LHAs have been conducted in the Douglas Pass area of Garfield County in Greater Sage-grouse habitat. Overall, a higher percentage of acres are meeting BLM upland land health standards compared with 2015.

Table 3.5-11. Comparison of GJFO Land Health Assessments (2015 and 2021)

Rating	Meeting Standards		Meeting with Problems*		Not Meeting (Current management a significant factor)		Not Meeting (Causes other than current management)	
	2015	2021	2015	2021	2015	2021	2015	2021
Acres surveyed	1,035,529	1,085,323	N/A	N/A	1,219	4,171	6,943	865
Percentage of surveyed area	82.4%	93.1%			0.01%	3.5%	5.5%	0.07%

N/A = Not applicable (category no longer used)

Significant Plant Communities

Significant plant communities are either rare (globally or state), ancient, or exemplary in that they have not been substantially altered by human activity. As such, they are typically in good condition with few invasive weeds or habitat fragmentation.

CRVFO

In the CRVFO decision area, the only areas that have been extensively inventoried for significant plant communities are portions of the Colorado River and Roaring Fork River riparian corridors. Thirteen occurrences of 10 significant plant communities have been identified. The significant plant communities within the planning area remain unchanged from the CRVFO Final EIS (BLM 2014) analysis. Most of these communities are still in good condition, with little fragmentation or invasion of exotic species.

GJFO

In the GJFO decision area, 50 occurrences of 28 significant plant communities have been identified. A few new occurrences of significant plant communities have been recorded since 2015 and are included in current CSU protections. Otherwise, the significant plant communities remain unchanged from the GJFO Final EIS (BLM 2015) analysis.

Wetlands, Floodplains, and Riparian Habitat

CRVFO

Riparian vegetation makes up approximately one percent of the total vegetation cover in the CRVFO decision area. There are approximately 280 miles of perennial, ephemeral, and intermittent streams that support riparian vegetation. Including springs, lakes, and seeps, approximately 3,993 acres of riparian vegetation have been identified in the CRVFO decision area.

Since the 2015 Final EIS, new information on the condition of riparian areas, floodplains, and wetlands is available from proper functioning condition (PFC) assessments and data collected using the BLM's National Aquatic Monitoring Framework (Technical Reference 1735-1). Many of these PFC assessments have been completed as part of LHAs. The PFC assessment method refers to a consistent approach for considering hydrologic, vegetative, and geomorphic attributes and processes to assess the condition of riparian areas and wetlands at a point in time. Information pertaining to 17 to 20 attributes and processes of a riparian system is foundational to determining its physical, hydrologic, and vegetative functions; this information is synthesized on an assessment form.

Based on the responses and comments on the assessment form, an interdisciplinary team places the stream reach in one of five rating categories: PFC, functioning at risk with an upward trend (FAR-up), functioning at risk with no apparent trend (FAR-NA), functioning at risk with a downward trend (FAR-down), and not functioning (NF). Each riparian area and wetland is judged against its capability and potential to conduct effective hydrologic, vegetative, and geomorphic processes.

Table 3.5-12, below, compares PFC rankings from the 2014 analysis to those completed in 2021. Values for 2014 were pulled from the Final EIS, and the trend was not noted for functioning at risk. PFC assessments and rankings for 2021 solely reflect the conditions of lentic and riparian areas assessed in 2021. The 2021 values in **Table 3.5-12** do not encompass the entirety of lotic and lentic riparian areas within the CRVFO. Ephemeral reaches are not assessed for PFC.

Table 3.5-12. CRVFO Riparian Condition Assessment (2014 and 2021)

Lotic Riparian Areas (Located along Streams)										
Rating	PFC		FAR-Up		FAR-NA		FAR-Down		NF	
Year surveyed	2014	2021	2014	2021	2014	2021	2014	2021	2014	2021
Miles surveyed	272	6	5	0	2	3.9	2	0	0	0
% of surveyed length	96%	60.9%	2%	0	<1%	39.4%	<1%	0	0	0

Lentic Riparian Areas (Not Located along Streams)										
Rating	PFC		FAR-Up		FAR-NA		FAR-Down		NF	
Year surveyed	2014	2021	2014	2021	2014	2021	2014	2021	2014	2021
Acres surveyed	73.4	33.4	0	0	0	42.6	0	43.2	0	0
% of surveyed area	100%	28%	0	0	0	35.7%	0	36.2%	0	0

Following the 2015 Final EIS, seven lentic areas were assessed, greatly increasing the recorded acres of lentic riparian habitat within the CRVFO.

Data collected using lotic AIM methodologies yield approximately 68 commonly used indicators. Several other indicators, particularly related to benthic macroinvertebrates, can also be computed. While all these indicators help characterize the chemical, physical, and biological condition of lotic and riparian resources, some indicators can be more responsive to land-use effects than others. Based on the mechanisms of potential impacts from oil and gas development, including infrastructure, indicators such as floodplain connectivity, bank overhead cover, bank stability and cover, fine sediment, invasive and noxious woody species, specific conductance, and macroinvertebrates are expected to yield the most immediate and strongest signals.

In addition to PFC assessments, the BLM used lotic AIM data to characterize conditions of lotic and riparian areas across the CRVFO. Lotic AIM data were collected using Technical Reference 1735-2, Version 1 and 2 (AIM National Aquatic Monitoring Framework: Field Protocol for Wadeable Lotic Systems; TR 1735-2). In total, 67 sites were sampled across the decision area between 2013 and 2022. Data in **Table 3.5-13** show both the number and overall percentage of sites that have inimal, moderate, and major departure from expected natural conditions for floodplain connectivity, bank overhead cover, banks covered and stable, noxious and invasive woody species, and fine sediment. The data presented in **Table 3.5-13** solely show the level of departure from reference for selected indicators of sampled sites across the CRVFO.

Table 3.5-13. Conditions of Lotic and Riparian Areas within the CRVFO

Indicator	Departure		
	Minimal (number of sites and %)	Moderate (number of sites and %)	Major (number of sites and %)
Floodplain connectivity	26 (41%)	13 (21%)	24 (38%)
Bank overhead cover	52 (79%)	6 (9%)	8 (12%)
Banks covered and stable	26 (39%)	9 (14%)	31 (47%)
Noxious and invasive species	22 (82%)	3 (11%)	2 (7%)
Fine sediment	52 (78%)	—	15 (22%)

Although 67 sites have been sampled across the decision area, some sites have missing values for the indicators listed in the table. Reasons for missing data include, but are not limited to, partial data collection and errors. The first number listed in each departure category is the number of sites for each specific

indicator that are either in minimal, moderate, or major departure from the reference condition. The second number in parentheses is the percentage of sites for each specific indicator that are in either minimal, moderate, or major departure from the reference condition.

The BLM compared data collected using the AIM strategy with benchmark values to assess whether indicators are departing from reference conditions and therefore meeting or not meeting Colorado's Land Health Standards and BLM management objectives. The benchmark values and approaches associated with each indicator can be found in the table in **Appendix C**. These benchmarks, along with their approaches, were selected by subject matter experts from the BLM in Colorado, the BLM National Operations Center, and aquatic ecologists from the National Aquatic Monitoring Center at Utah State University.

Established benchmarks in CDPHE's Regulation 31 (The Basic Standards and Methodologies for Surface Water) were compared against lotic AIM indicators, when available. However, when CDPHE policy did not have established benchmarks, other benchmark approaches were used, such as regional reference conditions, published literature values, and best professional judgement.

Lotic AIM data show that issues with floodplain connectivity, banks covered and stable, and fine sediment are the most pervasive throughout the CRVFO with 38 percent, 47 percent, and 22 percent of sampled sites showing major departures from reference conditions, respectively. Channel incision can negatively impact energy dissipation during high-flow events, leading to increased bank erosion and elevated fine sediment levels in the stream channel. Channel incision can also cause a decline in the water table, negatively impacting adjacent riparian areas.

GJFO

Riparian vegetation makes up less than one percent of the total vegetation cover in the GJFO decision area, totaling approximately 9,800 acres. Since the Final EIS, new information on the condition of riparian areas, floodplains, and wetlands is available from PFC assessments and data collected using the BLM's National Aquatic Monitoring Framework. Like for the CRVFO, many of these assessments have been completed as part of LHAs and are given one of five ratings (described above under CRVFO). Each riparian area and wetland is judged against its capability and potential to conduct effective hydrologic, vegetational, and geomorphic processes.

Table 3.5-14, below, compares PFC rankings from the 2015 analysis to the 2021 analysis. Values for 2015 were pulled from the Final EIS; the trend was not noted for functioning at risk. Changes in the miles of riparian habitat reflect the reclassification of reaches from perennial or intermittent to ephemeral status. Ephemeral reaches are not assessed for PFC. The overall trend in riparian areas appears to be downward, with a loss in riparian habitat in response to drought. Following the Final EIS, seven lentic areas were assessed, greatly increasing the recorded acres of lentic riparian habitat within the GJFO.

In addition to PFC assessments, the BLM used lotic AIM data to characterize conditions of lotic and riparian areas across the GJFO. In total, 55 sites were sampled across the decision area between 2013 and 2022. Data in **Table 3.5-15** show both the number and overall percentage of sites that have minimal, moderate, and major departure from expected natural conditions for floodplain connectivity, bank overhead cover, banks covered and stable, noxious and invasive woody species, and fine sediment. The data presented in **Table 3.5-15** solely show the level of departure from reference for selected indicators of sampled sites across the GJFO.

Table 3.5-14. GJFO Riparian Condition Assessment (2015 and 2021)

Lotic Riparian Areas (Located along Streams)										
Rating	PFC		FAR-Up		FAR-NA		FAR-Down		NF	
Year surveyed	2015	2021	2015	2021	2015	2021	2015	2021	2015	2021
Miles surveyed	393	351	NA	2.6	117.3	17.6	NA	3.8	6.3	2.5
% of surveyed length	76%	93%		<1%	23%	5%		1%	1%	1%

Lentic Riparian Areas (Not Located along Streams)										
Rating	PFC		FAR-Up		FAR-NA		FAR-Down		NF	
Year surveyed	2015	2021	2015	2021	2015	2021	2015	2021	2015	2021
Acres surveyed	1	126	0	66	0	72.5	0	0	0.1	0.1
% of surveyed area	100%	48%	0	25%	0	27%	0	0	9%	<1%

Table 3.5-15. Conditions of Lotic and Riparian Areas within the GJFO

Indicator	Departure		
	Minimal (number of sites and %)	Moderate (number of sites and %)	Major (number of sites and %)
Floodplain connectivity	17 (31.5%)	17 (31.5%)	20 (37%)
Bank overhead cover	39 (71%)	11 (20%)	5 (9%)
Banks covered and stable	21 (38%)	6 (11%)	28 (51%)
Noxious and invasive species	8 (33%)	1 (4%)	15 (63%)
Fine sediment	30 (59%)	—	21 (41%)

Although 55 sites have been sampled across the decision area, some sites have missing values for the indicators listed in the table. Reasons for missing data include, but are not limited to, partial data collection and errors. The first number listed in each departure category is the number of sites for each specific indicator that are either in minimal, moderate, or major departure from the reference condition. The second number in parentheses is the percentage of sites for each specific indicator that are in either minimal, moderate, or major departure from the reference condition.

Similar to the CRVFO, lotic AIM data show that issues with floodplain connectivity, banks covered and stable, fine sediment, and noxious and invasive woody species are also the most pervasive throughout the GJFO. Thirty-seven percent, 51 percent, 63 percent, and 41 percent of sampled sites show a major departure from the reference condition for floodplain connectivity, banks covered and stable, noxious and invasive woody species, and fine sediment, respectively.

Invasive, Nonnative Plants and Noxious Weeds

CRVFO and GJFO

Controlling the spread of invasive species and noxious weeds is a priority for the CRVFO and GJFO. Inventory and treatment of noxious and other invasive, nonnative plants are ongoing activities in the CRVFO and GJFO. However, no systematic surveys or mapping of weeds have occurred within the decision area, except for oil and gas sites, since the completion of the Final EIS. Herbicide and mechanical treatment of noxious weeds has been ongoing in readily accessible areas along roadsides and adjacent to riparian areas. Biocontrol agents, such as the Russian knapweed gall wasp, have also been used in harder-to-reach areas of the GJFO.

The CRVFO weed program treats approximately 1,200 acres per year, and the GJFO treats approximately 5,000 acres a year. Colorado A-list noxious weeds, with the highest priority of treatment and a goal of eradication, are currently rare in the CRVFO and GJFO. Species on the Colorado B and C lists of noxious weeds are also prioritized for treatment. Colorado B-list noxious weeds have a treatment goal of containing their spread. Colorado C-list species have a goal of facilitating integrated weed management on public and private lands. Because weed infestations are widespread throughout the decision area, it has not been possible to map every occurrence.

Direct and Indirect Impacts

This section presents the impacts on vegetation from the oil and gas leasing discussed in **Chapter 2**. This section incorporates by reference the methods, assumptions, and impacts for Alternatives A, B, C, and D described in the 2014 and 2015 RMPs/Final EISs (BLM 2014, Vegetation, pages 4-110 through 4-152; BLM 2015a, Vegetation, pages 4-114 through 4-139). The methods and assumptions also apply to Alternatives E and F. A summary as it relates to fluid minerals is included below.

Alternatives A, B, C, and D

CRVFO

Plant Communities

Under Alternative A, because the greatest amount of area would be open to future fluid mineral leasing, fluid minerals development would create the greatest adverse impacts on general plant communities, including forests and woodlands. Soil and water NSO and CSU stipulations would protect general plant communities from surface-disturbing activities associated with fluid mineral development.

Alternative B would result in less impact on general vegetation communities than Alternative A since more area would be closed to leasing. Alternative C would have the least impact when compared with Alternatives A, B, and D since the most area would be closed to leasing. Alternative D would have more impact than Alternatives B and C but less than Alternative A. Alternatives B, C, and D would not have fluid mineral stipulations to protect general plant communities. Alternatives B, C, and D would provide more benefit to forest and woodland vegetation than Alternative A since these alternatives have clearly defined objectives for old-growth maintenance and restoration, which would be a consideration for fluid mineral development.

Significant Plant Communities

Alternatives A, B, C, and D would include a CSU stipulation to protect significant plant communities (for example, rare plant associations, communities in excellent ecological condition, remnant vegetation, and old-growth forests and woodlands).

Wetlands, Floodplains, and Riparian Habitat

Alternative A would impact wetlands, floodplains, and riparian habitat the most since the greatest amount of area would be open to future fluid mineral leasing. Alternative A would have an NSO stipulation for riparian areas and wetlands but not for other waterbodies.

Alternative B would apply an NSO stipulation to prohibit surface occupancy within 325 feet of all riparian areas and waterbodies, including perennial streams and fisheries. Alternative C would be similar to Alternative B with a proposed NSO stipulation for all hydrologic features; however, the buffer would only

extend out to 50 feet. Alternative D would provide similar protective measures and levels of protection as Alternative A.

Invasive, Nonnative Plants and Noxious Weeds

Under all alternatives, the BLM would continue to monitor and treat new and existing populations of noxious and invasive weeds, including on and near fluid mineral development activities, and would continue to work with partners from local, State, and federal agencies to control weeds on a broad scale.

Alternative A would close the fewest acres to oil and gas development of any alternative and would provide the least protection from noxious weeds potentially related to fluid mineral development, followed by Alternative D. Alternative C would close the most acres.

GJFO

Plant Communities

Under Alternative A, because the greatest amount of area would be open to future fluid mineral leasing, fluid minerals development would create the greatest adverse impacts on general plant communities, including forests and woodlands. Soil and water NSO and CSU stipulations would protect general plant communities from surface-disturbing activities associated with fluid mineral development.

Alternative B would result in less impact on general vegetation communities than Alternative A since more area would be closed to leasing. Soil and water NSO and CSU stipulations would protect general plant communities from surface-disturbing activities associated with fluid mineral development.

Alternative C would have the least impact when compared with Alternatives A, B, and D since the most area would be closed to leasing. Soil and water NSO and CSU stipulations would protect general plant communities from surface-disturbing activities associated with fluid mineral development.

Alternative D would have more impacts than Alternatives B and C but less than Alternative A.

Significant Plant Communities

Alternative A would have the greatest impact on significant plant communities from fluid mineral development. Alternative A would not apply NSO or CSU stipulations for the protection of these communities.

Alternatives B, C, and D would apply CSU stipulations to protect significant plant communities. These stipulations would allow for relocation of proposed surface-disturbing activities by more than 200 meters, thereby avoiding and protecting occupied habitat and habitat necessary for the maintenance or recovery of the communities. In addition to CSU stipulations, significant plant communities would indirectly benefit from the implementation of NSO stipulations for other resources.

Wetlands, Floodplains, and Riparian Habitat

Under all alternatives, an NSO stipulation would be applied on 6,145 acres of riparian vegetation, and 3,000 acres would be managed for aquatic riparian vegetation.

Alternative A would have the most impact on wetlands, floodplains, and riparian habitat, since the greatest amount of area would be open to future fluid mineral leasing.

Alternative B would apply an NSO stipulation along rivers, streams, and riparian areas. Alternative C's impacts on wetlands, floodplains, and riparian areas would be similar to impacts under Alternative B regarding impacts from fluid mineral activities.

Alternative D would provide slightly less protection to riparian areas than Alternatives B and C and the same protection in major river corridors. Alternative D would require less stringent design, construction, maintenance, and reclamation plans; it also would apply CSU stipulations around riparian areas and wetlands.

Invasive, Nonnative Plants and Noxious Weeds

Because Alternative A would have the largest amount of area open for fluid mineral leasing, it would result in the greatest potential for weed introduction and spread. Alternative D would have the next greatest potential, followed by Alternative B then Alternative C, which would result in the least potential for weed introduction and spread.

Alternative E

Plant Communities

CRVFO and GJFO

Under this alternative, a greater area of plant communities would be protected compared with the alternatives analyzed in the previous Final EIS; this is because a greater amount of area would be closed to leasing. As a result, less fragmentation, soil disturbance, and direct removal of vegetation would occur. Areas that remain open to leasing would be potentially affected by the removal of vegetation; they also would contribute to, or mitigate, the potential for destabilized soils, erosion, decreases in species diversity, and reduced habitat and food for animals and products for human use.

Significant Plant Communities

CRVFO and GJFO

While current CSU constraints protect significant plant communities from direct impact, BLM management decisions on the location and amount of fluid minerals activities could potentially increase indirect effects, such as invasive species. Under this alternative, a greater area of plant communities would be protected compared with the alternatives analyzed in the previous Final EIS; this is because a larger amount of area would be closed to leasing. As a result, the BLM would expect reduced indirect impacts.

Wetlands, Floodplains, and Riparian Habitat

CRVFO

Current NSO stipulations prohibit surface occupancy and surface-disturbing activities within a buffer distance of 100 meters (328 horizontal feet from the outer edge of riparian and wetland zones. These stipulations include CRVFO-CSU-4 and CRVFO-NSO-5. These stipulations protect approximately 29,600 acres of lotic riparian habitat throughout the CRVFO. Riparian areas and wetlands within the CRVFO have the potential to be directly and indirectly affected by the surface-disturbing activities at the watershed level that could impact vegetation and the hydrologic and geomorphic processes essential for riparian and wetland health and function.

Under this alternative, a greater extent of riparian area within areas closed to leasing would be protected from these impacts compared with the alternatives analyzed in the previous Final EIS. This includes an

additional 139 miles of lotic riparian systems and 230 acres of lentic riparian systems compared with Alternative C, which was previously the most conservative proposed alternative. Direct impacts of Alternative E would be mostly positive due to the greatly reduced amount of land available for fluid minerals exploration and development. Positive indirect impacts from this alternative would include reducing the potential of riparian and wetland habitat loss, modification, or fragmentation; soil erosion and loss; and transport of sediments and chemical pollutants to surface waters.

Both the indirect and direct impacts would likely be minor or insignificant changes. Due to geologic conditions in the CRVFO, areas outside the high-potential area are less likely to be developed. Therefore, the impacts on wetlands, floodplains, and riparian habitat in the proposed oil and gas leasing closure area would likely remain undeveloped.

GJFO

Current NSO stipulations (GJFO-NSO-2, GJFO-NSO-4, and GJFO-NSO-5) prohibit surface occupancy, use, and surface-disturbing activities within a buffer of 100 meters from the ordinary high-water mark for lotic riparian corridors, and from the mapped extent of lentic riparian areas. Stipulations also apply to the Palisade and Grand Junction municipal watersheds (9,200 acres). The same direct and indirect impacts within the CRVFO for Alternative E also apply to GJFO. Under this alternative, a greater riparian area within no known, low, and medium potential would be protected from these indirect impacts compared with the alternatives analyzed in the previous Final EIS. This includes an additional 69 miles of lotic riparian systems and 6 acres of lentic riparian systems compared with Alternative C, which was previously the most conservative proposed alternative.

Invasive, Nonnative Plants and Noxious Weeds

CRVFO and GJFO

The CRVFO Integrated Weed Management Plan and Programmatic Environmental Assessment for the Glenwood Springs Field Office (BLM 2009b) and Noxious and Invasive Weed Management Plan for Oil and Gas Operators (BLM 2007b), and the GJFO Integrated Weeds Management Plan (2017) and Noxious and Invasive Weed Management Plan for Oil and Gas Operators (BLM 2007) require a weed management plan for new surface disturbance from oil and gas development. Even with these plans, introduction and spread of invasive, nonnative plants and noxious weeds still occurs. Invasive, nonnative plant species and noxious weeds pose a serious threat to the continued productivity, biological diversity, diversified use, and aesthetic value of ecosystems. Compared with the alternatives analyzed in the previous Final EIS, a larger area would be potentially protected from these impacts under Alternative E.

Alternative F

Plant Communities

CRVFO and GJFO

Compared with Alternative E, direct and indirect impacts would be further reduced under Alternative F. This is because it would close the largest area to oil and gas leasing. This alternative would have the highest protection of plant communities from potential disturbance due to oil and gas leasing.

Significant Plant Communities

CRVFO and GJFO

Compared with Alternative E, direct and indirect impacts would be further reduced under Alternative F. This is because it would close the largest area to oil and gas leasing. This alternative would have the highest protection of significant plant communities from potential disturbance due to oil and gas leasing. The same CSU constraints described under Alternative E would apply.

Wetlands, Floodplains, and Riparian Habitat

CRVFO

Compared with Alternative E, direct and indirect impacts would be further reduced under Alternative F. This is because it would close the largest area to oil and gas leasing. This alternative would have the highest protection of wetlands, floodplains, and riparian habitat from potential adjacent disturbance from oil and gas leasing. This includes an additional 166 miles of lotic riparian systems and 260 acres of lentic riparian systems compared with Alternative C, which was previously the most conservative proposed alternative. When compared with Alternative E, this is an additional 27 miles of lotic riparian systems and no additional acres of lentic riparian systems closed to oil and gas leasing.

Indirect benefits from Alternative F would result by reducing the potential amount of riparian and wetland habitat loss, modification, or fragmentation; soil erosion and loss; and transport of sediments and chemical pollutants to surface waters.

The same NSO constraints described under Alternative E would also apply.

GJFO

Under Alternative F, the same direct and indirect impacts within the CRVFO also apply to the GJFO. This alternative would have the highest protection of wetlands, floodplains, and riparian habitat from potential adjacent disturbance from oil and gas leasing. This includes an additional 83 miles of lotic riparian systems and 66 acres of lentic riparian systems compared with Alternative C, which was previously the most conservative proposed alternative. When compared with Alternative E, this is an additional 14 miles of lotic riparian systems and 60 acres of lentic riparian systems closed to oil and gas leasing.

Invasive, Nonnative Plants and Noxious Weeds

CRVFO and GJFO

Compared with Alternative E, direct and indirect impacts would be further reduced under Alternative F. This is because it would close the largest area to oil and gas leasing. This alternative would have the highest protection from invasive, nonnative plants and noxious weeds due to potential disturbance associated with oil and gas leasing. The same weed management plans described under Alternative E would apply.

Cumulative Impacts

Cumulative impacts described in the in the 2014 and 2015 Proposed RMPs/Final EISs (BLM 2014, Vegetation, pages 4-152 through 4-156; BLM 2015a, Vegetation, pages 4-139 through 4-140) are the same.

CRVFO and GJFO

Potential cumulative impacts on forest and woodland vegetation would occur from a combination of BLM and non-BLM activities and land uses occurring within the planning area boundaries and on public and

private lands immediately adjacent to the boundary. For the most part, soil disturbances would be revegetated or reclaimed, which would reduce bare ground and decrease the risk of weed invasion and spread; however, restoration efforts can have poor success rates, with a loss of species diversity, an increase in annuals, a decrease in perennials and woody plants, and an increase in weed species.

Cumulative effects on riparian and wetland resources from reasonably foreseeable actions (including those from other federal and nonfederal actions) include increased fluid minerals development, increased recreational use, water diversions, and removal of riparian vegetation for agricultural, residential, or commercial development. Noxious and invasive weed species are expected to continue to spread on all lands. Climate change may increase the recurrence and severity of drought conditions, resulting in a decrease in water flows and a resulting decline in riparian vegetation. Drought conditions may also increase the occurrence and severity of wildfires. All the above could adversely affect attributes and processes of riparian areas, resulting in a decline in the functioning condition or species composition of these systems.

Direct impacts on upland vegetation are considered to include disruption or removal of rooted vegetation, resulting in a reduction in areas of native vegetation, a reduction in the total numbers of plant species (species richness) within an area, and a reduction or loss of total area, diversity, structure, or function of wildlife habitat. Indirect impacts on vegetation include disruption or reduction of pollinator populations, the loss of habitat suitable for colonization due to surface disturbance, introduction of invasive and noxious weeds by various vectors or conditions that enhance the spread of weeds, and the general loss of habitat due to surface occupancy, surface compaction, or trampling.

Impacts from oil and gas development could occur within the decision area and on private and public lands adjacent to the decision area. Failure to perform adequate reclamation or to avoid riparian and wetland vegetation during development could, in turn, result in indirect impacts on BLM-administered lands through the increased incidence of invasive and noxious weeds and other undesirable plants or the transport of eroded soils and sediments. Degradation of these areas would also cause a decrease in the areal extent of natural vegetation communities throughout the larger area.

For both the CRVFO and GJFO, the potential for adverse cumulative impacts on vegetation would be lowest under Alternative F, as the greatest area would be closed to oil and gas leasing. Alternative E would have the second-lowest potential for adverse cumulative impacts on vegetation when compared with all the alternatives.

3.5.5 Fish and Wildlife

Affected Environment

This section incorporates by reference the affected environment described in the 2014 and 2015 Proposed RMPs/Final EISs (BLM 2014, Fish and Wildlife, pages 3-54 through 3-71; BLM 2015a, Fish and Wildlife, pages 3-83 through 3-94). A summary as it relates to the decisions for this supplemental EIS is included below.

Within both the CRVFO and GJFO and throughout Colorado, the BLM is responsible for managing habitats for fish and wildlife communities; however, it is not directly responsible for managing fish and wildlife populations. Instead, responsibility for direct population management belongs to the USFWS and CPW. Therefore, the BLM is indirectly responsible for the health and well-being of fish and wildlife populations utilizing habitats on BLM-administered lands, and the BLM works cooperatively with CPW

toward this end. CPW manages big game ungulates directly through hunting regulations, land acquisitions, and habitat treatments conducted cooperatively with landowners (including the BLM), while the BLM manages the habitat through lease and ROW stipulations and project-specific COAs.

Concurrently with this supplemental EIS, BLM Colorado is preparing a supplemental EIS specific to proper management of BLM-administered lands to reduce impacts on big game movement, including seasonal migrations. The result will be an RMP amendment for all BLM Colorado field offices (see **Section 2.2.2**).

The most important habitats for big game ungulates are production areas (for example, for elk calving, bighorn sheep lambing, and pronghorn fawning) and important winter habitats. Production areas are used during the spring season and are limited due to the needs of the young for lush forage, ample water to support lactation by the females, relatively gentle terrain, and adequate thermal and hiding cover. Both field offices protect these areas with a seasonal TL in late spring and early summer.

Also important for herd survivorship and maintenance are winter habitats that support concentrations of the animals or are relied on during severe winters, or both. Deer and elk severe winter range occurs primarily in lower, drier, and warmer areas where snow cover is thinner and less persistent. Movement through deep snow is stressful because of energetic needs (elk have an advantage over deer due to their longer legs). Low temperatures also tend to deplete energy stores for maintaining an adequate core temperature (another advantage for elk due to their large bodies). The BLM applies winter TLs in areas of important winter range, typically from December 1 through April 15 or April 30.

CRVFO

In **Table 3.5-16**, the current status (acres) of CPW-mapped big game seasonally important habitats in the CRVFO is shown in relation to the status at the time of the 2014 Proposed RMP/Final EIS preparation. Differences between years may reflect changes in land use or updated information on or interpretation of the boundaries between seasonal-use areas.

Table 3.5-16. Big Game Seasonally Important Habitats (2014 and 2022) – CRVFO

Species/Type of Seasonal Habitat¹	2014	2022
Elk production areas	41,000	43,900
Elk winter concentration + severe winter range ²	245,900	255,500
Mule deer winter concentration + severe winter range ²	253,600	302,100
Rocky Mountain bighorn sheep winter concentration areas	2,600	2,900
North American moose priority habitat	—	6,800
North American moose winter concentration areas	—	17,000

¹ There is no mapped habitat by CPW for desert bighorn sheep or pronghorn.

² Areas of overlap between the two categories are split equally and not double counted.

GJFO

In **Table 3.5-17**, the current status (acres) of CPW-mapped big game seasonally important habitats in the GJFO is shown in relation to the status at the time of the 2015 Proposed RMP/Final EIS preparation. Differences between years may reflect changes in land use or updated information on or interpretation of the boundaries between seasonal-use areas.

Table 3.5-17. Big Game Seasonally Important Habitats (2015 and 2022) – GJFO

Species/Type of Seasonal Habitat ¹	2015	2022
Elk production areas	60,200	61,200
Elk winter concentration + severe winter range ²	338,900	366,600
Mule deer winter concentration + severe winter range ²	412,400	421,100
Rocky Mountain bighorn sheep production areas	4,700	6,900
Rocky Mountain bighorn sheep winter concentration areas	15,000	11,600
Desert bighorn sheep production areas	9,300	9,300
Pronghorn winter concentration areas	24,600	24,500
North American moose priority habitat	—	11,800
North American moose winter concentration areas	—	15,200

¹ There is no mapped habitat by CPW for desert bighorn sheep or pronghorn.

² Areas of overlap between the two categories are split equally and not double counted.

Note that the combined areas of Rocky Mountain bighorn sheep winter concentration and production areas are very similar for 2015 (19,700 acres) and 2022 (18,500 acres). CPW is attempting to resolve whether the decrease of one habitat category and increase in the other is a change on the ground, a change in interpretation of the habitat boundaries, or a mapping error.

Direct and Indirect Impacts

This section presents the impacts on big game ungulates from oil and gas leasing as discussed in **Chapter 2**. This section incorporates by reference the methods, assumptions, and impacts for Alternatives A, B, C, and D as described in the 2014 and 2015 Proposed RMPs/Final EISs (BLM 2014, Fish and Wildlife, pages 4-157 through 4-239; BLM 2015a, Fish and Wildlife, pages 1-140 through 4-180). The methods and assumptions also apply to Alternatives E and F. A summary as it relates to fluid minerals is included below.

The following discussions for the CRVFO and GJFO focus on impacts associated with closures to oil and gas leasing under the Proposed RMPs/Final EISs. While these are not the only impacts on big game ungulates, the supplemental EIS compares impacts of two new alternatives (Alternatives E and F); both include extensive additional fluid minerals closures. Therefore, the discussions below provide background against which to evaluate the two newly proposed alternatives.

Alternatives A, B, C, and D

CRVFO

As shown in **Table 3.5-18**, the Proposed RMP/Final EIS included a variety of closures to oil and gas exploration and development; none of these were related specifically to big game ungulates. However, some areas of seasonally important habitats were affected by the closures relative to other resources and resource uses. Among the larger fluid minerals closures were SWAs (except the Garfield Creek SWA), WSAs, lands with wilderness characteristics, VRM Class I areas, and certain SRMAs and ACECs (ranging from one to four ACECs closed, depending on the alternative).

In the CRVFO, some of these closures to oil and gas leasing would be associated with habitats or special-use areas in areas east of the Grand Hogback; these areas encompass the central and eastern parts of the decision area and lack geological conditions for oil and gas development. The benefit of closures to big game in these parts of the CRVFO is therefore reduced.

Table 3.5-18. Big Game Seasonally Important Habitats in Relation to Oil and Gas Closures – CRVFO

Species and Type of Seasonal Habitat¹	Alternative A (acres)	Alternative B (acres)	Alternative C (acres)	Alternative D (acres)
Elk production areas	900	4,000	4,000	1,900
Elk/deer winter concentration + severe winter range ²	6,400	44,500	95,100	27,300
Rocky Mountain bighorn sheep production areas	3,800	800	600	3,800
Rocky Mountain bighorn sheep winter concentration areas	2,500	1,000	500	1,300
Moose priority habitat and winter concentration areas	0	0	0	0

¹ No habitat is mapped by CPW for desert bighorn sheep or pronghorn.

² Areas of overlap between the two categories are split equally and not double counted.

Access roads, pipelines, or well pads used to drill directionally into a private lease or a federal lease in an open area could impact areas that are closed to oil and gas leasing. Closures to oil and gas reduce the amount of oil and gas development and impact overall, particularly in the previously listed environmentally sensitive areas (SWAs, WSAs, etc.).

At the project level, the BLM applies NSO stipulations to 58,500 acres of priority wildlife habitat in 14 listed areas, including 12,900 acres in SWAs. Other stipulations specific to big game species include 205,200 acres with a 4.5-month TL for deer and elk winter range; a 4.5-month closure to mechanized and motorized travel in 16 specific areas of concentrated winter use by big game; 2.5-month TLs for 14,500 acres of elk calving areas; different 2.5-month TLs for Rocky Mountain bighorn sheep and pronghorn production areas; NSO and TL protections for Greater Sage-grouse habitat; and NSO and TL protections for riparian habitat.

GJFO

As shown in **Table 3.5-19**, the Proposed RMP/Final EIS included a variety of closures to oil and gas exploration and development, including the six wildlife emphasis areas in the GJFO; all these were established to protect production and/or crucial winter habitats for big game ungulates. Closures to fluid minerals under the Proposed RMP/Final EIS would include the six wildlife emphasis areas as well as closures related primarily to other resources and resource uses. Larger fluid minerals closures related to other resources and uses include WSAs and certain municipal watersheds, lands with wilderness characteristics, ACECs (ranging from one to 16 ACECs closed, depending on the alternative), a portion of the Dolores River corridor (Alternative C), and VRM Class I areas.

Geological conditions that have already supported oil and gas leasing and development and that could support substantial additional drilling and production occur throughout the GJFO decision area. Access roads, pipelines, or well pads used to drill directionally into a private lease or a federal lease that is not closed could impact areas that are not closed to oil and gas leasing. Closures to oil and gas do reduce the amount of oil and gas development overall, particularly in the previously listed environmentally sensitive areas (SWAs, WSAs, etc.).

Table 3.5-19. Big Game Important Habitats in Relation to Oil and Gas Closures – GJFO

Species and Type of Seasonal Habitat ¹	Alternative A (acres)	Alternative B (acres)	Alternative C (acres)	Alternative D (acres)
Elk production areas	500	16,600	24,000	500
Elk/deer winter concentration				
Severe winter range	68,700	154,200	313,600	69,600
Rocky Mountain bighorn sheep production areas	1,500	1,600	2,200	1,600
Rocky Mountain bighorn sheep winter concentration areas	6,100	6,300	8,900	6,300
Desert bighorn sheep production areas	0	3,000	3,200	0
Pronghorn winter concentration areas	0	0	10,400	0

¹ Areas of overlap between the two categories are split equally and not double counted.

At the project level, the BLM applies NSO stipulations to six ACECs, three SWAs, and six wildlife emphasis areas; TL stipulations for big game production areas and winter range; and winter travel closures in 10 specified areas for the benefit of big game.

Alternative E

CRVFO

By closing 568,300 acres (80 percent of the decision area) to future fluid minerals leasing, compared with 143,000 acres open, Alternative E would have less potential for oil and gas exploration and development than Alternatives A through D of the Proposed RMPs/Final EISs. Compare **Table 3.5-20** below with **Table 3.5-18**. **Table 3.5-20** includes a variety of closures to oil and gas exploration and development. Most of the closures are for reasons that are not related specifically to big game, although SWAs would be closed to oil and gas leasing.

Table 3.5-20. Big Game Crucial Habitats for Alternatives E and F – CRVFO and GJFO

Species and Type of Seasonal Habitat	CRVFO		GJFO	
	Alternative E (acres)	Alternative F (acres)	Alternative E (acres)	Alternative F (acres)
Elk production areas	31,100	33,200	51,100	44,300
Elk/deer winter concentration severe winter range ¹	313,800	327,700	492,200	502,000
Rocky Mountain bighorn sheep production areas ²	—	—	2,200	2,800
Rocky Mountain bighorn sheep winter concentration areas	2,700	2,800	9,600	10,900
Desert bighorn sheep production areas ³	—	—	3,800	3,300
Pronghorn winter concentration areas ³	—	—	21,900	22,00
Moose priority habitat and winter concentration areas	11,000	11,800	14,400	15,200

¹ Areas of overlap between the two categories are split equally and not double counted.

² There is no mapped habitat in the CRVFO decision area.

³ Not present in the CRVFO decision area.

Direct impacts of Alternative E on native grazers in the CRVFO would be mostly positive due to the greatly reduced amount of land available for fluid minerals exploration and development. Positive impacts on big game would include the reduction or elimination of impacts from noise, lights, fugitive dust, operation of heavy equipment, truck traffic, and interference with habitat use and seasonal movement patterns that could potentially reduce reproductive success and winter survivorship.

Indirect benefits would also include reduced impacts from habitat loss, modification, or fragmentation; reduced impacts from the introduction of invasive, nonnative plants; and a reduced potential for human-caused wildland fires. Closures would provide the BLM with increased flexibility in using fire as a forest management and vegetation treatment tool. There could also be indirect positive impacts associated with potentially more abundant or more widely distributed use by native ungulates.

However, wildlife habitat treatments performed by oil and gas companies in collaboration with the BLM and CPW would potentially be reduced. In many instances, the BLM and CPW have recognized the long-term benefits of habitat treatments conducted as mitigation to offset localized, temporary impacts of oil and gas activities on deer and elk. Many of these treatments also indirectly benefit livestock.

GJFO

By closing 998,000 acres (81 percent of the decision area) to oil and gas, compared with 239,000 acres open, Alternative E would have less potential exploration and development and therefore less impact on hoofed grazers. Compare **Table 3.5-20** with data for Alternatives A through D in **Table 3.5-19**. **Table 3.5-20** includes a variety of closures to oil and gas exploration and development. Most of the closures are for reasons that are not related specifically to big game, although SWAs and analyzed wildlife emphasis areas would be closed to oil and gas leasing.

Direct impacts of Alternative E on native grazers in the GJFO would be mostly positive due to the greatly reduced amount of land available for fluid minerals exploration and development. Positive impacts on big game would include the reduction or elimination of impacts from noise, lights, fugitive dust, operation of heavy equipment, truck traffic, and interference with habitat use and seasonal movement patterns. Indirect positive benefits would result from the accompanying decreases in impacts such as habitat loss, modification, or fragmentation; the introduction of invasive, nonnative plants; and the potential for human-caused wildland fire ignitions. Closure to fluid minerals leasing would benefit big game and other resources and uses indirectly by providing the BLM with increased flexibility in using fire as a forest management and vegetation treatment tool.

In the GJFO, Alternative E would close 119,500 acres of wildlife emphasis areas; of these, 79,900 acres would be in the high oil and gas development potential area, and 39,600 acres would be in the no, low, and medium potential areas. SWAs would also be closed; of these, 900 acres would be in the high oil and gas development potential area, and 400 acres would be in the no, low, and medium potential areas.

Alternative F

CRVFO

By closing 687,100 acres (97 percent of the decision area) to oil and gas, compared with 24,200 acres open, Alternative F would have the least area available for oil and gas among the alternatives; therefore, it would have the lowest potential for adverse impacts on big game ungulates. See **Table 3.5-20**, above, which includes a variety of closures to oil and gas exploration and development. Most of the closures are

for reasons that are not related specifically to big game, although SWAs would be closed to oil and gas leasing.

Under Alternative F, direct impacts on big game would be mostly positive due to the greatly reduced amount of land available for fuel minerals exploration and development. As with Alternative E, benefits to big game would include the reduction or elimination of associated impacts from noise; lights; fugitive dust; operation of heavy equipment; truck traffic; and interference with habitat use, seasonal movement patterns, reproductive success, and winter survivorship.

Indirect positive benefits would result from accompanying decreases in impacts such as vegetation loss, modification, or fragmentation; reductions in the introduction of invasive, nonnative plants; and the lower potential for human-caused wildland fires. Increased closures to fluid minerals leasing would also provide the BLM with increased flexibility in using fire as a forest management tool. There is a potential indirect negative impact stemming from reduced implementation of big game habitat treatments as mitigation approved by the BLM and CPW, as described for Alternative E. These approved habitat treatments are viewed by the BLM and CPW as having longer-term and greater benefits than the localized, temporary adverse impacts they mitigate.

GJFO

By closing 1,149,900 acres (93 percent of the decision area) to oil and gas, compared with 87,100 acres open, Alternative F would have the least potential for future leasing of fluid minerals and therefore the lowest potential impact on big game ungulates. See **Table 3.5-20**, above, which includes a variety of closures to oil and gas exploration and development. Most of the closures are for reasons that are not related specifically to big game, although SWAs, managed wildlife emphasis areas, and two bighorn sheep production areas would be closed to oil and gas leasing.

Since direct impacts under Alternative F would be mostly positive due to the greatly reduced amount of land available for fluid minerals exploration and development, Alternative F would also have positive indirect impacts on other resources. These indirect benefits would result from reducing the potential interference of oil and gas facilities and infrastructure with prescribed fires and other fire-related treatments that improve the health of woody plant (shrubland, woodland, and forest) habitats and reduce the risk of damage, loss, and use of other resources due to catastrophic fires. The potential adverse impact on deer and elk from having fewer opportunities to apply habitat treatments due to oil and gas projects also applies (see above for the CRVFO).

Regarding managed wildlife emphasis areas, 63,200 acres would be closed in the high oil and gas development potential areas, and 86,500 acres would be closed in the no, low, and medium potential areas. This alternative would also close 900 acres of SWAs that are in the high oil and gas development potential area and 400 acres in the no, low, and medium potential areas.

Cumulative Impacts

Cumulative impacts are described in the 2014 and 2015 Proposed RMPs/Final EISs (BLM 2014, Fish and Wildlife, pages 4-237 through 4-239; BLM 2015a, Fish and Wildlife, pages 4-170 to 4-180).

CRVFO and GJFO

Cumulative positive impacts on hoofed mammals under any of the alternatives considered in the supplemental EIS could result from impediments to oil and activities that prevent or reduce the amount of development in areas not closed to leasing. The extent of closures under the Proposed RMPs/Final EISs in relation to seasonally crucial native ungulate habitats with which they are coincident in **Table 3.5-18** and **Table 3.5-19**. These closures of seasonally crucial habitats, especially the more extensive closures under Alternatives E and F (**Table 3.5-20**), benefit native ungulates cumulatively by closing is shown a large percentage of other native habitats and agricultural lands utilized throughout the year to meet a variety of needs.

In areas not closed to fluid minerals leasing, the various alternatives impose other impediments to oil and gas activities that affect the amount of development. Examples include the application of NSO stipulations across large areas for a variety of resources and resource uses in addition to those for wildlife. While NSO stipulations do not prevent leasing and development of federal mineral estate under the surface, the various closures and NSO stipulations for a variety of purposes are cumulative to closures and stipulations specific to big game ungulates.

3.5.6 Special Status Species

Affected Environment

This section incorporates by reference the affected environment described in the 2014 and 2015 Proposed RMPs/Final EISs (BLM 2014, Special Status Species, pages 3-72 through 3-102; BLM 2015a, Special Status Species, pages 3-94 through 3-120). Updated information and a summary as they relate to the decisions for this supplemental EIS are included below.

Fish

Colorado River Big-River Fish (Endangered)

CRVFO and GJFO

Of the four threatened and endangered Colorado River endangered fish (Colorado pikeminnow [*Ptychocheilus lucius*], humpback chub [*Gila cypha*], bonytail chub [*Gila elegans*], and razorback sucker [*Xyrauchen texanus*]) addressed in the Proposed RMP/Final EIS, the razorback sucker was downlisted to threatened based on successes in its recovery through breeding, rearing, and release programs for reintroduction into suitable streams. No differences in management of this species occurred with downlisting.

In 2017, an updated PBO for impacts on the big-river Colorado River fish in the Colorado River drainage basin of western Colorado from depletions in streamflow resulting from the BLM's oil and gas program replaced the PBO prepared in 2008 by the USFWS. However, the PBO update did not represent substantial differences in threats or mandatory conservation measures. Threats to all four species continue to include changes in water quality and changes in habitat extent and quality for foraging, spawning, and survival/early growth of larvae through a combination of dams, which have changed natural seasonal flow regimes, and depletions in flows from consumptive use of Colorado River basin water for agricultural, commercial, municipal, and industrial uses, including oil and gas development.

In the CRVFO, the razorback sucker and Colorado pikeminnow extend upstream along the Colorado River as far as the town of Rifle. This reach is included in critical habitat for both species. In the GJFO,

both the razorback sucker and Colorado pikeminnow extend along the entire length of the Colorado River and along the Gunnison River to as far upstream as its confluence with the Uncompahgre River. Also, the bonytail chub and humpback chub extend a short distance into the GJFO from Utah in the Black Rocks area of the Colorado River.

Colorado River Cutthroat Trout (BLM Sensitive)

CRVFO and GJFO

The status of the Colorado River cutthroat trout (CRCT) has changed substantially during and since preparation of the two existing Proposed RMPs/Final EISs. Prior to preparation of the EISs, native populations and core populations (based on apparent genetic purity) of CRCT had been identified based primarily on morphological characteristics; populations were managed as a BLM sensitive species. Beginning around 2012, studies of supposed CRCT in numerous stream segments indicated that some populations were consistent with the federally listed (threatened) greenback cutthroat of the South Platte and Arkansas River drainages. These were referred to as “green lineage” cutthroat trout; because of the supposed genetic relationship to the greenback cutthroat, the “green lineage” cutthroat trout were managed by the USFWS at the time of the Proposed RMPs/Final EISs as threatened. At the same time, certain other assumed CRCT populations and core populations were determined, based on genetics and stocking records, to have been transplanted from the White River drainage basin; these are referred to as “blue lineage” cutthroats and are still treated as a BLM sensitive species.

At present, and until further studies unravel the taxonomic relationship of the various lineages (“strains”) of cutthroat trout in Colorado, the USFWS has determined that no basis exists for managing the green lineage CRCT as threatened. It is managed by the BLM as a sensitive species. This includes management actions and protections of green lineage populations and occupied or suitable habitat.

Currently, approximately 23 stream miles of occupied habitat for core populations of CRCT are within the CRVFO decision area. Despite the change in legal status from threatened to BLM sensitive, the same types of avoidance, buffer, and seasonal restrictions on project activity affecting the species continue to be applied at the project level. Currently, approximately 26 stream miles of core populations of CRCT are within the GJFO decision area.

Native Nongame Fish (BLM Sensitive)

CRVFO and GJFO

Native nongame fish include warmwater species such as the roundtail chub (*Gila robusta*), flannelmouth sucker (*Catostomus latipinnis*), and bluehead sucker (*Catostomus discobolus*); these species occur in the Colorado River as adults and may move into tributaries to spawn. Larvae and juveniles may remain in the tributaries during their early development, especially for the two suckers. Approximately 70 streams and 180 stream miles are mapped as fish-bearing streams in the CRVFO, potentially supporting use by some BLM sensitive nongame species during a portion of the year, especially in the lower Colorado River system. Minor changes in the known distribution due to ongoing surveys would not be expected to affect management actions and protections or the impacts under the supplemental EIS compared with the Final EIS.

In the GJFO, approximately 60 streams and 230 stream miles are mapped as fish-bearing streams, potentially supporting use by BLM sensitive nongame species (flannelmouth and bluehead suckers and

roundtail chub) during a portion of the year. The mountain sucker, which occurs at higher elevations farther up in the Colorado River drainage basin, is not listed by the BLM as present in the GJFO.

Wildlife

Yellow-Billed Cuckoo, Western Distinct Population Segment (Threatened)

CRVFO and GJFO

The western distinct population segment of the yellow-billed cuckoo (*Coccyzus americanus*) was listed under the Endangered Species Act (ESA) in November 2014 as threatened. The species breeds in large blocks of riparian habitats, particularly woodlands with cottonwoods and willows. Dense understory foliage, including tall shrubs and other woody species, appears to be an important factor in nest site selection. The western yellow-billed cuckoo feeds on larger insects than any other insectivorous birds, primarily by gleaning prey from foliage; however, it also catches flying insects or drops to the ground to catch grasshoppers and small amphibians or reptiles.

At the time of the Proposed RMP/Final EIS, the USFWS had proposed the designation of critical habitat in western Colorado. In 2021, the USFWS announced designated critical habitat at multiple locations, but none in the CRVFO and only one in the GJFO.

The designated critical habitat occurs along the lower Gunnison River and the Colorado River both upstream and downstream from their confluence (the “grand junction”). The designated area includes 3,100 acres along a combined 26 stream miles of riverine habitat. Of this total area, only 35 acres occur within the decision area of the supplemental EIS. None of the 35 acres is closed to fluid minerals under Alternatives A, B, C, or D as a result of closures for other resources, uses, or special designations. Isolated occurrences have been and are likely to continue to be documented along the Colorado River and major perennial tributaries in the decision area, but mostly in the GJFO.

Gunnison Sage-grouse (Threatened)

CRVFO

The Gunnison Sage-grouse (*Centrocercus minimus*) and suitable habitat for the species are not present in the CRVFO.

GJFO

The Gunnison Sage-grouse underwent an emergency listing by the USFWS in 2000 as endangered – critically imperiled. The listing was modified to threatened in 2014, at the time the Proposed RMP/Final EIS for the GJFO was nearing completion. The Gunnison Sage-grouse’s distribution in western Colorado and eastern Utah consists of eight small populations distributed across eight counties in Colorado and one county in Utah. One population, the Piñon Mesa population, is in the northern end of the Uncompahgre Plateau and partially contained in the GJFO. The current total range is believed to be only 10 percent of the historical range, and the total population is only about 5,000.

It is closely associated with sagebrush throughout the year, including more reliance on black sagebrush (widespread through the region) and mountain sagebrush at higher elevations. Both sagebrush species are shorter than the Wyoming sagebrush used by the Greater Sage-grouse.

The annual breeding cycle begins in early spring with communal courtship and mating activity in open areas within otherwise shrubbier areas, called leks. Leks, which are visited annually, are the most critical habitat

component of maintaining sage-grouse populations; therefore, leks receive the greatest protections, including being closed to oil and gas leasing. After breeding, females disperse widely, primarily in sagebrush, to lay their eggs. After hatching and through early brood rearing, family groups forage together through sagebrush mixed with grasses and forbs, which contribute to concealment, provide buds and green tissues, and support insect prey. As the vegetation dries out in the fall, the birds move to riparian areas and other moist areas. Sagebrush foliage is the primary food source in the winter.

Table 3.5-21, below, shows the areas of occupied habitat and critical habitat. Data shown for 2022 represent a 37 percent increase for occupied habitat and an 11 percent increase for critical habitat compared with mapping in 2015. These expansions reflect ongoing surveys into the distribution of Gunnison Sage-grouse in the GJFO.

BLM Colorado is currently preparing an EIS for the Gunnison Sage-grouse to assess and select management actions intended to ensure maintenance and recovery of this species based on the most recent data and trends regarding distribution, numbers, and critical habitat use. The result will be an RMP amendment for all field offices containing Gunnison Sage-grouse (see **Section 2.2.2**).

Table 3.5-21. Special Status Sage-grouse Habitat Mapping (2022)

Species and Type of Habitat	CRVFO (acres)	GJFO (acres)
Gunnison Sage-grouse (Threatened)		
Critical habitat	0	112,500
Occupied habitat	0	35,500
Greater Sage-grouse (BLM Sensitive)		
General habitat	26,700	13,400
Priority habitat	42,100	9,600
Occupied habitat	68,800	23,000

Greater Sage-grouse (Sensitive)

CRVFO and GJFO

The Greater Sage-grouse (*Centrocercus urophasianus*) is larger, more widespread, and more abundant, and distributed farther north than the Gunnison Sage-grouse. Like its threatened relative, the species has suffered considerable loss of habitat and numbers. It also faces similar threats from habitat loss and fragmentation, invasive plants, and predation from human-associated generalist predators using vertical structures (fences, utility poles, etc.) that have increased perching and nesting sites for birds of prey. Breeding behaviors and the annual cycle of habitat use are similar to those described above for the Gunnison Sage-grouse.

Management of the Greater Sage-grouse includes designation of priority and general habitat and linkage/connectivity habitat. Regular surveys are conducted to monitor numbers at lek sites during the early spring courtship/mating period, overall population trends, and reproductive and overwintering success. Protections currently include a no-leasing designation for oil and gas on lands within 4 miles of a lek. If the lek is on land already leased for oil and gas, the BLM applies an NSO restriction and designation of a ROW exclusion area. TLs are also applied to avoid or minimize disruption of seasonally critical behaviors and habitat use.

Following completion of the Proposed RMP/Final EIS, CPW habitat mapping has remained constant for the Greater Sage-grouse in the supplemental EIS decision area from 2015 to 2022. Acres mapped as different types of habitat are shown in **Table 3.5-21**, above.

The BLM Headquarters Office is currently preparing an EIS for the Greater Sage-grouse to assess and select management actions intended to ensure maintenance and recovery of this species based on the most recent data and trends regarding distribution, numbers, and critical habitat use. The result will be an RMP amendment for all field offices containing Greater Sage-grouse (see **Section 2.2.2**).

Canada Lynx (Threatened)

CRVFO

The Canada lynx (*Lynx canadensis*) was formerly considered extirpated from Colorado, although occasional unconfirmed sightings and a smaller number of confirmed sightings persisted. These sightings probably consisted of transient males from northeastern Utah or western Wyoming. CPW began releasing lynx into Colorado in 1999 and 2000, with multiple additional releases to a total of 218 by 2009. Despite high mortality of the transplanted individuals (up to half), the species has reproduced successfully, and animals produced in Colorado have established a resident population.

Lynx require heavy cover for concealment when stalking prey, especially dusky grouse, snowshoe hares, mountain cottontails, pine squirrels, and smaller rodents. Winter denning is critical to overwinter survival and reproductive success. Persistent deep snow cover is a key component for winter denning by limiting incursions into the habitat by bobcats and coyotes, which compete with the lynx for food and potentially are a threat to the young. Areas of occupied or suitable denning and foraging habitat for lynx are designated by the US Forest Service (Forest Service) as lynx analysis units (LAUs). Because these areas are often widely separated, lynx require adequate habitat connectors, called linkages, to provide shelter, prey, and seclusion during long-term and short-term movements. Lynx habitat is higher in elevation than most oil and gas activities.

The Proposed RMP/Final EIS identified four lynx linkages totaling 111,500 acres, with approximately 850 acres of LAUs within the supplemental EIS decision area. The 850 acres are a small part of a much greater extent of LAUs mapped in the nearby White River National Forest, which is outside the decision area of the supplemental EIS. Mapping of lynx distribution and occupied or potential habitat has not changed since the Final EIS time frame. No critical habitat for the lynx has been designated in Colorado; however, suitable habitat is mapped throughout the mountainous core of the state, with the CRVFO at its western limits. Protections for lynx and their habitat apply under the ESA, even if lynx are not in LAUs and linkages.

GJFO

Lynx could potentially travel through the GJFO area along higher elevations, such as on Grand Mesa and the western extent of Battlement Mesa, although heavy year-round recreational use of Grand Mesa may inhibit all but transitory use by lynx. However, the USFWS's range map for lynx largely avoids the GJFO. Both the existing Proposed RMP/Final EIS mapping and current mapping include no LAUs or linkages within the supplemental EIS decision area. Protections for lynx and their habitat apply under the ESA, even if lynx are not in LAUs and linkages.

Vegetation

CRVFO

There have been no changes in federal or BLM listing status of plant species since the Final EIS. However, there have been several changes in special status plant global and state rarity rankings since 2015. Changes in global rarity have changed as follows: from G3 to G2 for Roan Cliffs blazingstar (*Nuttallia rhizomata*), from G2 to G4T2 for De Beque phacelia (*Phacelia submutica*), and from G3/S3 to G2/G3/S2/3 for Colorado hookless cactus, which recent genetic research has split into two species (*Sclerocactus glaucus* and *Sclerocactus dawsonii*).²

Additional botanical surveys have been conducted since the Final EIS, resulting in new documented locations of Colorado hookless cactus, Roan Cliffs blazingstar, De Beque phacelia, Parachute penstemon (*Penstemon debilis*), and Harrington's beardtongue (*Penstemon harringtonii*). Since 2015, recent species status assessment (SSA) reports from the USFWS have been published for the Parachute penstemon, Colorado hookless cactus, and De Beque phacelia.

In the latest SSA for Parachute penstemon (USFWS 2020), the subpopulations within the decision area have moderate to low resiliency; this is mostly due to isolated and small population sizes and the occurrence along the Mount Logan Road. While oil and gas extraction and oil shale mining have had and may continue to have impacts on the species, it is likely that pollinator connectivity and climate change will have the greatest influence on the viability of Parachute penstemon.

The recent SSA for Colorado hookless cactus (USFWS 2021b) describes the species as relatively abundant across its limited range, which contributes to the high levels of resiliency. Current and future stressors include livestock use, invasive species, oil and gas development, off-highway vehicle (OHV) recreational use, predation, development and maintenance of utility corridors, and the effects of global climate change. Other stressors include herbicide and pesticide application, collection, and commercial trade. CRVFO occurrences are analyzed in the Roan Creek Analytical Unit (AU), which hosts *S. dawsonii*. This AU is considered to have high resiliency due to high levels of survivorship, high and moderate availability of habitat features that support the cactus, and a current water deficit that is similar to the historical average.

The recent De Beque phacelia SSA (USFWS 2022) found that new information on the species' asexual reproductive strategy has changed our understanding of the stressor of development, including energy production and communication and utility lines; these activities can increase or introduce human access to sensitive habitat but do not present a species-level concern across the species' range. De Beque phacelia is relatively abundant across its limited range, which contributes to the moderate resiliency. While the broad distribution of De Beque phacelia also contributes to the species' ability to adapt to changing conditions, the species' relatively low genetic diversity and highly specific habitat needs decrease its representation.

Stressors that influence De Beque phacelia now and into the future include livestock use, which disrupts the specific development and functional integrity of soils in De Beque phacelia habitat; OHV use, including users traveling in nonauthorized areas or authorized users traveling off designated routes, which also

² Global (G), National (N), and Subnational/State/Province (S) rarity rankings are used by the Colorado National Heritage Program to track rare species and natural communities in a standardized system to focus management on the most at-risk species. 1 = Critically Imperiled; 2 = Imperiled; 3 = Vulnerable to Extirpation; 4 = Apparently Secure; 5 = Demonstrably Widespread, Abundant, and Secure (Colorado National Heritage Program, 2023).

affects the functional integrity of soils; the introduction or spread of introduced and invasive plant species, which can deplete and outcompete De Beque phacelia for needed resources; and climate change, which can reduce the availability of moisture for the plant and alter the temperature regimes the species needs. These known stressors can influence viability, directly or indirectly, by altering habitat quality, reducing recruitment, lowering survivorship, and decreasing the number of individuals in each population.

Ute ladies' tresses (*Spiranthes diluvialis*) are also present within the CRVFO boundary. In 1992, the USFWS identified habitat loss and modification through urbanization, water development, and conversion of wetlands to agriculture; overcollection; competition from exotic weeds; and herbicides as the main current and potential threats to the long-term survival of Ute ladies'-tresses. Since 1992, other threats have been identified including impacts from recreation; mowing for hay production, (mowing, especially in conjunction with winter grazing, can have positive effects on Ute ladies'-tresses by reducing competing vegetative cover and protective cover for voles); grazing by cattle or horses; hydrology change (modification of wetland habitats through development, flood control, de-watering, and other changes to hydrology); herbivory by native wildlife (particularly voles); reduction in the number and diversity of insect pollinators; drought; absence or rarity of mycorrhizal symbionts; and conflicting management with other rare species (Environmental Conservation Online System, 2023).

Since the 2014 analysis, several new occurrences of special status species have been found in the Mount Logan ACEC. There are known occurrences of the federally listed species Colorado hookless cactus, De Beque phacelia, and Parachute penstemon, and BLM sensitive plants Naturita milkvetch (*Astragalus naturitensis*) and Roan Cliffs blazingstar. The ACEC also hosts critical habitat for Parachute penstemon. According to the Parachute penstemon SSA, the small subpopulation of Mount Logan Road plays a large role in the low resiliency of this subpopulation (USFWS 2020). As mentioned in the 2014 analysis, most of the special status plant habitat in the western portion of the decision area is already leased for fluid minerals development. This area includes nearly all of the Mount Logan Foothills ACEC.

GJFO

Both species of Colorado hookless cactus retain the federal listing status as threatened, and protections outlined in the 2015 RMP are unchanged. The USFWS's 2021 SSA for Colorado hookless cactus provides more information about the current genetic status of the cactus and its distribution (FWS 2021). New records of the cactus have been documented across the GJFO, most notably in the North Fruita Desert between 18 Road and the Grand Junction Regional Airport.

In the latest SSA for Colorado hookless cactus (USFWS 2021b), current and future stressors are the same as those listed for the CRVFO. The protections provided in the 2015 RMP greatly increased the resiliency of the species; however, the genetic research that led to splitting Colorado hookless cactus into two species has resulted in a smaller species' range for *Sclerocactus dawsonii*.

Minor changes to the list of special status species occurring within the GJFO have occurred since 2015. Eastwood's monkeyflower (*Mimulus eastwoodiae*) has been removed from the BLM sensitive species list due to a lack of threats to its habitat. Gypsum Valley cateye (*Oreocarya revealii*) has been removed from the list of species known to occur in the GJFO. In addition, the Colorado Natural Heritage Program has updated various global and state rankings. New occurrences of De Beque milkvetch (*Astragalus debequaeus*) have been recorded in the 16 Road and Whitewater areas, expanding its known range. The new locations near Cheney Reservoir are in an area mapped as moderate potential for oil and gas.

Botanical surveys conducted since 2017 have focused on areas designated as having moderate-high or moderate potential for occurrence of federally listed plant species. Other botanical survey emphasis areas have included ACECs, SRMAs, and the LBCWHR. Additional surveys are being conducted in response to proposed projects. Together, these surveys have documented new occurrence records for numerous species in the GJFO area.

Since 2015, new occurrences of De Beque phacelia have been recorded outside the designated critical habitat; however, no changes have been made to the mapped critical habitat. The trends and stressors described in the De Beque phacelia SSA for the CRVFO are the same for the GJFO. In addition, the report highlights that nine of the 25 De Beque phacelia known element occurrences occur within BLM ACECs. Eight of these element occurrences are in the South Shale Ridge AU, and one element occurrence is in the North Shire AU. One of the eight element occurrences in the South Shale Ridge AU is in the Pyramid Rock ACEC, which is intended specifically for the preservation of habitat for plant species, including DeBeque phacelia. This area is fenced and closed to livestock use; motorized, mechanized, and equestrian use; and hiking.

The South Shale Ridge ACEC, which overlaps the South Shale Ridge AU, is another protected area. This area is not completely fenced but does include many restrictions to help preserve wildlife habitat, scenic values, and rare plants like De Beque phacelia. Specifically, this ACEC currently limits motorized and mechanized travel to designated routes and restricts surface occupancy and surface-disturbing activities. Overall, 359 acres of occupied DeBeque phacelia habitat are within an ACEC, which represents 63 percent of occupied DeBeque phacelia habitat.

The Pyramid Rock ACEC contains two federally listed plants (Colorado hookless cactus and De Beque phacelia) and three sensitive plants (De Beque milkvetch, Naturita milkvetch, and aromatic Indian breadroot [*Pedimelum aromaticum*]). The ACEC also contains designated critical habitat for the De Beque phacelia. In the latest SSA for Colorado hookless cactus (USFWS 2021b), Pyramid Rock ACEC is considered a core conservation population area providing the highest level of protections against land use impacts.

Direct and Indirect Impacts

This section presents the impacts on special status species from oil and gas leasing as discussed in **Chapter 2**. This section incorporates by reference the methods, assumptions, and impacts for Alternatives A, B, C, and D as described in the 2014 and 2015 Proposed RMPs/Final EISs (BLM 2014, Special Status Species, pages 4-240 through 4-352; BLM 2015a, Special Status Species, pages 4-180 through 4-219). The methods and assumptions also apply to Alternatives E and F. A summary as it relates to fluid minerals is included below.

Alternatives A, B, C, and D

Fish

Colorado River Big-River Fish (Endangered)

CRVFO and GJFO

For the endangered big-river fish, the USFWS has identified depletions in flows in the Colorado River basin as a primary threat to spawning habitat, larval and juvenile nursery habitat, and maintenance of an adequate depth for survival during severe drought. Reductions in seasonal flushing flows interfere with

natural removal of accumulated fine sediments, gravel bars and beds, and the temporary flooding of areas utilized as nursery habitat. Depletion in flows can result from construction of dams, evaporation from reservoirs, and withdrawals from streams for agricultural, commercial/industrial, and municipal water sources.

The USFWS has addressed depletions from the Colorado River basin in a PBO (USFWS 2017) regarding BLM-authorized oil and gas projects in western Colorado. The PBO requires the BLM to report annual water use in oil and gas operations. The PBO also specifies other measures intended to reduce the risk of mortality of eggs, larvae, and juvenile and adult fish during the process of withdrawing water from occupied streams or tributaries to occupied streams.

Colorado River Cutthroat Trout (BLM Sensitive)

Essentially all special status fish and wildlife species are potentially affected, directly and indirectly, by oil and gas projects. For aquatic species, impacts include transport of sediments from eroded soils to surface waters; transport of chemical pollutants from spills and other unplanned releases; changes in channel morphology and substrate type from direct physical disturbance; interference with a long stream movement of fish and invertebrate prey; and loss, modification, or fragmentation of adjacent riparian vegetation. Riparian habitat provides thermal cover, acts to filter runoff from overland flow, and is a source of invertebrate prey that drops from the vegetation canopy. An additional and important source of human impacts on aquatic species consists of changes in flow regimes, particularly withdrawals from streams for consumptive uses. In fluid minerals development, these consumptive uses include use of water in drilling, completions, and both short-term (during construction) and long-term (during production) dust abatement along unpaved access roads.

Direct and indirect impacts on CRCT are the same as described previously for aquatic species, especially surface disturbances that cause soil erosion and sediment transport to the clean streams the species require. These disturbances impede a long stream movement of fish and invertebrate prey, and they cause loss, modification, or fragmentation of the riparian vegetation.

CRVFO

The decision area for the CRVFO includes an estimated 70 mapped segments of fish-bearing streams, excluding the Colorado River, along a length of approximately 180 miles. Of this total, 23 stream miles support conservation populations (that is, populations with high genetic purity) of CRCT.

Table 3.5-22, below, shows the scale of closures encompassing occupied stream lengths of the BLM sensitive CRCT and native nongame species.

Alternative B would also have an NSO stipulation for all perennial waterbodies and riparian zones.

Alternative C would also have an NSO stipulation for all perennial waterbodies and riparian zones.

Alternative D would also have an NSO stipulation for conservation and core conservation populations of CRCT.

Table 3.5-22. Closures for Other Resources and Uses Affecting BLM Sensitive Fish

Species/Type of Seasonal Habitat	Alternative A (stream miles)	Alternative B (stream miles)	Alternative C (stream miles)	Alternative D (stream miles)
CRVFO				
CRCT core populations ¹	0	6	12	2
Native nongame fish (flannelmouth sucker and bluehead sucker) ²	3	52	75	39
GJFO				
CRCT core populations ³	0	2	19	0
Native nongame fish (flannelmouth sucker and bluehead sucker) ⁴	3	68	114	7

¹ Total habitat = 23 miles

² Total habitat = 180 miles

³ Total habitat = 26 miles

⁴ Total habitat = 230 miles

GJFO

The GJFO decision area includes an estimated 60 mapped segments of fish-bearing streams, excluding the Colorado River, along a length of approximately 230 miles. Of this total, 26 stream miles support core populations of CRCT. **Table 3.5-22**, above shows the scale of closures encompassing occupied stream lengths of the BLM sensitive CRCT and native nongame species.

All alternatives would have a TL for special status fish.

Alternative C would also designate an ACEC (Coon Creek and Hawxhurst Creek) for cutthroat trout.

Alternative D would have an NSO stipulation for conservation populations of cutthroat trout.

Native Nongame Fish Species (BLM Sensitive)

CRVFO and GJFO

Closures to fluid minerals leasing and development, regardless of the purpose of the closures, provide a benefit to special status fish species by eliminating or reducing the potential impacts described above for the CRCT. In addition to closures for various resources and resource uses under the Proposed RMPs/Final EISs (**Table 3.5-22**), the CRVFO and GJFO apply various NSO and TL stipulations as protections for special status species' habitats, riparian areas, and streams, including a 0.25-mile buffer from the Colorado, Gunnison, and Dolores Rivers. These oil and gas stipulations protect habitat for special status fish, including the four endangered fish, in areas not closed to oil and gas.

Wildlife

Yellow-Billed Cuckoo, Western Distinct Population Segment (Threatened)

CRVFO

No designated critical habitat or clusters of use by yellow-billed cuckoo are known to occur in the CRVFO, and no critical habitat has been designated by the USFWS for this field office.

GJFO

The yellow-billed cuckoo occurs primarily in mature riparian cottonwood forests with a rich understory. The species is subject to the same types of impacts from oil and gas development as other species utilizing streams and stream corridors. These impacts include direct loss, modification, or fragmentation of the riparian habitat, and indirect impacts on the riparian community due to changes in the supporting flow regime, such as by depletions for other uses. Habitat fragmentation is an important concern; this is because the species uses elongated areas along narrow riparian corridors to provide the majority of foraging habitat needs.

In addition, the cuckoo is a secretive bird and susceptible to noise and other disturbance-related impacts. Proximity of many riparian areas to heavily traveled roads is an issue in that regard, as are adjacent agricultural activities and impacts on the understory by livestock grazing. Noise pollution is one of the primary impacts on wildlife, especially birds, in relation to oil and gas developments.

Potential impacts on the yellow-billed cuckoo are reduced under the Proposed RMP/Final EIS by NSO and TL stipulations related to federally listed species, streams (including major river corridors), and riparian habitat. The 35 acres of designated critical habitat for this species have no closures to fluid minerals, including closures for other resources and uses, under Alternatives A through D of the Proposed RMP/Final EIS.

Gunnison Sage-grouse (Threatened)

CRVFO

The Gunnison Sage-grouse and suitable habitat for the species are not present in the CRVFO.

GJFO

Potential impacts on Gunnison Sage-grouse from fluid minerals exploration and development include the same types of impacts as described previously for other species. These include direct or indirect habitat loss, modification, and fragmentation; introduction or expansion of invasive, nonnative plants; and disturbance from noise and light pollution, fugitive dust, operation of heavy equipment (especially during construction, drilling, and completions), and truck traffic on existing and newly constructed roads. Other indirect impacts include installation of vertical structures on well pads and other surface facilities that provide perching sites for avian predators and attraction of mammalian predators, such as coyotes and foxes, that commonly visit areas of human use.

For all alternatives under the Proposed RMP/Final EIS, occupied habitat (35,400 acres) and critical habitat (112,500 acres) for the Gunnison Sage-grouse would be closed to fluid minerals leasing following listing of this species as a threatened species. The GJFO also applies an NSO stipulation on occupied or critical habitat for all federally listed threatened and endangered species; the NSO stipulation includes an additional 0.125-mile buffer outside the edge of the habitat.

Any project potentially affecting the Gunnison Sage-grouse or its habitat requires consultation with the USFWS under the ESA and adherence to any conservation (mitigation) measures identified by that agency. Impacts and management requirements will be described in greater detail in the Gunnison Sage-grouse RMP amendment and EIS, which is anticipated in mid-2024.

Greater Sage-grouse (BLM Sensitive)

CRVFO and GJFO

The BLM sensitive Greater Sage-grouse is similar to the Gunnison Sage-grouse in the types of habitat used and in behaviors, including displaying and breeding in leks. Potential direct and indirect impacts from fluid minerals projects also are the same as described for the Gunnison Sage-grouse. **Table 3.5-23** lists the acres of closures to fluid minerals for priority and general habitat for this species in the CRVFO and GJFO. Other areas of use by this species are protected under NSO and TL stipulations.

Table 3.5-23. Closures Affecting Greater Sage-grouse Habitats

Habitat Uses	Alternative A (acres)	Alternative B (acres)	Alternative C (acres)	Alternative D (acres)
Priority habitat – CRVFO	200	5,100	20,100	1,600
General habitat – CRVFO	2,400	5,500	10,100	3,500
Priority habitat – GJFO	0	0	9,500	100
General habitat – GJFO	0	0	13,300	0

Canada Lynx (Threatened)

CRVFO

Impacts on the Canada lynx from fluid mineral exploration and development would include habitat loss, modification, and fragmentation in the middle- and higher-elevation conifer forests it normally occupies. Fragmentation is of special concern; this is because lynx require large tracts of suitable habitat except when traveling to new areas. Also of special importance relative to oil and gas is the construction of new access roads and typically snow removal or oversnow motorized travel associated with oil and gas operations or secondary use of the roads by winter recreationists on snow machines.

Lynx are highly adapted to moving through snow with their oversized paws; they are especially tolerant of cold temperatures (they remain active year-round near winter dens). Predators less mobile in deep or uncompacted snow, such as bobcats and coyotes, are able to utilize roads traveled by snowcats and snowmobiles, or where snow is bladed off for oil and gas winter access. Incursion of these predators into winter habitats normally unavailable to them can cause competition with lynx for prey, such as dusky grouse, rabbits, squirrels, and other small mammals.

Closures for other resources and uses that include lynx habitat, as defined by lands within LAUs under the Proposed RMP/Final EIS, are shown in **Table 3.5-24**. Linkages, also shown in the table, are large expanses of somewhat or marginally suitable habitat that may stretch for long distances between areas of focused use (LAUs).

Table 3.5-24. Closures for Other Resources and Uses Affecting Lynx Habitats

Habitat Uses	Alternative A (acres)	Alternative B (acres)	Alternative C (acres)	Alternative D (acres)
Lynx primary habitats (LAUs) – CRVFO	0	1,900	300	0
Lynx primary habitats (LAUs) – GJFO	0	0	0	0
Lynx linkages – CRVFO	19,000	27,200	37,600	22,600
Lynx linkages – GJFO	0	0	40	0

GJFO

As previously noted, both the existing Proposed RMP/Final EIS mapping and current mapping include no LAUs and only 40 acres of linkages within the decision area.

Vegetation

CRVFO

Table 3.5-25 compares management protections for special status plants by alternative. Under Alternative A, an NSO stipulation for threatened, endangered, proposed, and candidate plants and wildlife would prohibit surface-disturbing activities in occupied habitat and habitat necessary for ecosystem processes. This stipulation encompasses approximately 5,250 acres of habitat on BLM-administered lands and would afford direct protection for occupied habitat of special status plants. A CSU stipulation for BLM sensitive plants and wildlife would also provide some protection, allowing relocation of surface-disturbing activities; however, it would be unlikely to avoid all individuals where populations are extensive, and it would not protect potential, but currently unoccupied, habitat. The CSU stipulation would apply to 112,800 acres.

Table 3.5-25. Management Protections for Special Status Plants by Alternative

Special Status Plant Protections	Proposed Stipulations		BLM Surface Acres by Alternative			
	Buffer	Applicable Species	A	B	C	D
NSO Stipulations						
CRVFO-NSO-9 (CRV-NSO-18 under Alternative D)	200 meters	Federally listed or candidate plants		1,100		900
CRVFO-NSO-10	200 meters	BLM sensitive plants within ACECs		2,200		
CRVFO-NSO-11	Broad habitat	De Beque phacelia		Habitat unmapped	Habitat unmapped	Habitat unmapped
GS-NSO-12	Broad habitat	Federally listed or candidate plants and wildlife	5,200			
CRVFO-NSO-19	200 meters	Federally listed or candidate and BLM sensitive plants			23,000	
CRVFO-NSO-28	ACEC boundary	All listed and sensitive plants within Mount Logan Foothills ACEC		4,000		
CSU Stipulations						
GS-CSU-3	Broad habitat	All BLM sensitive plants and wildlife	112,800			
CRVFO-CSU-6	100 meters	BLM sensitive plants outside ACECs		6,400		
CRV-CSU-9	100 meters	All BLM sensitive plants				12,700
Number of ACECs for Special Status Plants			0	4	5	0
Number of ACEC Acres for Special Status Plants			0	12,500	14,200	0

Under Alternative B, fewer acres of special status plant potential habitat would be covered under NSO and CSU stipulations than under Alternative A. Although Alternative B would include fewer total acres of NSO and CSU stipulations for special status plants than Alternative A, all known existing populations (and subsequent populations that are found) would be included in these stipulations. Four ACECs—Hardscrabble-East Eagle, Lyons Gulch, Mount Logan Foothills, and Sheep Creek Uplands—would be designated specifically for special status plants, protecting 12,500 acres of core habitat.

Under Alternative C, all occupied special status plant habitats would be protected from surface-disturbing activities with a 200-meter buffer (CRVFO-NSO-19) to minimize direct and indirect impacts on special status plants and pollinator habitat. If properly implemented, the NSO stipulation for special status plants and their habitat would afford direct protection to plant populations, minimize habitat fragmentation and loss of pollinator habitat, and help maintain potential habitat for future population expansion. Under Alternative C, five ACECs would be designated specifically for the management of special status plants.

Under Alternative D, protections for special status plants would include an NSO stipulation with a 200-meter buffer for threatened, endangered, proposed, and candidate plant habitat. This NSO would affect approximately 1,100 acres. A CSU stipulation on roughly 12,700 acres would be applied to occupied habitat for all sensitive plant species. The CSU stipulation would protect most occupied habitat for special status plants (except in the cases of large, extensive populations) but would not likely protect suitable but unoccupied habitat or habitat for pollinator species. No ACECs would be designated specifically for special status plants. This alternative would provide the least protection for special status plants of all alternatives and would have the greatest risk of impacts on special status plants, potential habitat, and pollinators.

GJFO

In general, Alternative A would rely on management guidance that would not reflect current conditions and issues. It would lack a landscape-level approach to land planning. Known special status species' populations would be protected; impacts would be more likely to occur on previously undiscovered special status species' populations.

Under Alternative B, the BLM would implement more protective management measures for special status species, including applying NSO, CSU, and TL stipulations, and managing areas as ROW avoidance and exclusion. By prioritizing desired plant communities and designating ACECs, the BLM would be able to focus its habitat management efforts in the areas that would be most effective to preserve and protect habitats. Vegetation management under Alternative B would emphasize improving and restoring vegetation and special status species' habitats. Actions would be implemented to reduce fragmentation.

Under Alternative C, the BLM would implement the most protective management measures for special status species and stipulations and restrictions to reduce impacts from resource uses. A variety of stipulations would be applied to protect special status species' habitats and populations. An additional stipulation would be NSO within 200 meters of current and historically occupied and suitable habitat for BLM sensitive plant species. As a result, the stipulations under Alternative C would provide the greatest protection for special status species compared with Alternatives A, B, and D.

Alternative D would emphasize habitat management for commodities and resource uses, as well as maintenance of vegetation conditions. While the BLM would comply with all laws and regulations, there would be less focus on resource protection through wildlife emphasis areas and ACECs and on

improvement or restoration of habitats under Alternative D. There would also be fewer measures to reduce or limit surface-disturbing activities, such as fewer NSO, CSU, and TL stipulations, as well as ROW avoidance and exclusion areas.

Alternative E

Fish and Wildlife

CRVFO and GJFO

For all special status species addressed above, there is a much greater area of closures to fluid minerals leasing under Alternative E than under Alternatives A through D (see **Chapter 2** of this supplemental EIS).

The types of impacts on special status fish and wildlife are as described above for Alternatives A through D under the Proposed RMPs/Final EISs. These include direct or indirect habitat loss, modification, and fragmentation; introduction or expansion of invasive, nonnative plants; and disturbance from noise and light pollution, fugitive dust, operation of heavy equipment (especially during construction, drilling, and completions), and truck traffic on existing and newly constructed roads.

Table 3.5-26, below, is a compilation of the closures under Alternative E for CRCT conservation populations, native nongame fish, Greater Sage-grouse, and Canada lynx habitat use. These habitats were not specifically closed to leasing under Alternatives A to D of the Proposed RMPs/Final EISs, but they were coincidentally closed to some extent due to overlap with closures for other resources, uses, or special designations. The table below also presents the larger area of overlap with those species and habitat under Alternative F.

Table 3.5-26. Selected Crucial Habitat Closures for Alternatives E and F

Species and Type of Seasonal Habitat	Alternative E		Alternative F	
	CRVFO	GJFO	CRVFO	GJFO
CRCT core populations (stream miles)	15	21	21	23
Native nongame fish (stream miles)	154	156	196	187
Greater Sage-grouse priority habitat (acres)	41,800	9,400	42,100	9,500
Greater Sage-grouse general habitat (acres)	26,500	13,100	26,700	13,200
Canada lynx LAUs (acres)	117,100	0	88,400	0
Canada lynx linkages (acres)	3,800	30	5,000	40

Vegetation

CRVFO

Compared with all the alternatives analyzed from the 2014 Proposed RMP/Final EIS, the impacts from Alternative E would be reduced because more area would be closed to oil and gas leasing. All special designated areas closed to fluid mineral leasing under Alternative C would remain the same. In addition to these areas, oil and gas development potential areas with no known, low, and medium potential would also be closed. This would increase protection of special status species, mostly Ute ladies'-tresses (*Spiranthes diluvialis*) and Harrington's beardtongue (*Penstemon harringtonii*), that occur outside the currently designated areas.

Much of the area that is designated as high potential would remain open to fluid mineral leasing. The Mount Logan ACEC was not previously considered for closure to leasing in the 2014 CRVFO Proposed

RMP/Final EIS, nor is it considered under Alternative E. An NSO stipulation would continue to prohibit surface occupancy and surface-disturbing activities within 200 meters of habitat areas for those plant species listed under the ESA as threatened or endangered, and for federal proposed or candidate plant species. Habitat areas include designated critical habitat, currently or historically occupied habitat, suitable habitat near occupied habitat, and habitat necessary for the maintenance or recovery of the species.

An NSO stipulation would also continue to apply to BLM sensitive plant species that occur within ACEC boundaries for 100 meters. BLM sensitive plant species occurring outside ACECs would have a CSU constraint to surface-disturbing activities within 100 meters. While no direct impacts such as trampling, dust, and spills, would occur on any federally listed and BLM sensitive species within ACECs, indirect impacts, such as habitat fragmentation, introduction of weeds from adjacent disturbance, changes in hydrologic conditions, and a reduction in pollinator habitat, would potentially continue to occur under this alternative for areas still open to leasing.

Impacts on special status plants from oil and gas activity would be mitigated to the extent possible with COAs. The BLM would consult with the USFWS on any activities that may affect ESA-listed plants.

GJFO

Similar to the CRVFO, the impacts from Alternative E would be reduced compared with the alternatives analyzed from the 2015 Proposed RMP/Final EIS. All the designated areas closed to fluid mineral leasing under Alternative C would remain the same. In addition to these areas, oil and gas development potential areas with no known, low, and medium potential would also be closed. This would increase protection of special status species from potential adjacent disturbance.

The same NSO and CSU constraints described for the CRVFO would also apply to the GJFO.

The Pyramid Rock ACEC is not currently closed to fluid mineral entry, nor is it considered under Alternative E. While a current NSO stipulation is applied to all these species, and the USFWS would be consulted on any activities that may affect ESA-listed plants, the area would remain open to fluid mineral leasing.

Alternative F

Fish and Wildlife

CRVFO and GJFO

The types of impacts on special status fish and wildlife are described above for the various species and species groups. For all special status species, the much greater area of fluid minerals closures under Alternative F compared with under Alternatives A through D of the Proposed RMPs/Final EISs—and somewhat greater area than under Alternative E—is due to adding areas of closure from the public scoping process (see **Chapter 2** of this supplemental EIS).

Table 3.5-26, above, is a compilation of the closures under Alternative F for CRCT core populations, native nongame fish, Greater Sage-grouse, and Canada lynx habitat use. These areas were not specifically closed to leasing under Alternatives A through D of the Proposed RMPs/Final EISs, but they were coincidentally closed to varying extents due to overlap with closures for other resources, uses, or special designations (see **Table 3.5-22**, **Table 3.5-23**, and **Table 3.5-24**).

Table 3.5-26 also compares the extent of closures for selected special status fish and wildlife under Alternative F with those under Alternative E.

For the CRVFO, Alternative F would close 1,500 acres of designated threatened and endangered species wildlife habitat in the high oil and gas development potential area and 3,500 acres in the no, low, and medium potential areas. For the GJFO, Alternative F would close 30,000 acres of designated threatened and endangered species wildlife habitat in the high oil and gas development potential area and no acres in the no, low, and medium potential areas.

For the CRVFO, Alternative F would close 800 acres of native trout crucial habitat in the high oil and gas development potential area and 1,300 acres in the no, low, and medium potential areas. For the GJFO, Alternative F would close 800 acres of native trout crucial habitat in the high oil and gas development potential area and no acres in the no, low, and medium potential areas.

Vegetation

CRVFO

Compared with Alternative E, direct and indirect impacts would be further reduced under Alternative F. This is because it would close the largest area to oil and gas leasing. This alternative would have the highest protection of special status species from potential adjacent disturbance due to oil and gas leasing.

The same NSO and CSU constraints described under Alternative E would apply.

The Mount Logan ACEC would be closed to oil and gas leasing under this alternative. As a result, impacts on this sensitive area would no longer be a concern.

GJFO

Compared with Alternative E, direct and indirect impacts would be further reduced under Alternative F. This is because it would close the largest area to oil and gas leasing. This alternative would have the highest protection of special status species from potential adjacent disturbance due to oil and gas leasing.

The same NSO and CSU constraints described under Alternative E would apply.

The Pyramid Rock ACEC would be closed to oil and gas leasing under this alternative. As a result, impacts on this sensitive area would no longer be a concern.

Cumulative Impacts

Cumulative impacts are described in the in the 2014 and 2015 Proposed RMPs/Final EISs (BLM 2014, Special Status Species, pages 4-271 through 4-272; BLM 2015a, Special Status Species, pages 4-218 through 4-219) and remain the same for both field offices.

CRVFO and GJFO

Fish and Wildlife

The impacts of closures to fluid minerals leasing on special status fish and wildlife under Alternatives A through D in the Proposed RMPs/Final EISs and under new Alternatives E and F are mostly positive due to reductions in disturbance from noise, dust, lights, traffic volumes, and operations of heavy equipment. Other positive impacts include reductions in vegetation loss, modification, fragmentation; infestations or expansions of invasive plants; and the potential for human-caused wildland fires. These benefits are

cumulative with benefits from closures for other resources, uses, and special designations that overlap crucial or overall habitat for special status fish and wildlife.

To a lesser extent, the mostly positive impacts from closures to oil and gas, whether specific to a particular species or for another species or habitat, are also cumulative with applicable NSO stipulations and/or TL stipulations. While NSO and other protective stipulations do not prevent development of an oil and gas lease, they do limit the amount of surface and disturbance impacts associated with fluid mineral leasing and potential development on BLM-administered lands not affected by a closure to oil and gas.

Vegetation

The cumulative impact analysis boundary for special status plants includes the entire planning area plus private and public lands adjacent to the CRVFO and GJFO that contain occurrences of these species. Past, present, and reasonably foreseeable future actions and conditions that could impact special status plants still include oil and gas development, other energy exploration and development, utility corridors and communication sites, grazing, recreation, travel management, weed invasion and spread, prescribed and wildland fires, vegetation treatments, range development projects, insects, disease, and drought. These actions would affect special status plants mostly through habitat fragmentation and degradation through construction and use of roads, well pads, and utility corridors; OHV use; and introduction and spread of invasive species.

As a result, both Alternative E and F are expected to reduce cumulative impacts compared with the previous RMP alternatives due to the increased closure area to oil and gas leasing. Alternative F would reduce these cumulative impacts on special status species the most. As mentioned in the previous analyses, many documented special status plant species within the planning area occur within areas of high potential for oil and gas development, and most of their habitat has already been leased for oil and gas. While protective stipulations developed in this planning effort cannot be attached to existing leases, the BLM could continue to apply COAs and mitigation measures to avoid direct impacts on these species from new development.

3.5.7 Wild Horses

Affected Environment

This section incorporates by reference the affected environment described in the 2015 GJFO Proposed RMP/Final EIS (BLM 2015a, Wild Horses, pages 3-120 through 3-121). A summary as it relates to the decisions for this supplemental EIS is included below.

CRVFO

The CRVFO does not manage wild horses.

GJFO

The LBCWHR is part of the larger Little Book Cliffs Herd Area (approximately 52,600 acres), which was established after passage of the 1971 Wild and Free-Roaming Horses and Burros Act. The LBCWHR is 13 miles long and encompasses 36,100 acres, of which 35,200 are public and 900 are private. As reflected in the population management plan, the appropriate management level ranges from 90 to 150 horses. The appropriate management level is a dynamic number that is adjusted as range conditions warrant and in accordance with BLM policy. There is no authorized livestock grazing within the wild horse range.

Direct and Indirect Impacts

This section presents the impacts on wild horses from oil and gas leasing discussed in **Chapter 2**. This section incorporates by reference the methods, assumptions, and impacts for Alternatives A, B, C, and D described in the GJFO 2015 Proposed RMP/Final EIS (2015a, Wild Horses, pages 4-219 through 4-229). The methods and assumptions also apply to Alternatives E and F. A summary as it relates to fluid minerals is included below.

Impacts on wild horses generally result from activities that affect available forage and water, or cause harassment or disruption to the wild and free-roaming nature of the herd. Oil and gas leasing would likely result in development, which would temporarily or permanently remove forage, disturb the herd by increased human presence, and disrupt herd dynamics. Interim and final reclamation of disturbed areas would reduce potential impacts.

Alternatives A, B, C, and D

CRVFO

The CRVFO does not manage wild horses.

GJFO

About 35 percent of the 35,200-acre LBCWHR would be open to oil and gas leasing under Alternatives A, B, and D, but closed under Alternative C (**Table 3.5-27**). The application of NSO and CSU stipulations would mitigate some potential impacts and vary by alternative. NSO stipulations would apply to 37 percent of the LBCWHR area open to leasing under Alternative A, 100 percent under Alternative B, and 43 percent under Alternative D. CSU stipulations would apply to 100 percent of the LBCWHR area open to leasing under Alternative A, 52 percent under Alternative B, and 100 percent under Alternative D.

Table 3.5-27. Impacts within the LBCWHR

Management Action	Alternative A (acres)	Alternative B (acres)	Alternative C (acres)	Alternative D (acres)	Alternative E (acres)	Alternative F (acres)
Open to fluid mineral leasing	12,400	Same as Alternative A	0	Same as Alternative A	Same as Alternative C	Same as Alternative C
Subject to NSO stipulation	4,600	12,400	0	5,300	Same as Alternative C	Same as Alternative C
Subject to CSU stipulation	12,400	Same as Alternative A	0	Same as Alternative A	Same as Alternative C	Same as Alternative C

Alternative E

CRVFO

The CRVFO does not manage wild horses.

GJFO

The GJFO has several existing oil and gas leases within the LBCWHR. Those leases would remain valid; however, like under Alternative C, the LBCWHR would be closed to future oil and gas leasing under Alternative E. Activities related to existing leases would continue. Reduced oil and gas leasing and potentially less development could reduce impacts on forage condition and water supply, and could reduce

the potential for disruption to the herd associated with oil and gas activities. All 35,200 acres closed within the wild horse range would be in the high oil and gas development potential area.

Alternative F

CRVFO

The CRVFO does not manage wild horses.

GJFO

Like Alternatives C and E, the LBCWHR would be closed to future oil and gas leasing under Alternative F. However, activities related to existing leases would continue. Reduced oil and gas leasing and potentially less development could reduce impacts on forage condition and water supply, and could reduce the potential for disruption to the herd associated with oil and gas activities. All 35,200 acres closed within the wild horse range would be in the high oil and gas development potential area.

Cumulative Impacts

This section incorporates by reference the cumulative impacts described in the 2015 GJFO Proposed RMP/Final EIS (BLM 2015a, Wild Horses, page 4-229).

CRVFO

The CRVFO does not manage wild horses.

GJFO

Motorized travel or other potential disturbance by people, vehicles, and industrial activities would reduce available and easily accessible forage and water sources in the short term and would impact the wild and free-roaming nature of the herd. Restrictions, such as limiting areas open to leasing and applying stipulations as described in the alternatives, may reduce cumulative impacts on wild horses by removing a potentially impactful activity on forage and the water supply and removing a disruptive activity.

3.5.8 Cultural Resources

Affected Environment

This section incorporates by reference the affected environment described in the 2014 and 2015 Proposed RMPs/Final EISs (BLM 2014, Cultural Resources, pages 3-103 through 3-113; BLM 2015a, Cultural Resources, pages 3-128 through 3-139). New information and a summary as they relate to the decisions for this supplemental EIS are included below.

An extensive framework of laws, regulations, EOs, and formal agreements provide protection of cultural resources during federal undertakings. This extensive network of laws and regulations is continuously amended, expanded, and added to over time to emphasize and strengthen protections. **Table 3.5-28** lists a summary of cultural resources legislation and public directives, but specific changes and additions are summarized here.

- In 2014, Public Law 13-287 moved the National Historic Preservation Act of 1966's (NHPA) provisions from title 16 of the United States Code (USC) to title 54, with minimal and non-substantive changes to the text of the act and a reordering of some of its provisions.

Table 3.5-28. Cultural Resource Mandates and Authorities

Laws and Proclamations
Antiquities Act of 1906 (Public Law 59-209; 34 Stat. 225; 16 USC 431–433)
Historic Sites Act of 1935 (Public Law 74-292; 49 Stat. 666; 16 USC 461)
Reservoir Salvage Act of 1960, as amended by the Archaeological and Historic Preservation Act of 1974 (Public Law 86-523; 74 Stat. 220, 221; 16 USC 469; Public Law 93-291; 88 Stat. 174; 16 USC 469)
*NHPA, as amended (NHPA 2016) (Public Law 89-665; 80 Stat. 915; 54 USC 300101)
NEPA (Public Law 91-190; 83 Stat. 852; 42 USC 4321)
Archaeological and Historic Preservation Act of 1974 (16 USC 469–469C)
*FLPMA, as amended September 2016 (Public Law 94-579; 90 Stat. 2743; 43 USC 1701)
American Indian Religious Freedom Act of 1978 (Public Law 5-431; 92 Stat. 469; 42 USC 1996)
Archaeological Resources Protection Act of 1979 (Public Law 96-95; 93 Stat. 721; 16 USC 470AA et seq.), as amended (Public Law 100-555; Public Law 100-588)
Native American Graves Protection and Repatriation Act of 1990 (Public Law 101-601; 104 Stat. 3048; 25 USC 3001)
Regulations
36 CFR 7 – Special Regulations, Areas of the National Park System
36 CFR 60 – National Register of Historic Places
36 CFR 79 – Curation of Federally Owned and Administered Archaeological Collections
36 CFR 800 – Protection of Historic Properties
43 CFR 3 – Preservation of American Antiquities; implementing regulations for the Antiquities Act
43 CFR 7 – Protection of Archaeological Resources
43 CFR 10 – Native American Graves Protection and Repatriation Act Regulations; Final Rule
Executive Orders
EO 11593 – Protection and Enhancement of the Cultural Environment
EO 13007 – Providing for American Indian and Alaska Native Religious Freedom and Sacred Land Protections
EO 13084 – Consultation and Coordination with Indian Tribal Governments
EO 13195 – Trails for America in the 21st Century
EO 13287 – Preserve America
EO 13175 – Consultation and Coordination with Indian Tribal Governments
Secretarial Order 3317 – Department of the Interior Policy on Consultation with Indian Tribes
Presidential Memorandum on Tribal Consultation and Strengthening Nation-to-Nation Relationships (January 2021)
BLM Cultural Resource Mandates
BLM Manual 8100 – The Foundations for Managing Cultural Resources
BLM Manual 8110 – Identifying and Evaluating Cultural Resources
BLM Manual 8130 – Planning for Uses of Cultural Resources
BLM Manual 8140 – Protecting Cultural Resources
BLM Manual 8150 – Permitting Uses of Cultural Resources
BLM Manual 8160 – Preserving Museum Collections
BLM Manual 8170 – Interpreting Cultural Resources for the Public
BLM Departmental Manual Part 411 – Museum Property Management
*BLM Manual 1780 – Tribal Relations
*BLM Handbook H-1780-1 – Improving and Sustaining BLM-Tribal Relations
BLM Handbook H-1742 – BLM Emergency Fire Rehabilitation Handbook
*BLM Colorado Handbook of Guidelines and Procedures for Inventory, Evaluation, and Mitigation of Cultural Resources 1998 (revised March 2021)
National Register Bulletin – National Park Service, Department of the Interior (1990, revised 1997)
*BLM Instruction Memorandum 2022-046 – Tribal Relations Program Plan

Agreements

Programmatic Agreement among the Bureau of Land Management, the Advisory Council on Historic Preservation, and the National Conference of State Historic Preservation Officers regarding the manner in which the BLM will meet its responsibilities under the NHPA (February 2012)

*State Protocol Agreement between the Colorado State Director of the BLM and the Colorado SHPO regarding the manner in which the BLM will meet its responsibilities under the NHPA and the NPA among the BLM, the Advisory Council on Historic Preservation, and the National Conference of State Historic Preservation Officers (October 2014)

* Indicates policy that is new or updated since the CRVFO and GJFO Proposed RMPs/Final EISs

- The National Programmatic Agreement (NPA) with the Advisory Council on Historic Preservation and the National Conference of State Historic Preservation Officers was signed in 2012. This NPA describes how the State Historic Preservation Office (SHPO) and BLM will interact. In October 2014, the State Protocol Agreement between the Colorado State Director of the BLM and the SHPO was updated. This protocol supplements the NPA between the BLM, Advisory Council on Historic Preservation, and National Conference of State Historic Preservation Officers regarding the manner in which the BLM will meet its responsibilities under the NHPA (February 2012).
- In 2016, the BLM released the new Manual 1780 for Tribal Relations, which replaced Manual 8120 for Tribal Consultation under Cultural Resources (BLM 1974). Simultaneously, in 2016 the BLM released a new handbook (H-1780-1) for Improving and Sustaining BLM-Tribal Relations, which replaced H-8120-1 in the BLM Handbook Guidelines for Conducting Tribal Consultation (BLM 1975). This new manual and handbook emphasize the policies, roles and responsibilities, and standards for BLM tribal relations and government-to-government tribal consultation within a comprehensive framework of those legal authorities affecting this relationship. In addition, this manual provides policy direction on the BLM's tribal consultation responsibilities across all BLM program areas.
- In 2021, the president of the United States issued the Memorandum on Tribal Consultation and Strengthening Nation-to-Nation Relationships. This memorandum reaffirms the policy and directives issued in EO 13175, which charges all executive departments and agencies with engaging in regular, meaningful, and robust consultation with tribal officials in the development of federal policies that have tribal implications.

Federal undertakings require agencies to consider the effects of the undertaking on historic properties through Section 106 of the NHPA during projects they carry out, assist, fund, permit, license, or approve. This process continuously adds data and information about cultural resources to the BLM's knowledge of the area.

Since the 2014 and 2015 Proposed RMPs/Final EISs, tribal consultation and building relationships with tribal nations has been a priority. Following EO 13084, EO 13175, Handbook 1780-1, and information shared by the tribes during the BLM's Ute Ethnohistory project (Ott 2010), the CRVFO and GJFO have focused efforts on gathering information and designing projects that align with tribal interests and concerns. The CRVFO and GJFO have increased tribal consultation both in person and through written communication. The BLM has prioritized projects that identify and preserve cultural resources and sites of tribal importance. This has led to increased knowledge of areas the tribes have identified as significant and require protection or additional mitigation during undertakings.

CRVFO

Review of cultural resource survey and site data compiled since the initial analysis for the CRVFO does not reveal any new information or resource concerns that would significantly change the cultural modeling performed for the original Final EIS or for the cultural resource portions of the previous alternatives. The BLM will conduct cultural resource analysis on a project-by-project basis to resolve the need for cultural inventories in determining the presence or absence of previously unidentified resources. Existing NSO stipulations will ensure significant cultural resources discovered in the future are equally protected under the EIS.

GJFO

The amount of acreage surveyed, and the number of cultural resource sites and isolated finds recorded, have approximately doubled since the 2015 Final EIS; however, despite the substantial increases, there has not been a significant change in the density of cultural resources identified that would change any assumptions or analysis undertaken for the Final EIS. The BLM will continue to conduct cultural resource analysis on a project-by-project basis to resolve the need for cultural inventories in determining the presence or absence of previously unidentified resources.

Direct and Indirect Impacts

This section presents the impacts on cultural resources from the oil and gas leasing discussed in **Chapter 2**. This section incorporates by reference the methods, assumptions, and impacts for Alternatives A, B, C, and D described in the 2014 and 2015 Proposed RMPs/Final EISs (BLM 2014, Cultural Resources, pages 4-353 through 4-378; BLM 2015a, Cultural Resources, 4-229 through 4-252). The methods and assumptions also apply to Alternatives E and F. A summary as it relates to fluid minerals is included below.

Under all alternatives, the assumption is that BLM-held cultural resources are managed and protected according to relevant laws and regulations. Consultation with Native American tribes and recognition of tribal interests during the planning phase of proposed federal undertakings are required. Any ground-disturbing activity is considered a potential risk to cultural resources and Native American traditional properties. NSO stipulations would likely protect cultural resources.

Potential impacts associated with the exploration and development of fluid minerals include both surface and subsurface physical disturbance to archaeological deposits, the loss to sites and landscapes of integrities related to cultural and environmental settings from oil and gas infrastructure (aural and visual intrusions), and degradation and reduced access to Native American traditional use sites. Increased access resulting from routes created in association with development can also lead to vandalism and unauthorized collection. Due to requisite cultural surveys prior to fluid mineral exploration and development, cultural resource inventories and documented sites increase. However, withdrawing land and restricting surface and subsurface development for use in fluid mineral leasing would provide direct and indirect protection of cultural resources.

Alternatives A, B, C, and D

CRVFO

Table 3.5-29 presents the potential for oil and gas development within areas with high cultural resources sensitivity.

Table 3.5-29. Cultural Resources Sensitivity in Oil and Gas Development Potential Areas

Percentage of Area within High Cultural Resources Sensitivity	High Gas Potential (%)	Medium Gas Potential (%)	Low Gas Potential (%)	Unknown Gas Potential (%)
Prehistoric	34	41	23	3
Historic	5	8	6	1

Most of the high and medium gas potential areas occur within high prehistoric zones, which would result in a greater probability of direct and indirect impacts on cultural resources. Potential impacts on historic resources would be low across most gas potential areas, because gas exploration and development tend to be outside town boundaries and urban areas where historic resources are concentrated and more likely to occur.

Alternatives A and D have roughly comparable levels of potential impacts on cultural resources since about 96 and 92 percent, respectively, of the decision area would be open to leasing. Under Alternatives B and C, about 87 and 80 percent, respectively, of the decision area would be open to leasing. Thus, Alternative C would have the fewest potential impacts on cultural resources.

GJFO

Under Alternatives B, C, and D, additional measures for cultural resource protection and Native American resource and traditional use protection would apply. Alternative A would apply a cultural resource NSO stipulation to 4,600 acres. Additional cultural resource CSU stipulations would be applied to 53,500 acres under Alternative B, 68,400 acres under Alternative C, and 51,400 acres under Alternative D.

Regarding areas open to leasing, Alternatives A and D would have the same level of potential impacts on cultural resources since about 92 percent of the decision area would be open to leasing under both alternatives. Under Alternatives B and C, about 80 and 50 percent, respectively, of the decision area would be open to leasing. Thus, Alternative C would have the fewest potential impacts on cultural resources.

Alternative E

Closing land to fluid mineral leasing would provide direct and indirect protection of cultural resources. Alternative E would close more cultural resources and areas of tribal significance to impacts from oil and gas leasing than Alternative C.

CRVFO

Alternative E would close 568,337 acres to fluid mineral leasing and would therefore close 1,200 documented cultural resources to impacts from oil and gas leasing. Of the 1,200 cultural resources, 221 are eligible or potentially eligible for the National Register of Historic Places (NRHP). A total of 16,255 acres of areas identified by tribes as significant would be closed under Alternative E.

Under Alternative E, 845 cultural resources would remain in areas open to leasing, which includes 156 cultural resources that are eligible or potentially eligible for the NRHP. Within Alternative E, 1,923 acres of areas significant to tribes would remain open to leasing.

GJFO

Under Alternative E, closing 998,000 acres to fluid mineral leasing could affect 1,575 known historic properties eligible to the NRHP, including sites that need data, that are unevaluated, and contributing segments and sites to eligible linear sites and districts. A total of 140,022 acres of areas identified by tribes as significant would be closed under Alternative E. The closures would also protect an unknown number of unrecorded historic properties and traditional use sites from impacts associated with fluid mineral leasing.

Under Alternative E, 342 known historic properties and 38 Native American traditional use sites in proposed areas open to fluid mineral leasing would continue to potentially be affected by the impacts noted above. Additionally, a total of 14,404 acres of areas identified by tribes as significant would be open to leasing under Alternative E.

Alternative F

Closing land to fluid mineral leasing would provide direct and indirect protection of cultural resources. Alternative F would close more cultural resources and areas of tribal significance to impacts from oil and gas leasing than Alternative C or Alternative E.

CRVFO

Alternative F would close 687,159 acres to fluid mineral leasing and would therefore protect 2,002 documented cultural resources from impacts from oil and gas leasing. Of the 2,002 cultural resources, 369 are eligible or potentially eligible to the NRHP. A total of 18,179 acres of areas identified by tribes as significant would be closed under Alternative F.

Under Alternative F, 90 cultural resources would remain in areas open to leasing, which includes 21 cultural resources that are eligible or potentially eligible for the NRHP. Under Alternative F, no areas significant to tribes would remain open to leasing.

GJFO

Under Alternative F, closing 1,149,000 acres to fluid mineral leasing could affect 1,750 known historic properties eligible to the NRHP, including sites that need data, sites that are unevaluated, and contributing segments and sites to eligible linear sites and districts. A total of 154,426 acres of areas identified by tribes as significant would be closed under Alternative F. The closures would also protect an unknown number of unrecorded historic properties and traditional use sites from impacts associated with fluid mineral leasing.

Under Alternative F, 473 known historic properties and 33 Native American traditional use sites in proposed areas open to fluid mineral leasing would continue to potentially be affected by the impacts noted above. Under Alternative F, no areas significant to tribes would remain open to leasing.

Cumulative Impacts

This section incorporates by reference the cumulative impacts described in the 2014 and 2015 Proposed RMPs/Final EISs (BLM 2014, Cultural Resources, pages 4-378 through 4-379; BLM 2015a, Cultural Resources, pages 4-250 through 4-252).

CRVFO and GJFO

Increasing development pressures, including increased mineral development and renewable energy development; recreation uses; construction of pipelines, transmission lines, roads, and water diversions; urban expansion; and livestock grazing, would likely continue on a regional scale. These would continue to affect cultural resources and cultural landscapes through the loss or disturbance of resources that are not or cannot be protected, changes in the setting, pressure from incremental use, the loss of access for Native Americans to resources, and theft or vandalism of cultural resources. If this trend continues as expected, the preservation of cultural resources, research, public education, and consultation with Native American tribes will become even more critical. The continued documentation of new cultural resources from undertakings and permitted actions that would require inventory and tribal consultation for compliance would broaden the BLM's understanding of cultural resources.

3.5.9 Visual Resources

Affected Environment

This section incorporates by reference the affected environment described in the 2014 and 2015 Proposed RMPs/Final EISs (BLM 2014, Visual Resources, pages 3-119 through 3-124; BLM 2015a, Visual Resources, pages 3-144 through 3-148). A summary as it relates to the decisions for this supplemental EIS is included below.

Visual resources refer to the visible features and objects, natural and human made, that compose the character of the landscape as visually observed from a given location (that is, the objects and features that are visible on a landscape). These resources contribute to the scenic or visual quality/visual appeal of the landscape. Visual impact is the creation of an intrusion or perceptible contrast that affects the landscape's scenic quality. A visual impact can be perceived by an individual or group as either positive or negative, depending on a variety of factors or conditions (for example, personal experience, time of day, and weather and seasonal conditions).

The FLPMA mandates protection of scenic values. Section 102 (43 USC 1701) states, "(a) The Congress declares that it is the policy of the US that – (8) the public lands be managed in a manner that will protect the quality of scientific, scenic, historical...and archeological values; that, where appropriate, will preserve and protect certain public lands in their natural condition...."

Section 201 (43 USC) states: "(a)...shall prepare and maintain on a continuing basis an inventory of all public lands and their resource and other values (including... scenic values)" "This inventory shall be kept current...."

In response to the FLPMA mandate, the BLM's VRM policy is set forth in Manual 8400 with implementation guidance provided in handbooks H-8410-1, Visual Resource Inventory, and H-8431-1, Contrast Rating. Policy dictates that all BLM-administered surface acreage will be inventoried for visual values, and the BLM will manage visual values through designation of VRM classes.

CRVFO

The landscape type is diverse and consists of foothills, mountains, plateaus, mesas, canyons, and broad and narrow river valleys. Vegetation types vary from lowland sagebrush, grasslands, and scrub oak; pinyon; and juniper forests, to aspen and spruce in the higher elevations. Some streams and rivers flowing through and adjacent to the CRVFO decision area include the Colorado, Eagle, and Roaring Fork Rivers, and Deep,

Thompson, Sweetwater, Elk, Rock, Egeria, and Abrams Creeks. Several prominent landscape features also occur in the CRVFO decision area, such as Anvil Points, the Grand Hogback, Castle Peak, Deep Creek Canyon, Bull Gulch, Thompson Creek, and the East Fork of Parachute Creek. While most of the valley bottoms are private and within the foreground of the viewsheds, adjacent public lands serve as important scenic backdrops and visual open space.

The CRVFO encompasses 10 communities (Parachute, Rifle, Silt, New Castle, Glenwood Springs, Dotsero, Gypsum, Eagle, Carbondale, and El Jebel/Basalt) and is bisected by some of Colorado's busiest highway corridors (Interstate 70 [I-70] and State Highways 82, 131, and 13). Much of the CRVFO planning area is viewed while traveling to or from major tourist destinations, such as Vail and Aspen. As the state's population grows, more visitors will be attracted to BLM-administered lands for recreation in natural landscapes. A high demand is being placed on scenic resources near these population centers.

The CRVFO completed a visual resource inventory (VRI) as part of the 2014 RMP process. The VRI process provides a means for determining visual values of a landscape. The inventory consists of a scenic quality evaluation, sensitivity level analysis, and a delineation of distance zones. Based on these three factors, BLM-administered lands are placed into one of four VRI classes. VRI Class I is reserved for special areas where a management decision to preserve the natural landscape condition preceded the land use planning process. VRI Classes II, III and IV are the result of the three VRI factors being evaluated in combination to assign a VRI class. VRI Class II lands have the greatest relative visual value, and VRI Class IV lands have the lowest relative visual value. The VRI class values and the individual VRI factors serve as the primary source of information for VRM class decisions.

Table 3.5-30 summarizes the breakdown of the four VRI classes within the CRVFO decision area as well as the sensitivity, scenic quality, and distance zones.

Table 3.5-30. Visual Resource Inventory Classes, Sensitivity, Scenic Quality Rating Units, and Distance Zones for the CRVFO Decision Area

VRI Class	Acres
Class I	0
Class II	228,100
Class III	129,100
Class IV	148,000
Sensitivity	Acres
High	290,000
Medium	215,000
Low	200
Scenic Quality	Acres
A	60,500
B	363,700
C	81,000
Distance Zones	Acres
Background	110,900
Foreground/ Middleground	283,700
Seldom Seen	110,600

Table 3.5-31 shows the breakdown of VRM classes in the CRVFO in the 2014 Proposed RMP.

Table 3.5-31. Visual Resource Management Classes in the CRVFO Decision Area

VRM Class	Acres
Class I	35,600
Class II	267,900
Class III	83,800
Class IV	116,900

GJFO

The landscape of the GJFO planning area is visually diverse in both topography and vegetation. The topography of the area consists of foothills, mountains, plateaus, mesas, deep canyons, and broad and narrow river valleys. Some streams and rivers flowing through and adjacent to BLM-administered land in the planning area include the Colorado, Dolores, and Gunnison Rivers and the Blue, Rough Canyon, East, and West Creeks. Prominent features in the landscape include Mount Garfield, the cliffs of the Sinbad Valley, the Palisade, Douglas Pass, the Book Cliffs, and multiple canyons known for their scenic values.

While portions of the GJFO planning area are still largely undeveloped, range improvements, linear disturbances (for example, pipelines and roads), and energy developments have altered the landscape over the past 20 years, especially in areas with high oil and gas development and areas with densely populated routes. Sources of artificial light, including from residential housing, signage on commercial buildings, and oil and gas drill rigs, have also increased.

Management of multiple resources on BLM-administered lands can alter visual resources. With an increased amount of urban development throughout the planning area on adjacent private land, increased management activities are also occurring on BLM-administered lands. Growing pressure is being placed on the visual resources from activities such as oil and gas extraction, fire management, ROW corridors, roads and trails, communication sites, pipelines, livestock grazing, and water tanks.

Public concern over preservation of visual and scenic quality is also increasing for open space and scenic backgrounds in residential areas and for recreational uses. Most gas development has taken place in the planning area's northeastern portion; this development has modified the landscape into a more industrialized setting. In response to increasing concerns from local communities, the condition of visual resources is being assessed for the major transportation corridors, population centers, and other scenic viewsheds to determine how the BLM should manage these sensitive viewsheds and corridors.

The BLM completed a VRI for the GJFO decision area in 2009. **Table 3.5-32** presents the sensitivity, scenic quality, distance zones, and VRI class distribution for the GJFO decision area.

Table 3.5-32. Visual Resource Inventory Classes, Sensitivity, Scenic Quality Rating Units, and Distance Zones for the GJFO Decision Area

VRI Class	Acres
Class I	0
Class II	376,100
Class III	382,300
Class IV	302,700

Sensitivity	Acres
High	321,600
Medium	484,900
Low	254,600
Scenic Quality	Acres
A	9,200
B	776,900
C	275,100
Distance Zones	Acres
Background	0
Foreground/ Middleground	1,061,100
Seldom Seen	0

Table 3.5-33 shows the breakdown of VRM classes in the GJFO in the 2015 Proposed RMP.

Table 3.5-33. Visual Resource Management Classes in the GJFO Decision Area

VRM Class	Acres
Class I	98,800
Class II	390,700
Class III	395,900
Class IV	172,800

Direct and Indirect Impacts

This section presents the impacts on visual resources from the oil and gas leasing discussed in **Chapter 2**. This section incorporates by reference the methods, assumptions, and impacts for Alternatives A, B, C, and D described in the 2014 and 2015 Proposed RMPs/Final EISs (BLM 2014, Visual Resources, pages 4-385 through 4-401; BLM 2015a, Wilderness Study Areas, pages 4-264 through 4-278). The methods and assumptions also apply to Alternatives E and F. A summary as it relates to fluid minerals is included below.

The VRM classes assigned in the CRVFO and GJFO provide the visual management standards for the design and development of future projects and for rehabilitation of existing projects. BLM VRM class objectives and descriptions are in BLM Manual Handbook H-8431-1 (BLM 1986) and are summarized in the two Proposed RMPs/Final EISs (CRVFO 2014, Table 3.2.10-1, page 3-120; GJFO 2015a, Table 3-23, page 3-145). The following are the objectives of VRM classes:

- VRM Class I: The objective of VRM Class I is to preserve the landscape's existing character.
- VRM Class II: The objective of this class is to retain the landscape's existing character.
- VRM Class III: The VRM Class III objective is to partially retain the landscape's existing character.
- VRM Class IV: The objective of VRM Class IV is to provide for management activities that require major modifications to the landscape's existing character.

All surface-disturbing activities, regardless of the alternative or management action, would be subject to the management objectives of the area within which the activity takes place. The visual resource contrast rating system is used to analyze the potential site-specific impacts of surface disturbance and the facility design and placement. Surface-disturbing activities and facilities would be designed to mitigate their visual

impacts and to conform to the area's designated VRM objective. Mitigation could include painting, facility design, and placement.

The analysis below identifies impacts on visual resources from oil and gas development. Under each alternative, portions of the respective CRVFO and GJFO planning areas would be available for development. Much of the decision area with oil and gas development potential is currently leased. Areas identified previously as VRI Class II would be most sensitive to such development, but these areas would be protected with more restrictive VRM class designations. While development associated with oil and gas extraction can impact scenic quality, impacts from decisions made in this amendment affecting new leases would be minimal. Areas of high to very high development potential in the CRVFO and GJFO are predominately within VRI Class III and IV; therefore, any new development would have less of an impact on the scenic quality in those areas.

The criteria for analysis were the number of acres of the various VRM classes to be designated under each alternative and the associated number of impacts and surface disturbance anticipated for each class. At the broadscale level, the analysis of the impacts on visual resources is discussed in terms of the number of acres in each VRM class; this is because the management actions would be required to not exceed the designated VRM class objectives within the planning area. Impacts on visual resources are determined through the consistency of proposed management actions with the identified VRM class prescriptions and objectives.

More surface disturbance or structures would add to the cumulative impact of resource development on the visual quality of the landscape. Degradation of visual qualities would primarily occur from surface-disturbing activities, such as those associated with construction of ROWs (for example, pipelines, transmission lines, and communication lines) and oil and gas facilities (for example, well pads, reserve pits, and roads). The development of permanent structures would result in long-term degradation of scenic quality and in some cases could become the dominant feature on the landscape. The degree of impact would depend on the amount of development projected to occur and the effectiveness of mitigation measures (for example, siting, painting, and screening).

This section presents potential impacts of the alternatives on visual resources, specifically the potential for management decisions to create visual changes in, or contrasts from, the existing landscape. Visual resources generally are impacted by surface-disturbing activities that introduce new visual elements into the landscape and change the features that characterize the existing landscape (for example, the form, line, color, and texture of the landform, water, vegetation, and structures). Generally, the greater the surface disturbance, the greater the change to the characteristic landscape.

Table 3.5-34 and **Table 3.5-35** show the acres of the VRI and designated VRM management classes in the CRVFO and GJFO under each alternative. This analysis assumed the objectives of areas designated as VRM Class III and VRM Class IV would permit more surface-disturbing impacts and potentially have greater adverse impacts on visual resources and scenic quality than those areas designated with VRM Class I and Class II objectives. The cumulative numbers for the VRM classes resulted from the final combination of proposed special designations (for example, ACECs and SRMAs) and land units managed for wilderness characteristics.

Table 3.5-34. Acres of VRM Classes by Alternative in the CRVFO

VRM Class	Alternative A	Alternative B	Alternative C	Alternative D	Alternative E	Alternative F
Class I	22,700	35,600	35,800	35,200	35,800	39,700
Class II	227,800	268,900	256,900	217,900	256,900	290,700
Class III	112,900	84,200	96,200	113,100	96,200	69,860
Class IV	141,800	116,500	116,300	139,000	116,300	104,940
Total	505,200	505,200	505,200	505,200	505,200	505,200

Table 3.5-35. Acres of VRM Classes by Alternative in the GJFO

VRM Class	Alternative A	Alternative B	Alternative C	Alternative D	Alternative E	Alternative F
Class I	27,100	98,800	100,100	96,300	100,100	100,100
Class II	132,300	392,300	556,500	194,900	556,500	492,980
Class III	206,000	396,800	215,000	530,000	215,000	312,670
Class IV	—	173,100	188,000	240,000	188,000	155,250
Undesignated	695,600	—	—	—	—	—
Total	1,061,000	1,061,000	1,059,600	1,061,200	1,061,000	1,061,000

Alternatives A, B, C, and D**CRVFO**

Alternative A would leave the greatest area of the CRVFO open to fluid minerals leasing for oil and gas development. In areas with development, the construction of roads, well pads, and other facilities add impacts on the visual landscape. Many developments would be visible and would attract attention, which would result in changes to the scenic quality. Fluid mineral development could have long-term adverse impacts on visual resources. Alternative A would manage 672,500 acres as open and close 28,700 acres to fluid minerals leasing and development.

Alternatives D, B, and C would close progressively more area to fluid minerals leasing, with 52,800, 98,100, and 179,700 acres closed, respectively. The greater area closed would present potentially fewer impacts on visual resources from oil and gas leasing.

GJFO

Fluid mineral development would have the most potential to impact visual resources under Alternative A, which would leave the greatest area of the GJFO open to leasing. Development associated with oil and gas extraction can impact the scenic quality, and Alternative A would manage 1,134,600 acres as open and close 96,500 acres to fluid minerals leasing and development.

Alternatives D, B, and C would close progressively more area to fluid minerals leasing, with 100,500, 325,400, and 623,600 acres closed, respectively. The greater area closed would present potentially fewer impacts on visual resources from oil and gas leasing. Under Alternative C, approximately two-thirds of the decision area would be managed with VRM Class I or VRM Class II objectives. Under these management regimes, most future development of any kind must be designed to blend into the landscape and should not be evident to the casual observer from key observation points. Alternative C would protect the visual resources of much of the GJFO.

Alternative E

CRVFO

Impacts under Alternative E would be similar to those described under Alternative C, but with additional lands closed to future fluid minerals leasing. Alternative E would close 568,300 acres (80 percent of the decision area) to fluid mineral leasing. With more lands closed to leasing, Alternative E would potentially create fewer impacts on visual resources.

GJFO

Impacts under Alternative E would be similar to those described under Alternative C, but with additional lands closed to future fluid minerals leasing. Alternative E would close 998,000 acres (81 percent of the decision area) to fluid mineral leasing. With more lands closed to leasing, Alternative E would potentially create fewer impacts on visual resources.

Alternative F

CRVFO

Alternative F would provide the greatest protection to visual resources. Under Alternative F, the BLM would close 687,100 acres (97 percent of the decision area) to fluid mineral leasing. Alternative F would potentially create the fewest impacts on visual resources. Additionally, under Alternative F, more lands would be managed as VRM Class I and VRM Class II than under other alternatives. Under Alternative F, the BLM would manage 330,400 acres with VRM Class I or Class II objectives. Areas managed with VRM Class I and VRM Class II objectives restrict more surface-disturbing impacts and would have fewer adverse impacts on visual resources and scenic quality than those areas managed with VRM Class III and Class IV objectives.

GJFO

Impacts under Alternative F would be similar to those described under Alternative E, except Alternative F would close 1,149,900 acres (93 percent of the decision area) to fluid mineral leasing. Alternative F would potentially create the fewest impacts on visual resources. Additionally, under Alternative F, more lands would be managed as VRM Class I and VRM Class II than under other alternatives. Under Alternative F, the BLM would manage 759,980 acres with VRM Class I or Class II objectives. Areas managed with VRM Class I and VRM Class II objectives restrict more surface-disturbing impacts and would have fewer adverse impacts on visual resources and scenic quality than those areas managed with VRM Class III and VRM Class IV objectives.

Cumulative Impacts

This section incorporates by reference the cumulative impacts described in the 2014 and 2015 Proposed RMPs/Final EISs (BLM 2014, Visual Resources, page 4-401; BLM 2015a, Visual Resources, page 4-277 through 4-278).

CRVFO and GJFO

Any development within and outside the analysis boundary could produce impacts on visual resources. Potential impacts on VRM would result primarily from surface-disturbing activities that cause visual intrusions and degrade visual quality. Activities related to oil and gas development have the potential to degrade visual resources. Cumulative impacts would likely be greater in areas where mineral potential is greatest.

As the communities on Colorado's Western Slope continue to grow, development of lands near BLM-administered lands could also lead to an increased demand for energy resources, building materials, utilities, and minerals; all of these adversely affect visual resources.

For both the CRVFO and GJFO, Alternatives E or F would likely result in the fewest cumulative impacts on visual resources by closing more land area to fluid mineral leasing, thus limiting the potential for future development.

3.5.10 Lands with Wilderness Characteristics

Affected Environment

This section incorporates by reference the affected environment described in the 2014 and 2015 Proposed RMPs/Final EISs (BLM 2014, Lands Managed for the Protection of Wilderness Characteristics, pages 3-130 through 3-139; BLM 2015a, Lands with Wilderness Characteristics, pages 3-148 through 3-154). Updated information and a summary as they relate to the decisions for this supplemental EIS are included below.

With the passage of the FLPMA, Congress directed the BLM to maintain an inventory of its lands for all resources and their values, including lands possessing the resource of wilderness, as identified by the characteristics described in the Wilderness Act of 1964.

The BLM's wilderness inventory process can be separated into two evaluations. The first is directed by Section 603 of FLPMA, including the steps of inventory, study, reporting, and non-impairing management. Areas identified in the pre-1991 inventory are known as WSAs. The inventory process occurring after 1991 includes the steps of inventory, study, and resource management planning. Through this planning process, the BLM has discretion to determine which portions of BLM-administered lands with wilderness characteristics would be managed for those characteristics.

Second, the BLM evaluates all its lands for the presence or absence of the wilderness resource as required in Section 201(a) of FLPMA, which states, "The Secretary shall prepare and maintain on a continuing basis an inventory of all public lands and their resource and other values." Wilderness is a public land resource, as expressed in Section 2(a) of the Wilderness Act. Therefore, the resource inventory required by FLPMA includes the inventory of wilderness characteristics, consistent with the definition of wilderness found in Section 2(c) of the Wilderness Act. The following three criteria must each be present for an area to possess wilderness characteristics: size, naturalness, and outstanding opportunities for either solitude or a primitive and unconfined recreation:

- **Size**—Roadless areas with over 5,000 acres of contiguous BLM-administered lands, or smaller areas of sufficient size to make practicable the preservation of an unimpaired condition. Smaller areas may include roadless islands, areas adjacent to other federal lands formally determined to have wilderness characteristics and protected by the administering agency, and other areas demonstrated to be of practical size. The word "roadless" refers to the absence of roads that have been improved and maintained by mechanical means to ensure relatively regular and continuous use. A way, also known as a primitive route, maintained solely by the passage of vehicles, does not constitute a road.
- **Naturalness**—Areas that appear to have been affected primarily by the forces of nature, and where any work of human beings is substantially unnoticeable.

- Outstanding opportunities for solitude or a primitive unconfined type of recreation—Areas that have outstanding opportunities for solitude or a primitive and unconfined type of recreation. The word “or” means the area has to possess one or the other but does not have to possess opportunities for both elements.
- Supplemental values—The area may contain ecological, geological, or other features of scientific, educational, scenic, or historical value. This criterion does not have to be met for an area to possess wilderness characteristics.

Guidance for conducting wilderness characteristics inventory and considering wilderness characteristics in land use planning is provided in BLM Manual 6310, Conducting Wilderness Characteristics Inventory on BLM Public Lands (BLM 2021b), and Manual 6320, Considering Lands with Wilderness Characteristics in the BLM Land Use Planning Process (BLM 2021c).

CRVFO

Table 3.5-36 shows the areas within the CRVFO assessed as part of this supplemental EIS. These areas are documented to possess wilderness characteristics.

Table 3.5-36. CRVFO Lands with Wilderness Characteristics

Name	Acres
Castle Peak Addition	3,900
Deep Creek	4,300
East Fork	8,300
Flat Tops Addition	3,500
Grand Hogback	11,400
Northeast Cliffs	5,800
Pisgah Mountain	14,500
Thompson Creek	8,200
Total	59,900

Per the 2015 RMP, the CRVFO currently manages five of these units for the protection of their wilderness characteristics (Castle Peak Addition, Deep Creek, Flat Tops Addition, Pisgah Mountain, and Thompson Creek). The BLM has currently closed these units to fluid mineral leasing and prohibits surface occupancy and surface-disturbing activities.

In addition to the units where the BLM found wilderness characteristics present, citizens’ inventory work found wilderness characteristics in other units throughout the CRVFO. **Table 3.5-37** shows these units.

Table 3.5-37. Additional Citizen-Proposed CRVFO Units Considered

Name	Acres
Blowout Hill	9,732
Bull Gulch Contiguous	6,570
Hogback East	6,524
King Mountain	10,930
Lucky Gulch	7,467
Red Hill West	10,846
Total	52,069

GJFO

Table 3.5-38 shows the areas within the GJFO assessed as part of this supplemental EIS. These areas are documented to possess wilderness characteristics.

Table 3.5-38. GJFO Lands with Wilderness Characteristics

Name	Acres
Bangs Canyon*	20,434
Book Cliffs South*	70,180
De Beque Rim*	3,302
Demaree South*	3,970
East Demaree	4,787
East Salt	15,471
Head of Main Canyon*	151
Kings Canyon	9,586
Lumsden Canyon	9,966
Maverick	20,327
Pine Ridge*	1,974
Redrock*	993
South Shale Ridge*	34,312
Spink Canyon	13,056
Spring Canyon	8,831
Unawweep	7,140
West Creek	111
Winter Flats*	1,597
Total	226,188

* Identifies units inventoried since the 2015 GJFO RMP ROD

Several units within the GJFO have received an updated inventory since the 2015 RMP ROD. In addition to the units where the BLM found wilderness characteristics present, citizens' inventory work found wilderness characteristics in another unit in the GJFO. **Table 3.5-39** shows this unit.

Table 3.5-39. Additional Citizen-Proposed GJFO Unit Considered

Name	Acres
Cone Mountain Canyons	18,123
Total	18,123

Direct and Indirect Impacts

This section presents the impacts on lands with wilderness characteristics from the oil and gas leasing discussed in **Chapter 2**. This section incorporates by reference the methods, assumptions, and impacts for Alternatives A, B, C, and D described in the 2014 and 2015 Proposed RMPs/Final EISs (BLM 2014, Lands Proposed for the Protection of Wilderness Characteristics, pages 4-422 through 4-442; BLM 2015a, Wilderness Study Areas, pages 4-389 through 4-400). The methods and assumptions also apply to Alternatives E and F. A summary as it relates to fluid minerals is included below.

Wilderness values considered in this analysis include size, naturalness, opportunities for solitude, and opportunities for primitive and unconfined recreation, as well as any supplemental values found within units. Impacts identified in this section are limited to potential changes in wilderness characteristics for only the identified areas.

In areas open to oil and gas leasing, the construction and operation of oil and gas wells and associated support facilities, including roads, surface and buried pipelines, power lines, and compressor stations, disturb soil and vegetation and degrade wilderness characteristics. The presence and noise of people, vehicles, and equipment needed for exploration, development, production, and maintenance of energy resources impacts opportunities for solitude and primitive recreation.

Alternatives A, B, C, and D

CRVFO

Under Alternative A, no land use planning decisions would be made to protect wilderness characteristics. Naturalness and opportunities for solitude and primitive and unconfined types of recreation would likely become degraded.

Under Alternative B, no leasing would occur within the Castle Peak Addition, Deep Creek, Flat Tops Addition, Pisgah Mountain, or Thompson Creek units, and wilderness characteristics would be protected. In addition, while the Grand Hogback would not be closed to leasing, certain stipulations could indirectly benefit the area’s wilderness characteristics.

Impacts under Alternative C would be the same as those described under Alternative B, but the Grand Hogback unit would be closed to future leasing.

Under Alternative D, the BLM would not manage any lands to protect their wilderness characteristics outside existing WSAs. Consequently, Alternative D would be similar to Alternative A and would likely result in the least protection of wilderness characteristics among the previous alternatives.

Table 3.5-40. Lands Managed to Protect Wilderness Characteristics by Alternative in the CRVFO

	Alternative A	Alternative B	Alternative C	Alternative D
Units managed to protect wilderness characteristics	None	Castle Peak Addition, Deep Creek, Flat Tops, Pisgah Mountain, and Thompson Creek	Castle Peak Addition, Deep Creek, Flat Tops, Grand Hogback, Pisgah Mountain, and Thompson Creek	None
Acres	0	34,400	45,900	0

GJFO

Under Alternatives A and D, the BLM would not manage any lands for the protection of their wilderness characteristics. Management actions to protect other resources and special designation areas would offer some protection of wilderness characteristics. However, surface-disturbing activities, such as fluid mineral extraction, could impact naturalness and opportunities for solitude or primitive recreation in lands found to possess wilderness characteristics. All or a portion of each unit found to possess wilderness characteristics would continue to be protected by NSO stipulations for fluid mineral development.

Under Alternative B, the BLM would manage the Bangs, Maverick, and Unaweep units for the protection of their wilderness characteristics. Closing these units to fluid mineral leasing, mineral materials disposal, and nonenergy leasable development and exploration would protect wilderness characteristics by prohibiting development and the infrastructure related to those actions.

Under Alternative C, the BLM would manage 171,200 acres of lands for the protection of their wilderness characteristics. Of Alternatives A, B, C, and D, this alternative would provide the greatest protection to lands with wilderness characteristics.

Table 3.5-41. Lands Managed to Protect Wilderness Characteristics by Alternative in the GJFO

	Alternative A	Alternative B	Alternative C	Alternative D
Units managed to protect wilderness characteristics	None	Bangs, Maverick, and Unaweep	Bangs,* East Demaree, East Salt Creek, Hunter Canyon,* Kings Canyon, Lumsden Canyon, Maverick, South Shale Ridge, Spink Canyon, Spring Canyon, Unaweep, and West Creek	None
Acres	0	44,100	171,200	0

Alternative E

CRVFO

Under Alternative E, the impacts on lands with wilderness characteristics would be similar to those described under Alternative C of the CRVFO Proposed RMP/Final EIS. Alternatives C and E would close the same acreage of lands with wilderness characteristics to future oil and gas leasing. These lands would be closed to future leasing and managed for the protection of wilderness characteristics. **Table 3.5-42**, below, shows the areas. Overall, Alternative E would close more lands within the CRVFO to future leasing; this would improve wilderness characteristics in surrounding areas.

All resource management actions that benefit air quality and scenic quality could have indirect impacts on visitors' outstanding opportunities for solitude or primitive and unconfined recreation, providing benefits to lands with wilderness characteristics. Approximately 5,000 acres of the lands with wilderness characteristics would be in the high oil and gas development potential area, and 41,000 acres would be in the no, low, and medium potential areas.

Table 3.5-42. CRVFO Units Managed to Protect Wilderness Characteristics under Alternative E

Name	Acres
Castle Peak Addition	3,900
Deep Creek	4,400
Flat Tops Addition	3,500
Grand Hogback	11,400
Pisgah Mountain	14,500
Thompson Creek	8,200
Total	45,900

GJFO

Under Alternative E, the impacts on lands with wilderness characteristics would be similar to those described under Alternative C of the GJFO Proposed RMP/Final EIS. Alternatives C and E would close the same acreage of lands with wilderness characteristics to future oil and gas leasing. These lands would be

closed to future leasing and managed for the protection of wilderness characteristics. **Table 3.5-43**, below, shows the areas. Overall, Alternative E would close more lands within the GJFO to future leasing; this would improve wilderness characteristics in surrounding areas.

All resource management actions that benefit air quality and scenic quality could have indirect impacts on visitors' outstanding opportunities for solitude or primitive and unconfined recreation, providing benefits to land with wilderness characteristics. Approximately 72,500 acres of the lands with wilderness characteristics would be in the high oil and gas development potential area, and 98,500 acres would be in the no, low, and medium potential areas.

Table 3.5-43. GJFO Units Managed to Protect Wilderness Characteristics under Alternative E

Name	Acres
Bangs Canyon	20,400
East Demaree Canyon	4,800
East Salt Creek	17,000
Hunter Canyon	32,200
Kings Canyon	9,600
Lumsden Canyon	10,100
Maverick	20,400
South Shale Ridge	27,500
Spink Canyon	13,100
Spring Canyon	8,800
UnawEEP	7,200
West Creek	100
Total	171,200

Alternative F

CRVFO

Under Alternative F, the BLM would close all lands found to possess wilderness characteristics (108,000 acres), including areas determined to possess wilderness characteristics in citizens' proposals, to fluid mineral leasing. In total, Alternative F would close 687,100 acres (97 percent of the decision area) to fluid mineral leasing, which is an increase of 118,800 acres over what would be closed under Alternative E.

Additionally, under this alternative, each inventoried area would be managed to protect the wilderness characteristics present. Goals, objectives, management actions, and restrictions of the areas would be identical to management proposed under Alternative C of the CRVFO Proposed RMP/Final EIS. Alternative F would incorporate by reference Alternative C of the Proposed RMP/Final EIS (BLM 2014, Lands Proposed for the Protection of Wilderness Characteristics, Alternative C, pages 2-81 through 2-85). This alternative would provide the greatest benefit to wilderness characteristics.

Approximately 9,400 acres of the lands with wilderness characteristics would be in the high oil and gas development potential area, and 91,400 acres would be in the no, low, and medium potential areas.

Table 3.5-44. CRVFO Units Managed to Protect Wilderness Characteristics under Alternative F

Name	Acres
Blowout Hill	9,732
Bull Gulch Contiguous	6,570
Deep Creek	4,300
East Fork	8,300
Flat Tops Addition	3,500
Grand Hogback	11,400
Hogback East	6,524
King Mountain	10,930
Lucky Gulch	7,467
Northeast Cliffs	5,800
Pisgah Mountain	14,500
Red Hill West	10,846
Thompson Creek	8,200
Total	108,069

GJFO

Under Alternative F, the BLM would close all lands found to possess wilderness characteristics (244,300 acres), including areas determined to possess wilderness characteristics in citizens' proposals, to fluid mineral leasing. In total, Alternative F would close 1,171,800 acres (93 percent of the decision area) to fluid mineral leasing, which is an increase of 173,800 acres over what would be closed under Alternative E.

Additionally, under this alternative, each inventoried area would be managed to protect the wilderness characteristics present. Goals, objectives, management actions, and restrictions of the areas would be identical to management proposed under Alternative C of the GJFO Proposed RMP/Final EIS. Alternative F would incorporate by reference Alternative C's lands with wilderness characteristics (BLM 2015a, Lands with Wilderness Characteristics, Alternative C, pages 2-150 through 2-152). This alternative would provide the greatest benefit to wilderness characteristics.

Approximately 117,400 acres of the lands with wilderness characteristics would be in the high oil and gas development potential area, and 127,300 acres would be in the no, low, and medium potential areas.

Table 3.5-45. GJFO Units Managed to Protect Wilderness Characteristics under Alternative F

Name	Acres
Bangs Canyon*	20,434
Book Cliffs South*	70,180
Cone Mountain Canyons	18,123
DeBeque Rim*	3,302
Demaree South*	3,970
East Demaree Canyon	4,787
East Salt Creek	15,471
Head of Main Canyon*	151
Kings Canyon	9,586
Lumsden Canyon*	9,966

Name	Acres
Maverick	20,327
Pine Ridge*	1,974
Redrock*	993
South Shale Ridge*	34,312
Spink Canyon	13,056
Spring Canyon	8,831
UnawEEP*	7,140
West Creek	111
Winter Flats*	1,597
Total	244,311

*Indicates units inventoried since the 2015 GJFO RMP ROD

Cumulative Impacts

Cumulative impacts are described in the 2014 and 2015 Proposed RMPs/Final EISs (BLM 2014, Lands Managed for the Protection of Wilderness Characteristics, pages 4-441 and 4-442; BLM 2015a, Lands with Wilderness Characteristics, pages 4-297 and 4-298).

CRVFO and GJFO

The cumulative impacts analysis area used to analyze cumulative impacts on lands with wilderness characteristics includes the planning area and all adjacent BLM-identified lands with wilderness characteristics that are adjacent to or overlap the planning area boundary, including adjacent land managed by BLM field offices in Canon City, Craig, Kremmling, Gunnison, Meeker, Moab, and Montrose.

Many past, present, and reasonably foreseeable actions have impacted or have the potential to impact the wilderness characteristics of lands with wilderness characteristics. Continued population growth and increased recreational use on public lands in western Colorado will likely increase visitor use on BLM-administered lands, including lands with wilderness characteristics; this would potentially impact wilderness characteristics by reducing opportunities for solitude and primitive and unconfined recreation.

Many citizens' groups and congressional representatives have proposed the designation of additional wilderness in Colorado, which includes BLM-administered lands within the CRVFO, the GJFO, and surrounding national forests, including lands found to possess wilderness characteristics. Representative Diana DeGette has proposed legislation, Protecting America's Wilderness and Public Lands Act (HR 803), in the US House of Representatives that would designate additional federal lands throughout Colorado as components of the National Wilderness Preservation System. These lands include Flat Tops Addition, Grand Hogback, and Thompson Creek (named Assignment Ridge in HR 803) in the CRVFO and Bangs Canyon and UnawEEP in the GJFO. Designation of these areas as wilderness would provide for more durable protection of these areas.

3.6 RESOURCES USES

3.6.1 Recreation and Visitor Services

Affected Environment

This section incorporates by reference the affected environment described in the 2014 and 2015 Proposed RMPs/Final EISs (BLM 2014, Recreation and Visitor Services, pages 3-149 through 3-158; BLM 2015a, Recreation and Visitor Services, pages 3-187 through 3-197). A summary as it relates to the decisions for this supplemental EIS is included below.

For both field offices, ERMA's are managed to support and sustain the principal recreational activities and the associated qualities and conditions of the ERMA, including facilitating visitor participation and maintaining particular recreation setting characteristics. An SRMA is an administrative unit where existing or proposed recreational opportunities and recreation setting characteristics are recognized for their unique value, importance, and/or distinctiveness, especially as compared with other areas used for recreation.

The BLM has not added any additional ERMA's or SRMA's since the 2015 RMP. All other lands are to be managed as "undesigned" with respect to recreation, where the objective is to meet basic recreation and visitor services and resource stewardship needs. Recreation is not an emphasis in these undesigned areas. Implementation-level decisions, including improving and developing campgrounds, trails and trailheads, and other recreation facilities, are ongoing. The CRVFO and GJFO implement an extensive visitor services program, including informational signs and brochures displayed at trailheads, campgrounds, and the field office visitor reception area.

CRVFO

BLM-administered lands in north-central Colorado offer a variety of outdoor recreational opportunities, including land-based, water-based, and snow-sports activities. The CRVFO RMP's recreation objective has been to ensure the continued availability of outdoor recreational opportunities, which the public seeks and which are not readily available from other sources, to reduce the impacts of recreational use on fragile and unique resource values, and to provide for visitor safety.

GJFO

The primary recreational activities are mountain biking, trail running, all-terrain vehicle use, off-road motorcycling, motorized vehicle touring, hiking, big and small game hunting, backpacking, horseback riding, sight-seeing, rock climbing, river boating, and snow-sports activities. The GJFO seeks to provide recreational opportunities that include dispersed, organized, competitive, and commercial uses.

Direct and Indirect Impacts

This section presents the impacts on recreation and visitor services from the management actions of other resources and resource uses discussed in **Chapter 2**. This section incorporates by reference the methods, assumptions, and impacts for Alternatives A, B, C, and D described in the 2014 and 2015 Proposed RMPs/Final EISs (BLM 2014, Recreation and Visitor Services, pages 4-484 through 4-537; BLM 2015a, Recreation and Visitor Services, pages 4-322 through 4-353). The methods and assumptions also apply to Alternatives E and F. A summary of impacts as they relate to fluid minerals is included below.

Alternatives A, B, C, and D

CRVFO

Under Alternative A, 28,700 acres would be closed to oil and gas leasing. Under Alternative A, the BLM would close the least amount of land to oil and gas leasing. It is generally understood that closing areas to oil and gas leasing would benefit recreation and visitor services. The BLM would designate eight SRMA's, totaling 60,400 acres. The remaining BLM-administered lands would be managed as a large, nonspecific ERMA.

Under Alternative B, 98,100 acres would be closed to oil and gas leasing, which is more than under Alternative A and D. The BLM would designate five SRMA's, totaling 62,800 acres. One SRMA (Upper

Colorado River) would be closed to leasing, and the remaining four would have an NSO stipulation. Six ERMAs would be designated, totaling 40,900 acres.

Under Alternative C, 179,700 acres would be closed to oil and gas leasing; this is more than under the other alternatives in the Final EIS. The BLM would designate two SRMAs, totaling 23,800 acres. One SRMA (Upper Colorado River) would be closed to leasing, and the other SRMA would have an NSO stipulation. The BLM would designate nine ERMAs, totaling 64,300 acres.

Alternative C would provide more stringent resource protections, and fewer recreation management areas would promote quiet, dispersed recreational activities. This would benefit those visitors who value a quiet soundscape and less structured recreational opportunities. Likewise, those seeking cross-country, motorized recreation experiences and those visitors looking for a structured setting would find fewer opportunities. In addition, closing the areas to oil and gas leasing would provide further protections to help support and sustain the principal recreational activities and the associated qualities and conditions of the SRMAs and ERMAs.

Under Alternative D, 100,500 acres would be closed to oil and gas leasing; this is the second-least amount of land. The BLM would designate seven SRMAs, totaling 63,600 acres. Three SRMAs would have an NSO stipulation. The BLM would designate five ERMAs, totaling 33,000 acres.

GJFO

Under Alternative A, 96,500 acres would be closed to oil and gas leasing. When compared with Alternatives B through F, Alternative A would close the least amount of land to oil and gas leasing. It is generally understood that closing areas to oil and gas leasing would benefit recreation and visitor services.

Under Alternative B, 325,400 acres would be closed to oil and gas leasing; this is more than under Alternatives A and D. The BLM would designate five SRMAs and six ERMAs. Three SRMAs would be no leasing for fluid minerals.

Under Alternative C, 623,600 acres would be closed to oil and gas leasing; this is more than under the other alternatives in the Final EIS. The BLM would designate two SRMAs, totaling 60,000 acres, and both would be no leasing for fluid minerals. No ERMAs would be designated.

Alternative C would provide more stringent resource protections, and fewer recreation management areas would promote quiet, dispersed recreational activities. This would benefit those visitors who value a quiet soundscape and less structured recreational opportunities. Likewise, those seeking cross-country, motorized recreation experiences and those visitors looking for a structured setting would find fewer opportunities. In addition, closing the areas to oil and gas leasing would provide further protections to help support and sustain the principal recreational activities and the associated qualities and conditions of the SRMAs and ERMAs.

Under Alternative D, the BLM would close 52,800 acres to oil and gas leasing; this is the second-least amount of land.

For both field offices, the BLM would place a greater emphasis on promoting recreation. As a result, SRMAs, in particular, would become increasingly popular destinations. In addition, closing the areas to oil

and gas leasing would provide further protections to help support and sustain the principal recreational activities and the associated qualities and conditions of the SRMAs and ERMA.

Alternative E

Impacts on recreation and visitor services from management of resources and uses would be the same as or similar to those described under Alternative C of the CRVFO and GJFO Final EIS, except as described below.

CRVFO

Alternative E would result in 568,300 acres in the CRVFO closed to future oil and gas leasing and 143,000 acres open. Under Alternative E, the Upper Colorado River SRMA and no ERMA within the CRVFO would specifically be closed to fluid mineral leasing. All five SRMAs and five of the six ERMA analyzed in the Final EIS would be closed to fluid mineral leasing as a result of being within no known, low, and medium oil and gas development potential. Silt Mesa ERMA would remain open to leasing with a CSU stipulation to minimize conflicts with recreational opportunities, recreation setting characteristics, and visitor health and safety. Fewer areas open to oil and gas leasing would reduce the potential for development. Quiet, dispersed recreational activities would not be impacted by potential oil and gas development.

GJFO

Alternative E would result in 998,000 acres in the GJFO closed to future oil and gas leasing and 239,000 acres open. Under Alternative E, Bangs and North Fruita Desert SRMAs and no ERMA within the GJFO would specifically be closed to fluid mineral leasing. Four of the five SRMAs analyzed in the Final EIS would be closed to oil and gas leasing, more than half of the Grand Valley OHV SRMA would be closed, and two of the six ERMA (Gateway and Gunnison River Bluffs ERMA) analyzed in the Final EIS would be closed to oil and gas leasing, as a result of these areas being within no known, low, and medium oil and gas development potential areas.

The North Desert ERMA would be mostly closed to oil and gas leasing with a small portion (less than half of the ERMA) remaining open. Barrel Springs, the Grand Valley Ranges, and Horse Mountain ERMA would remain open to oil and gas leasing. Closing the SRMAs and ERMA to oil and gas leasing would provide further protections to help support and sustain the principal recreational activities and the associated qualities and conditions of the SRMAs and ERMA. Fewer areas open to oil and gas leasing would reduce the potential for development. Quiet, dispersed recreational activities would not be impacted by potential oil and gas development.

Alternative F

For both field offices, closing the areas to oil and gas leasing would provide further protections to help support and sustain the principal recreational activities and the associated qualities and conditions of the SRMAs and ERMA.

Alternative F would emphasize the conservation of natural and cultural resources recreation setting characteristics. Closing additional lands to oil and gas leasing would create recreation settings that are more remote from developed routes and facilities, and more natural appearing.

Impacts on recreation and visitor services from management of resources and uses would be the same as or similar to those described under Alternative C of the CRVFO and GJFO amended RMPs, except as described below.

CRVFO

Under Alternative F, the BLM would close all SRMAs and ERMA within the CRVFO to oil and gas leasing. As described under Alternative E, all five SRMAs and five of the six ERMAs analyzed in the Final EIS are within no known, low, and medium oil and gas development potential areas. The Silt Mesa ERMA is in the high-potential area.

Closing the SRMAs and ERMAs to oil and gas leasing would provide further protections to help support and sustain the principal recreational activities and the associated qualities and conditions of the SRMAs and ERMAs. Fewer areas open to oil and gas leasing would reduce the potential for development. Within and outside the SRMAs and ERMAs, quiet, dispersed recreational activities would not be impacted by potential oil and gas development. **Table 3.6-1** shows the designated SRMAs and ERMA in the CRVFO and the oil and gas potential they overlay.

Table 3.6-1. ERMAs and SRMAs in the CRVFO and the Oil and Gas Potential

SRMA	Oil and Gas Potential
Hardscrabble-East Eagle	100% low
King Mountain	16% medium, 84% low or No
Red Hill	100% low
The Crown	16% medium, 84% low
Upper Colorado River	18% medium, 82% low or no
ERMA	Oil and Gas Potential
Bocco Mountain	100% medium
Eagle River	16% medium, 84% low
Gypsum Hills	100% low
New Castle	9% high, 72% medium, 19% low
Silt Mesa	1% medium, 99% low
Thompson Creek	2% high, 88% medium, 10% low

GJFO

Under Alternative F, the BLM would close all SRMAs and ERMAs within the GJFO to oil and gas leasing. As described under Alternative E, four of the five SRMAs analyzed in the Final EIS and two of the six ERMAs (Gateway and Gunnison River Bluffs ERMAs) analyzed in the Final EIS are within no known, low, and medium oil and gas development potential areas. Closing the SRMAs and ERMAs to oil and gas leasing would provide further protections to help support and sustain the principal recreational activities and the associated qualities and conditions of the SRMAs and ERMAs. Fewer areas open to oil and gas leasing would reduce the potential for development. Within and outside the SRMAs and ERMAs, quiet, dispersed recreational activities would not be impacted by potential oil and gas development. **Table 3.6-2** shows the designated SRMAs and ERMA in the GJFO and the oil and gas potential they overlay.

Table 3.6-2. ERMA and SRMAs in the GJFO and the Oil and Gas Potential

SRMA	Oil and Gas Potential
Bangs	100% low
Dolores River Canyon	100% low
Grand Valley	36% high, 64% low
North Fruita Desert	88% high, 12% low
Palisade Rim	100% high
ERMA	Oil and Gas Potential
Barrel Spring	100% high
Gateway	100% low
Grand Valley Shooting Ranges	100% high
Gunnison River Bluffs	100% low
Horse Mountain	100% high
North Desert	36% high, 64% low

Cumulative Impacts

This section incorporates by reference the cumulative impacts described in the 2014 and 2015 Proposed RMPs/Final EISs (BLM 2014, Recreation and Visitor Services, pages 4-534 through 4-537; BLM 2015a, Recreation and Visitor Services, pages 4-351 through 4-353).

CRVFO and GJFO

Fluid mineral leasing and development may have a small cumulative impact on recreation and visitor services. Development of facilities and traffic associated with fluid mineral leasing would reduce the remoteness and natural appearance of recreation areas and would reduce the opportunity for quiet, dispersed recreational activities.

3.6.2 Energy and Minerals

Coal

Affected Environment

This section incorporates by reference the affected environment described in the 2014 and 2015 Proposed RMPs/Final EISs (BLM 2014, Coal, pages 3-179 through 3-180; BLM 2015a: Coal, pages 3-169 through 3-170). A summary as it relates to the decisions for this supplemental EIS is included below.

CRVFO

No coal leases or active coal developments currently exist within the CRVFO, although coal was historically mined at multiple locations. The BLM's determination that no known coal resources within the CRVFO are potentially developable is based on the geologic and economic constraints associated with those coal resources and the lack of expression of interest in coal leasing since publication of the 1988 RMP (BLM 1988a).

GJFO

One idle underground coal mine is in the GJFO along Highway 139 in the Book Cliffs. A larger underground coal mine has been proposed in the Book Cliffs near the McClane Canyon mine. The closed Cameo Mine is east of the Colorado River in the Grand Mesa coal field, as are several old coal mines just east of Palisade. The two geologic intervals of coal-bearing rocks in the GJFO planning area are the Dakota Sandstone and the Mesaverde Group. The Dakota Sandstone is exposed and partly eroded on the flanks

of the Uncompahgre Uplift west of Delta, Colorado. The coal it contains is up to 6 feet thick in the Grand Junction area and is mostly impure coal with high ash content.

Direct and Indirect Impacts

This section presents the impacts on coal from oil and gas leasing as discussed in **Chapter 2**. This section incorporates by reference the methods, assumptions, and impacts for Alternatives A, B, C, and D, as described in the 2014 and 2015 Proposed RMPs/Final EISs (BLM 2014, Coal, pages 5-572 through 4-575; BLM 2015a, Coal, pages 4-370 through 4-371). The methods and assumptions also apply to Alternatives E and F.

Alternatives A, B, C, and D

CRVFO

Impacts from fluid minerals management on coal resources would be negligible under Alternative A. Although the Grand Hogback area contains coal and oil and gas resources, any coal mining would be limited in areal extent by the thin, steeply dipping coal seams. Fluid mineral resources potentially accessed from the Grand Hogback are at depths several thousand feet deeper than the potentially developable near-surface coal deposits, allowing potential downhole targets to be reached by directional drilling from surface locations offset by horizontal distances of up to 0.25 miles.

Under Alternative A, stipulations for coal resources include an NSO stipulation for surface mines and a CSU stipulation for underground mines. These stipulations are specifically intended to avoid or minimize development conflicts between coal and fluid minerals development.

Only Alternative A designates any BLM-administered lands as open to coal mining. Under all alternatives in the Proposed RMP/Final EIS, any future proposals for coal leasing and development would be evaluated under the screening criteria of 43 CFR 3420.1 in connection with a project-specific NEPA analysis. However, all alternatives except Alternative A would require an RMP amendment for authorizing future coal developments. Therefore, closures to fluid minerals leasing and development to avoid impacts on coal mining are not anticipated under Alternatives B, C, and D.

GJFO

Under all alternatives, areas available for coal resources were refined using the four specific land use screening steps that are unique to developing land use planning decisions for federal coal lands (43 CFR 3420). Different maximum depths of the coal resources were used between Alternative A and Alternatives B, C, and D to adjust for new technology that allows deeper coal to be mined. When screening against the criteria listed in 43 CFR 3420, those areas with coal resource potential that also pass the screening criteria were defined as potentially acceptable for coal leasing and development. An estimated 300,286 acres of lands were considered acceptable for coal mining under the Proposed RMP/Final EIS. Acceptable areas under the other alternatives were screened as including 252,100 acres under Alternative B; 251,200 acres under Alternative C; and 265,000 acres under Alternative D.

Oil and gas leasing and development under the Proposed RMP/Final EIS would not be subject to closure in relation to coal leases under Alternatives A, B, and D. However, Alternative C would close 11,500 acres to oil and gas to avoid conflicts with underground mining of coal leases. Any closures in relation to other resources, uses, and designations would not affect future coal development.

Alternative E

CRVFO

Closures of oil and gas leasing and development in areas that would be closed under Alternative E are not expected to affect future coal development. Although minable coal reserves are present in these portions of the CRVFO, no interest has been shown in these reserves for several decades due to the thin coal layers, and, along the Grand Hogback, the steep dip of the coal layers.

GJFO

Closures to oil and gas under Alternative E would include areas with current and potentially future coal leasing and development. Under Alternative E, 11,900 acres would be closed to fluid mineral leasing in areas of existing coal leases. These closures would avoid conflicts between future oil and gas development and the development of the coal leases.

Alternative F

CRVFO

Closures of oil and gas leasing and development for the protection of a variety of other resources, uses, and special designations would not have positive or negative impacts on future coal projects. This is because future mining of the remaining coal resources in the CRVFO is not expected, as described above for Alternatives A through D and Alternative E.

GJFO

Closures to oil and gas under Alternative F would include areas with current and potentially future coal leasing and development. Under Alternative F, 11,900 acres would be closed to fluid mineral leasing in areas of existing coal leases. These closures would avoid conflicts between future oil and gas development and the development of the coal leases.

Cumulative Impacts

Cumulative impacts are described in the 2014 and 2015 Proposed RMPs/Final EISs (BLM 2014, Coal, page 4-578; BLM 2015a, Coal, pages 4-388 through 4-389).

CRVFO and GJFO

No impacts of closures of oil and gas leasing on coal were identified. Therefore, no cumulative impacts would occur.

Oil and Gas

Affected Environment

This section incorporates by reference the affected environment described in the 2014 and 2015 Proposed RMPs/Final EISs (BLM 2014, Oil and Gas, pages 3-177 through 3-179; BLM 2015a, Oil and Gas, pages 3-171 through 3-172). A summary of new information as it relates to the decisions for this supplemental EIS are included below.

Most of the natural gas use in the US is for heating and generating electricity. The largest use of natural gas in the US is for electric power (37 percent), followed by industrial use (33 percent), residential use (15 percent), commercial use (11 percent), and transportation (4 percent). In 2021, natural gas accounted for about 38 percent of total utility-scale US electricity generation. Industry uses natural gas for heating

and as a raw material to produce chemicals, fertilizer, and hydrogen. Residential natural gas use is to heat buildings and water, to cook, and to dry clothes. About half of the homes in the US use natural gas for space heating and water heating. Commercial natural gas use is primarily to heat buildings and water, to operate refrigeration and cooling equipment, to cook, to dry clothes, and to provide outdoor lighting. The transportation sector uses natural gas as a fuel to operate compressors that move natural gas through pipelines and as a vehicle fuel in the form of compressed natural gas and liquefied natural gas (EIA 2022b).

Crude oil is refined into petroleum products. Petroleum has historically been the largest major energy source for total annual US energy consumption, used to propel vehicles, to heat buildings, and to produce electricity. The largest use of oil in the US is for transportation (67 percent), followed by industrial use (27 percent), residential use (3 percent), commercial use (2.5 percent), and electric power (0.5 percent). Gasoline, used for transportation, is the most consumed petroleum product in the US. In the industrial sector, petroleum is used as a raw material (a feedstock) to make products such as plastics, polyurethane, solvents, and hundreds of other intermediate and end-user goods (EIA 2022c).

The oil and gas resource within the decision area is in the Piceance Basin and a small part of the Uinta Basin. The USGS assessed undiscovered conventional and unconventional oil and gas in 2016. The USGS estimated a mean of 66 trillion cubic feet of gas, a mean of 74 million barrels of oil, and a mean of 45 million barrels of natural gas liquids in the Uinta-Piceance Basin (USGS 2016).

Table 3.6-3 shows the approximate acres within oil and gas production potential areas in the supplemental EIS decision area. As described in **Section 1.5.1**, the BLM determined the oil and gas development potential in the RFD reports developed for the 2014 and 2015 Proposed RMP/Final EISs.

Table 3.6-3. Oil and Gas Development Potential

Oil and Gas Potential in the Decision Area	CRVFO		GJFO (Combined Conventional/Mancos)		Combined Field Offices	
	Acres	%	Acres	%	Acres	%
No known	29,300	4	0	0	29,300	1
Low/very low	350,100	49	626,300	51	976,400	50
Medium	178,100	25	73,700	6	251,800	13
High/very high	153,800	22	535,600	43	689,400	36

Both field offices have issued oil and gas leases. The oil and gas leases within the CRVFO are all within the high oil and gas development potential areas. Oil and gas leases within the GJFO occur within all oil and gas development potential areas except for the “no known potential” area. **Table 3.6-4** shows BLM-administered surface lands and decision area lands (BLM and split-estate) currently leased within each oil and gas development potential area for the two field offices. **Table 3.6-5** shows the approximate acres and percentage of each oil and gas development potential area currently leased by the two field offices. **Figure 3.6-1** depicts the leases within each oil gas potential area within decision areas.

Table 3.6-4. BLM-Administered Surface Lands and Decision Area Lands Leased by the Two Field Offices

	CRVFO		GJFO		Combined Field Offices	
	Acres	%	Acres	%	Acres	%
BLM-administered surface lands currently leased	66,400	10	293,500	28	359,900	23
Decision area lands currently leased	85,700	12	349,700	28	435,400	22

Table 3.6-5. Oil and Gas Leases within Oil and Gas Development Potential

Leased Area within Oil and Gas Potential in the Decision Area	CRVFO		GJFO (Combined Conventional/Mancos)		Combined Field Offices	
	Acres	%¹	Acres	%¹	Acres	%¹
No known	0	0	0	0	0	0
Low/very low	0	0	83,500	13	83,500	9
Medium	0	0	40,900	55	40,900	16
High/very high	85,700	56	225,400	42	311,100	45

¹ % is percentage of "potential"

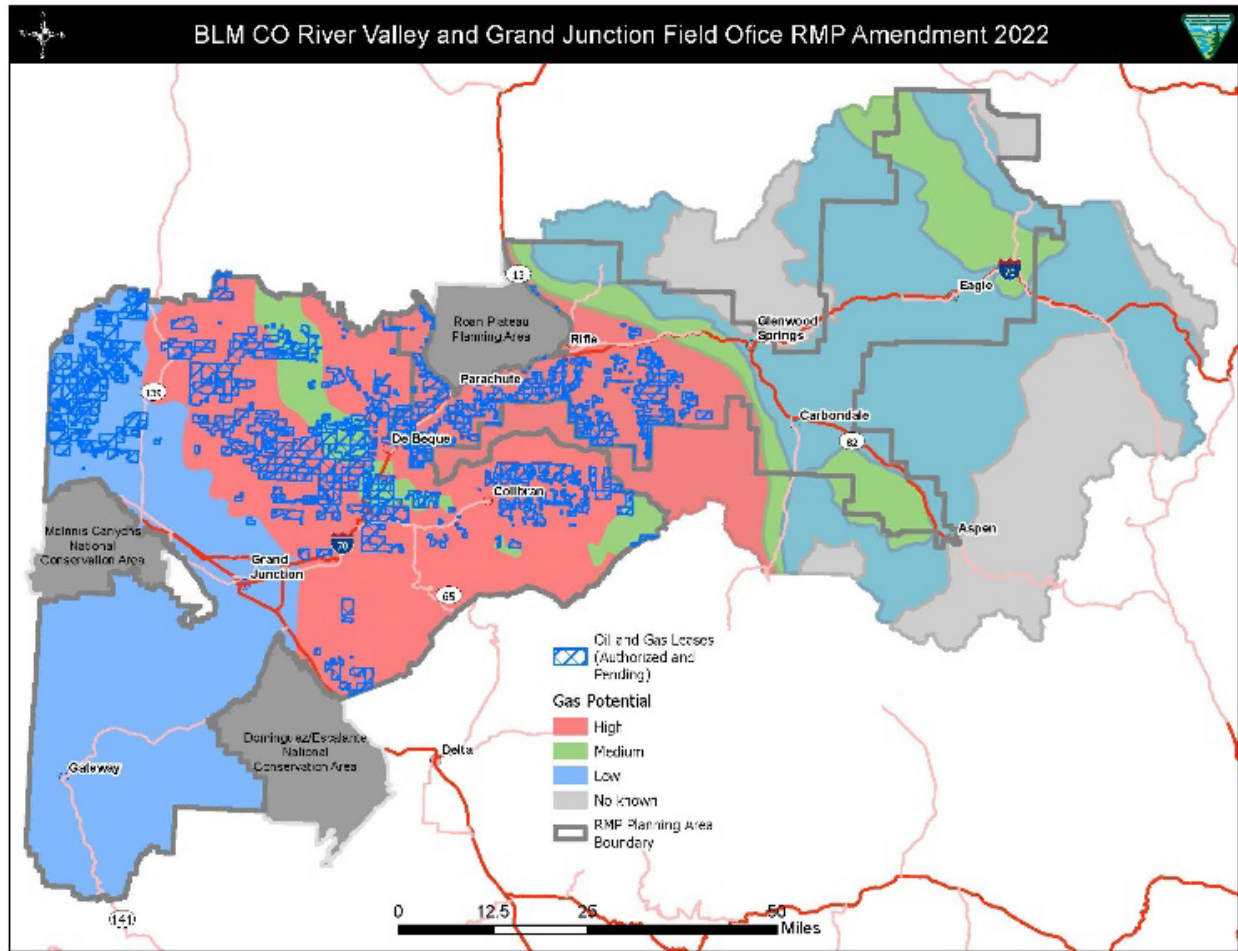


Figure 3.6-1. Locations of Oil and Gas Leases in the CRVFO and GJFO

CRVFO

The western 20 percent of the CRVFO, including the Grand Hogback and to the west, is part of the Piceance Basin. Most hydrocarbon production is natural gas with some associated oil, natural gas liquids, and water. Surface exposures are primarily sedimentary rocks of the Green River and Wasatch Formations. Gas production is from the Tertiary Wasatch Formation, Cretaceous Mesaverde Group, and, more recently, the Niobrara and Mancos Formations. Fifty-six percent of the western portion of the CRVFO with high oil and gas development potential is leased and being developed for oil and gas resources.

Comprising the Eagle Basin, White River Uplift, and mountain ranges to the south and east, the eastern 80 percent of the CRVFO has no known, low, and medium oil and gas development potential.

Table 3.6-6 describes the acres and percentage of each oil and gas development potential area within the 711,300-acre CRVFO decision area. The table also describes the amount of decision area currently leased, by oil and gas development potential, and the number of leases, pads, and wells.

Table 3.6-6. Description of Oil and Gas Potential and Leased Area within the CRVFO Decision Area

Oil and Gas Potential within the 711,300-acre CRVFO Decision Area											
High Potential			Medium			Low			No Known		
Acres	%		Acres	%		Acres	%		Acres	%	
153,800	22		178,100	25		350,100	49		29,300	4	
Currently Leased for Oil and Gas (% relates to the oil and gas potential area)											
Acres	%	# Leases	Acres	%	# Leases	Acres	%	# Leases	Acres	%	# Leases
85,700	56	84	0	0	0	0	0	0	0	0	0

GJFO

The northeastern half of the GJFO is part of the Piceance Basin and bounded by the Axial Basin Arch to the north, Douglas Creek Arch to the west, Uncompahgre Uplift to the southwest, and Gunnison Uplift to the south. Surface exposures include the Mancos Shale, Mesaverde Group, Wasatch Formation, Green River Formation, and Uinta Formation. The upper portion of the Piceance Basin sequence (the Uinta, Green River, and Wasatch Formations) is found in the De Beque area. The Wasatch and Mesaverde crop out along valley slopes, and the Mancos Shale is exposed in the valleys below the Mesaverde outcrop. Source rocks include coal beds and organic-rich carbonaceous shale rocks of the Upper Cretaceous Mesaverde Group, Mancos Formation, and Lower Cretaceous Mowry Formation. High conventional oil and gas development potential generally occurs along the northeastern GJFO boundary, encompassing the De Beque and Collbran areas. Shifting west of this high conventional area, high Mancos Shale oil and gas development potential generally occurs diagonally from Douglas Pass to Palisade and south.

The other half of the GJFO comprises the Grand Valley, northwest-trending Uncompahgre Plateau, and Paradox Basin to the southwest. This area has low oil and gas development potential.

Table 3.6-7 describes the acres and percentage of each oil and gas development potential area within the 1,235,600-acre GJFO decision area. The table also describes the amount of decision area currently leased, by oil and gas development potential, and the number of leases, pads, and wells.

Table 3.6-7. Description of Oil and Gas Potential and Leased Area within the GJFO Decision Area

Oil and Gas Potential within the 1,235,600-acre GJFO Decision Area											
High Potential			Medium			Low			No Known		
Acres	%		Acres	%		Acres	%		Acres	%	
535,600	43		73,700	6		626,300	51		0	0	
Currently Leased for Oil and Gas (% relates to the oil and gas potential area)											
Acres	%	# Leases	Acres	%	# Leases	Acres	%	# Leases	Acres	%	# Leases
225,400	42	248	40,900	55	82	83,500	13	129	0	0	0

The GJFO has a helium resource, which is recovered from produced natural gas. Helium is a critical component in many fields, including, but not limited to (BLM 2022f):

- Diving (creation of a safe artificial breathing atmosphere by mixing helium and oxygen)

- Manufacturing (protective gas in titanium and zirconium production and in growing silicon and germanium crystals, testing seals of products [aerosols, tires, refrigerators, fire extinguishers, air conditioners, and other devices], and creation of an inert-gas shield while arc welding)
- Medical technology (used for essential diagnostic equipment [such as magnetic resonance imaging], detection and monitoring of certain physiological processes, helium-neon laser eye surgery, and cardiopulmonary resuscitation pumps)
- Monitoring (detection of gas leaks in products and used in blimps used by the border patrol)
- National defense (rocket engine testing, scientific balloons, surveillance craft, and air-to-air missile guidance systems)
- Science and research (cryogenics; safe, inert tracer gas; superconductivity; laser pointers; supersonic wind tunnels; liquid-fuel rocket manufacturing and use; separate hot gases and ultra-cold liquid fuel during rocket liftoff)
- Cooling (cool search-and-rescue thermographic cameras and equipment, and cool nuclear reactors)

For many of the applications shown above, there is no substitute for helium. Helium is a nonrenewable resource found in recoverable quantities in only a few locations around the world; many of these are being depleted. Accordingly, the US has important economic and national security interests in ensuring a reliable supply of helium (BLM 2022f).

The area with the recoverable helium resource is west of Highway 139 and north of I-70. That portion of the supplemental EIS decision area is approximately 191,300 acres. **Figure 3.6-2** depicts the area with a potentially recoverable helium resource. **Table 3.6-8** shows the amount of the area with the recoverable helium resource that is within low and high oil and gas development potential (there is not a medium potential within that area), the amount and percentage of the area currently leased that is within low and high oil and gas development potential, and the percentage of the total leased area that is within low and high oil and gas development potential.

Table 3.6-8. Leased Area within the Recoverable Helium Resource (CRVFO and GJFO)

	Acres (Total Area of Oil and Gas Potential)	Acres Leased	% of Area Leased	% of Leased Acres
Area total	191,300	81,200	42	100
Low potential	175,900	80,400	46	99
High potential	15,400	800	5	1

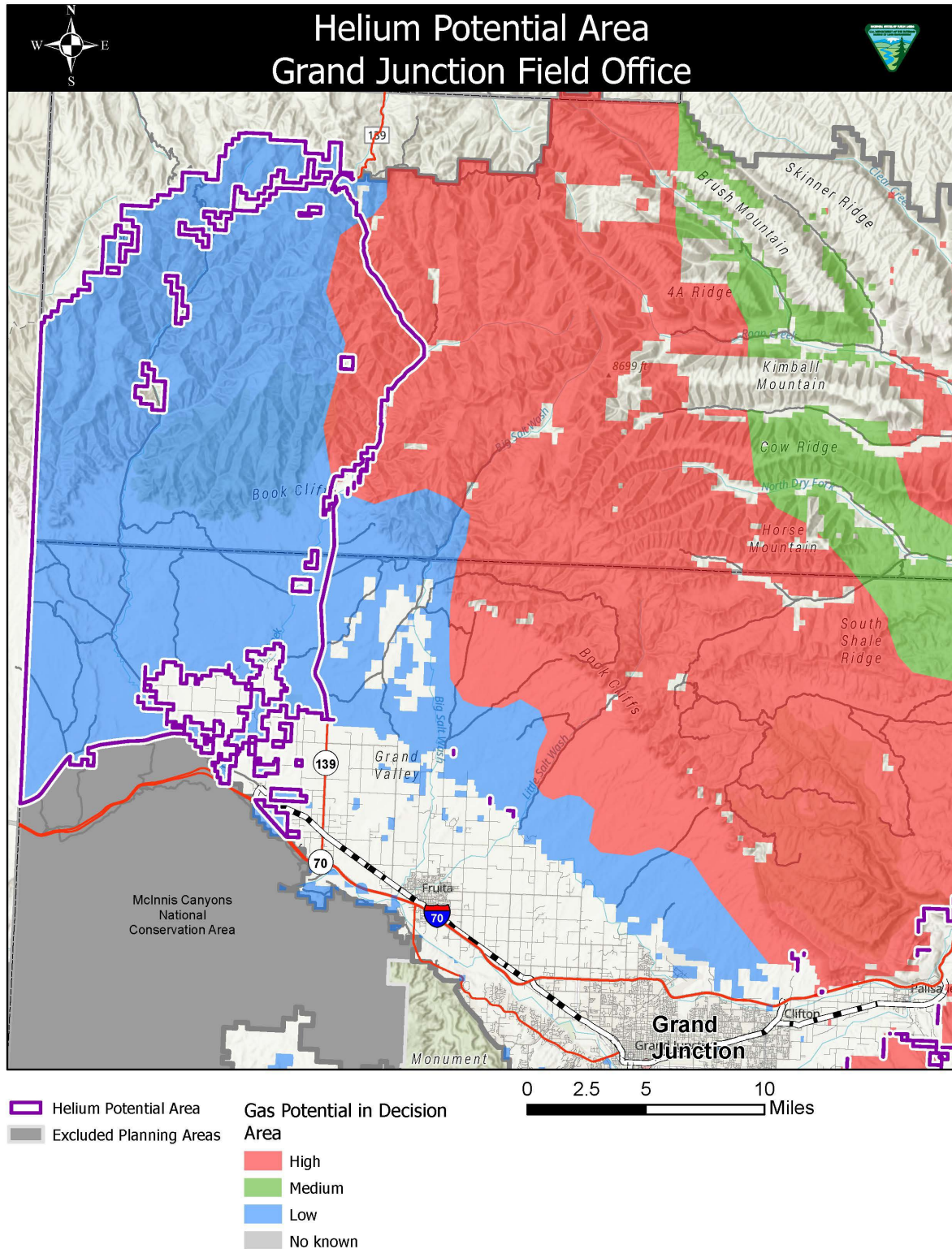


Figure 3.6-2. Area with the Potentially Recoverable Helium Resource

Direct and Indirect Impacts

This section presents the impacts on oil and gas resources from the oil and gas leasing discussed in **Chapter 2**. This section incorporates by reference the methods, assumptions, and impacts for Alternatives A, B, C, and D described in the 2014 and 2015 Proposed RMPs/Final EISs (BLM 2014, Fluid Minerals, pages 4-575 through 4-593; BLM 2015a, Energy and Minerals, pages 4-366 through 4-388). The methods and assumptions also apply to Alternatives E and F.

Alternatives A, B, C, and D

CRVFO and GJFO

Potential oil and gas development from leasing would reduce oil and gas resources. Consequently, the likelihood of oil and gas development in the future would be reduced. Oil and gas resources in areas closed to leasing would not be developed (besides those associated with existing leases).

CRVFO

Under Alternatives A through D, areas open and closed to leasing would vary, as shown in **Table 3.6-9**. The Proposed RMP/Final EIS assumes 5,318 wells could potentially be drilled over a 20-year period. **Table 3.6-10** shows the potential number of wells reduced (forgone) because of restrictions by alternative.

Table 3.6-9. CRVFO Oil and Gas Development Potential Areas Open and Closed to Leasing

Oil and Gas Development Potential	Portion of the Decision Area		Portion of Potential Area Open to Leasing by Alternative				Portion of Potential Area Closed to Leasing by Alternative			
	Acres	%	A	B	C	D	A	B	C	D
No known potential	29,300	4%	100%	98%	88%	98%	0	2%	12%	2%
Low potential	350,100	49%	96%	87%	81%	92%	4%	13%	19%	8%
Medium potential	178,100	25%	91%	80%	67%	85%	9%	20%	33%	15%
High potential	153,800	22%	100%	100%	99%	100%	0	0	1%	0
Total acres	711,300	100%	682,600	617,700	568,000	655,000	28,700	93,600	143,300	56,300

Table 3.6-10. CRVFO Number of Potential Wells Forgone over 20 Years due to Restrictions

Alternatives A–D from the Final EIS				Supplemental EIS Alternatives	
A	B	C	D	E	F
0	56	56	0	58	75

GJFO

Under Alternatives A through D, areas open and closed to leasing would vary, as shown in **Table 3.6-11**. The Proposed RMP/Final EIS assumes 3,940 wells could potentially be drilled over a 20-year period. **Table 3.6-12** shows the potential number of wells reduced (forgone) because of restrictions by alternative.

Table 3.6-11. GJFO Oil and Gas Development Potential Areas Open and Closed to Leasing

Oil and Gas Development Potential	Portion of the Decision Area		Portion of Potential Area Open to Leasing by Alternative				Portion of Potential Area Closed to Leasing by Alternative			
	Acres	%	A	B	C	D	A	B	C	D
No known potential	0	0	—	—	—	—	—	—	—	—
Very low/low potential	626,300	51%	89%	69%	52%	88%	11%	31%	48%	12%
Medium potential	73,700	6%	100%	100%	66%	100%	0	0	34%	0
High/very high potential	535,600	43%	94%	91%	46%	94%	6%	9%	54%	6%
Total acres	1,235,600	100%	964,200	843,500	502,100	956,700	96,700	217,400	558,800	104,200

Table 3.6-12. GJFO Number of Potential Wells Forgone over 20 Years due to Restrictions

Alternatives A–D from the Final EIS (Scenario 3)				Supplemental EIS Alternatives	
A	B	C	D	E	F
0	3	369	5	541	703

Areas that would be closed to fluid mineral leasing would also prevent extracting the recoverable helium resource. Within the area with a recoverable helium resource (generally west of Highway 139 and north of I-70), Alternative A would close 22,200 acres within low oil and gas development potential, Alternatives B and D would close 23,100 acres, and Alternative C would close 69,100 acres. Alternatives A, B, and D would close 500 acres within high oil and gas development potential, and Alternative C would close 700 acres.

Alternative E

Closing areas to leasing, either adjacent to existing leases or adjacent to areas that could be leased in the future, has the potential for drainage of federal minerals from adjacent federal fluid mineral development or adjacent private fluid mineral development. Drainage would result in the loss of the federal minerals and the loss of royalty payments to the US Treasury. Existing fluid mineral leases would continue under current lease terms unless the lease expires or is relinquished. See **Table 3.6-10** (CRVFO) and **Table 3.6-12** (GJFO) for the potential reduction of the number of wells because of restrictions from this alternative.

CRVFO

Under Alternative E, nearly all (93 percent) of the high/very high oil and gas development potential area would be open to leasing. About 20 percent of the overall CRVFO decision area would remain open to leasing and 80 percent would be closed to leasing.

GJFO

Under Alternative E, less than half (44 percent) of the high/very high oil and gas development potential area would be open to leasing. About 19 percent of the overall GJFO decision area would remain open to leasing and 81 percent would be closed to leasing.

Closing areas to fluid mineral leasing would also prevent extracting the recoverable helium resource. Within the area with a recoverable helium resource (generally west of Highway 139 and north of I-70),

all the low oil and gas development potential area (175,000 acres) would be closed to future leasing, and 8,000 acres of the high potential (15,400 acres) would be closed to future leasing. Areas within the high oil and gas development potential that would be closed to future leasing include the East Salt Creek Wildlife Emphasis Area, a portion of the Demaree Canyons WSA, and the Spink Canyon and East Demaree lands with wilderness characteristics units.

Alternative F

Closing areas to leasing, either adjacent to existing leases or adjacent to areas that could be leased in the future, has the potential for drainage of federal minerals from adjacent federal fluid mineral development or adjacent private fluid mineral development. Drainage would result in the loss of the federal mineral and the loss of royalty payments to the US Treasury. Existing fluid mineral leases would continue under current lease terms unless the lease expires or is relinquished. See **Table 3.6-10** (CRVFO) and **Table 3.6-12** (GJFO) for the potential reduction of the number of wells because of restrictions from this alternative.

CRVFO

Under Alternative F, about 16 percent of the high/very high oil and gas development potential area would be open to leasing. About 3 percent of the overall CRVFO decision area would remain open to leasing and 97 percent would be closed to leasing.

GJFO

Under Alternative F, about 12 percent of the high/very high oil and gas development potential area would be open to leasing. About 5 percent of the overall GJFO decision area would remain open to leasing and 95 percent would be closed to leasing.

Closing areas to fluid mineral leasing would also prevent extracting the recoverable helium resource. Within the area with a recoverable helium resource (generally west of Highway 139 and north of I-70), all the low oil and gas development potential area (175,000 acres) would be closed to future leasing, and 10,500 acres of the high potential (15,400 acres) would be closed to future leasing. Areas within the high oil and gas development potential that would be closed to future leasing include the East Salt Creek Wildlife Emphasis Area, a portion of the Demaree Canyons WSA, the Spink Canyon and East Demaree lands with wilderness characteristics units, the Horse Mountain ERMA, the Baxter/Douglas Pass soil slump area, and a Colorado National Heritage Program potential conservation area.

Cumulative Impacts

Cumulative impacts are described in the in the 2014 and 2015 Proposed RMPs/Final EISs (BLM 2014, Fluid Minerals, pages 4-594 and 4-595; BLM 2015a, Energy and Minerals, pages 4-388 and 4-389).

CRVFO

Based on industry analysis, leasing activity, prior exploration and development activity, and the probability of resource occurrence—and if areas were not closed to leasing—it is estimated that nearly all future wells would be drilled within the high oil and gas development potential area. About 56 percent of the federal fluid minerals in the CRVFO high-potential area are already leased. The high-potential area remaining available for oil and gas leasing is along the Grand Hogback and in small, scattered parcels. While valid existing lease rights would remain in effect, if any of the existing leases expired or were withdrawn by the BLM, subsequent re-leasing of those areas would be subject to stipulations and closure decisions of each supplemental EIS alternative.

Oil and gas development could increase over the next several years, but the level of development would depend on market fluctuations, pipeline capacity, available markets for distribution, state and federal regulatory constraints, geopolitical considerations, new technologies, reservoir depletion, and areas that are open or closed to future leasing. With multiple constraints (that is, lease stipulations, COAs, and COGCC rules) on oil and gas development, as well as closing areas to leasing, the amount of federal oil and gas in the CRVFO decision area available for market would likely reduce in the long term. However, since much of the high oil and gas development potential area is already leased, closing areas to leasing and adding constraints would affect only the unleased lands and, potentially, a small amount of the existing leases that expire or are withdrawn. Consequently, natural market factors, such as supply and demand, would be the major limitations on future development of federal oil and gas in the CRVFO decision area.

Alternative C would close the Grand Hogback ACEC and the Garfield Creek State Wildlife Area to oil and gas leasing (although valid existing leases may still be developed), which would further reduce potential future federal oil and gas development in the CRVFO decision area. This would likely result in decreased employment as well as royalty and tax payments to the federal government; tax revenues and other indirect economic benefits to the state, county, and local governments; and supply of federal natural gas from the CRVFO decision area.

Cumulative impacts from Alternative E would be similar to those of Alternative C, plus the areas with no known, low, and medium oil and gas development potential would not be leased in the future. Possible development of valid existing leases in areas closed to future leasing could continue. As such, cumulative impacts in the closed areas would be more notable in the long term than in the short term.

Cumulative impacts from Alternative F would be similar to those of Alternatives C and E; however, Alternative F would amplify the impacts since 84 percent of the high oil and gas development potential area in the CRVFO decision area would be closed to leasing.

GJFO

Based on industry analysis, leasing activity, prior exploration and development activity, and the probability of resource occurrence—and if areas were not closed to leasing—it is estimated that the majority of future wells would be drilled within the medium and high/very high oil and gas development potential areas of the northeastern part of the GJFO. Development estimated to occur in low/very low oil and gas development potential areas would likely be related to fringe, infill, or wildcat wells. About 42 percent of the federal fluid minerals in the GJFO high/very high-potential area are already leased. While valid existing lease rights would remain in effect, if any of the existing leases expired or were withdrawn by the BLM, subsequent re-leasing of those areas would be subject to stipulations and closure decisions of each supplemental EIS alternative.

Oil and gas development could increase over the next several years, but the level of development would depend on market fluctuations, pipeline capacity, available markets for distribution, state and federal regulatory constraints, geopolitical considerations, new technologies, reservoir depletion, and areas that are open or closed to future leasing. With multiple constraints (that is, lease stipulations, COAs, and COGCC rules) on oil and gas development, as well as closing areas to leasing, the amount of federal oil and gas in the GJFO decision area available for market would likely reduce in the long term.

Alternative C would close additional areas to federal oil and gas leasing (although valid existing leases may still be developed). These additional closed areas include multiple ACECs (Atwell Gulch, Roan and Carr Creeks, and South Shale Ridge), the North Fruita Desert SRMA, occupied sage-grouse habitat, multiple lands managed for wilderness characteristics, multiple wildlife emphasis areas, Little Book Cliffs WSA and wild horse range, SWAs (Jerry Creek and Plateau Creek), Vega State Park, and multiple municipal watersheds (Collbran, Jerry Creek, and Mesa/ Powderhorn). These closures would further reduce the potential future federal oil and gas development in the GJFO decision area. This would likely result in decreased employment as well as royalty and tax payments to the federal government; tax revenues and other indirect economic benefits to the state, county, and local governments; and supply of federal natural gas from the GJFO decision area.

Cumulative impacts from Alternative E would be similar to those of Alternative C, plus the areas with no known, very low/low, and medium oil and gas development potential would not be leased in the future. Possible development of valid existing leases in areas closed to future leasing could continue. As such, cumulative impacts in the closed areas would be more notable in the long term than in the short term.

Cumulative impacts from Alternative F would be similar to those of Alternative E; however, Alternative F would amplify the impacts since an additional third of the high oil and gas development potential area in the GJFO decision area would be closed to leasing compared with Alternative E.

Oil Shale

Affected Environment

This section incorporates by reference the affected environment described in the 2014 and 2015 Proposed RMPs/Final EISs (BLM 2014, Oil Shale, pages 3-180 through 3-181; BLM 2015a: Oil Shale, page 3-170). The methods and assumptions also apply to Alternatives E and F. A summary as it relates to fluid minerals and a summary as it relates to the decisions for this supplemental EIS are included below.

CRVFO

Within the CRVFO, limited acres are underlain by prospectively valuable oil shale deposits. Most of the oil shale resource in the most geologically prospective area is included in the Naval Oil Shale Reserves Nos. 1 and 3, which are in the Roan Plateau planning area and outside the scope of the supplemental EIS. For areas outside the Roan Plateau planning area, oil shale resources in the CRVFO are limited in extent and considered of low commercial potential due to relatively thin layers. Consequently, no oil shale research leases have been issued outside the Roan Plateau planning area, and no commercial development is anticipated.

GJFO

Oil shale resources in the GJFO decision area occur in mesas that are erosional remnants of a formerly extensive area. Although these locations are relatively accessible, there has been no interest from potential proponents since a decision in the 1987 RMP making lands available for oil shale leasing. A NEPA analysis would be conducted prior to lease issuance in the unlikely event of a future application.

Direct and Indirect Impacts

This section presents the impacts on oil shale from oil and gas leasing as discussed in **Chapter 2**. This section incorporates by reference the methods, assumptions, and impacts for Alternatives A, B, C, and D

as described in the 2014 and 2015 Proposed RMPs/Final EISs (BLM 2014, Oil Shale, page 4-575; BLM 2015a, Oil Shale, page 4-372).

Alternatives A, B, C, and D

CRVFO and GJFO

In the CRVFO, oil shale resources outside the Roan Plateau area are considered unsuitable for development. Consequently, no oil shale research leases have been issued in the decision area, and no commercial oil shale development is anticipated during the life of the RMP. No direct or indirect impacts under the Proposed RMP/Final EIS are expected.

GJFO

There is no current interest in the oil shale deposits in the GJFO decision area, and there is no difference among the alternatives specifically concerning oil shale leasing or extraction. No direct or indirect impacts under the Proposed RMP/Final EIS are expected.

Alternative E

CRVFO

No future development of oil shale in the CRVFO is anticipated; therefore, no direct or indirect impacts from closing areas to oil shale development are anticipated under Alternative E.

GJFO

As previously noted, no direct or indirect impacts on oil shale in the GJFO are anticipated.

Alternative F

CRVFO

No future development of oil shale in the CRVFO is anticipated; therefore, no direct or indirect impacts from closing areas to oil shale development are anticipated under Alternative F.

GJFO

As previously noted, no direct or indirect impacts on oil shale in the GJFO are anticipated.

Cumulative Impacts

Cumulative impacts are described in the 2014 and 2015 Proposed RMPs/Final EISs (BLM 2014, Oil Shale, page 4-575; BLM 2015a, Oil Shale, page 4-372).

CRVFO and GJFO

No impacts from closing oil and gas leasing on oil shale were identified. Therefore, no cumulative impacts would occur.

Renewable Energy

Affected Environment

This section incorporates by reference the affected environment described in the 2014 and 2015 Proposed RMPs/Final EISs (BLM 2014, Renewables, pages 3-185 through 3-188; BLM 2015a, Energy and Minerals,

pages 3-166 through 3-187, Forestry, pages 3-155 through 3-161). New information and a summary as it relates to the decisions for this supplemental EIS are included below.

Solar, wind, biomass, and geothermal are considered renewable energy resources. BLM management decisions on the location and amount of fluid minerals activities could affect the amount of land available for development of renewable energy resources.

CRVFO

The potential for utility-scale solar and wind development in the planning area is low due to the findings of the BLM Solar Programmatic EIS (BLM 2012a) and BLM Wind Energy Programmatic EIS (BLM 2005a). These determined most BLM-administered lands within the CRVFO are not suitable for utility-scale solar development and have a low potential for wind energy development. The potential exists and is increasing for small-scale solar development as technologies improve and advance. The BLM Headquarters Office published the NOI in the *Federal Register* to begin analysis on an updated solar programmatic EIS on December 8, 2022.

In cooperation with the National Renewable Energy Laboratory, the BLM assessed renewable energy resources on public lands in the western US (BLM and DOE 2003). The BLM reviewed the potential for geothermal energy on BLM, Bureau of Indian Affairs, and National Forest System lands in 12 states in the western US. In May 2008, the BLM signed a ROD for the Programmatic EIS for Geothermal Leasing in the Western US (Geothermal PEIS; BLM 2008). This document serves as the baseline for the assessment of geothermal resources in the CRVFO decision area.

The Geothermal PEIS focused on areas where there may be underground reservoirs of hot water or steam created by heat from the earth or that have subsurface areas of dry, hot rock. These areas are where the BLM would mostly likely receive geothermal lease nominations and applications in the future. The Geothermal PEIS used GIS data from the Colorado Geological Survey and included areas of both direct (nonelectrical) use and indirect (electrical power) applications. This information was based on data from known hot springs combined with oil and gas basins that have the potential for geothermal resources by virtue of bottom-hole temperatures. The Colorado Geological Survey considered geothermal heat flow and gradient data from other sources in creating the potential area.

The entire CRVFO planning area is mapped as an area with geothermal potential in the Geothermal PEIS (BLM 2008, Figure 1-5). The ROD for the Geothermal PEIS identified 567,172 acres as being open to geothermal leasing and 27,717 acres as being closed to geothermal leasing in the CRVFO planning area. No current geothermal activities exist on BLM-administered lands in the planning area.

Biomass power is obtained from the energy in plants and plant-derived materials, such as food crops and grassy and woody plants, residues from agriculture or forestry, and the organic component of municipal and industrial wastes. The National Renewable Energy Laboratory study (BLM and DOE 2003) shows the availability of biomass within the CRVFO. There are currently no biomass facilities and no pending applications for biomass facilities within the CRVFO planning area.

GJFO

While strong solar resources are available across the planning area, there are limited areas with the appropriate conditions for utility-scale solar emphasis zones, as discussed in the findings of the 2012 Solar

PEIS. The 2012 Solar PEIS determined most BLM-administered lands within the GJFO are not suitable for utility-scale solar development. The 2012 Solar PEIS does note the area with the most notable appropriate conditions for utility-scale solar energy development as the desert north of Grand Junction, from Mount Garfield to the Utah state line. The potential also exists and is increasing for small-scale development as technologies improve and advance. The BLM Headquarters Office published the NOI in the *Federal Register* to begin analysis on an updated solar programmatic EIS on December 8, 2022.

In general, lands within the GJFO do not have high potential for wind energy, as determined in the BLM Wind Energy Programmatic EIS (BLM 2005a). However, the 2015 GJFO RMP does identify an area with excellent potential south of Palisade.

There is some potential for geothermal energy throughout the eastern part of the planning area. The potential for geothermal energy may be of interest to commercial developers, depending on economic factors. No interest has been shown for geothermal development.

Some potential for biomass exists, depending on economic factors; however, no current biomass facilities exist on BLM-administered lands or use BLM products in the planning area.

Direct and Indirect Impacts

This section presents the impacts on renewable energy from the oil and gas leasing discussed in **Chapter 2**. This section incorporates by reference the methods, assumptions, and impacts for Alternatives A, B, C, and D described in the 2014 and 2015 Proposed RMPs/Final EISs (BLM 2014, Renewable Energy, page 4-612; BLM 2015a, Forestry, pages 4-298 through 4-305, Lands and Realty, pages 4-353 through 4-364, Energy and Minerals, pages 4-366 through 4-388). The methods and assumptions also apply to Alternatives E and F.

Alternatives A, B, C, and D

CRVFO

Currently, no biomass facilities or solar, wind, and geothermal development are in the decision area. The 2014 Final EIS did not discuss impacts of solar and wind energy in relation to areas open or closed to leasing; rather, the impacts were discussed in relation to ROW exclusion and avoidance areas. Because of little interest in biomass, the Final EIS did not distinguish impacts from fluid mineral leasing among alternatives.

The 2014 Final EIS left 682,600 acres open to fluid minerals and geothermal leasing under Alternative A, 617,700 acres under Alternative B, 568,000 acres under Alternative C, and 655,000 acres under Alternative D. The acreages open to fluid mineral leasing of each alternative from greatest to least are A, D, B, and C. Areas closed to fluid minerals would include closure to geothermal resources.

GJFO

Currently, no biomass facilities or solar, wind, and geothermal development are in the decision area. The 2015 Final EIS did not discuss impacts in relation to areas open or closed to leasing; rather, it discussed the impacts in relation to ROW exclusion and avoidance areas. Because of little interest in biomass, the Final EIS did not distinguish impacts from fluid mineral leasing among the alternatives.

The 2015 Final EIS left 1,138,900 acres open to fluid minerals and geothermal leasing under Alternative A, 993,900 acres under Alternative B, 614,300 acres under Alternative C, and 1,131,300 acres under Alternative D. The acreages open to fluid mineral leasing of each alternative from greatest to least are A, D, B, and C. Areas closed to fluid minerals would include closure to geothermal resources.

Alternative E

CRVFO and GJFO

Biomass

Under Alternative E, impacts on biomass availability from fluid minerals leasing would be minor. Approximately 80 percent of the decision area would be closed to fluid mineral leasing. Under Alternative E, more areas closed to fluid minerals leasing could slightly increase the areas available for biomass harvest due to less fluid mineral development compared with Alternatives A through D.

Geothermal

Alternative E would have an exception for geothermal resources. Geothermal resources would remain open to leasing, and fluid mineral stipulations approved in the RMPs would be applied. Leasing decisions would not impact the area available for leasing geothermal resources. Fluid mineral development likely would not impact geothermal resource development.

Wind and Solar

More areas closed to fluid minerals leasing could result in fewer roads and well pads being constructed, which would leave undissected terrain more suitable for solar and wind development. However, the area with excellent wind potential south of Palisade would remain open to fluid mineral leasing. Fluid mineral development could impact the potential for wind and solar development in this area.

Alternative F

CRVFO and GJFO

Biomass

Under Alternative F, impacts on biomass availability from fluid minerals leasing would be minor. Approximately 95 percent of the decision area would be closed to fluid mineral leasing. Under Alternative F, more areas closed to fluid minerals leasing could slightly increase the areas available for biomass harvest due to less fluid mineral development compared with Alternatives A through D.

Geothermal

Alternative F would have an exception for geothermal resources. Geothermal resources would remain open to leasing, and fluid mineral stipulations approved in the RMPs would be applied. Leasing decisions would not impact the area available for leasing geothermal resources. Fluid mineral development likely not impact geothermal resource development.

Solar and Wind

Alternative F would close the most area to fluid minerals leasing. This could result in fewer roads and well pads being constructed, which would leave undissected terrain more suitable for solar and wind development. The area with wind and solar potential in the GJFO decision area would be closed to fluid mineral leasing.

Cumulative Impacts

Cumulative impacts are described in the in the 2014 and 2015 Proposed RMPs/Final EISs (BLM 2014, Renewable Energy, page 4-612; BLM 2015a, Forestry, page 4-305, Lands and Realty, pages 4-364 through 4-366, Energy and Minerals, pages, 4-388 through 4-389).

CRVFO and GJFO

Fluid mineral leasing under Alternatives E and F would not add to cumulative impacts from the previous alternatives on biomass, wind, and solar energy. Impacts would be reduced with the reduction in area available for leasing.

There could potentially be an increase in cumulative impacts associated with geothermal resources, if these resources are developed. The exception for geothermal resources (no areas closed) under Alternatives E and F would result in more area open to geothermal resource development than under Alternatives A–D.

Solid Minerals

Affected Environment

This section incorporates by reference the affected environment described in the 2014 and 2015 Proposed RMPs/Final EISs (BLM 2014, Energy and Minerals, pages 3-176 through 3-184; BLM 2015a, Energy and Minerals, pages 3-166 through 3-187). A summary as it relates to the decisions for this supplemental EIS is included below.

Mineral production on public land in Colorado involves three distinct categories: leasable minerals, locatable minerals, and salable minerals (mineral materials). A description of these categories, as well as the General Mining Law of 1872, is in the affected environment sections of the Final EISs (incorporated by reference, above).

CRVFO

All BLM-administered lands are open to mineral entry and development under the General Mining Law of 1872, unless they are already withdrawn, proposed for administrative withdrawal, or designated as wilderness or as a WSA. In the CRVFO decision area, 342,700 acres are open for mineral materials development and solid leasable mineral development.

Locatable Minerals

Locatable minerals in the CRVFO decision area include gypsum, limestone, uranium, vanadium, and other locatable minerals (gold, silver, lead, and copper). Numerous mining claims exist, but the only significant mining activity is associated with gypsum and an uncommon variety of limestone mining claims. A description of these minerals is in the affected environment sections of the Final EIS. A total of 342,700 acres are currently open to locatable mineral exploration or development in the CRVFO decision area.

Salable Minerals (Mineral Materials)

Salable minerals in the CRVFO decision area include volcanic cinders, decorative rock, building stone, and sand and gravel. The activity is primarily limited to small- to medium-sized sales for commercial and residential uses. Mineral materials are sold at fair market value to the public or through free use permits

to government agencies, such as Eagle County, for road maintenance. A total of 28,000 acres are currently closed to mineral materials sales in the CRVFO decision area.

The volcanic cinder mining operation adjacent to the Dotsero Crater is no longer active. Two common use areas have been designated for various mineral materials across the CRVFO decision area. The Cattle Creek common use area supplies decorative stones of basalt boulders and a limited amount of moss rock. The Sheep Gulch common use area supplies sand and gravel material.

GJFO

All BLM-administered lands are open to mineral entry and development under the General Mining Law of 1872, unless they are already withdrawn, proposed for administrative withdrawal, or designated as wilderness or as a WSA. In the GJFO decision area, 783,800 acres are open for consideration for development of mineral materials and 518,600 acres are open for consideration for solid leasable mineral development.

Locatable Minerals

Locatable minerals (metallic and nonmetallic) are those that can be located and claimed under the General Mining Law of 1872. These include placer and lode gold, limestone (special quality/special-use variety), alabaster, copper, silver, gemstones (amethyst and fluorite), and uranium.

There is currently one mining operation along Highway 141 southwest of Whitewater, Colorado (BLM 2009a).

Salable Minerals (Mineral Materials)

Salable minerals in the GJFO decision area include sand and gravel, and construction materials that are sold or permitted under the Mineral Materials Sale Act of 1947. The mineral materials program on BLM-administered lands within the GJFO planning area centers mainly around the use of sand and gravel for concrete aggregate, road base and coverings, construction fill, and rock for aggregate, riprap, and decorative purposes (flagstone and moss rock). Mineral materials are sold at a fair market value or through free use permits to local governmental agencies. County and state road construction divisions are large users of gravel and sand resources.

Sand and gravel, as construction aggregate, is an extremely important resource. The extraction of the resource varies directly with the amount of development nearby (road building and maintenance and urban development). This is because sand and gravel are necessary for these types of infrastructure development. Even more than for other resources, the proximity of both transportation and markets is a key element in the development of a deposit.

Generally, the most valuable component is the gravel; therefore, deposits containing higher proportions of gravel are commonly sought, including stream channel deposits. Floodplain and older terrace deposits are commonly utilized, along with alluvial fans. In general, floodplain areas are privately owned, including both surface and mineral estate, and are not under the GJFO's administration.

Salable varieties of clay are widespread in the GJFO planning area and present in several stratigraphic units. None of the clays present have been defined or described as locatable varieties.

Direct and Indirect Impacts

This section presents the impacts on solid minerals from oil and gas leasing discussed in **Chapter 2**. This section incorporates by reference the methods, assumptions, and impacts for Alternatives A, B, C, and D described in the 2014 and 2015 Proposed RMPs/Final EISs (BLM 2014, Energy and Minerals, pages 3-176 through 3-184; BLM 2015a, Energy and Minerals, pages 3-166 through 3-187). The methods and assumptions also apply to Alternatives E and F. A summary as it relates to fluid minerals is included below.

Additional Assumptions

- In general, mineral exploration and extraction activities depend on commodity prices. They also depend in part on the amount of surface acres made available for drilling and other mining activities. Areas withdrawn from mineral entry limit energy and mineral activities. The BLM restricts energy and mineral activities to comply with the land management direction and multiple-use considerations that are part of its responsibilities under FLPMA.
- Rapid population growth in both the CRVFO and GJFO planning areas may create more demand for more mineral materials. Existing leases and claims will not be affected by the closures proposed.

Alternatives A, B, C, and D

CRVFO

For all alternatives, high-potential oil and gas areas do not occur in conjunction with locatable and salable mineral potential areas or existing areas. If development conflicts occur, oil and gas wells could be practically and feasibly directionally drilled from a well pad that is not located vertically above the subsurface reserves.

Under Alternative A, fluid mineral management would have a negligible impact on mineral resources. Impacts under Alternative B would be like those under Alternative A, but with more fluid mineral development and stipulations for resource protections. Impacts under Alternative C would be like those under Alternatives A and B, except more acres would be closed to oil and gas leasing and slightly more acres would be protected by NSO and CSU stipulations. Impacts under Alternative D would be like those under Alternative B, but with slightly fewer protective measures, and a high percentage of the decision area would be open to oil and gas leasing.

GJFO

Most of the decision area with high potential for locatable minerals has already been claimed, so the management actions considered would affect only future mining claims. Accelerated urban development in the southern half of the planning area could lead to moderate potential impacts for salable minerals.

Under Alternatives A through D, the following **Table 3.6-13** shows the quantitative impacts on solid minerals.

Table 3.6-13. Solid Mineral Impacts by Alternative in the GJFO Decision Area

	Alternative A (acres)	Alternative B (acres)	Alternative C (acres)	Alternative D (acres)
Salable Minerals				
Closed to salable minerals	274,300	277,700	452,000	155,300
Open to salable minerals	787,100	783,800	609,400	906,100
Open to salable minerals with NSO or surface-disturbing activities stipulations	N/A	332,800	365,600	307,500
Locatable Minerals				
Mining claims within areas withdrawn	1,300	1,300	1,300	1,300
Mining claims within areas petitioned for withdrawal	0	2,400	6,000	0

Alternative ECRVFO and GJFO

Under Alternative E, approximately 80 percent of the decision areas would be closed to fluid mineral leasing. Closure to fluid mineral leasing would affect solid minerals minimally; this is because much of the area with mineral potential would be closed to fluid minerals leasing. Also, mineral exploration depends on commodity prices and the amount of surface areas available for mining and development. Fluid mineral leasing likely would not impact salable minerals used by counties and the public under free use permits or sale.

Alternative FCRVFO and GJFO

Under Alternative F, approximately 95 percent of the decision areas would be closed to fluid mineral leasing. Closure to fluid mineral leasing would affect solid minerals minimally; this is because much of the area with mineral potential would be closed to fluid minerals leasing. Also, mineral exploration depends on commodity prices and the amount of surface areas available for mining and development. Fluid mineral leasing likely would not impact salable minerals used by counties and the public under free use permits or sale.

Cumulative Impacts

Cumulative impacts are described in the in the 2014 and 2015 Proposed RMPs/Final EISs (BLM 2014, Energy and Minerals, pages 3-176 through 3-184; BLM 2015a, Energy and Minerals, pages 3-166 through 3-187).

Alternatives E and F are not anticipated to add to cumulative impacts beyond those described in the two Final EISs.

3.7 SPECIAL DESIGNATIONS**3.7.1 Wilderness Study Areas*****Affected Environment***

This section incorporates by reference the affected environment described in the 2014 and 2015 Proposed RMPs/Final EISs (BLM 2014, Wilderness and Wilderness Study Areas, pages 3-193 through 3-197; BLM

2015b; Wilderness Study Areas, pages 3-215 through 3-219). A summary as it pertains to the decisions for this supplemental EIS is included below.

In 1964, Congress passed the Wilderness Act, establishing a national system of lands for the purpose of preserving a representative sample of ecosystems in a natural condition for the benefit of future generations. With the passage of FLPMA in 1976, Congress directed the BLM to inventory, study, and recommend which lands under its administration should be designated as wilderness. Sections 201 and 202 of FLPMA provide general direction for BLM-administered land and resource inventory and planning. Section 201 requires the BLM to inventory all public lands and their resources, including wilderness values, and provides the basis for inventorying lands for wilderness characteristics. Section 202 requires the BLM to develop, maintain, and revise land use plans for public lands; these plans set the framework for management, use, and protection of the planning area. Additionally, under Section 603, Congress provided the BLM 15 years to complete a wilderness inventory of BLM-administered lands. Inventories conducted under Section 201 served as the basis for the wilderness review required under Section 603 of FLPMA.

Following completion of the Section 603 wilderness review, the BLM’s obligation to inventory for the presence or absence of wilderness resources on BLM-administered lands continued under Section 201 of FLPMA. Section 202 of FLPMA further provides the BLM with broad discretion and authority in deciding how to manage public lands, including management for the preservation of inventoried wilderness resources. The BLM continues to have discretion under Section 202 to designate a WSA (Section 202 WSA) and manage such areas of land to protect wilderness resources, including under a non-impairment standard.

The BLM administers all WSAs under the management policies for WSAs (BLM Manual 6330, Management of Wilderness Study Areas [BLM 2012b]) to avoid impairing the suitability of such areas for preservation as wilderness. Activities that would impair wilderness suitability are prohibited unless that use is grandfathered or a valid existing right that predates the BLM’s designation of the area as a WSA. The BLM has discretion to modify Section 202 WSA designations through its land use planning process.³ This contrasts to Section 603 WSAs, which the BLM must continue to manage under the terms of that provision until action by Congress.

CRVFO

Four WSAs, totaling 27,760 acres, are in the CRVFO decision area (**Table 3.7-1**). Bull Gulch and Castle Peak were studied under Section 603 of FLPMA, while Eagle Mountain and Hack Lake were studied under Section 202. Each WSA in the CRVFO was included in the Wilderness Study Reports submitted to Congress in 1993.⁴

Table 3.7-1. CRVFO Wilderness Study Areas

WSA Name	Acres
Bull Gulch	15,206
Castle Peak	12,232

³ Since 2003, the BLM has not designated any WSAs under its Section 202 land use planning authority. The BLM is currently reevaluating its policies regarding WSAs, including those designated under Section 202, and intends to issue new policy soon.

⁴ WSAs studied under Section 202 of FLPMA prior to 1993 included in the Wilderness Study Reports submitted to Congress; these cannot be altered through land use planning.

WSA Name	Acres
Eagle Mountain	318
Hack Lake	4
Total	27,760

GJFO

In 1989, the BLM Grand Junction Resource Area issued its final Wilderness EIS that included analysis and recommendations for seven WSAs within the GJFO. Three areas have since been designated as wilderness and are not within the planning area for this supplemental EIS. The Black Ridge Canyons and Black Ridge Canyons West WSAs were combined and designated as the Black Ridge Canyons Wilderness Area in 2000 (Public Law 106-353); they are managed as part of the McInnis Canyons National Conservation Area. In 2009, Congress designated the Dominguez Canyon Wilderness Area (Public Law 111-11), which is managed as part of the Dominguez-Escalante National Conservation Area.

Four WSAs, totaling 96,500 acres, are in the GJFO (**Table 3.7-2**). Each WSA was identified under Section 603 of FLPMA.

Table 3.7-2. GJFO Wilderness Study Areas

WSA Name	Acres
Demaree Canyon	22,700
Little Book Cliffs	29,300
The Palisade	26,700
Sewemup Mesa	17,800
Total	96,500

It should be noted that the Sewemup Mesa WSA extends into the Uncompahgre Field Office to the south. The acreages discussed here are only for the portion of the WSA in the GJFO. As such, acreage figures differ slightly from the 1991 study report and recommendation.

Direct and Indirect Impacts

This section presents the impacts on WSAs from proposed management actions of other resources and resource uses, as discussed in **Chapter 2**. This section incorporates by reference the methods, assumptions, and impacts for Alternatives A, B, C, and D described in the 2014 and 2015 Proposed RMPs/Final EISs (BLM 2014, Wilderness Study Areas, pages 4-694 through 4-700; BLM 2015a, Wilderness Study Areas, pages 4-389 through 4-400). Impacts are limited to potential changes to the individual wilderness characteristics within the WSAs (size, naturally appearing, opportunities for solitude or primitive and unconfined recreation, and unique or supplemental values).

CRVFO

Under Alternatives A, B, C, and D, each WSA in the CRVFO would be closed to future fluid minerals leasing, and any impacts from oil and gas development would be a result of activities occurring outside the WSAs. Impacts on WSAs would result from some actions proposed under other resources and uses. These impacts may be realized on air quality, climate, soils, or water resources of the WSAs, among others.

Among Alternatives A, B, C, and D, Alternative A would leave the most area open to fluid minerals development, while Alternative C would close the most land area. Among these alternatives, impacts on WSAs from activities outside WSAs would be greatest under Alternative A.

GJFO

As with the CRVFO, above, under Alternatives A, B, C, and D, each WSA in the GJFO decision area would be closed to future fluid minerals leasing. Any impacts from oil and gas development would be the result of activities occurring outside the WSAs.

Among Alternatives A, B, C, and D, Alternative A would leave the most area open to fluid minerals development, while Alternative C would close the most land area. Among these alternatives, impacts on WSAs from activities outside WSAs would be greatest under Alternative A.

The oil, gas, and coal leases in Demaree Canyon and Little Book Cliffs WSAs are considered valid existing rights. They have existing structures, such as access roads, drill pads, wells, and pipeline gathering systems. Mineral leasing uses can continue in the manner and to the degree in which these uses were being conducted at the time FLPMA was passed, so long as they do not cause unnecessary or undue degradation of the lands. These uses existed at the time of WSAs designation, and any future development would be the same under all alternatives.

Alternative E

CRVFO

Under Alternative E, all WSAs (27,700 acres) would be closed to fluid mineral leasing. This is similar to each of the previous alternatives in the Proposed RMP/Final EIS. Alternative E would close 568,300 acres (80 percent of the decision area) to fluid mineral leasing; this is an increase of 388,600 acres over what would be closed under Alternative C (179,700 acres). Additional lands closed to fluid mineral leasing would provide indirect benefits to the wilderness characteristics of WSAs. All resource management actions that benefit air quality and scenic quality could have indirect impacts on visitors' outstanding opportunities for solitude or primitive and unconfined recreation in WSAs. Closing additional areas to fluid mineral leasing under Alternative E would benefit WSAs in the CRVFO decision area.

Additionally, if Congress were to release the Bull Gulch, Castle Peak, Eagle Mountain, or Hack Lake WSAs from wilderness consideration, the areas' wilderness characteristics would be preserved by closing these areas to future oil and gas leasing under Alternative E.

GJFO

Under Alternative E, all WSAs (96,500 acres) would be closed to fluid mineral leasing. This is similar to each alternative in the Proposed RMP/Final EIS. Alternative E would close 998,000 acres (81 percent of the decision area) to fluid mineral leasing; this is an increase of 374,400 acres over what would be closed under Alternative C (623,600 acres). Additional lands closed to fluid mineral leasing would provide indirect benefits to the wilderness characteristics of WSAs. All resource management actions that benefit air quality and scenic quality could have indirect impacts on visitors' outstanding opportunities for solitude or primitive and unconfined recreation in WSAs. Closing additional areas to fluid mineral leasing under Alternative E would benefit WSAs in the GJFO decision area.

Additionally, if Congress were to release the Demaree Canyon, Little Book Cliffs, Palisade, or Sewemup Mesa WSAs from wilderness consideration, the areas' wilderness characteristics would be preserved by closing these areas to future oil and gas leasing under Alternative E.

Alternative F

CRVFO

Under Alternative F, all WSAs (27,700 acres) would be closed to fluid mineral leasing. This is similar to each alternative in the Proposed RMP/Final EIS. Alternative F would close 687,105 acres (97 percent of the decision area) to fluid mineral leasing; this is an increase of 507,405 acres over what would be closed under Alternative C (179,700 acres). Additional lands closed to fluid mineral would provide indirect benefits to the wilderness characteristics of WSAs. All resource management actions that benefit air quality and scenic quality could have indirect impacts on visitors' outstanding opportunities for solitude or primitive and unconfined recreation in WSAs. Closing additional areas to fluid mineral leasing under Alternative F would benefit WSAs in the CRVFO decision area.

In addition, under Alternative F, the BLM would designate the Castle Peak Addition lands with wilderness characteristics unit (3,900 acres) as a Section 202 WSA. The BLM would manage these lands to preserve the wilderness character under a non-impairment standard consistent with BLM Manual 6330, Management of BLM Wilderness Study Areas. This alternative would provide for slightly greater protection to this unit than under Alternatives C and E. This is because in addition to being closed to future minerals leasing, the unit would also be managed with VRM Class I objectives, be closed to motorized and mechanized travel, and have an NSO stipulation, consistent with other WSAs in the CRVFO decision area.

If Congress were to release the Bull Gulch, Castle Peak, Eagle Mountain, or Hack Lake WSAs from wilderness consideration, wilderness characteristics would be preserved under Alternative F.

GJFO

Under Alternative F, all WSAs (96,500 acres) would be closed to fluid mineral leasing. This is similar to each alternative in the Proposed RMP/Final EIS. Alternative F would close 1,171,800 acres (95 percent of the decision area) to fluid mineral leasing; this is an increase of 548,200 acres over what would be closed under Alternative C (623,600 acres). Additional lands closed to fluid mineral would provide indirect benefits to the wilderness characteristics of WSAs. All resource management actions that benefit air quality and scenic quality could have indirect impacts on visitors' outstanding opportunities for solitude or primitive and unconfined recreation in WSAs. Closing additional areas to fluid mineral leasing under Alternative E would benefit WSAs in the GJFO decision area.

If Congress were to release the Demaree Canyon, Little Book Cliffs, Palisade, or Sewemup Mesa WSAs from wilderness consideration, wilderness characteristics would be preserved for the long term under Alternative F.

Cumulative Impacts

Cumulative impacts are described in the in the 2014 and 2015 Proposed RMPs/Final EISs (BLM 2014, Lands Proposed for the Protection of Wilderness Characteristics, pages 4-441 through 4-442; BLM 2015b; Wilderness Study Areas, page 4-400).

CRVFO and GJFO

Factors such as population growth and increased demand for recreational resources are expected to continue on Colorado's Western Slope, which may impact wilderness characteristics over time.

Many citizens' groups and congressional representatives have proposed the designation of additional wilderness in Colorado, which includes BLM-administered lands within the CRVFO, GJFO, and surrounding national forests. Representative Diana DeGette proposed legislation—Protecting America's Wilderness and Public Lands Act (HR 803)—in the 117th Congress that identified federal lands throughout Colorado as proposed units of the National Wilderness Preservation System, including Bull Gulch, Castle Peak, and Eagle Mountain WSAs in the CRVFO and the Demaree Canyon, Little Book Cliffs, Sewemup Mesa, and Palisade WSAs in the GJFO. Designation of these areas as wilderness provides for more durable protection of these areas.

Under all alternatives, WSAs would be managed under the management policies for WSAs (BLM Manual 6330, Management of Wilderness Study Areas) to avoid impairing the suitability of these areas for preservation as wilderness. Lands identified as having wilderness characteristics in the 1993 report to Congress will continue to be managed in this manner until Congress either designates or releases all or portions of the WSAs from further consideration for wilderness. With respect to any lands subsequently designated as a Section 202 WSA, including the potential designation of the Castle Peak Addition as a Section 202 WSA, the BLM will continue to manage these lands as a WSA under a non-impairment standard until the BLM changes this approach through a superseding land use planning decision under Section 202 of FLPMA. As a result, there are no present or future actions, or combination of actions, likely to have significant cumulative effects on the wilderness characteristics in WSAs.

3.7.2 Areas of Critical Environmental Concern

Affected Environment

This section incorporates by reference the affected environment described in the 2014 and 2015 Proposed RMPs/Final EISs (BLM 2014, Areas of Critical Environmental Concern, pages 3-189 through 3-192; BLM 2015a, Areas of Critical Environmental Concern, pages 3-220 through 3-225). A summary as it relates to the decisions for this supplemental EIS is included below.

ACECs are defined in FLPMA (Public Law 94-579), Section 103(a) as areas “within the BLM lands where special management attention is required to protect and prevent irreparable damage to important historical, cultural, or scenic values, fish and wildlife resources or other natural systems or processes, or to protect life and safety from natural hazards.” FLPMA states that the BLM will give priority to the designation and protection of ACECs in the development and revision of land use plans. ACECs differ from some other special designations in that designation by itself does not automatically prohibit or restrict other uses in the area. The special management attention is designed specifically for the relevant and important values; therefore, these values vary from area to area.

To qualify as a potential ACEC, both relevance and importance criteria outlined in 43 CFR 1610.7-2 must be met. These criteria are defined as:

- **Relevance:** The presence of a significant historical, cultural, or scenic value; a fish or wildlife resource or other natural system or process; or a natural hazard.

- Importance: The value, resource, system, process, or hazard must have substantial significance and value. This generally requires qualities that are more than locally significant and that are fragile, rare, exemplary, or vulnerable to adverse change.

Restrictions that arise from an ACEC designation are determined at the time the designation is made and are designed to protect the values or serve the purposes for which the designation was made. In addition, ACECs are protected by the provisions of 43 CFR 3809.1-4(b)(3), which requires an approved plan of operations for activities resulting in more than 5 acres of disturbance under the mining laws.

CRVFO

Six existing ACECs were in the CRVFO at the time of the Proposed RMP/Final EIS (**Table 3.7-3**). The values the ACECs were designated to protect are still present and require continued management attention.

Table 3.7-3. Existing ACECs in the CRVFO at the Time of the Proposed RMP/Final EIS

ACEC Name	Acres
Blue Hill	3,700
Bull Gulch	10,400
Deep Creek	2,400
Glenwood Springs Debris Flow	6,100
Lower Colorado River	130
Thompson Creek	4,300
Total	27,030

Each existing ACEC is also a designated Natural Area under the Colorado Natural Areas Program. Such areas are designated through voluntary land management agreements between the Colorado Natural Areas Program and a landowner (in this case, the BLM) who agrees to work cooperatively with the State to assure the protection of the site’s significant features.

During scoping for the CRVFO RMP revision, 91 areas were nominated for ACEC designation either by the public or by CRVFO staff. The CRVFO staff evaluated these areas for relevance and importance as part of the planning process. Based on these evaluations, the CRVFO identified 17 areas as potential ACECs, including the 6 existing ACECs and 11 potential ACECs (see **Table 3.7-4**, below). The table shows 12 areas because East Eagle ACEC was split from the Hardscrabble-Mayer Gulch ACEC and analyzed separately in some alternatives in the Final EIS.

Table 3.7-4. New Potential ACECs in the CRVFO at the Time of the Proposed RMP/Final EIS

ACEC Name	Acres
Abrams Creek	190
Colorado River Seeps	470
Dotsero Crater	100
East Eagle	800
Grand Hogback	14,000
Greater Sage-grouse Habitat	24,600
Hardscrabble-Mayer Gulch	4,200
Lyons Gulch	480
McCoy Fan Delta	220

ACEC Name	Acres
Mount Logan Foothills	3,900
Sheep Creek Uplands	4,500
The Crown Ridge	1,000
Total	54,460

GJFO

As shown in **Table 3.7-5**, five existing ACECs were in the GJFO at the time of the Proposed RMP/Final EIS.

Table 3.7-5. Existing ACECs in the GJFO at the Time of the Proposed RMP/Final EIS

ACEC Name	Acres
Badger Wash	1,900
Pyramid Rock	550
Rough Canyon	2,700
The Palisade	23,600
Unaweeep Seep	80
Total	28,830

In accordance with BLM Manual 1613, Areas of Critical Environmental Concern (BLM 1988b), the GJFO interdisciplinary team reviewed all BLM-administered land in the planning area to determine whether any areas should be considered for designation as ACECs. The BLM reviewed both internal and external nominations, as well as areas identified through inventory and monitoring, and adjacent designations of other federal and State agencies. Areas determined to meet the relevance and importance criteria, as defined by 43 CFR 1610.7-2(a)(1) and 43 CFR 1610.7-2(a)(2), and guidance in BLM Manual 1613 (BLM 1988b), are provided temporary management to protect human life and safety or significant resource values from degradation until the area is fully evaluated through the RMP process.

The review brought forward for analysis 23 ACECs totaling approximately 139,000 acres. **Table 3.7-6** below displays these proposed ACECs. Where an expansion of an existing ACEC is proposed, only the additional acres are shown.

Table 3.7-6. New Potential ACECs in the GJFO at the Time of the Proposed RMP/Final EIS

ACEC Name	Acres
Atwell Gulch	6,100
Badger Wash expansion	300
Colorado River Riparian	880
Coon Creek	110
Dolores River Riparian	7,400
Glade Park–Pinyon Mesa	27,100
Gunnison River Riparian	460
Hawxhurst Creek	860
Indian Creek	1,700
John Brown Canyon	1,400
Juanita Arch	1,600
Mt. Garfield	5,700
Nine-mile Hill Boulders	90
Plateau Creek	220
Prairie Canyon	6,900

ACEC Name	Acres
Pyramid Rock expansion	750
Reeder Mesa	470
Roan and Carr Creeks	33,700
Rough Canyon expansion	100
Sinbad Valley	6,400
South Shale Ridge	28,200
The Palisade expansion	8,700
Unaweeep Seep expansion	5
Total	139,145

Direct and Indirect Impacts

This section presents the impacts on ACECs from the oil and gas leasing discussed in **Chapter 2**. This section incorporates by reference the methods, assumptions, and impacts for Alternatives A, B, C, and D described in the 2014 and 2015 Proposed RMPs/Final EISs (BLM 2014, Areas of Critical Environmental Concern, pages 4-613 through 4-693; BLM 2015a, Areas of Critical Environmental Concern, pages 4-400 through 4-408). The methods and assumptions also apply to Alternatives E and F.

The acreage designated as ACECs under each alternative would be directly correlated with the extent of resources afforded protection throughout the decision area. As such, the more acreage that is designated as an ACEC, the more resources would be protected.

In general, management actions that protect resources, such as improvements in water quality and quantity, surface disturbance restrictions, management for desired plant communities and habitats, travel restrictions and closures, and recreation restrictions, would help maintain and improve the relevant and important values within ACECs. Impacts would vary depending on the ACEC and the values that would be affected.

A summary of impacts described in the Proposed RMPs/Final EISs is below.

Alternatives A, B, C, and D

CRVFO

ACECs are not set aside from all resource uses and project-related activities, but the combination of closures of some ACECs to fluid minerals leasing and the application of multiple NSO, CSU, and TL stipulations are intended to avoid, minimize, or offset impacts. Although oil and gas exploration and development constitute only one of many potential uses on BLM-administered lands, it represents a wider range of potential adverse impacts. These include direct impacts on soils and vegetation, with potential indirect impacts on surface waters from sediment transport; direct or indirect impacts on surface waters from accidental spills and releases of chemicals used or produced by the development; consumptive use of water for drilling, completion, and dust abatement; increased traffic on roadways used to access a project site, including public roads; noise and light pollution and fugitive dust emissions, especially during construction and drilling/completion; disturbance of wildlife, leading to temporary or longer-term interference with seasonally critical habitat uses and movement patterns; and changes in the landscape and visual quality.

The Proposed RMP/Final EIS analyzed four of the six existing ACECs and one potential ACEC for designation as closed to fluid minerals leasing under Alternative C. These five—the existing Blue Hill, Bull

Gulch, Deep Creek, and Thompson Creek ACECs and the proposed Greater Sage-grouse Habitat ACEC—were designated closed to oil and gas development under Alternative C and collectively include 49,100 acres closed to leasing. Other alternatives analyzed in the Proposed RMP/Final EIS varied with 11,300 acres under Alternative A, 14,200 under Alternative D, and 19,900 acres under Alternative B.

The designated and proposed ACECs incorporated a variety of relevant and important values, included the following: six for botanical qualities, four for scenic values, four for geological/paleontological resources, three for fish and wildlife resources, one for culture and history, and one for avoidance of a natural hazard. This total of 19 criteria results in some ACECs having more than one driver. The existing ACECs designated for closure under Alternative C (Blue Hill, Bull Gulch, Deep Creek, and Thompson Creek) and certain others were also analyzed as having an NSO stipulation to add protections associated with uses besides the precluded oil and gas uses. A variety of other NSO, CSU, and TL stipulations were applied to the relevant and important values and additional sensitive resources and uses in ACECs.

GJFO

The Proposed RMP/Final EIS described, as common to all alternatives, the direct and indirect impacts of fluid minerals development on ACECs. These impacts include surface-disturbing activities, vegetation removal or modification, habitat fragmentation, soil erosion and soil loss, sediment transport to surface waters from disturbed soils and unpaved access roads, accidental chemical spills and releases, fugitive dust emissions, noise and light pollution, disturbance of wildlife, changes in visual quality, increased risk of human-caused wildland fires, and more difficult fire suppression. Closure to fluid minerals does not eliminate the risk of adverse impacts, and both the BLM and the State administer their oil and gas programs to minimize the frequency and severity of potential impacts. However, no other management action would have the same degree of avoidance or reduction of potential adverse impacts as closing an ACEC to oil and gas leasing.

The BLM analyzed 18 additional potential ACECs in the Proposed RMP/Final EIS, totaling approximately 168,000 acres, under Alternative C. Of these acres, approximately 166,000 acres were closed to fluid minerals leasing. Areas of ACECs closed under other alternatives varied with 21,700 acres under Alternative A, 26,600 acres under Alternative D, and 40,800 acres under Alternative B. Other protections under the Proposed RMP/Final EIS included applying an NSO stipulation to the five existing ACECs and the proposed Plateau Creek ACEC. Measures variously applied to existing and potential ACECs included closing approximately 118,900 acres to motorized use, closing an additional 49,100 acres to motorized use seasonally or limiting motorized use to designated routes, and precluding livestock grazing on 74,300 acres. Lease stipulations, including multiple NSO, CSU, and TL stipulations, were also applied to avoid or minimize impacts on relevant and important values and other specific resources and uses.

Alternative E

CRVFO

Under Alternative E, impacts on ACECs would be like those described under Alternative C. In the CRVFO decision area, the BLM would designate the following ACECs and specifically close them to future fluid mineral leasing:

- Blue Hill
- Bull Gulch

- Deep Creek
- Greater Sage-grouse Habitat
- Thompson Creek

The remaining existing and potential ACECs would not be designated and would be open to future fluid minerals leasing. ACECs designated in the 2015 ROD would remain ACECs.

By closing 568,300 acres (80 percent of the decision area) to oil and gas, compared with 143,000 acres designated as open, Alternative E would have less potential exploration and development. Therefore, Alternative E would have less potential impact on ACECs resulting from fluid minerals development than under the Proposed RMP/Final EIS. The scale of the benefit to ACECs would be enhanced by the fact that some ACECs closed to leasing under Alternative E are in areas of medium, low, and no known potentials without closures to ACECs under the Proposed RMP/Final EIS. This is indicated by the total of 67,300 acres of ACECs closed and 8,600 acres in ACECs open to oil and gas under Alternative E.

Since the direct impacts of Alternative E would be mostly positive due to the greatly reduced amount of land available for fluid minerals exploration and development, Alternative E would also have positive indirect impacts on resources and resource uses included within the ACEC boundaries besides those upon which the ACEC designation was based. Because ACECs are so varied in the resources they contain and the uses they allow, the indirect impacts can be assessed only for individual ACECs and not on ACECs collectively.

In addition to decreasing the risk of indirect impacts related to oil and gas development and long-term production activities, less future oil and gas development would also reduce interference of oil and gas facilities and infrastructure with use of prescribed fires and other fire-related treatments to improve the health of woody plant (shrubland, woodland, and forest) habitats and to reduce the risk of damage, loss, and use of other resources due to catastrophic fires.

GJFO

Under Alternative E, impacts on ACECs would be like those described under Alternative C. In the GJFO decision area, the BLM would designate the following ACECs and specifically close them to future fluid mineral leasing:

- Atwell Gulch
- Badger Wash
- Dolores River Riparian
- Glade Park–Pinyon Mesa
- John Brown Canyon
- Juanita Arch
- Mount Garfield
- Plateau Creek
- Prairie Canyon
- Pyramid Rock
- Roan and Carr Creeks

- Rough Canyon
- Sinbad Valley
- South Shale Ridge
- The Palisade

The remaining existing and potential ACECs would not be designated and would be open to future fluid minerals leasing. ACECs designated in the 2015 ROD would remain ACECs.

By closing 998,000 acres (81 percent of the decision area) to oil and gas leasing, compared with 239,000 acres open, Alternative E would have less potential exploration and development and therefore less impacts on ACECs from fluid minerals development. The scale of the benefit to ACECs would be enhanced under Alternative E by the fact that most of the GJFO decision area has geological conditions favorable for additional fluid minerals development, including all or part of ACECs not protected with a specific closure under the Proposed RMP/Final EIS. Although the amount of closure under Alternative E is approximately the same as under the Proposed RMP/Final EIS, managing ACECs to protect the associated relevant and important values would be enhanced by the closure, in many cases, of lands adjacent to the ACECs. These closures would reduce or avoid adverse off-lease impacts from nearby oil and gas operations.

Since direct the impacts of Alternative E would be mostly positive due to the greatly reduced amount of land available for fluid minerals exploration and development, Alternative E would also have positive indirect impacts on resources and resource uses included within the ACEC boundaries besides those upon which the ACEC designation was based. Because ACECs are so varied in the resources they contain and the uses they allow, the indirect impacts can be assessed only for individual ACECs and not on ACECs collectively.

Alternative F

CRVFO

Under Alternative F, all 17 existing and new potential ACECs in the CRVFO decision area would be designated and closed to future fluid minerals leasing. By closing 687,100 acres (97 percent of the decision area) to oil and gas, compared with 24,200 acres open, Alternative F would have the least area available for oil and gas among the alternatives and therefore the lowest potential for adverse impacts on ACECs. The scale of the benefit to ACECs would be enhanced by the fact that some ACECs closed to leasing under Alternative F are in areas that lacked closure under other alternatives. This is indicated by the total of 80,400 acres of ACECs closed and no areas in ACECs open to fluid minerals under Alternative F.

Since direct impacts of Alternative F would be mostly positive due to the greatly reduced amount of land available for fluid minerals exploration and development, Alternative F would also have positive indirect impacts on resources and resource uses included within the ACEC boundaries besides those upon which the ACEC designation was based. Because ACECs are varied in the resources they contain and the uses they allow, the indirect impacts can be assessed only for individual ACECs and not on ACECs collectively. However, indirect benefits on all ACECs would include reducing potential interference of oil and gas facilities and infrastructure with prescribed fires and other fire-related treatments to improve the health of woody plant (shrubland, woodland, and forest) habitats and to reduce the risk of damage, loss, and use of other resources due to catastrophic fires.

Additionally, under this alternative, each potential ACEC analyzed in the Proposed RMP/Final EIS would be designated as an ACEC. Goals, objectives, management actions, and restrictions of the areas would be identical to management proposed under Alternative C of the CRVFO Proposed RMP/Final EIS. Alternative F incorporates by reference Alternative C of the Proposed RMP/Final EIS (BLM 2014, Areas of Critical Environmental Concern, Alternative C, pages 2-118 through 2-137). Impacts would be like those described under Alternative C regarding the ACEC designation.

Of the potential ACECs that would be designated and that would be closed to leasing, approximately 13,000 acres would be in the high oil and gas development potential area, and 67,000 acres would be in the no, low, and medium potential areas.

GJFO

Under Alternative F, all 23 existing and new proposed ACECs in the GJFO decision area would be designated and closed to future fluid minerals leasing. By closing 1,149,900 acres (93 percent of the decision area) to oil and gas leasing, compared with 87,100 acres designated as open, Alternative F would have the least potential for future leasing of fluid minerals and therefore the lowest potential for impacts of fluid minerals development on ACECs. The scale of the benefit to ACECs would be enhanced under Alternative F by the fact that most of the GJFO decision area has geological conditions favorable for additional fluid minerals development, including all or part of ACECs not protected with a specific closure under the Proposed RMP/Final EIS. Although the amount of closure under Alternative F is approximately the same as under the Proposed RMP/Final EIS, managing ACECs to protect their relevant and important values would be enhanced by the closure, in many cases, of lands adjacent to the ACECs. These closures would reduce or avoid adverse off-lease impacts from nearby oil and gas operations.

Since the direct impacts of Alternative F would be mostly positive due to the greatly reduced amount of land available for fluid minerals exploration and development, Alternative F would also have positive indirect impacts on ACECs by benefiting resources and uses within the ACEC boundaries besides those upon which the ACEC designation was based. Because ACECs are varied in the resources they contain and the uses they allow, the indirect impacts can be assessed only for individual ACECs and not on ACECs collectively. However, indirect benefits on all ACECs would include reducing potential interference of oil and gas facilities and infrastructure with prescribed fires and other fire-related treatments to improve the health of woody plant (shrubland, woodland, and forest) habitats and to reduce the risk of damage, loss, and use of other resources due to catastrophic fires.

Additionally, under this alternative, each potential ACEC analyzed in the Proposed RMP/Final EIS would be designated as an ACEC. Goals, objectives, management actions, and restrictions of the areas would be identical to management proposed under Alternative C of the GJFO Proposed RMP/Final EIS. Alternative F incorporates by reference Alternative C of the Proposed RMP/Final EIS (BLM 2014, Areas of Critical Environmental Concern, Alternative C, pages 2-413 through 2-439). Impacts would be like those described under Alternative C regarding the ACEC designation.

Of the potential ACECs that would be designated and that would be closed to leasing, approximately 58,000 acres would be in the high oil and gas development potential area, and 110,000 acres would be in the no, low, and medium potential areas.

Cumulative Impacts

Cumulative impacts are described in the in the 2014 and 2015 Proposed RMPs/Final EISs (BLM 2014, Areas of Critical Environmental Concern, pages 4-691 through 4-693; BLM 2015a, Areas of Critical Environmental Concern, page 4-408).

Cumulative impacts on ACECs under any of the alternatives considered in the supplemental EIS could result from non-BLM actions and decisions on lands adjacent to or interspersed within BLM-administered lands. While protections exist within ACECs, changes such as population growth, energy and minerals development, and recreation throughout the planning area may, over time, encroach upon these areas, causing potential degradation of the important and relevant resources through increased noise, air pollution, and light pollution. Other impacts include displacement of species, habitat fragmentation, and changes to the visual landscape that could indirectly affect resources within ACECs. Impacts would be less in areas managed adaptively to protect ACEC values and minimize impacts.

CRVFO and GJFO

For both the CRVFO and GJFO, closure to fluid minerals under Alternative F would result in cumulative, positive impacts on resources and uses included in ACECs. Designation of ACECs provide special management prescriptions that would enhance the relevant and important values of ACECs. This alternative would close future leasing to all areas containing medium, low, and no known oil and gas potential, as well as all existing and new proposed ACECs, providing for the most protection of the values within the CRVFO and GJFO ACECs among the alternatives.

3.7.3 Wild and Scenic Rivers

Affected Environment

This section incorporates by reference the affected environment described in the 2014 and 2015 Proposed RMPs/Final EISs (BLM 2014, Wild and Scenic Rivers, pages 3-198 through 3-204; BLM 2015a, Wild and Scenic Rivers, pages 3-225 through 3-228). A summary as it relates to the decisions for this supplemental EIS is included below.

There are no designated WSR streams in the CRVFO planning area. WSRs are rivers or river sections designated by Congress under the authority of the Wild and Scenic Rivers Act of 1968 (Public Law 90-542, as amended; 16 USC 1271-1287) for the purpose of preserving the river or river section in its free-flowing condition, preserving water quality, and protecting its outstandingly remarkable values (ORVs) and tentative classification. River segment ORVs are identified on a segment-specific basis and may include scenic, recreational, geologic, fish and wildlife, historic, cultural, or other similar values.

CRVFO

Twenty-six BLM-administered segments in the CRVFO planning area are identified in previous studies as eligible for inclusion in the NWSRS. The BLM studied each segment for suitability as part of the CRVFO RMP/EIS planning process in the Final Wild and Scenic Rivers Suitability Report. The suitability report determined two segments of Deep Creek were suitable for inclusion in the NWSRS to protect the free-flowing condition, water quality, ORVs, and tentative classification (wild and recreational). For two additional segments, Colorado River Segments 6 and 7, the BLM deferred a suitability determination and will make a suitability determination for these stream segments only under the following conditions:

- The BLM and Forest Service, after consulting with the Upper Colorado Wild and Scenic River Stakeholder Group, conclude the Upper Colorado Wild and Scenic Stakeholder Group Plan is not sufficiently protecting the free-flowing condition, ORVs, and water quality in the river segment to comply with the Forest Service and BLM; or
- The stakeholder group plan is terminated by the members of the stakeholder group.

As shown in **Table 3.7-7**, 13 BLM-administered segments in the CRVFO planning area were identified as eligible and were studied for suitability as part of the planning process for the 2014 Proposed RMP/Final EIS.

Table 3.7-7. CRVFO Stream Segments Eligible or Suitable as Wild and Scenic Rivers

River or Creek	Segment	Total Segment Length (miles)	Length on BLM-Administered Land (miles)	Suitability Determination	Tentative Classification
Abrams Creek	One segment	3.44	3.44	Not Suitable	Recreational
Battlement Creek	One segment	2.88	1.66	Not Suitable	Recreational
Colorado River	Total of two segments	71.38 (total)	33.10 (total)		
	Segment 6	45.38	27.30	Deferred – Remains Eligible	Recreational
	Segment 7	26.00	5.80	Deferred – Remains Eligible	Recreational
Deep Creek	Total of two segments	4.46 (total)	4.46 (total)		
	Segment 2	3.60	3.60	Suitable	Wild
	Segment 3	0.86	0.86	Suitable	Recreational
Eagle River	One segment	25.69	5.46	Not Suitable	Recreational
Egeria Creek	Segment 2	8.31	7.78	Not Suitable	Recreational
Hack Creek	One segment	2.42	1.63	Not Suitable	Scenic
Mitchell Creek	One segment	0.89	0.89	Not Suitable	Recreational
No Name Creek	One segment	0.08	0.08	Not Suitable	Recreational
Rock Creek	One segment	4.78	3.17	Not Suitable	Recreational
Thompson Creek	One segment	4.76	4.76	Not Suitable	Scenic

Activities that would adversely affect eligible WSR stream segments include those that would adversely affect the ORVs or the free-flowing condition of the segments. Similarly, activities that affect the tentative classification of a stream segment or the water quality of the stream segment would impact the segment.

GJFO

In March 2009, the GJFO completed the eligibility phase of a WSR evaluation as part of the RMP/EIS. The eligibility study identified 20 segments within the GJFO decision area as eligible for inclusion in the NWSRS. All or portions of five segments identified as eligible fall within the Dominguez-Escalante National Conservation Area: Dominguez Creek, Big Dominguez Creek, Little Dominguez Creek (two segments), and Gunnison River. These segments were included in the suitability report developed as part of the Dominguez-Escalante National Conservation Area RMP; therefore, they are outside the scope of this supplemental EIS. Additionally, the Little Dolores River was removed from further consideration due to a land status that was verified through an updated cadastral survey. This was addressed in an amendment

to the eligibility report. In total, the BLM studied 14 eligible segments for suitability in the 2015 GJFO WSR Suitability Report, as shown in **Table 3.7-8**.

Table 3.7-8. GJFO Stream Segments Eligible or Suitable as Wild and Scenic Rivers

River or Creek	Segment	Total Segment Length (miles)	Length on BLM-Administered Land (miles)	Suitability Determination	Proposed Classification
Blue Creek	One segment	11.36	10.08	Not Suitable	Scenic
Carr Creek	One segment	15.10	5.06	Not Suitable	Scenic
Colorado River	Total of three segments	78.91 (total)	27.77 (total)		
	Segment 1	17.76	7.32	Not Suitable	Recreational
	Segment 2	40.24	1.31	Not Suitable	Recreational
	Segment 3	20.91	19.14	Not Suitable	Scenic
Dolores River	One segment	32.01	10.38	Suitable	Recreational
			8.24	Not Suitable	
East Creek	One segment	20.26	8.96	Not Suitable	Recreational
Gunnison River	Segment 2	16.63	3.85	Not Suitable	Recreational
North Fork Mesa Creek	One segment	2.05	2.05	Not Suitable	Scenic
North Fork West Creek	One segment	8.46	3.31	Not Suitable	Wild
Roan Creek	One segment	17.04	6.47	Not Suitable	Scenic
Rough Canyon	One segment	4.21	4.21	Not Suitable	Scenic
Ute Creek	One segment	4.22	4.19	Not Suitable	Scenic
West Creek	One segment	23.56	4.93	Not Suitable	Recreational

The tentative classification establishes a guideline for management and restricts certain types of development. Proposed developments must comply with those permitted by the WSR Act. Through regular monitoring of the ORVs, the BLM can assess whether they are present at the same level that they were when the segment was found suitable.

Direct and Indirect Impacts

This section presents the impacts on WSRs from the oil and gas leasing discussed in **Chapter 2**. This section incorporates by reference the methods, assumptions, and impacts for Alternatives A, B, C, and D described in the 2014 and 2015 Proposed RMPs/Final EISs (BLM 2014, Wild and Scenic Rivers, pages 4-701 through 4-740; BLM 2015a, Wild and Scenic Rivers, pages 4-408 through 4-429). The methods and assumptions also apply to Alternatives E and F.

Indicators of impacts on WSRs include the following:

- Any potential change to the ORVs, tentative classification (that is, wild, scenic, or recreational), or free-flowing nature of the river segment or corridor area from its current state

Development resulting from fluid mineral leasing has the potential to impact the ORVs and tentative classification of segments. Some of these impacts may be mitigated through stipulations. To further reduce impacts, the ORVs and tentative classification may benefit from being closed to fluid mineral leasing.

Alternatives A, B, C, and D

CRVFO

Under Alternative A, no eligible or suitable NWSRS segment would be closed to future fluid mineral leasing. The CRVFO would continue to manage the 13 segments as eligible for inclusion in the NWSRS, and would protect the free-flowing condition, water quality, associated ORVs, and tentative classifications as wild, scenic, or recreational until suitability is determined. Implementation of Alternative A would be a continuation of current management and would not result in effects on WSR segments from oil and gas leasing. Instead, it would continue to provide long-term benefits on the characteristics associated with WSRs because they would continue to be protected under the eligibility determination.

Under Alternative B, nine segments in the CRVFO decision area would be determined as not suitable. However, these segments could still receive protection from management measures for other resources. Impacts on WSRs from air resources, soils resource management, weed management, wildlife management, paleontological resources, wildland fire management, livestock grazing management, fluid minerals management, and wilderness and WSA management would be the same as or similar to those under Alternative A.

Under Alternative B, impacts on Colorado River Segments 6 and 7 would be similar to those described under Alternative A, except 10,000 acres (30 river miles) would be closed to oil and gas leasing. In addition, the Deep Creek segments would be more protected because they would be closed to fluid minerals leasing. Closure would provide protection to the river corridor by reducing the potential for impacts from oil and gas development and by protecting the scenic, botanic, wildlife and geologic ORVs.

A total of 800 acres (2.5 not suitable river miles) of the Thompson Creek area would be closed to fluid minerals leasing, which would protect the scenic and geologic ORVs. Hack Creek and a portion of the Eagle River and Egeria Creek would also be closed to leasing. In addition, many NSO and CSU stipulations on not suitable river segments would also provide further protection. While these management actions would provide some protection of the WSR characteristics of these segments that would be determined not suitable, they would not afford the level of protection specific to the ORVs, free-flowing condition, water quality, or tentative classification that would be provided either by an eligibility or suitability determination.

Under Alternative C, impacts would be the same as those described under Alternative B, above, with the following additional impacts. No leasing would be allowed within the Eagle River, Egeria Creek, Rock Creek, Hack Creek, Mitchell Creek, Battlement Creek, and Abrams Creek corridors to protect historic, fish, and recreational ORVs.

Impacts under Alternative D would be the same as those described under Alternative A, except no leasing would be allowed along portions of the Colorado River corridor to benefit the scenic, wildlife, botanic, and geologic ORVs.

GJFO

Under Alternative A, the GJFO would continue to manage the 14 segments identified in **Table 3.7-8** as eligible for inclusion in the NWSRS. The BLM would protect the free-flowing nature, ORVs, and tentative classifications (that is, wild, scenic, or recreational) of the segments until a suitability determination is made for the segments. All the segments with medium to high potential for oil and gas development (a portion

of Roan Creek, a portion of Carr Creek, and Colorado River Segment 1) would be open to fluid mineral leasing. However, they may be subject to stipulations that would mitigate impacts from such activities.

Under Alternative B, the BLM would determine that a portion of the Dolores River is suitable for inclusion in the NWSRS and determine that the remaining portions of the river are not suitable. While only a portion of the Dolores River would be managed as suitable, Alternative B would provide some protection to study segments via stipulations imposed on fluid mineral leasing and other surface-disturbing activities. All the segments with development potential for oil and gas (Roan Creek, Carr Creek, Colorado River Segment 1, and portions of Colorado River Segment 2) would be open to fluid mineral leasing. However, they may be subject to stipulations that would mitigate impacts from such activities.

Under Alternative C, all segments would be determined suitable for inclusion in the NWSRS. The BLM would continue managing the segments to protect the free-flowing nature, associated ORVs, and tentative classification. Implementation of Alternative C would result in impacts similar to or the same as those described under Alternative A; this is because the BLM would not approve any action that would adversely affect the free-flowing nature of any of the 14 WSR segments, their ORVs, or tentative classifications. Alternative C would provide the most protection to WSR study segments via stipulations. Compared with Alternative A, 9 percent more acres would be protected by NSO stipulations, 35 percent fewer acres would be protected by CSU stipulations, and 4.3 times more acres would be protected by TL stipulations.

Under Alternative D, all 14 eligible segments would be determined not suitable. This would lead to a potential long-term impact on the WSR characteristics of these segments because the ORVs, free-flowing nature, and tentative classification identified during eligibility would not be protected by either eligibility or suitability management.

Alternative E

CRVFO

Under Alternative E, impacts on WSRs would be similar to those described under Alternative C; this is because both alternatives would close the 13 segments found eligible for inclusion in the NWSRS to future oil and gas leasing. Under Alternative E, however, a greater area would be closed to fluid mineral leasing than under Alternative C. Alternative E would close areas with no known, low, and medium potential (568,300 acres in the CRVFO decision area) to future oil and gas leasing. This decrease in leasable acres would reduce impacts on surface water resources throughout the CRVFO decision area, which, in turn, would reduce downstream impacts on WSR segments.

With less mineral leasing, fewer roads, pads, and pipeline corridors would be built, decreasing the amount of surface water runoff. This would also decrease the amount of sediment and other pollutants into surface water, thereby reducing the likelihood of impacting the water quality in WSRs. Of the suitable WSR segments that would be closed to leasing, 2 miles (600 acres) would be in the high oil and gas development potential area, and 56 miles (19,000 acres) would be in the no, low, and medium potential areas.

GJFO

Under Alternative E, impacts on WSRs would be similar to those described under Alternative C; this is because both alternatives would close the Dolores River corridor to future oil and gas leasing. Under Alternative E, however, a greater area would be closed to fluid mineral leasing than under Alternative C. Alternative E would close areas with no known, low, and medium oil and gas development potential

(998,000 acres in the GJFO decision area) to future oil and gas leasing. This decrease in leasable acres would reduce impacts on surface water resources throughout the GJFO decision area, which, in turn, would reduce downstream impacts on WSR segments.

With less mineral leasing, fewer roads, pads, and pipeline corridors would be built, decreasing the amount of surface water runoff. This would also decrease the amount of sediment and other pollutants into surface water, thereby reducing the likelihood of impacting water quality in WSRs. Within the Dolores River corridor, 11 miles (3,200 acres) associated with the suitable segment classification and 7 miles (2,900 acres) of eligible segments would be in the no, low, and medium oil and gas development potential areas, and none would be in the high-potential area.

Alternative F

CRVFO

Under Alternative F, impacts on WSRs would be similar to those described under Alternatives C and E; this is because each alternative would close the 13 segments found eligible for inclusion in the NWSRS to future oil and gas leasing.

Under Alternative F, the total number of acres closed to future oil and gas development in the CRVFO decision area would be 687,100 (97 percent of the decision area). Therefore, Alternative F would be the most restrictive alternative. With the most amount of area closed to mineral fluid leasing, Alternative F would provide the greatest reduction of impacts on surface water resources. With less mineral leasing, fewer roads, pads, and pipeline corridors would be built, decreasing the amount of surface water runoff. This would also decrease the amount of sediment and other pollutants into surface water, aiding to preserve the water quality in WSR segments in downstream areas.

Additionally, under this alternative, each eligible WSR segment would be determined suitable. As explained in the affected environment section, the suitability report determined two segments of Deep Creek were suitable for inclusion in the NWSRS to protect the free-flowing condition, water quality, ORVs, and tentative classification (wild and recreational). For two additional segments (Colorado River Segments 6 and 7), the BLM deferred a suitability determination. Goals, objectives, management actions, and restrictions of the WSR segments would be identical to management proposed under Alternative C of the CRVFO Proposed RMP/Final EIS. Alternative F would incorporate by reference Alternative C of the Proposed RMP/Final EIS (BLM 2014, Wild and Scenic Rivers, Alternative C, pages 2-140 through 2-143). Impacts would be similar to those described for Alternative C in regard to the suitability determination.

Of the segments found eligible for WSR inclusion, which would be no leasing under Alternative F, 2 miles (600 acres) would be in the high oil and gas development potential area, and 54 miles (19,000 acres) would be in the no, low, and medium potential areas.

GJFO

Under Alternative F, impacts on WSRs would be similar to those described under Alternative C, in addition to closing the 14 segments found eligible for inclusion in the NWSRS to future oil and gas leasing.

Under Alternative F, 1,149,900 acres (93 percent of the GJFO decision area) would be closed to future oil and gas development. Therefore, Alternative F would be the most restrictive alternative. With the most amount of area closed to mineral fluid leasing, Alternative F would provide the greatest reduction

of impacts on surface water resources. In addition, with less mineral leasing, fewer roads, pads, and pipeline corridors would be built, decreasing the amount of surface water runoff. This would also decrease the amount of sediment and other pollutants into surface water, aiding to preserve the water quality in WSR segments in downstream areas.

Additionally, under this alternative, each eligible WSR segment would be determined suitable. The suitability report determined one segment is suitable for inclusion in the NWSRS to protect the free-flowing condition, water quality, and ORVs. Goals, objectives, management actions, and restrictions of the WSR segments would be identical to management proposed under Alternative C of the GJFO Proposed RMP/Final EIS. Alternative F would incorporate by reference Alternative C of the Proposed RMP/Final EIS (BLM 2015a, Wild and Scenic Rivers, Alternative C, pages 2-447 through 2-451). Impacts would be similar to those described under Alternative C in regard to the suitability determination.

Of the segments found eligible for WSR inclusion, which would be closed to leasing under Alternative F, 15 miles (5,100 acres) would be in the high oil and gas development potential area, and 70 miles (22,500 acres) would be in the no, low, and medium potential areas.

Cumulative Impacts

Cumulative impacts for Alternatives A through D are described in the in the 2014 and 2015 Proposed RMPs/Final EISs (BLM 2014, Wild and Scenic Rivers, page 4-740; BLM 2015a, Wild and Scenic Rivers, pages 4-428 through 4-429) and remain the same for both field offices.

CRVFO and GJFO

The cumulative impact analysis area for WSRs includes the entire planning area, regardless of ownership, and the surrounding BLM field offices and national forests.

Many past, present, and reasonably foreseeable actions have impacted or have the potential to impact WSRs. Continued population growth and increased development adjacent to public lands in western Colorado would likely lead to impacts on ORVs along stream segments found eligible or suitable for inclusion in the NWSRS. Future impacts on WSRs may come from livestock grazing, recreation development, the spread of invasive species, fires, vegetation treatments, insects and disease, and drought.

Alternatives A, B, C, and D allow for the most future oil and gas development; thus, they have the potential to have the greatest cumulative impacts on WSRs. Both Alternatives E and F are expected to reduce cumulative impacts compared with the previous alternatives due to the increased closure area to oil and gas leasing. Alternative F would reduce these cumulative impacts on WSRs the most.

3.7.4 National Trails

Affected Environment

This section incorporates by reference the affected environment described in the 2014 and 2015 Proposed RMPs/Final EISs (BLM 2014, National Trails and Scenic Byways, pages 3-205 through 3-206; BLM 2015a, National Trails, pages 3-229 through 3-330). A summary as it relates to the decisions for this supplemental EIS is included below.

CRVFO

National scenic trails and national historic trails are congressionally designated under the authority of the National Trails System Act of 1968. National scenic trails are extended trails that provide maximum outdoor recreation potential and that provide for the conservation and enjoyment of the various qualities—scenic, historical, natural, and cultural—of the areas through which they pass. The BLM currently manages land along five national scenic trails; portions of the Continental Divide National Scenic Trail occur in the CRVFO planning area, but none of the trail is on BLM-administered land. There are no CRVFO-administered lands within the viewshed of the national scenic trail corridor. The Forest Service manages the greatest amount of land along the Continental Divide National Scenic Trail corridor, including the segment that crosses the CRVFO planning area.

GJFO

National historic trails are extended trails that closely follow a historic trail or route of travel of national significance. Designation identifies and protects historic routes, historic remnants, and artifacts for public use and enjoyment. Nationwide, the BLM currently manages 11 national historic trails. They must meet the following three criteria listed in Section 5(b)(11) of the National Trails System Act:

- They must follow the actual documented route of historic use.
- They must be of national significance.
- They must possess significant potential for public recreation or interpretation, or both.

The Old Spanish National Historic Trail was designated on December 4, 2002, by the Old Spanish Trail Recognition Act of 2002 (Public Law 107-325). The BLM and the National Park Service jointly administer the Old Spanish National Historic Trail. Fifty-one miles of the Old Spanish National Historic Trail fall within the GJFO planning area, and 40 miles are within the GJFO decision area. However, only 6.9 miles of the congressionally designated route are under BLM jurisdiction; the remaining portions are on land with other surface ownership.

Direct and Indirect Impacts

This section presents the impacts on national trails from the oil and gas leasing discussed in **Chapter 2**. This section incorporates by reference the methods, assumptions, and impacts for Alternatives A, B, C, and D described in the 2014 and 2015 Proposed RMPs/Final EISs (BLM 2014, National Trails and Scenic Byways, page 4-741 through 4-751; BLM 2015a, National Trails, pages 4-429 through 4-435). The methods and assumptions also apply to Alternatives E and F.

Alternatives A, B, C, and D

CRVFO

The CRVFO does not have any specific management goals, objectives, or associated land use plan decisions for national trails. Adverse effects on scenic viewsheds could occur if BLM decisions created changes to a scenic viewshed or introduced new features into the scenic viewshed that do not complement the existing landscape. Beneficial effects on scenic viewsheds would occur if other resource management actions improve, enhance, or protect a scenic viewshed.

Among Alternatives A, B, C, and D, Alternative A identifies the most acres as open to leasing and gas development. Despite the variance in acres open to leasing and gas development, impacts on national trails are not expected to vary among these alternatives.

GJFO

This section discusses impacts on national trails from proposed management actions of other resources and resource uses. Direct impacts on national trails typically result from actions that disturb the soil or alter the characteristics of the surrounding environment that contribute to the trail's significance. Direct impacts also result from actions that introduce visual elements out of character with the property, alter its setting, or result in neglect of the resource to the extent that it is deteriorated or destroyed. Conversely, actions that result in data collection and preservation of national historic and recreational trails would also be considered impacts. Indirect impacts on national trails result from project-induced increases or decreases in activity.

The indicators of impacts on national trails include the following:

- Alterations to the level of public recreation and the features giving the Old Spanish National Historic Trail its national historic significance
- Alterations to the level of public recreation or changes to the scenic, natural, and cultural resources of the Old Spanish National Recreation Trail
- Substantial interference with the nature and purposes/values for which the components of the system were designated
- Impacts on the resources, qualities, values, and associated settings of the public land areas through which the national trails may pass, and the primary trail use or uses

For all BLM undertakings that could impact national trails, the BLM complies with Section 106 of the NHPA prior to conducting the undertaking. Section 106 compliance typically includes inventory, evaluation, and consultation with the Colorado SHPO.

The analysis includes the following assumptions:

- Protection of national trails and related sites occurs in accordance with federal laws and BLM regulations and agreements.
- The BLM looks favorably at opportunities to cooperate with private landowners to minimize or eliminate disturbance to national trails.
- Recognizing that national trails often comprise numerous routes rather than a single trace, all protective zones begin at the outer edges of trails rather than at a centerline, which is difficult to define.
- Certain projects, due to their size or the topography of the land, may require consideration of visual intrusions into the setting beyond the foreground or middleground zones to comply with Section 106 of the NHPA.

Under Alternative A, no special restrictions would be put in place for fluid mineral leasing surrounding the Old Spanish National Historic Trail, which could result in impacts on visual resources or the setting for the trail.

Under Alternatives B and D, management of the Old Spanish National Historic Trail would continue as described under Alternative A. In addition, an NSO stipulation prohibiting surface occupancy and surface-disturbing activities within a 50-meter buffer around the Old Spanish National Historic Trail would be in place, providing more protection from surface-disturbing activities than under Alternative A.

Under Alternative C, management of the Old Spanish National Historic Trail would continue as described under Alternative A. In addition, an NSO stipulation prohibiting surface occupancy and surface-disturbing activities within a 0.5-mile buffer of the Old Spanish National Historic Trail would be in place. A CSU stipulation would be applied within 5 miles of either side of the Old Spanish National Historic Trail. Combined, these stipulations would provide the most protection from surface-disturbing activities among Alternatives A, B, C, and D.

Alternative E

CRVFO

Fluid mineral development is concentrated on the western part of the planning area, where high potential for the occurrence of mineral resources is found. The eastern part of the CRVFO has a lower potential for the occurrence of oil and gas resources. The Continental Divide National Scenic Trail is at the field office's far eastern boundary.

Under this alternative, any potential future fluid mineral development would be outside the viewshed of the Continental Divide National Scenic Trail. However, all resource management actions that degrade air quality could have indirect impacts on scenic viewsheds within national trails. Smoke, dust, haze, or other pollutants could reduce visibility in the short and long term and impact a visitor's experience along national trails. Closing additional areas to fluid mineral leasing under Alternative E would benefit the Continental Divide National Scenic Trail.

GJFO

No special restrictions would be put in place for surface occupancy or fluid mineral leasing outside the Old Spanish National Historic Trail corridor (a 50-meter buffer from the trail centerline), which could result in impacts on visual resources or the trail's setting. A portion of the Old Spanish National Historic Trail would run along an area open to fluid mineral leasing. An NSO stipulation would apply to the trail. All resource management actions that degrade air quality could have indirect impacts on scenic viewsheds within national trails. Smoke, dust, haze, or other pollutants could reduce visibility in the short and long term and impact a visitor's experience along national trails. Closing additional areas to fluid mineral leasing under Alternative E would benefit the Old Spanish National Historic Trail.

Alternative F

CRVFO

Impacts on national trails under this alternative would be like those under Alternative E but with increased benefits to national trails. Closing additional areas to fluid mineral leasing under Alternative F could provide positive indirect benefit to the scenic viewshed of the Continental Divide National Scenic Trail.

GJFO

As with the CRVFO, impacts on national trails under this alternative would be like those under Alternative E, but with increased benefit to national trails. The Old Spanish National Historic Trail would not be in an

area that is open to fluid mineral leasing. Closing additional areas to fluid mineral leasing under Alternative F could provide positive indirect benefit to the scenic viewshed of the Old Spanish National Historic Trail.

Cumulative Impacts

Cumulative impacts are described in the in the 2014 and 2015 Proposed RMPs/Final EISs (BLM 2014, National Trails and Scenic Byways, pages 4-750 through 4-751; BLM 2015a, National Trails, page 4-435).

CRVFO

Potential cumulative impacts on national trails in the planning area would result primarily from surface-disturbing activities on adjacent lands, including OHV use, mineral exploration and development, livestock grazing, vegetation treatments (including prescribed burning), wildfires, and ROW authorizations. These activities would remove vegetation cover, exposing bare soil and creating visual scars in the landscape. These scars may not be in the corridors themselves, but they would be within the corridor viewshed. These impacts would alter the natural appearance of a viewshed corridor and could diminish the scenic value, potentially affecting a visitor's overall travel experience.

Proposed management action and allowable use decisions under Alternatives A and D would maintain the scenic viewsheds within national trails corridors. However, this maintenance would decrease over time, since Alternatives A and D recognize and accommodate more land uses. Alternative A has the greatest risk of negative cumulative impacts on BLM-administered lands, with those activities currently occurring and reasonably certain to occur on private lands. Alternatives C, E, and F would place major constraints on surface-disturbing activities and designate the most acres of ACECs, lands managed for wilderness characteristics, and ROW exclusion areas. Cumulative impacts would be the least under these alternatives. Alternative D would provide the least benefit to viewsheds within national trails corridors.

GJFO

Past, present, and reasonably foreseeable actions with the potential to have cumulative impacts on national trails include continued oil and gas development, ROW location, and, most importantly, increasing recreation and visitor use in the region, which put additional pressure on trails. Management of the Old Spanish National Historic Trail is conducted in coordination with the National Park Service and local nonfederal partners. Management direction provided for in planning and strategy documents has the potential to decrease the potential for degradation and assist in the preservation of natural, cultural, and historic trail resources.

3.8 SUPPORT

3.8.1 Transportation Facilities

Affected Environment

This section incorporates by reference the affected environment described in the 2014 and 2015 Proposed RMPs/Final EISs (BLM 2014, Transportation Facilities, pages 3-207 through 3-212; BLM 2015a [there is no analogous section for the GJFO Proposed RMP/Final EIS]). A summary as it relates to the decisions for the supplemental EIS is included below.

The BLM transportation system represents one of the most critical assets to the accomplishment of the BLM's mission. A well-functioning transportation system is essential for the resource harvesting, energy production, and recreation that take place on BLM-administered lands. In addition to allowing the BLM to

achieve its goal of sustaining the health, diversity, and economic vitality of BLM-administered lands, transportation enables ongoing contributions to the regional and national economies. With the increase in the regional population, the continued demand for energy and ROWs, the growth in recreational use, and wildland fire management, the combined CRVFO and GJFO transportation system is also expected to grow.

CRVFO

Federal, State, and County Roads

A network of federal, state, and county roads provides access throughout the CRVFO planning area. I-70 bisects the adjoining planning areas; other major roads, such as US Highway 6 and 40, and State Highways 9, 13, 82, 125, and 131, bring traffic to the region from throughout the US. Traffic volumes on the road network are highly variable. The highest volumes are on major roadways in or near the largest communities. I-70 and other highways carry the largest traffic volumes, followed by county roads. Due to the geography of the planning area and location of mountain communities, these routes are major thoroughfares that have moderate to high use throughout the year.

BLM Roads

BLM roads provide public and administrative (BLM and permittee) access to BLM-administered lands, through BLM-administered lands, and to inholdings of private land within the planning area. Most BLM and administratively permitted roads (for example, ROWs, grazing roads, and oil and gas access roads) have natural (dirt) surfaces; depending on the type and intensity of use, these are periodically graded to maintain safe and passable conditions. Most roads constructed or used for energy development are graveled to provide all-weather surfaces and reduce fugitive dust. No BLM roads in the planning area are paved. The BLM is responsible for the associated infrastructure, such as bridges and culverts, on all BLM roads.

The BLM responds to public requests for land use authorizations. Reasonable administrative access is made available to persons engaged in valid uses, such as energy development, mining claims, and livestock grazing. Road construction maintenance for authorized roads is typically the responsibility of the permittee. The BLM does not remove snow, but portions on some access routes are plowed by county road maintenance, utility companies, oil and gas operators, mining companies, or private landowners if the roads provide access to their property, facilities, or operations.

GJFO

Federal, State, and County Roads

A network of federal, state, and county roads provides access throughout the planning area. I-70 bisects the planning area, bringing traffic to the region from throughout the US. Traffic volumes on the road network are highly variable. The highest volume counts are found on major roadways in or near the largest communities. I-70, US Highways 6 and 50, and State Highways 141 and 139 carry the largest traffic volumes, followed by county roads.

BLM Roads

Resource roads on BLM-administered lands are spur roads that provide point access, such as to energy exploration and development sites, grazing lands, and recreational venues. Resource roads may also connect to local or collector roads. They carry very low volume and accommodate only one or two types of use. Use restrictions are applied to prevent conflicts between users needing the road and users

attracted to the road. The location and design of these roads are governed by environmental compatibility and minimizing BLM costs with minimal consideration for users' cost, comfort, or travel time.

New or existing roads on BLM-administered lands that are used for fluid mineral development are often open only to administrative access by BLM personnel or its contractors and, on a road-specific basis, to energy and mineral development companies and other special-use permittees. Energy and mining access roads are maintained or improved by the authorized users and their contractors.

Direct and Indirect Impacts

This section presents the impacts on transportation facilities from oil and gas leasing, as discussed in **Chapter 2**. This section incorporates by reference the methods, assumptions, and impacts for Alternatives A, B, C, and D as described in the 2014 and 2015 Proposed RMPs/Final EISs (BLM 2014, Transportation Facilities, pages 4-752 through 4-757; BLM 2015a [there is no analogous section for the GJFO Proposed RMP/Final EIS]). The methods and assumptions also apply to Alternatives E and F.

The GJFO Final EIS did not include a section on transportation facilities that could be incorporated by reference into this supplemental EIS. However, Section 4.5.2 (Wilderness Study Areas) and Section 4.5.3 (Areas of Critical Environmental Concern) of the GJFO Final EIS described permanent and seasonal closures to motorized vehicles and restrictions to existing routes for the purpose of reducing potential adverse impacts of road use on the resource values for which the WSAs and ACECs were designated.

Alternatives A, B, C, and D

CRVFO

The Final EIS concluded that leasing the oil and gas mineral estate under the fluid minerals program would have the greatest potential effect on the transportation program by requiring construction of new roads, increasing traffic on existing roads, and upgrading existing routes for access to well pads. A short-term increase in the volume of both heavy and light traffic would occur during construction, drilling, and completion phases of developing gas resources. Temporary conflicts, including potential delays, dust, road degradation, and increased public safety concerns, would occur during the well construction and drilling phase and recompletion and workover activities. Traffic levels and their impacts would decrease once wells were in long-term operation.

Because the distribution of oil and gas development would occur in the same area of the CRVFO decision area (the high-potential area for oil and gas) under all four alternatives, the Proposed RMP/Final EIS concluded that impacts on BLM roads from fluid minerals activities would be similar under Alternatives A, B, C, and D. The Final EIS alternatives included some road closures, seasonal closures, or restrictions to existing routes to reduce impacts on specific resources, uses, and values. These include high-value wildlife areas, certain ACECs, and WSAs (see Sections 4.3.5, 4.4.1, and 4.4.2 of the CRVFO Final EIS). Although these closures are coincident with closures for protection of specific resources or resource uses, they also would reduce general impacts associated with road use for oil and gas or other focused uses by avoiding associated traffic, fugitive dust, noise, and sediment transport. Table 3.8-1 shows the extent of public roads and administrative (nonpublic) roads in areas open and closed to oil and gas development. As noted in the paragraph above, being in areas closed to leasing does not necessarily mean that the roads are closed to oil and gas or other travel, although such may be the case. However, it is likely that roads in areas closed to fluid minerals leasing receive less development-related traffic; therefore, there would be fewer conflicts with other uses and fewer impacts from noise, fugitive dust, sediment transport to surface waters, and disturbance of wildlife along and near the road.

Table 3.8-1. Portions of BLM Roads in Areas Closed or Open to Fluid Minerals Leasing – CRVFO Decision Area

Type of Road and Use ¹		Alternative A ²	Alternative B ²	Alternative C ²	Alternative D ²
		Miles (%)	Miles (%)	Miles (%)	Miles (%)
Public use, full-sized vehicles ¹	Closed to leasing	1 (0.2)	27 (5.2)	121 (23.3)	13 (2.5)
	Open to leasing	519	493	399	507
Administrative use, full-sized vehicles ¹	Closed to leasing	0 (0)	16 (4.5)	49 (13.9)	12 (3.4)
	Open to leasing	353	337	304	341

¹ Full-sized vehicles do not include all-terrain vehicles or similar vehicles.

² Percentage in areas closed to leasing based on 520 miles of public roads and 353 miles of administrative roads

GJFO

Road capacity, maintenance, and safety issues from mineral and energy development-related traffic are issues in the GJFO planning area in areas where mineral and energy resources are being developed. A short-term increase in the volume of both heavy and light traffic occurs during the construction, well drilling, and completion phases of developing mineral and energy resources. Temporary conflicts (including a potential for delays, dust, road degradation, and increased safety risks) occur during construction, drilling, and completion activities, but they decline when the wells shift into the long-term operation phase.

Existing unimproved roads that become used for energy development require repair and improvement to accommodate the increased traffic volume and travel by large trucks and heavy equipment. These roads are required to be graveled to provide all-weather access; provide for safe travel; and reduce fugitive dust emissions, sediment transport to surface waters, and road degradation. Many new roads have also been created to facilitate gas production by providing access to well pads. These new roads across public lands are required to be built to BLM road standards described in The Gold Book (DOI and USDA 2007).

As for the CRVFO, road closures, seasonal closures, or restrictions on new roads are associated with certain ACECs, WSAs, seasonally crucial big game habitats, and other resources or uses. Therefore, the data in **Table 3.8-2** do not indicate the extent of road closures, but the extent to which the BLM road

network, including public roads and administrative roads, is coincident with area closures for a variety of resource and resource-use protections.

Table 3.8-2. Portions of BLM Roads in Areas Closed or Open to Fluid Minerals, Leasing – GJFO Decision Area

Type of Road and Use ¹		Alternative A ² Miles (%)	Alternative B ² Miles (%)	Alternative C ² Miles (%)	Alternative D ² Miles (%)
Public use, full-sized vehicles ¹	Closed to leasing	2	91	365	9
	Open to leasing	1,111	1,027	785	1,104
Administrative use, full-sized vehicles ¹	Closed to leasing	9 (0.8)	64 (5.8)	171 (15.4)	9 (0.8)
	Open to leasing	514	459	352	514

¹ Full-sized vehicles do not include all-terrain vehicles or similar vehicles.

² Percentage in areas closed to leasing based on 1,113 miles of public roads and 523 miles of administrative roads

Alternative E

CRVFO and GJFO

This alternative would include closing future fluid minerals leasing in all of the medium, low, and no known areas of oil and gas development potential as well as all areas designated for closure to leasing under Alternative C of the Proposed RMPs/Final EISs. As described earlier for Alternatives A through D, closing an area to future leasing is expected to reduce road-related impacts associated with oil and gas development, resulting in as lower traffic volumes, less travel by large trucks or heavy equipment, less noise and fugitive dust from vehicular travel, less potential transport of sediments to surface waters, less disturbance of wildlife along roads and adjacent areas, and more.

Impacts of oil and gas activities on roads depend on the type of road. For natural-surface (dirt) roads being upgraded to accommodate heavier traffic volumes and heavier vehicles, and to meet dust abatement requirements, the application of and periodic reapplication of gravel is required by the BLM. These upgrades result in easier and safer travel for all users, as do other aspects of road improvements. These include widening the driving surface, improving grades, improving unsafe curves, correcting inadequate sight distances, and installing water bars, culverts, and roadside drainage.

Table 3.8-3 shows the miles of public use and administrative use roads for both the CRVFO and GJFO encompassed within areas closed to fluid minerals leasing under new Alternatives E and F.

Table 3.8-3. Portions of BLM Roads in Areas Closed or Open to Fluid Minerals Leasing – Alternative E and Alternative F (CRVFO and GJFO Decision Areas)

Type of Road and Use ¹		Alternative E ² Miles (%)		Alternative F ² Miles (%)	
		CRVFO	GJFO	CRVFO	GJFO
Public use, full-sized vehicles ¹	Closed to leasing	445 (85.6)	916 (82.3)	455 (87.5)	941 (84.5)
	Open to leasing	75	221	65	193
Administrative use, full-sized vehicles ¹	Closed to leasing	216 (61.2)	137 (12.3)	304 (86.1)	49 (9.3)
	Open to leasing	375	148	383	149

¹ Full-sized vehicles do not include all-terrain vehicles or similar vehicles.

² Percentage in areas closed to leasing based on 520 miles of public roads and 353 miles of administrative roads in the CRVFO decision area, and 1,113 miles of public roads and 523 miles of administrative roads in the GJFO decision area.

Alternative F

CRVFO and GJFO

As shown in **Table 3.8-3**, Alternatives E and F encompass similar numbers of road miles, for both public and administrative roads, for areas closed versus open for fluid minerals leasing. In comparison to **Table 3.8-1** and **Table 3.8-2**, the number of road miles in closed areas is much greater in the two new alternatives than in Alternatives A through D. The description of impacts associated with closing areas to oil and gas leasing presented above for Alternative F in the CRVFO and GJFO decision areas is essentially the same as for Alternative E.

The overarching result of Alternatives E and F is that reduced acres available for leasing, and therefore subsequent developing, would result in fewer leases, which in turn would mean fewer well pads, wells, and ancillary surface facilities. The smaller scale of development in turn would mean greatly reduced noise, fugitive dust, potential transport of sediments to streams, disturbance of wildlife along and near the roads, and safety risks associated with large volumes and large sizes of vehicles used in fluid minerals activities.

Cumulative Impacts

Cumulative impacts are described in the 2014 and 2015 Proposed RMPs/Final EISs (BLM 2014, Transportation, page 4-757; BLM 2015a [there is no analogous section for the GJFO Proposed RMP/Final EIS]).

CRVFO and GJFO

The continued maintenance of federal and state highways would provide arterial connections to BLM system roads. County-maintained routes that connect federal and state highways to BLM system routes would maintain and improve access to resources and resource uses. Past, present, and reasonably foreseeable future nonfederal actions have affected, and will continue to affect, transportation management within the planning area. These actions—including urban development patterns, growth of vehicle-based recreation, planned road and highway projects, and population growth—are expected to increase *demand* and construction of transportation routes in and near the CRVFO and GJFO.

Actions that would limit or restrict transportation project design (for example, area use closures, VRM designations, and NSO stipulations) would result in impacts on transportation and access.

3.9 SOCIAL AND ECONOMIC CONDITIONS

3.9.1 Public Health and Safety

Affected Environment

This section incorporates, by reference, the affected environment described in the 2014 and 2015 proposed RMPs/Final EISs (BLM 2014; Public Health and Safety, pages 3-213 through 3-226; BLM 2015a, Public Health and Safety, pages 3-242 through 3-256). A summary, as it relates to the decisions for this supplemental EIS, is included below.

CRVFO

Both federal and private oil and gas developments in the CRVFO are limited to the area of high potential extending from the Grand Hogback near the Town of New Castle to the boundary between the CRVFO and the GJFO near the Town of De Beque. Therefore, areas extending southeastward (Roaring Fork River), eastward (Eagle River), and northeastward (Colorado River) are at lower statistical risk of

exposures to toxic or hazardous substances than areas west of the Grand Hogback to the CRVFO's western boundary. Most potential public exposures, whether related to BLM-authorized activities or other sources, are not a health risk at the concentrations or durations at which exposures could occur. In rare instances, direct (dermal, inhalation, or ingestion) exposures related to oil and gas activities are possible as a result of an unplanned release, such as at a well pad, from a pipeline, or along an access road, and not in proximity to residential areas or other areas of concentrated public human use.

GJFO

Both federal and private oil and gas developments in the GJFO are distributed throughout most of the area, primarily not adjacent to areas of residential development or concentrated human use such as along the I-70 and US 50 corridors. Most potential public exposures to toxic or hazardous substances are not a risk at the concentrations or durations at which exposure occurs. In rare instances, direct (dermal, inhalation, or ingestion) exposures are possible as a result of an unplanned release, such as at a well pad, from a pipeline, or along an access road, primarily remote from substantial or any public use. However, spills of toxic or hazardous chemicals, whether related to oil and gas or other industrial/commercial origins, could occur along heavily traveled highways. In these situations, emergency services personnel would quickly respond to abate the spill and, in the meantime, close or direct traffic around the spill.

Direct and Indirect Impacts

This section presents the impacts on public health and safety from oil and gas leasing as discussed in **Chapter 2**. This section incorporates, by reference, the methods, assumptions, and impacts for Alternatives A, B, C, and D as described in the 2014 and 2015 proposed RMPs/Final EISs (BLM 2014, Public Health and Safety, pages 4-758 through 4-762; BLM 2015a, Public Health and Safety, pages 4-441 through 4-445). The methods and assumptions also apply to Alternatives E and F.

Alternatives A, B, C, and D

CRVFO

The BLM regulations and policies regarding fluid minerals projects are aimed at avoiding or minimizing risks to public health and safety from oil and gas development. Although these are highly effective, differences in the extent of areas closed to leasing would represent somewhat different risks to the public. In the CRVFO, only about 22 percent of oil and gas development involves BLM-authorized wells. Private lease development in Colorado is regulated by the State of Colorado, which has requirements comparable to those of the BLM's and equally protective of public health and safety. Recently, state regulation of both private and federal oil and gas facilities included a wider setback from private property lines and a minimum 2,000-foot setback of well pads from residential building units and other types of buildings.

Under the proposed RMP/Final EIS, acres closed to fluid minerals exploration and development included a total of 359,300 acres, consisting of the following under the four alternatives analyzed: Alternative A = 28,700 acres; Alternative B = 98,100 acres; Alternative C = 179,700 acres; and Alternative D = 52,800 acres. Alternative B was the selected alternative under the proposed RMP/Final EIS, with Alternative C being the most restrictive alternative.

Since direct impacts of fluid minerals closures would be mostly positive, Alternatives A and D, with the fewest closed acres, would have more positive indirect impacts than Alternatives B and C. These indirect benefits would result from reducing the potential amount of vegetation loss, modification, or fragmentation; introduction or expansion of invasive nonnative plants; soil erosion and loss; transport of

sediments and chemical pollutants to surface waters; disturbance/displacement/reduced survivorship of wildlife; and impacts on the public from noise and light pollution, periodically heavy truck traffic on access roads, and fugitive dust emissions.

GJFO

BLM regulations and policies regarding fluid minerals projects are aimed at avoiding or minimizing risks to public health and safety from oil and gas development. Although these are highly effective, differences in the extent of areas closed to leasing would represent somewhat different risks to the public. In the GJFO, only about 14 percent of oil and gas well development involves BLM-authorized wells. Private mineral estate development in Colorado is regulated by the State of Colorado, which has requirements comparable to those of the BLM's and equally protective of public health and safety. Recently, state regulation of both private and federal oil and gas facilities has included a wider setback from private property lines and a minimum 2,000-foot setback of well pads from residential building units and other types of buildings.

Under the proposed RMP/Final EIS, acres closed to fluid minerals in exploration and development in the GJFO included a total of 1,146,000 acres, distributed among the four alternatives as follows: Alternative A = 96,500 acres; Alternative B = 325,400 acres; Alternative C = 623,600 acres; and Alternative D = 100,500 acres. Alternative B was the selected alternative under the proposed RMP/Final EIS, with Alternative C being the most restrictive alternative.

Since direct impacts of fluid minerals closures would be mostly positive, Alternatives A and D, with the fewest closed acres, would have more positive indirect impacts than Alternatives B and C. These indirect benefits would result from reducing the potential amount of vegetation loss, modification, or fragmentation; introduction or expansion of invasive nonnative plants; soil erosion and loss; transport of sediments and chemical pollutants to surface waters; disturbance/displacement/reduced survivorship of wildlife; and impacts on the public from noise and light pollution, periodically heavy truck traffic on access roads, and fugitive dust emissions.

Alternative E

CRVFO

Alternative E would close 568,300 acres (80 percent of the decision area) to fluid mineral leasing. The remaining areas open to future leasing under Alternative E would include 143,000 acres. Because of less development anticipated under Alternative E, it would have fewer direct and indirect impacts on other resources such as vegetation, wildlife, soils, surface water, and cultural resources and on nonconsumptive resources' uses such as recreation. Types of adverse direct impacts that would be reduced under Alternative E would be similar to those under Alternatives A through D. Reduced indirect impacts on public health and safety also would occur, such as reduced traffic and visual impacts associated with oil and gas support services and facilities. Positive indirect impacts resulting from Alternative E also would be the same in type, although larger in scale, than under the proposed RMP/Final EIS.

GJFO

Alternative E would close 998,000 acres (81 percent of the decision area) to future oil and gas leasing, leaving 239,000 acres open. The total closure would be 76,400 acres greater than under Alternative C (623,600 acres). Remaining areas open to future leasing under Alternative E would include 143,000 acres. Because of less development anticipated under Alternative E, it would have the fewest direct and indirect

impacts on other resources such as: vegetation, wildlife, soils, surface water, and cultural resources and on nonconsumptive resources' uses such as recreation. Types of adverse direct impacts that would be reduced under Alternative E would be similar to those under Alternatives A through D. Reduced indirect impacts on public health and safety also would occur, such as reduced traffic and visual impacts associated with oil and gas support services and facilities. Positive indirect impacts resulting from Alternative E also would be the same in type, although larger in scale, than under the proposed RMP/Final EIS.

Alternative F

CRVFO

Alternative F would close 657,100 acres to fluid minerals leasing in the CRVFO (97 percent of the decision area), with 24,200 acres open. Since direct impacts of Alternative F would be mostly positive on resource protections and nonconsumptive resources' uses such as recreation, indirect impacts also would be mostly positive. These indirect benefits would result by reducing impacts on resources such as vegetation, wildlife, soils, surface water, and cultural resources and on nonconsumptive resources' uses such as recreation. Types of adverse direct impacts that would be reduced under Alternative F would be similar to those under Alternatives A through D. Reduced indirect impacts on public health and safety also would occur, such as reduced traffic and visual impacts associated with oil and gas support services and facilities. Positive indirect impacts resulting from Alternative F also would be of the same type, although larger in scale, than under the proposed RMP/Final EIS. Positive indirect impacts on public health and safety also would result, such as by reducing traffic associated with oil and gas service companies.

GJFO

Alternative F would close 1,149,900 acres (93 percent of the decision area) to future oil and gas leasing, leaving 87,100 acres open. As previously described, the areas of medium, low, and no known oil and gas development potential in the GJFO have historically supported oil and gas leasing and development. Because of less development anticipated under Alternative F, it would have both the fewest direct and indirect impacts on other resources such as: vegetation, wildlife, soils, surface water, and cultural resources and on nonconsumptive resources' uses such as recreation. Types of adverse direct impacts that would be reduced under Alternative F would be similar to those under Alternatives A through D. Reduced indirect impacts on public health and safety also would occur, such as reduced traffic and visual impacts associated with oil and gas support services and facilities. Positive indirect impacts resulting from Alternative F also would be the same in type, although larger in scale, than under the proposed RMP/Final EIS.

Cumulative Impacts

Cumulative impacts are described in the 2014 and 2015 proposed RMPs/Final EISs (BLM 2014, Public Health and Safety, pages 4-762; BLM 2015a, Public Health and Safety, page 445).

CRVFO and GJFO

For both the CRVFO and the GJFO, Alternative F would result in positive cumulative impacts on public health and safety by adding closures in areas of high, medium, low, and no known potentials while retaining closures in the proposed RMP/Final EIS for the benefit of other resources and uses. The negative cumulative impact of Alternative F on oil and gas would be less in the CRVFO, because all the additional closures would be in areas geologically unsuitable for oil and gas production. The additional closures under

Alternative F in combination with closures under other alternatives in the proposed RMPs/Final EISs would be an adverse cumulative impact on oil and gas.

3.9.2 Social and Economic Conditions

Affected Environment

This section provides a detailed discussion of existing socioeconomic conditions within the socioeconomic study area. This includes a detailed overview of existing population demographics, economic and workforce conditions, and revenues derived from mineral extraction. The discussion also provides details, where available, pertaining to the specific contributions from BLM-administered lands and resources, including grazing, recreation, and federal minerals. Finally, the discussion provides an overview of populations for future EJ considerations.

Public lands management decisions have direct impacts on many groups and communities. As a steward of area resources, the BLM operates within this social context and they play a principal role in the economy amid the presence of specific industries and the complex array of human concerns. The socioeconomic study area is defined as the geographic region within which social and economic conditions may affect or be affected by the BLM's land use decisions.

For this supplemental EIS, the socioeconomic study area has been identified as the following four counties⁵ within which the CRVFO and GJFO decision areas are located: Eagle County, Garfield County, Mesa County, and Pitkin County. Socioeconomic information is presented for these counties and, for comparison purposes, for the State of Colorado. Taken together, the BLM's CRVFO and GJFO manage approximately 1.84 million acres of public lands and 2.56 million acres of federal mineral estate (BLM 2022b; BLM 2022c).

It should be noted that economic data presented in this discussion include annual averages for the most recent reporting periods. These include the widespread economic effects of the recession brought about by the 2020 global COVID-19 pandemic that impacted local and regional economies through severe short-term reductions in employment and industrial output. The effects are still ongoing and they are not evenly distributed across industries. While the economic impact remains to be seen, it can be assumed that supply-chain shortages affected construction. Also, service-oriented activities in industries, such as retail and tourism, were affected. For the most recent data on economic indicators reflecting the 2020 COVID-19 pandemic's impacts, refer to monthly rates of unemployment reported by the US Bureau of Labor Statistics and personal income and employment by industry data reported by the US Bureau of Economic Analysis.

Population and Migration

Historical and projected population growth are important socioeconomic indicators that provide valuable information on the impact of economic changes in a community, such as boom and bust cycles in employment or a regional economic downturn. **Table 3.9-1** shows the historical and projected population for each of the four counties that make up the study area, the combined study area, and the state overall. The historical populations through 2020 are compiled by the State Demography Office, a

⁵ Although the CRVFO administers small areas of public land within Routt and Rio Blanco Counties, these Counties were not included in the socioeconomic study area because doing so would over-represent the comparatively minor contributions to the economic setting from management actions on federal lands attributable to the field office.

division of the Colorado Department of Local Affairs. The 2030 and 2040 projections also were prepared by the State Demography Office.

Table 3.9-1. Historical and Projected Population

Geography	Historical Population			Projected Population		Projected Change 2020 to 2040	
	2010	2015	2020	2030	2040	Total Change	Percentage Change
State and Study Area Overall							
Colorado	5,050,332	5,446,593	5,784,156	6,416,217	7,073,418	1,289,262	22.3%
Four-County Study Area	272,518	276,750	290,721	325,787	376,748	86,027	29.6%
Counties in the Study Area							
Eagle	52,057	52,780	55,642	60,216	69,698	14,056	25.3%
Garfield	56,150	57,495	61,780	71,971	86,470	24,690	40.0%
Mesa	147,155	148,774	155,950	176,032	202,388	46,438	29.8%
Pitkin	17,156	17,701	17,349	17,568	18,191	842	4.9%

Source: Colorado State Demography Office (DOLA 2021a; DOLA 2021b)

The population of the entire four-county study area in 2020 was 290,721. This constituted roughly 5 percent of the State of Colorado's total population. Among the four counties, the 2020 population was greatest in Mesa County, which had 155,950 people. Garfield County was the second most populous with a total of 61,780 residents. Eagle and Pitkin Counties had populations of 55,642 and 17,349, respectively. Compared with the State of Colorado, study area growth from 2020 to 2040 is expected to occur at a slightly higher rate with population gains being most notable in Garfield County (40 percent). Projected population growth was lowest in Pitkin County (4.9 percent).

Housing

Income and Employment

Compared with the rest of the state, employment increased slower while total personal income has seen a greater growth rate in the study area (see **Table 3.9-2**). Within the study area, per capita personal income in 2020 was highest in Pitkin County (\$155,067) and lowest in Mesa County (\$25,644) (BEA 2020a). The largest percentage changes in employment in the study area counties over the 20-year period (2000–2020) were in Garfield and Mesa Counties, which showed employment growth of 28.8 percent and 25.2 percent, respectively (BEA 2020a).

Table 3.9-2. Employment and Income Trends (2000 to 2020)

Employment or Income	2000	2020	Change 2000 to 2020	Percentage Change 2000 to 2020
Colorado				
Employment (full- and part-time jobs)	2,918,002	3,737,075	819,073	28.1%
Personal income (in thousands of 2020 dollars)	\$147,242,413	\$370,392,116	\$223,149,703	151.6%
Average earnings per job (in 2020 dollars)	\$40,182	\$69,629	\$29,447	73.3%
Per capita income (in 2020 dollars)	\$34,029	\$63,776	\$29,747	87.4%
Study Area				
Employment (full- and part-time jobs)	158,964	192,951	33,987	21.4%

Employment or Income	2000	2020	Change 2000 to 2020	Percentage Change 2000 to 2020
Personal income (in thousands of 2020 dollars)	\$7,281,158	\$18,915,795	\$11,634,637	159.8%
Average earnings per job (in 2020 dollars)	\$32,723	\$54,714	\$21,991	67.2%
Per capita income (in 2020 dollars)	\$33,298	\$65,500	\$32,202	96.7%

Source: BEA 2020a

Table 3.9-3 shows average annual unemployment rates from 2012 through 2020⁶. Unemployment in the study area generally followed state-level trends, with peaks in 2012 and 2020. Within the study area, counties with the highest rate of unemployment in 2020 were Pitkin and Eagle Counties (9.9 percent and 9.0 percent, respectively). Within the study area, Garfield County had the lowest unemployment rate in 2020 (6.5 percent).

Table 3.9-3. Average Annual Percentage of Unemployment (2012 to 2020)

Year	2012	2013	2014	2015	2016	2017	2018	2019	2020
State and Study Area Overall									
Colorado	8.0%	6.7%	5.0%	3.7%	3.1%	2.6%	3.0%	2.6%	6.9%
Study Area	8.8%	7.6%	5.4%	4.4%	4.0%	3.1%	3.3%	2.8%	7.6%
Counties in the Study Area									
Eagle	7.3%	5.9%	4.2%	3.0%	2.6%	2.2%	2.5%	2.1%	9.0%
Garfield	8.6%	7.3%	5.2%	4.0%	3.3%	2.7%	2.9%	2.6%	6.5%
Mesa	9.8%	8.6%	6.2%	5.3%	5.1%	3.7%	3.7%	3.2%	7.1%
Pitkin	7.3%	6.4%	4.8%	3.7%	3.2%	2.9%	3.5%	3.0%	9.9%

Source: BLS 2021a

When examined by industry, key economic sectors can be identified. **Table 3.9-4** displays the most recent employment data by industry sector for the study area, revealing the top economic sectors. In 2020, the three nongovernment industry sectors with the highest percentage of total employment within the study area were accommodation and food services (10.4 percent), health care and social assistance (10.3 percent), and retail trade (10.0 percent). Compared with the State of Colorado, the study area has a similar percentage of employment associated with nearly all sectors. From 2010 to 2020, the three industry sectors with the highest percentage growth in the study area were educational services (53.2 percent growth), health care and social assistance (37.2 percent growth), and management of companies and enterprises (23.3 percent growth).⁷ In terms of net jobs lost or gained over the period, the biggest net job gains were in health care and social assistance, and the biggest net job losses were in mining. The estimated 2020 earnings of health care and social assistance, construction, retail trade, and

⁶ Unemployment rates presented are not seasonally adjusted. Unemployment, particularly in the tourism, recreation, and service-oriented industries, are atypically high during 2020 due to restrictions brought on by the COVID-19 pandemic, which impacted local and regional economies through severe short-term reductions in employment and industrial output. The effects are still ongoing and they are not evenly distributed across industries. While the economic impact remains to be seen, it can be assumed that supply-chain shortages have affected construction and service-oriented activities in industries such as retail and tourism. For the most recent data on economic indicators reflecting the 2020 COVID-19 pandemic's impacts, please refer to monthly rates of unemployment reported by the US Bureau of Labor Statistics and personal income and employment by industry data reported by the US Bureau of Economic Analysis.

⁷ Unemployment rates, particularly in the tourism, recreation, and service-oriented industries, are atypically high during 2020 due to restrictions brought on by the COVID-19 pandemic, which impacted local and regional economies through severe short-term reductions in employment and industrial output.

accommodation and food services in the study area were \$1,552,249, \$1,407,937, \$880,523, and \$862,482, respectively (see **Table 3.9-5**).

Table 3.9-4. Estimated Employment by Industry (2010 to 2020)

Industry	Socioeconomic Study Area				Colorado	
	2010	2020	Percentage of Total Employment in 2020±	Percentage Change 2010 to 2020	Percentage of Total Employment in 2020±	Percentage Change 2010 to 2020
Total Employment	183,069	192,951	—	5.4%	—	18.9%
Non-services related	~30,337	~30,281	15.7%	-0.2%	14.1%	22.8%
Farm	3,430	3,992	2.1%	16.4%	1.3%	8.7%
Forestry, fishing, and related activities	~670	~768	0.4%	14.6%	0.4%	15.1%
Mining (including fossil fuels)	~7,070	~3,073	1.6%	-56.5%	1.0%	-19.6%
Construction	15,276	17,764	9.2%	16.3%	7.0%	41.6%
Manufacturing	3,891	4,684	2.4%	20.4%	4.4%	17.8%
Services related	~131,541	140,585	72.9%	6.9%	72.4%	19.7%
Utilities	~534	537	0.3%	0.6%	0.2%	5.1%
Wholesale trade	~4,140	3,953	2.0%	-4.5%	3.2%	16.8%
Retail trade	18,435	19,355	10.0%	5.0%	8.7%	9.0%
Transportation and warehousing	4,846	5,356	2.8%	10.5%	4.1%	96.3%
Information	2,095	1,596	0.8%	-23.8%	2.4%	5.2%
Finance and insurance	7,845	8,029	4.2%	2.3%	5.9%	15.3%
Real estate and rental and leasing	15,609	16,481	8.5%	5.6%	5.8%	20.2%
Professional and technical services	10,290	11,727	6.1%	14.0%	9.8%	33.8%
Management of companies and enterprises	748	922	0.5%	23.3%	1.3%	53.5%
Administrative and waste services	9,966	10,497	5.4%	5.3%	5.4%	9.6%
Educational services	1,932	2,960	1.5%	53.2%	2.0%	27.9%
Health care and social assistance	14,465	19,844	10.3%	37.2%	9.4%	24.7%
Arts, entertainment, and recreation	8,988	8,348	4.3%	-7.1%	2.3%	1.8%
Accommodation and food services	20,204	20,043	10.4%	-0.8%	6.6%	6.5%
Other services, except public administration	10,444	10,937	5.7%	4.7%	5.1%	15.4%

Source: BEA 2020b; ± percentages do not add to 100 because government jobs are not included.

Note: Estimates for data that were not disclosed are indicated with tildes (~).

Table 3.9-5. Study Area Estimated Earnings by Industry (2010–2020) (in thousands of 2021 dollars)

Industry	Socioeconomic Study Area					Colorado	
	2010	2020	2020 Percentage of Total Labor Earnings±	Change 2010 to 2020	Percentage Change 2010 to 2020	2020 Percentage of Total Labor Earnings±	Percentage Change 2010 to 2020
Labor earnings	\$8,892,141	\$11,053,287	-	\$2,161,146	24.3%	-	44.9%
Non-services related	~\$1,723,789	~\$2,077,293	18.8%	~\$353,504	20.5%	19.1%	61.1%
Farm	\$10,471	\$71,277	0.6%	\$60,806	580.7%	0.7%	59.4%
Forestry, fishing, and related activities	~\$10,833	~\$13,069	0.1%	~\$2,236	20.6%	0.1%	25.7%
Mining (including fossil fuels)	~\$593,504	~\$321,120	2.9%	(~\$272,384)	-45.9%	4.4%	50.8%
Construction	\$897,804	\$1,407,937	12.7%	\$510,133	56.8%	8.0%	103.1%
Manufacturing	\$211,177	\$263,891	2.4%	\$52,714	25.0%	5.8%	31.4%
Services related	~\$5,647,696	\$7,348,570	66.5%	~\$1,700,874	30.1%	65.4%	48.1%
Utilities	~\$65,042	\$76,599	0.7%	~\$11,557	17.8%	0.7%	30.6%
Wholesale trade	~\$283,901	\$297,868	2.7%	~\$13,967	4.9%	4.8%	36.4%
Retail trade	\$699,493	\$880,523	8.0%	\$181,030	25.9%	5.2%	30.0%
Transportation and warehousing	\$326,895	\$353,204	3.2%	\$26,309	8.0%	3.7%	88.2%
Information	\$124,565	\$81,533	0.7%	(\$43,032)	-34.5%	3.7%	8.8%
Finance and insurance	\$322,757	\$405,581	3.7%	\$82,824	25.7%	6.2%	46.0%
Real estate and rental and leasing	\$134,217	\$575,072	5.2%	\$440,855	328.5%	3.3%	n.d.
Professional and technical services	\$619,002	\$729,825	6.6%	\$110,823	17.9%	13.4%	52.1%
Management of companies and enterprises	\$37,187	\$74,633	0.7%	\$37,446	100.7%	2.9%	47.8%
Administrative and waste services	\$409,527	\$487,673	4.4%	\$78,146	19.1%	4.0%	36.5%
Educational services	\$68,640	\$114,746	1.0%	\$46,106	67.2%	1.2%	36.9%
Health care and social assistance	\$1,093,164	\$1,552,249	14.0%	\$459,085	42.0%	8.9%	33.5%
Arts, entertainment, and recreation	\$299,363	\$379,998	3.4%	\$80,635	26.9%	1.1%	38.0%
Accommodation and food services	\$689,819	\$862,482	7.8%	\$172,663	25.0%	3.1%	33.7%
Other services, except public administration	\$474,124	\$476,584	4.3%	\$2,460	0.5%	3.5%	33.4%

Source: BEA 2020b; ± percentages do not add to 100 because government labor earnings are not included.

Note: Estimates for data that were not disclosed are indicated with tildes (~).

Table 3.9-6 presents employment and labor earnings in specific industry sectors most relevant to BLM management decisions—agricultural and tourism—as a percentage of the total for each county. Most notably, non-services-related employment—and farm employment, in particular—represents a relatively small share of total employment in the study area. By contrast, employment in services-related industries—particularly accommodation and food services—is more heavily represented, especially in Eagle and Pitkin Counties. Labor earnings in these industries, as a proportion of total county-level labor earnings, follow this general trend.

Table 3.9-6. County-Level Employment and Labor Earnings by Sector, as a Percentage of Total (2020)

Indicator	County	Industrial Sector				
		Non-services Related			Services Related	
		Farm	Forestry, Fishing, and Related Activities	Mining (Including Fossil Fuels)	Arts, Entertainment, and Recreation	Accommodation and Food Services
Employment	Eagle	0.6%	0.3%	0.5%	7.3%	14.6%
	Garfield	2.3%	0.4%	2.7%	2.8%	8.0%
	Mesa	3.2%	0.6%	2.0%	1.9%	7.5%
	Pitkin	0.5%	n.d.	0.6%	10.6%	17.2%
Labor Earnings	Eagle	0.2%	0.1%	0.1%	2.8%	7.0%
	Garfield	0.6%	0.1%	2.6%	0.7%	2.5%
	Mesa	0.5%	0.1%	2.2%	0.3%	2.4%
	Pitkin	0.0%	n.d.	n.d.	6.4%	7.5%

Source: BEA 2020c; BEA 2020d

Note: n.d. = not disclosed in source data

Income is composed of labor earnings, which are wages paid to employed workers, and nonlabor income, which includes investment income and entitlements such as: Medicaid, Medicare, Social Security, unemployment, and welfare programs. While labor earnings are the main source of income for the state overall (63.1 percent), they represent a smaller proportion of income within the study area (50.0 percent) as compared with the state (see **Table 3.9-7**). Dividends, interests, and rent represent higher percentages of total personal income in the study area (32.7 percent) than in the State of Colorado as a whole (20.3 percent).

Table 3.9-7. Labor Earnings and Nonlabor Income, 2000 to 2020 (in 2021 dollars)

Income Type	Total/Percentage of Labor Income				Change 2000 to 2020	Percentage Change 2000 to 2020
	2000		2020			
Colorado						
Total personal income (\$1,000)	231,759,558	-	387,800,564	-	156,041,006	67.3%
Labor earnings	166,584,227	71.9%	244,650,547	63.1%	78,066,320	46.9%
Nonlabor income	65,175,331	28.1%	143,150,017	36.9%	77,974,686	119.6%
Dividends, interest, and rent	46,210,617	19.9%	78,598,600	20.3%	32,387,983	70.1%
Transfer payments (age-related and other)	13,829,607	6.0%	43,056,929	11.1%	29,227,322	211.3%
Hardship-related payments	5,135,107	2.2%	21,494,489	5.5%	16,359,382	318.6%

Income Type	Total/Percentage of Labor Income				Change 2000 to 2020	Percentage Change 2000 to 2020
	2000		2020			
Study Area						
Total personal income (\$1,000)	11,460,543	-	19,804,838	-	8,344,295	72.8%
Labor earnings	7,325,270	63.9%	9,893,657	50.0%	2,568,387	35.1%
Nonlabor income	4,135,273	36.1%	9,911,181	50.0%	5,775,908	139.7%
Dividends, interest, and rent	3,128,334	27.3%	6,466,681	32.7%	3,338,347	106.7%
Transfer payments (age-related and other)	782,023	6.8%	2,286,585	11.5%	1,504,562	192.4%
Hardship-related payments	224,915	2.0%	1,157,915	5.8%	933,000	414.8%

Source: BEA 2020e

The Greater Roaring Fork Regional Housing Study reports an aging and retiring population; they project a 60 percent increase in the population over 65 years of age between 2017 and 2027 (Economic & Planning Systems 2019). **Table 3.9-8** shows nonlabor income as a percentage of total income that was higher in the study area compared with the overall state. Within the study area, nonlabor income was proportionally high in Pitkin and Garfield Counties, where it accounted for 68.7 percent and 50.9 percent of total income, respectively. Nonlabor income as a percentage of total income was lowest in Eagle and Mesa Counties, where it accounted for 47.1 percent and 44.6 percent, respectively.

Table 3.9-8. Labor and Nonlabor Income by County, 2020 (in 2021\$)

Geography	Per Capita Personal Income	Total Personal Income	Nonlabor Income Percentage of Total Income		
			All Nonlabor Income	Dividends, Interest, and Rent	Transfer Payments
State and Study Area Overall					
Colorado	\$63,776	\$387,800,564	36.9%	20.3%	16.6%
Study Area	\$46,768	\$19,804,838	50.0%	32.7%	17.4%
Counties in the Study Area					
Eagle	\$87,872	\$5,053,551	47.1%	37.5%	9.6%
Garfield	\$62,581	\$3,955,298	50.9%	35.3%	15.6%
Mesa	\$25,644	\$7,890,802	44.6%	17.4%	27.2%
Pitkin	\$155,067	\$2,905,187	68.7%	62.0%	6.7%

Source: BEA 2020a

Public Finance

Taxes

The State of Colorado and various local governments collect a variety of revenues related to the use of natural resources. The following is a description of major sources of revenue and the potential link to BLM resources and resource uses.

Tax revenue at the state level is collected from various sources including the following:

- State business income taxes and personal income taxes on employee earnings—collected for earning on employment and industries associated with resources and resource uses.
- Colorado severance tax, imposed upon nonrenewable natural resources that are removed from the Earth. Natural resources that are subject to severance taxation include metallic minerals,

molybdenum, oil and gas, oil shale, and coal. Rates of taxation vary by mineral resource. For example, the oil and gas rate ranges from 2-4 percent of gross income based on size of operation and for metallic minerals it is 2.25 percent of gross income.

- Fuel tax is imposed on gasoline and special fuel acquired, sold, imported, or used in Colorado. Public land visitors pay taxes for vehicles to travel for recreation or other purposes.
- State sales tax is imposed at a rate of 2.9 percent, and it would be imposed on purchases directly or indirectly associated with BLM-administered lands and resource use (that is, purchases of recreation equipment and purchases of household goods by a livestock operator on the BLM-administered lands).

At the local level, taxes that can be impacted by public land uses include the following:

- Local sales tax imposed at a variable rate based on jurisdiction would be imposed on purchases directly or indirectly associated with BLM-administered lands and resource use as described for state sales tax above.
- Local lodging tax imposed on those staying at lodges in the region who are visiting for recreational or other purposes.
- Other local taxes, such as the automobile rental tax and the passenger facility charge, may be impacted by public land visitors.
- Property tax is determined based on local mill levy rates and property valuations. Should valuation of properties be impacted by local access to public lands, property rates may be impacted by managing these lands.

Revenue from Grazing

Livestock operators in the study area pay state and local sales taxes on goods and services purchased in support of their businesses, and gasoline taxes when fueling motor vehicles. They also pay business income taxes. Employees of livestock businesses pay personal income taxes on their earnings. Additionally, specific revenue streams are associated with public land laws governing the return of receipts from other land uses. For example, under the Taylor Grazing Act a portion of BLM grazing revenue is returned to the county of origin; 50 percent of Section 15⁸ fees collected are returned to counties and 12.5 percent of Section 3⁹ fees are returned to counties. Contributions from grazing on BLM-administered lands would vary by county and they may have a higher level of importance at the local level for some communities.

Federal Mineral Royalties

Additional revenue is collected for bonus, rent, and royalties on federal mineral leases. Revenues from oil, gas, and coal extraction come from these bonuses, royalties, and rents paid by producers on public lands. These funds are collected and subsequently distributed to the federal and state governments.

The DOI, through ONRR, collects a set percentage of the sales value of federal oil, natural gas, and coal—known as a royalty. In August 2022, the US Congress passed HR 5376 - Inflation Reduction Act of 2022

⁸Section 15 lands are public lands that lie outside a grazing district administered by the BLM under Section 15 of the Taylor Grazing Act. The BLM authorizes livestock grazing on these lands by issuing leases to private parties.

⁹Section 3 of the Taylor Grazing Act concerns grazing permits issued on public lands within the grazing districts established under the Act. It gave leasing preference to landowners and homesteaders in or adjacent to the grazing district lands.

(the IRA), which updated federal oil and gas leasing terms, including the royalty rate, rental rate, and minimum bonus bid rate. The IRA increased federal royalty rates for oil and natural gas leases from 12.5 percent to 16 and 2/3 percent (US House of Representatives [HR] 2022). Federal royalties for coal remain at the previously set rate of 12.5 percent for surface coal and 8 percent for coal extracted from underground mines (United States Government Accountability Office [GAO] 2021). Leaseholders can competitively bid; pay an initial bonus (that is higher than the minimum bonus bids); and subsequently pay rent for the right to develop the resources on public lands (the IRA eliminated the option for noncompetitive lease sales). The IRA increased the annual rental rates for new competitive oil and gas leases from \$1.50 per acre (or a fraction thereof) in the first 5 years and \$2.00 per acre each year thereafter to \$3 per acre from the first 2 years, \$5 per acre for years 3 through 8, and \$15 per acre for years 9 and 10. After 10 years, those set rental rates will be the minimum (US HR 2022). Federal coal leases require payment of an annual rental fee of not less than \$3 per acre or a fraction thereof (BLM 2022b). The IRA also increased the minimum bonus bid from \$2 per acre to \$10 per acre for 10 years, then after 10 years, \$10 per acre is the statutory minimum. Other revenues that are not included in the royalty, rent, or bonus categories include minimum royalties, estimated royalties, settlement agreements, and expression of interest fees. Approximately 50 percent of revenues go to the US Treasury and 49 percent of federal mineral revenues are transferred to the Colorado State Treasurer. The portion of revenue allocated to the state, in turn, is distributed to counties, cities, and school districts based on Senate Bill 08-218. Lease revenues and royalties to the state and county provide an additional economic contribution from mineral resource extraction. **Table 3.9-9** provides revenue collected from oil and gas and coal development in the planning area in 2019. Royalties from oil and gas leases in Garfield County, which totaled \$63,667,759, were notably the highest among all counties in the planning area. Revenue from rents was also highest in Garfield County. This revenue does not factor in the new royalty rates, rental rates, and minimum bonus bids from the IRA. Revenue and production from new oil and gas leases is expected to change as a result of the IRA, but the magnitude of this change is not yet known.

Table 3.9-9. Rents, Royalty, and Bonus Revenue Collected (Fiscal Year 2019)

Geography	Commodity	Revenue			
		Rents	Royalties	Bonuses	Other Revenue ¹
State of Colorado	Oil and Gas	\$1,553,872.89	\$151,546,152.09	\$2,086,869.00	\$10,694,686.90
	Coal	\$182,114.21	\$18,173,354.81	\$1,609,760.00	\$64,274.73
Study Area	Oil and Gas	\$176,908.45	\$69,816,169.27	-	\$6,236,578.38
	Coal	\$4,106.21	-	-	-
Eagle	Oil and Gas	-	-	-	-
Garfield	Oil and Gas	\$123,974.39	\$63,667,758.83	-	\$5,963,873.50
	Coal	\$4,106.21	-	-	-
Mesa	Oil and Gas	\$52,934.23	\$6,148,410.44	-	\$189,913.35
Pitkin	Oil and Gas	\$(0.17)	-	-	\$82,791.53

Source: ONNR 2022

¹Negative amounts in ONRR's revenue summaries result from recoupments of overpayments occurring in different years.

Payments in Lieu of Taxes (PILT)

PILTs are federal payments to local governments that help offset losses in property taxes due to nontaxable federal lands within their boundaries. Public Law 94-565, dated October 20, 1976, was rewritten and amended by Public Law 97-258 on September 13, 1982, and it was codified at 31 USC 69.

The law recognizes the inability of local governments to collect property taxes on federally owned land that can create a financial impact.

The BLM-surface administered lands fall under Section 6902 of the PILT law, which establishes a formula for calculating payments for qualifying acres of entitlement lands. Payment is typically made directly to the eligible local government. Section 6902 of the PILT act states that PILTs may be used by recipients (usually counties) for any governmental purpose, and they are not required to be distributed to other local government units.

The DOI computes payments authorized under Section 6902 of the Act using the greater of the following two alternatives: (1) \$2.87 (in 2021) multiplied by the number of acres of qualified federal surface land in the unit of local government (as defined previously), reduced by the amount of funds received by the locality in the prior fiscal year under certain other federal surface land revenue sharing programs, such as the Secure Rural Schools program or the mineral leasing program or (2) \$0.41 (in 2021) multiplied by the number of acres of qualified federal surface land in the unit of local government, with no deduction for the prior year's payments. Both alternatives are subject to a population ceiling limitation computed by multiplying the county population by a corresponding dollar value (adjusted annually for inflation) contained in the Act.

PILTs are transferred to state or local governments, as applicable, and they are in addition to other federal revenues, including those from grazing fees. The four study area counties received approximately \$11.2 million in PILTs in 2021 for federal lands totaling over 4 million acres, approximately 45 percent of which (1,891,985 acres) were BLM-administered land. The estimated BLM-related portion of PILT revenue to counties totaled over \$4.9 million (see **Table 3.9-10**).

Table 3.9-10. Estimated BLM-Related Payments in Lieu of Taxes (PILT) Revenue for Counties within the Study Area, 2021

County	2021 Total PILT to County	Total Approximate Entitlement Acres (Qualifying Federal Lands)	Average 2021 Payment per Acre	Approximate BLM Acreage	Estimated BLM-related Portion of PILT Revenue to County
Eagle	\$2,440,544	851,544	\$2.87	235,289	\$674,343
Garfield	\$3,390,802	1,188,316	\$2.85	670,154	\$1,912,252
Mesa	\$3,772,492	1,556,549	\$2.42	960,717	\$2,328,418
Pitkin	\$1,613,825	562,946	\$2.87	25,825	\$74,034
Totals	\$11,217,663	4,159,355	—	1,891,985	\$4,989,048

Source: DOI 2021

Social and Economic Activity Related to BLM Management Actions

Local economies benefit directly and indirectly from expenditures and revenues generated by a variety of activities on BLM-administered lands within the four-county study area. These contributions are discussed in detail below.

Energy and Mineral Development

Mineral development under the BLM is managed under three main categories: leasable, locatable, and saleable minerals/mineral materials. Each is subject to different federal laws and implementing regulations. Leasable minerals are a category of mineral resources made available for exploration and development by

mineral leasing. They are specific types of mineral resources described by the Mineral Leasing Act of 1920, including fluid leasables (such as crude oil and natural gas), solid leasables (such as coal), as well as nonenergy leasable (such as sodium, phosphate, and potassium) and geothermal energy. Locatable minerals are sometimes called hard rock minerals and they may include deposits of gold, silver, lead, zinc, copper, molybdenum, uranium, gypsum, chemical-grade limestone, and other rare or high-value minerals and metals.

Rights to locatable minerals are obtained by staking mining claims, unlike leasable minerals where rights are obtained via mineral leases. Locatable minerals technically include any valuable mineral deposits that are subject to exploration and production under the Mining Law of 1872, as amended. Salable minerals and mineral materials are common minerals sold or given away at the discretion of the BLM. Salable minerals are defined as lower-value, common variety materials, such as rock, gravel, and soil. The term salable minerals is synonymous with mineral materials and it also can be called common variety minerals. The BLM has discretion to manage the sale or removal of these materials, with sale regulated by commercial permits. Salable minerals are also sometimes provided free of charge to local governments for public projects under free use permits.

Federal Oil and Gas Production within the Decision Area

The CRVFO contains approximately 2,300 producing federal oil and gas wells and it processes the most applications for permit to drill in Colorado. The vast majority of oil and gas development within the CRVFO boundaries (about 80 percent) is on private land and minerals where the BLM has no jurisdiction. Of the 773,000 acres of federal minerals within the CRVFO, roughly 200,000 acres are leased for oil and gas. The CRVFO does not expect much new land to be leased over the next 20 years, but it expects continued development in the areas that are already leased. The CRVFO also manages solid mineral operations including gypsum, cinders, limestone, decorative stone, sand, and gravel. Within the GJFO, approximately 513,913 acres are leased for oil and gas. Most acres open to oil and gas leasing are already leased, with the highest production areas north and east of Grand Junction (BLM 2019). Current production volumes within the study are presented in **Table 3.9-11**.

Table 3.9-11. Federal Oil and Gas Production within the Decision Area (Fiscal Year 2020)

	Eagle County	Garfield County	Mesa County	Pitkin County
Oil Production (bbl)	0	430,664.26	29,237.99	0
Gas Production (mcf)	0	176,728,660.13	15,66,601.32	0

Source: ONNR, 2021

Mining Sector Employment within the Study Area

The mining sector share (including oil and natural gas) of the 2.6 million overall employment in Colorado was about 0.8 percent in 2020 (an estimated 21,614 workers). The four-county area has a history of oil and gas development and the ties with this industry are most notable in Garfield County, which has levels of employment in the mining industry (3.2 percent) that are well above state levels (0.8 percent) (see **Table 3.9-12**).

Effects on local economies during boom cycles of mineral development include large short-term increases in employment and population growth. A study of Colorado, Texas, and Wyoming found that approximately 2.35 jobs were created with every \$1 million in gas production. The population also increased by about 25 people for each billion cubic feet (Weber 2012).

Table 3.9-12. Mining Sector Employment within the Study Area (2020)

Category	Eagle County	Garfield County	Mesa County	Pitkin County	Study Area	Colorado
Total Employment	30,226	24,707	60,563	15,213	130,709	2,602,371
Mining	27	798	1,120	~8	~1,953	~21,614
Oil and gas	~6	~714	1,084	0	~1,804	17,365
Extraction	~1	432	54	0	~487	7,802
Drilling	0	~56	164	0	~220	892
Support	~5	226	866	0	~1,097	8,671
Coal mining	0	0	~6	0	~6	1,205
Percent of Total Employment						
Mining	0.1%	3.2%	1.8%	0.1%	1.5%	0.8%
Oil and gas	0.0%	~2.9%	1.8%	0.0%	~1.4%	0.7%
Extraction	0.0%	1.7%	0.1%	0.0%	~0.4%	0.3%
Drilling	-	~0.2%	0.3%	0.0%	~0.2%	0.0%
Support	0.0%	0.9%	1.4%	0.0%	~0.8%	0.3%
Coal mining	-	-	-	0.0%	0.0%	0.0%

Source: BLS 2021b

Notes: Estimates for data that were not disclosed are indicated with tildes (~).

Data represent the number of part- or full-time employees and the percentage of total employment. Employment estimates may vary from the official labor force data released by the Bureau of Labor Statistics because of differences in survey design and data collection.

While mining sector employment is supported by oil and gas development and production activities, such industrial employment during boom times does not necessarily present an outsized positive influence on local economies. Weinstein et al. (2018) found, for instance, that positive spillovers from the oil and gas industry are smaller or at least no larger than the effects of the equal-sized shocks in the rest of the economy. Moreover, resource-rich regions may lack incentives for diversification of their economies and they tend to underinvest in other productive assets.

Agriculture and Livestock Grazing

Table 3.9-13 provides the percentage of farm employment in the study area. The percentage of farm employment for the study area was only slightly higher than the state total of 1.3 percent. In 2020, study area counties with the highest percentage of farm employment were Mesa (with 3.2 percent of total employment in the county) and Garfield (with 2.3 percent of total employment in the county). Farm employment was lowest in Pitkin (with 0.5 percent of total employment in the county) and Eagle Counties (with 0.6 percent of total employment in the county).

Table 3.9-13. Agricultural Sector Employment within the Study Area (2020)

Area	Farm Employment	Percentage of Total Employment
State and Study Area Overall		
Colorado	49,011	1.3%
Study Area	3,992	2.1%
Counties in the Study Area		
Eagle	249	0.6%
Garfield	869	2.3%
Mesa	2,758	3.2%
Pitkin	116	0.5%

Source: BEA 2020d

Currently, grazing authorizations on 417 grazing allotments are located on over 1.8 million BLM-administered acres throughout both the CRVFO and GJFO decision area. There are currently roughly 98,965 active permitted animal unit-months (AUMs) (for cattle, sheep, and horses) managed by the two field offices (BLM 2022b; BLM 2022c). Permitted use represents the maximum level of use; however, billed use varies by year based on multiple factors, including, but not limited to, natural resource and forage conditions (for example, drought, wildfire, and post-fire restrictions on use), and operator preference (for example, reduction in use for personal reasons and market conditions). **Table 3.9-14** shows the regional estimated economic contributions supported by livestock, per 1,000 AUMs. The estimates presented in this table are calculated using response coefficients provided by the BLM, where the current permitted AUMs are multiplied by a response coefficient (BLM 2021d). It should be noted that the number of jobs expressed is not a direct reflection of the number of permittees engaged in grazing activities on BLM-administered lands; rather, in terms of jobs, it is a function of the modeled economic output for activities connected to grazing on BLM-administered lands per 1,000 AUMs. The BLM does not include unpaid employment.

Table 3.9-14. Estimated Contribution per 1,000 AUMs (2021 dollars)

Commodity	Effect	Impact Type	Contribution
Cows	Direct	Jobs	1.4
		Labor Income	\$19,045
	Indirect and Induced	Jobs	0.9
		Labor Income	\$37,773
Sheep	Direct	Jobs	5.4
		Labor Income	\$85,240
	Indirect and Induced	Jobs	3.4
		Labor Income	\$134,810

Source: BLM 2021d

Recreation

Recreational opportunities in the study area include hiking, camping, river rafting, mountain biking, rock and ice climbing, off-road vehicle use, fishing, and hunting. The study area is within the Northwest Travel and Tourism Region in Colorado, as defined by Colorado’s Tourism Office, which in addition to the four counties included in this study includes Rio Blanco, Moffat, Routt, Jackson, Grand, and Summit Counties (CPW 2018a). In 2017, the economic contributions of outdoor recreation from counties in this region of Colorado resulted in 133,658 jobs and nearly \$5.1 billion in salaries and wages (CPW 2018b). Abundant recreational opportunities exist on public lands in the study area and recreation plays an important role in the local economy. Employment in the travel- and tourism-related sectors in the four-county study area comprised 21.4 percent of total employment in the study area, which was 8.0 percentage points higher than that of the state overall (BLS 2021c).

Recreation opportunities on BLM-administered lands in the GJFO include 31 recreation sites, 5 SRMAs, and 6 ERMAs. The CRVFO contains 6 SRMAs, 6 ERMAs and 14 developed recreation sites, which include six river access sites to the Colorado and Eagle Rivers (BLM 2019). Visitation statistics for these areas are presented in **Table 3.9-15**. More information on these recreational opportunities is provided in **Section 3.6.1** of this supplemental EIS.

Table 3.9-15. Visitation at Selected BLM Recreation Areas (2017 to 2021)

Area	FY17	FY18	FY19	FY20	FY21
CRVFO					
Hardscrabble- East Eagle SRMA	2,888	2,850	3,674	25,048	7,000
Hack Lake SRMA	0	0	0	0	30,052
King Mountain SRMA	60,101	60,039	60,049	126,157	119,750
Red Hill SRMA	3,231	5,478	5,433	4,888	4,869
The Crown SRMA	14,145	13,797	15,118	45,277	5,884
Upper Colorado River SRMA	48,461	33,508	37,133	39,689	29,980
Bocco Mountain ERMA	2,742	2,666	2,666	4,413	2,354
Eagle River ERMA	62,270	61,081	77,536	78,122	13,826
Gypsum Hills ERMA	1,516	1,500	1,667	1,856	1,825
New Castle ERMA	3,833	4,083	10,333	24,099	27,469
Silt Mesa ERMA	417	417	417	390	761
Thompson Creek ERMA	4,330	4,260	4,259	4,758	3,887
Total CRVFO Visitor Days	203,934	189,679	218,285	354,697	247,657
GJFO					
Bangs Canyon SRMA	177,891	185,359	175,470	300,414	368,185
Dolores River Canyon SRMA	36,161	37,291	36,510	27,594	40,124
Grand Valley OHV SRMA	144,104	126,860	127,199	134,000	160,110
North Fruita Desert SRMA	79,755	81,185	74,222	95,644	107,627
Palisade Rim SRMA	19,483	21,985	19,772	24,776	37,633
Barrel Springs ERMA	1,214	1,438	4,300	2,109	1,050
Gateway ERMA	6,512	6,528	7,680	7,769	8,825
Grand Valley Shooting Range ERMA	23,122	24,980	26,937	14,151	21,872
Gunnison River Bluffs ERMA	5,433	5,487	9,125	19,178	21,776
Horse Mountain ERMA	7,920	41,536	41,538	43,425	41,538
North Desert ERMA	153,719	157,265	138,921	148,887	184,588
Total GJFO Visitor Days	655,314	689,914	661,674	817,947	993,328

Source: RMIS 2017-2021

Hunting is a popular recreational activity in the study area. As shown in **Table 3.9-16**, economic contributions from hunting in the four-county study area support roughly 793 jobs and create approximately \$22.6 million in labor income. Big game hunting supports jobs through direct spending on guides and outfitters and indirectly through spending on equipment manufacturing, retail, transportation, and other supportive industries. **Table 3.9-17** presents estimated direct spending by category.

Table 3.9-16. Total Hunting Economic Contributions within the Study Area

Area	Output (\$millions)	Labor Income (\$millions)	State/Local Taxes (\$millions)	Federal Taxes (\$millions)	Jobs
State and Study Area Overall					
Colorado	\$602.4	\$219.6	\$34.4	\$50.4	6,304
Study Area	\$60.1	\$22.6	\$4.3	\$5.2	793
Counties in the Study Area					
Eagle	\$14.1	\$5.8	\$1.0	\$1.3	144
Garfield	\$15.2	\$6.7	\$1.4	\$1.5	217
Mesa	\$26.9	\$8.4	\$1.7	\$2.0	392
Pitkin	\$3.8	\$1.7	\$0.3	\$0.3	40

Source: CPW 2018b

Table 3.9-17. Estimated Recreational Visitor Spending by Category in the Study Area (2019 dollars)

Category	Nonlocal Day Visit	Nonlocal Overnight Visit	Local Day Visit	Local Overnight Visit
Hotel/Motel/Bed and Breakfast	—	\$48.74	—	\$12.49
Camping	—	\$31.77	—	\$22.94
Restaurant	\$19.07	\$31.12	\$6.94	\$11.43
Groceries	\$10.10	\$55.32	\$6.13	\$67.34
Gas and oil	\$26.16	\$59.32	\$12.16	\$41.09
Other transportation	\$0.48	\$4.14	\$0.11	\$4.13
Entry fees	\$3.80	\$5.93	\$2.56	\$5.60
Recreation and entertainment	\$3.44	\$8.13	\$1.25	\$2.25
Sporting goods	\$3.03	\$11.15	\$3.14	\$10.10
Souvenirs and other expenses	\$2.53	\$8.47	\$0.67	\$2.02

Source: Stillings 2021

Community and Social Conditions

Affected Groups and Individuals

Specific stakeholder groups may have interests in the management of public lands or minerals. The socioeconomic study area is a diverse setting with portions having suburban or urban characteristics that have experienced increasing development in recent decades. Populations present in communities located within the CRVFO and GJFO decision area include groups and individuals who have similar values, but who may not represent a physical community or region, but rather a specific group for whom management of public land or minerals is of particular interest. Categorizing interests under the headings provided below allows for a simplified means of organizing the many perspectives from which the BLM management can be viewed. A general overview of the main interests of these groups is provided below. It should be noted that individuals can hold multiple interests and be stakeholders in various groups.

Residents and Private Landowners

Neighboring landowners adjacent to public lands are an important group to consider in the planning process. All landowner groups are concerned about how management decisions may affect the quality or quantity of local natural resources. Some common concerns include the quality and quantity of water and the protection of adjacent lands from wildland fire. Additional planning issues of importance include impacts from development on adjacent lands, rural lifestyle preservation, and public land recreational opportunities.

Subsistence Users

BLM-administered lands in the area contribute to the livelihoods of area residents through subsistence uses, as well as through market-based economic production and income generation. Public lands provide products of value to households at no or low cost (permit fees), such as fuelwood, wood posts, and livestock forage. Additional products with subsistence value may include fish, game, plants, berries, and seeds. Use of these products is often part of traditions that sustain local cultures (BLM 2014).

Livestock Producers

Currently, grazing authorizations on 417 grazing allotments are located on over 1.8 million of BLM-administered acres throughout both the CRVFO and GJFO planning area (BLM 2022b; BLM 2022c). Ranchers today face many challenges, including changes in federal regulations, economic issues, estate

planning, financial and business planning, and varying goals of family members in the business. Permittees may face increasingly stressful social situations as they try to balance their traditional lifestyles with demands from government agencies and other public users, such as recreationists.

Oil and Gas Leaseholders

Development of mineral resources is of primary importance in the study area economy. Details of the contributions of these resources are discussed above under **Section 3.6.2**, Energy and Mineral Development. It should be noted that oil and gas leaseholders include fractional leaseholders who are physically located out of the state or who reside in larger urban areas in Colorado. Leaseholders and working interest partners are particularly interested in keeping restrictions on leasing to a minimum to keep the costs and delays of production low.

Recreational Visitors

Recreation is a component of many lifestyles in the study area and it is an important element of the overall quality of life for many residents. The BLM administers land for a wide range of dispersed and casual use recreation, such as camping, hiking, and hunting. Recreationists are very diverse groups of people. Changes in recreation management can affect the people differently who engage in various activities.

Individuals and Groups Who Prioritize Resource Protection

Various individuals and groups at the local, regional, and national levels are interested in how the BLM administers public lands. Many of their concerns are regarding oil and gas development and the impacts on water quality, air quality, and visual quality. They value public lands for open space, wildlife, recreation, and scenic qualities, among other aspects.

Individuals and Groups Who Prioritize Resource Use

Due to the history of fossil fuels development in the study area, the local, state, and regional economy is tied to fossil fuels development. Interested parties include local, regional, and national energy development companies and local retailers that directly support construction, drilling, and operations for the industry. In addition, local retailers that offer lodging, food, and other services to oil and gas employees have an interest in management decisions affecting the level of permitted development. Fossil fuels development on public lands and minerals represents only a portion of total fossil fuels development, but it may have local or regional impacts.

Nonmarket Values

The value of goods traded in a market can be obtained from information on the quantity sold and its market price. However, for some goods supported by natural resources, markets do not exist for some resources, such as recreation opportunities and environmental services. Measuring their value is important, since without estimates, these resources may be implicitly undervalued, and decisions regarding their use may not accurately reflect their true value to society. Because these recreation and environmental values are not traded in markets, they can be characterized as nonmarket values.

Nonmarket values can be broken down into use and nonuse values. The use value of a nonmarket good is the value to society from the direct or indirect use of the asset; within the planning area this occurs through such activities as recreational fishing, hunting, and bird watching. The use of nonmarket goods often requires consumption of associated market goods, such as lodging, gas, and fishing equipment.

Economic benefits to individuals can be measured using consumer surplus values to visitors and recreationists. Consumer surplus is the maximum dollar amount, above any actual payments made, that a consumer would be willing to pay to enjoy a good and service. For example, any amount a recreationist would be willing to pay (such as price of the gasoline used to reach a location), to use an otherwise free resource, represents the nonmarket consumer surplus value of that resource to that consumer. Consumer surplus values for the planning area can be estimated by applying recreational usage values (for example, visitor days) to an estimate of consumer surplus values per person per day by recreation activity, derived from specific individual studies or from a 2017 report summarizing findings from 421 studies covering US and Canada from 1958 to 2015 (Rosenberger et al. 2017).

Nonuse, or passive use, values of a nonmarket good reflect the value of an asset beyond its current use. These can be described as existence, option, and bequest values. Existence values are the amount society is willing to pay to guarantee that an asset simply exists. An existence value for the CRVFO might be the value of knowing that undisturbed native plant habitat exists, or the value associated with undeveloped scenic landscapes. In addition to implicit existence values, society's willingness to pay to preserve resources for future use attaches additional passive use values. The potential benefits people would receive from future use are referred to as option values when future use is expected to occur within the same generation and as bequest values when preservation allows future generations to benefit from the resource. Bequest and option values may exist for many of the resources managed on BLM-administered lands within these six counties including plant species, WSRs and landscapes, heritage sites, and recreational trails. Economic benefits of such values to local economies can be estimated based impacts of proximity to open spaces on property values.

Preservation interests generally place a high nonmarket value on protective land designations, as these tend to preserve the valued natural resources. Whether or not these resources have use or nonuse value, a larger acreage of protective land designation likely will lead to a greater nonmarket value being achieved.

Nonmarket use and nonuse values can be distinguished by the methods used to estimate them. Use values are often estimated using revealed preference methods or stated preference methods, while nonuse values can be estimated only by using hypothetical methods. While use and nonuse values exist for the planning area, evaluation is not always feasible during the planning process. However, this does not preclude their consideration in the planning process.

Researchers have found that while both market and nonmarket benefits of oil and gas development are geographically widespread, many of the nonmarket costs are concentrated in the areas of drilling, creating disproportionate effects that may drive much of the controversy over the use of particular extraction methods such as hydraulic fracturing (Loomis and Haeefe, 2017). Perceptions of mineral resources' impacts on quality of life are highly subjective. A recent study in Colorado (Malin et al. 2019) indicates that divergent views regarding perceptions of quality of life and the perceived impacts of oil and gas production are driven by political ideology and party affiliation. Mineral development can also affect different aspects of the economy in both adverse and beneficial ways. A study in Colorado found home prices were reduced by approximately 35 percent when highly intensive drilling (or, around 16 wells) occurred within a mile of the house (Boslett et al. 2019). However, in a study completed on nonurban areas across the US, it was found that incomes were 11 percent higher in counties with shale development than their nonshale counterparts and "boom" counties had incomes that were 29 percent higher (Maniloff & Mastro Monaco, 2017).

Direct and Indirect Impacts

This section incorporates by reference the methods, assumptions, and impacts for Alternatives A, B, C, and D described in the 2014 and 2015 proposed RMPs/Final EISs (BLM 2014, Social and Economic Conditions, pages 4-763 through 4-789; BLM 2015a, Socioeconomics and EJ, pages 4-445 through 4-495). Additional information for Alternatives E and F is described below.

Alternatives A, B, C, and D

Appendix D, Table D-1, describes the number of wells that could be forgone (reduced) because of restrictions by alternative. In addition to Alternatives A, B, C, and D, **Appendix D** also contains the numbers for Alternatives E and F. **Appendix D**, Table D-2, describes the average annual economic effects per well from forgone well development using 2022 dollars. In addition to Alternatives A, B, C, and D, **Appendix D** also contains the numbers for Alternatives E and F.

Appendix E describes the economic modeling technical approach to support socioeconomic analysis.

Alternative E

Nature and Type of Effects

For the purposes of this analysis, the nature and type of effects on social and economic conditions are analyzed in terms of how management actions would affect fluid mineral development and production. The effects described here are most relevant to oil and gas-related development. Fluid mineral production is specific to mineral resource extraction and it involves different inputs than development, which includes exploration, drilling, and completion.

This supplemental analysis addresses potential effects from Alternative E (specific only to oil and gas leasing), with respect to the lands that are allocated as open or closed for oil and gas leasing. Specifically, Alternative E would close areas with no known, very low/low, or medium potential for oil and gas leasing, and areas that were considered for closure in the most restrictive alternative (Alternative C) from the proposed RMPs/Final EISs. This action would affect future leasing and development opportunities on a federal mineral estate, with associated effects on economic contributions from development and production. Potential economic impacts include changes in jobs, income, and economic output. Specifically, direct employment in the oil and gas sectors, as well as indirect contributions due to spending in these industries, would occur. In addition, tax revenues, the rates for which are described in the affected environment, could change. Though the analysis of economic contributions focuses on federal mineral development, impacts and economic contributions would not be constrained to a federal mineral estate; instead, they would be dispersed throughout the planning area and the wider region. Impacts could be directly related to proposed management, or they could be secondary to the initial economic impact.

Closure of areas with no known, very low/low, or medium oil and gas development potential could result in changes (albeit slight) in employment and income from oil and gas development. Secondary socioeconomic effects may stem from these changes, such as decreases in local population and area property values. This could impact housing, infrastructure, and government services. Depending on the percentage of labor required from the skilled workforce residing outside the socioeconomic study area, proposed management could change the demand for public services and housing. A decrease in workers who reside within the socioeconomic study area could reduce the amount of household goods and services consumed and housing investments spent locally.

General Economic Impacts

Economic effects from the reduction in oil and gas development likely would be spread throughout the socioeconomic study area. This is because employees would be drawn from the four-county area throughout which oil and gas production is reasonably foreseeable (that is, Eagle, Garfield, Mesa and Pitkin Counties). The effects on the local labor force engaged in oil production, as well as for oil and gas well drilling and completion, would be felt most acutely by those workers currently employed in the mineral development industry; those currently unemployed who might otherwise have gained employment in the industry; and, potentially, those who might have relocated on a temporary or permanent basis to the planning area.

Increases in unemployment often cause economic instability in rural communities, and the stress of financial uncertainty and instability can negatively affect the well-being of residents. During periods of economic downturns from reduced mineral development, increased rates of depression have been reported. In addition, demand for public services, including public assistance programs, alcohol and drug treatment, and law enforcement, also has been observed to increase during economic downturns following slowed activity and lower employment in mineral extraction industries (Shandro et al. 2011). Collectively, these factors can adversely affect community cohesion and the quality of life in affected communities (Klastic et al. 2022). However, it should be noted that job losses in some industries may be offset by job gains in other industries, although this tradeoff may occur outside of the local area economy. This is evidenced in statewide total employment numbers for the study area, which increased by approximately 5 percent from 2010 to 2020, while employment in the mining industry declined by approximately 57 percent over the same period, as shown in **Table 3.9-4** (BEA 2020b).

The potential for localized impacts on quality-of-life indicators due to loss in oil and gas development-related revenues and employment also could occur depending upon the level of anticipated reduction. BLM-administered actions that change development levels or have population growth-inducing effects could change the social setting and nonmarket contributions for communities and groups of interest. Those who prioritize resource conservation also could experience beneficial effects on values such as open space, viewshed, and recreational opportunities. In contrast, values important for mineral estate owners and those who prioritize resource use could be adversely affected by reduced mineral development.

Market and nonmarket values also can be discussed in the framework of ecosystem services. These represent goods and services that an ecosystem provides for human use. Impacts on ecosystem services from mineral development activities would include potential impacts on provisioning services¹⁰ of minerals and water; regulating services, such as maintenance of water and air quality; supporting services of habitat for wildlife; and information services related to aesthetic values and recreation opportunities. For example, regarding agricultural values, the potential decrease in availability or increasing costs of nitrogen-based fertilizers derived as a byproduct of oil and gas production activities¹¹ could affect the economic viability

¹⁰Provisioning services are the products directly obtained from ecosystems for basic human needs (for example, food, water, minerals, shelter, and fuel).

¹¹One of the by-products of oil refining is petroleum coke, also known as 'coke' or 'petcoke'. With over 80 percent carbon, petroleum coke is essential to the manufacture of fertilizer, where it undergoes a gasification process to create ammonia and urea ammonium nitrate. This is then used to create nitrogen fertilizers. In addition, natural gas is used as feedstock to make nitrogenous fertilizers and a range of chemical products including ammonia, hydrogen, and methanol.

of certain agricultural commodities, with impacts on agricultural producers, although the nature and extent of such effects is difficult to quantify given that they would extend to communities and economies beyond the four-county study area.

Modeled Impacts on Employment, Labor Income, and Value Added from Forgone Fluid Mineral Development and Production

Reasonable foreseeable development documents developed for the 2015 RMPs provide reasonable estimates of future oil and gas development in the RFD analysis area based on average annual production and development estimates. The level of actual production and development would vary, however, based on oil and gas market price. For instance, average monthly crude oil prices ranged from \$33.35 to \$122.45 per barrel from 2000 to 2020 (EIA 2021). Future development and production levels would be more likely to vary due to market conditions than they would in response to this RMP's management decisions. Under Alternative E, 568,300 acres of BLM-administered lands would be closed to future oil and gas leasing in the CRVFO (leaving 143,000 acres open). In addition, 998,000 acres of BLM-administered lands also would be closed to future oil and gas leasing in GJFO (leaving 239,000 open). Under this alternative, the BLM also would close to future oil and gas leasing all areas with no-known, low and medium oil and gas development potential and the areas considered for closure in Alternative C of the 2014 CRVFO and 2015 GJFO Final EIS. The high and very high-potential areas would remain open for oil and gas leasing, except for areas considered for closure in Alternative C of the Final EISs.

Under Alternative E, the effects of reduced oil and gas production in terms of forgone employment from foreseeable fluid mineral development would be approximately 11 jobs (most of which would be attributable to indirect employment)¹² annually per well or 333 jobs for all wells, over the 20-year timeframe from 2023 to 2042. This would represent approximately 18 percent of total oil and gas sector employment within the socioeconomic study area, which accounted for an estimated 1,804 jobs in 2020 (BLS 2021b). As shown in **Table 3.9-18**, annual losses in total labor income¹³ per well would be approximately \$516,000. The total value added¹⁴ that would be forgone on an annual basis per well under Alternative E would be approximately \$748,000. It should be noted that due to the impact analysis for planning (IMPLAN) model's computational linearity, effects can be accurately scaled according to changing market conditions. For example, employment and labor income effects would be proportionately higher or lower to those presented here depending on fluctuating costs of well development.

¹²Note: Employment numbers represent employment over a 1-year timeframe and not permanent employment. Additionally, this analysis does not assess net jobs, rather it presents total or gross jobs that would be supported by the forecast level of development. A person employed during project construction could, for example, have been employed elsewhere in the state beforehand, and, as a result, not all gross jobs represent a net additional job. A net jobs analysis would subtract job losses in other areas from the direct job gains of the new project to identify only the net increase in jobs.

¹³Labor income is defined as the sum of employee compensation (wages and benefits) and proprietor income. It represents the total value of all forms of employment income paid throughout a defined economy during a specified period of time.

¹⁴Value added is equivalent to the industry's contribution to gross domestic product. It represents the difference between output and the cost of intermediate inputs throughout a defined economy during a specified time period. It equals gross output (sales or receipts and other operating income, plus inventory change) minus intermediate inputs (consumption of goods and services purchased from other industries or imported). Total value added over the 20-year period is the sum of value added for each 5-year increment.

Table 3.9-18. Average Annual Economic Effects per Well from Forgone Well Development (2022 dollars) under Alternative E

Indicator	Total Annual Contributions (Drilling and Completion, per Well)	Total Annual Contributions (Drilling and Completion, All Wells)	Total for 20-Year Period (Drilling and Completion, All Wells)
Employment	11	333	6,669
Labor Income	\$516,255	\$15,461,850	\$309,236,992
Value Added	\$748,119	\$22,406,166	\$448,123,327
Total Output	\$2,287,910	\$68,522,908	\$1,370,458,150

Source: IMPLAN 2022

The effects of Alternative E on the economy from a reduction in foreseeable fluid mineral production would range from approximately \$40 million to more than \$43 million in direct labor income over the 20-year timeframe from 2023 to 2042. As shown in **Table 3.9-19**, total labor income (including direct, indirect, and induced) would range from approximately \$85 million during the 5-year period from 2023 to 2027 to approximately \$91 million during the 5-year period from 2028 to 2032. Total employment would range from 1,069 to 1,143 jobs over the 20-year period, and total value added over the 20-year period would be approximately \$346 million.

Table 3.9-19. Average Annual Economic Effects 2023–2042 (from Forgone Fluid Mineral Production) (2022 dollars) under Alternative E

Impact Period and Type ¹	Employment	Labor Income	Value Added
2023–2027			
Direct Effect	398	\$40,789,851	\$16,394,891
Indirect Effect	400	\$31,503,733	\$42,225,005
Induced Effect	271	\$12,841,777	\$24,262,686
Total Effect	1,069	\$85,135,361	\$82,882,582
2028–2032			
Direct Effect	425	\$43,609,091	\$17,528,044
Indirect Effect	428	\$33,681,152	\$45,143,437
Induced Effect	290	\$13,729,352	\$25,939,631
Total Effect	1,143	\$91,019,595	\$88,611,112
2033–2037			
Direct Effect	418	\$42,900,256	\$17,243,138
Indirect Effect	421	\$33,133,689	\$44,409,663
Induced Effect	285	\$13,506,191	\$25,518,001
Total Effect	1,125	\$89,540,136	\$87,170,802
2038–2042			
Direct Effect	418	\$42,839,472	\$17,218,707
Indirect Effect	420	\$33,086,742	\$44,346,740
Induced Effect	285	\$13,487,055	\$25,481,845
Total Effect	1,123	\$89,413,268	\$87,047,291

Source: IMPLAN 2022

¹Direct effects are reflective of production changes or expenditures made by producers/consumers as a result of an activity or policy. Indirect effects are the business-to-business purchases in the supply chain taking place in the region that stem from the initial industry input purchases and that occur as the industry specified spends money in the region with their suppliers. Induced effects are the values stemming from household spending of labor income, generated by the spending of the employees within the business supply chain and after removal of taxes, savings, and commuter income. It should be noted that long-term IMPLAN projections assume no major structural changes occurring in the underlying economies.

Impacts on Tax Revenue from Forgone Fluid Mineral Production

Estimated annual tax payments and revenues forgone from the anticipated reduction in oil and gas development under Alternative E are provided in **Table 3.9-20**.

Table 3.9-20. Estimated Annual Oil and Gas Royalty Revenues Forgone under Alternative E (2022\$)

5-Year Increments	Federal Royalty Payments Collected¹
2023–2027	\$48,871,653.06
2028–2032	\$52,249,476.72
2033–2037	\$51,400,198.70
2038–2042	\$51,327,370.79

Source: EIA 2022; US HR 2022

¹For federal royalty payments, gross revenue from oil and gas production is taxed at 16 and 2/3 percent; 50 percent of this is directed back to the State of Colorado.

Given the variability of future market conditions, the exact nature of economic effects is uncertain and it cannot be accurately predicted. However, the modeled results presented here illustrate a range of possible effects based on best available information obtained from industry and agency sources.

Alternative F

Alternative F would result in further reductions in federal lands available to oil and gas development. Given that IMPLAN is a linear computational model, a multiplier may be applied to the results presented above, which would yield a change in economic impacts proportional to the change in lands available for mineral production. For example, assuming that Alternative F would result in an increase of 30 percent more federal lands closed to mineral production, it is estimated that the resulting economic effects could be expressed as a multiple of 0.3 for each of the effects described under Alternative E.

Cumulative Impacts

Economic impacts from employment, labor income, economic output, and social setting changes could be compounded when considered with other concurrent or future projects in the planning area and surrounding area. Such current and future projects are not limited to federal projects and they include potential development on private, tribal, and state lands.

Reasonably foreseeable future projects could contribute to cumulative impacts. A quantitative analysis of the impacts on jobs, income, economic output, or demands on public services, as well as changes to the social setting, is not feasible due to uncertainties in the specific timing and location of development. The severity of cumulative effects would depend upon the timing of development of reasonably foreseeable future projects and whether they would occur concurrently with the development of oil and gas wells described in the analysis of impacts above.

The economic impacts of concurrent development projects could offset any losses in oil and gas development on federal lands and potentially still result in net economic gains for the region. Due to the reduced requirements for employment and ground-disturbing activities during the production phase, cumulative economic contributions, as well as impacts on the social setting and other resource uses, could be less than the impacts from drilling and development activities.

3.9.3 Environmental Justice

Affected Environment

Environmental justice refers to the fair treatment and meaningful involvement of all people, regardless of race, color, national origin, or income, with respect to the development, implementation, and enforcement of environmental laws, regulations, and policies. Fair treatment means that no racial, ethnic, or socioeconomic group should bear a disproportionate share of the negative environmental consequences of industrial, municipal, and commercial operations or the execution of federal, state, local, and tribal programs and policies (BLM 2005).

Executive Order 12898 requires each federal agency to “make achieving environmental justice part of its mission by identifying and addressing, as appropriate, disproportionately high and adverse human health or environmental effects of its programs, policies, and activities on minority populations and low-income populations” (EO 12898, 59 *Federal Register* 7629).

Environmental Justice Population Identification

The BLM incorporates EJ efforts into the planning process by identifying potential areas where proposed action(s) could have disproportionately high and adverse impacts on the health of minority populations, low-income communities, and tribes or their surrounding environment, and documenting findings and recommended solutions (BLM 2005). It also should be noted that the updated BLM direction on the identification of EJ communities was published via Instruction Memorandum (IM)2022-059 on September 22, 2022, which recognizes the diversity of communities, projects, and processes requires the flexibility to adopt multiple approaches or select more sensitive or context-specific approaches. To identify communities of potential EJ concern within the study area, the BLM used US Census Bureau data to analyze populations in each county.

The total minority populations are defined as the population who do not identify as white, of non-Hispanic descent. For this analysis, the BLM used a threshold analysis and meaningfully greater analysis. The 50 percent threshold analysis involves identifying any counties with a total minority population of 50 percent or greater. No counties met this threshold. For the meaningfully greater analysis, the BLM uses 110 percent of the minority percentage of the geographic reference area as the threshold for meaningfully greater (BLM 2022). In this case, 110 percent of the total minority population for Colorado (the reference area) is 35.7 percent. No communities met the criteria for the meaningfully greater analysis, therefore, there are no meaningfully greater minority populations identified in the four-county study area. However, it should be noted that both Eagle and Garfield Counties have minority populations slightly above and slightly below the state level and higher than the study area average. Federally recognized tribes are considered EJ populations and, as such, they are included in the analysis as separate minority populations.

Low-income populations are defined relative to the annual statistical poverty thresholds from the US Census Bureau (CEQ 1997). The CEQ guidance on EJ (CEQ 1997) defines low-income populations based on the US Census Bureau’s annual statistical poverty thresholds. CEQ guidance does not provide criteria for determining low-income populations as specifically as it does for minority populations; however, the BLM defines low-income individuals as people whose income is less than or equal to twice (200 percent of) the federal “poverty level” (BLM 2022). For this analysis, the BLM used a 50 percent threshold analysis and meaningfully greater analysis. For the 50 percent threshold analysis, areas in which the percent of the population living at or below 200 percent of the poverty line exceeds 50 percent are considered low-income populations. No counties within the study area met this threshold. For the low-income threshold

analysis, any study area that has a low-income percentage of the population equal to or higher than the reference area is identified as having a low-income EJ community of concern. Garfield and Mesa Counties met the low-income threshold and they have been identified as low-income EJ communities of concern for this analysis. Additionally, the study area as a whole has a low-income population higher than the reference area (Colorado) and it is identified as a low-income EJ community of concern.

Mineral development activities are often disproportionately co-located with communities of EJ concern. For instance, Zwickl (2019) found that the probability of a hydraulic fracturing well within 1.5 km (0.9 miles) of a block group increased with a higher portion of African American or Hispanic residents and decreased with a higher portion of other minorities in Colorado. The percentage of the population identified as low income and the percentage of minorities in the population are displayed for each county in **Table 3.9-21**. Within the planning area, several of the county populations analyzed are considered EJ populations.

Table 3.9-21. County-Level Populations for Environmental Justice Consideration (2020)

Geography	Environmental Justice Indicators (Race/Ethnicity and Poverty Status) as a Percentage of Total Population					Meets “Meaningfully Greater” Environmental Justice Threshold	
	Total Minority Population ¹	Hispanic or Latino Population	Native American Population	African American Population	Low Income ²	Minority Criteria Met ^{3,4}	Low-income Criteria Met ^{3,5}
	State and Study Area Overall						
Colorado	32.5	21.7	0.9	4.1	24.5	-	-
Study Area	24.4	20.1	0.7	0.7	27.6	No	Yes
Planning Area Counties							
Eagle	33.6	29.3	0.2	1.0	23.9	No	No
Garfield	32.2	28.6	0.5	0.5	25.0	No	Yes
Mesa	19.1	14.7	0.9	0.7	31.7	No	Yes
Pitkin	15.5	10.3	0.1	0.5	13.4	No	No

Source: US Census Bureau 2020c

¹Total minority population is calculated based on the total population minus those identifying as white, of non-Hispanic descent.

²Total low-income population is calculated by taking the estimate for individuals with income below 200 percent of the poverty level as a percentage of the total population for whom poverty status is determined.

³Calculated based on comparison with the state.

⁴For the meaningfully greater analysis for minority populations, any study area that has a total minority population equal to or higher than 110 percent of the reference area total minority population is identified as having a minority EJ community of concern. This table used the following calculation to identify the meaningfully greater state total minority population threshold (32.5x1.1 = 35.7 percent).

⁵For the Low-Income Threshold Analysis any study area that has a low-income percentage of the population equal to or higher than the reference area is identified as having a low-income EJ community of concern.

An additional level of screening for EJ communities was undertaken in which Census tracts identified in the EPA EJScreen application as being in the 95th percentile or higher for low-income of minority indicators were compared against reference populations at the state level. Results from this screening are presented in **Table 3.9-22**.

Table 3.9-22. Census Tract-Level Populations for Environmental Justice Consideration (2020)

Census Geography¹	BLM Field Office	Low Income	Minority
Reference Area (Colorado)	-	25%	34.7%
Garfield County	GJFO/CRVFO	26%	35.1%
Tract: 08045952002	CRVFO	28.0%	30.0%
Mesa County	GJFO	32%	21.6%
Tract: 08077000500		71.0%	25.0%
Tract: 08077000602		54.0%	22.0%
Tract: 08077001501		31.0%	18.0%
Eagle County	CRVFO	25%	34.4%
Tract: 08037000503		37.0%	48.0%
Pitkin County (no tracts met criteria)	CRVFO	16%	11.8%

Source: EPA 2022c

¹The use of smaller geographies, such as Census tracts (as opposed to counties), can produce sampling errors, which can overstate or understate actual demographic characteristics.

As noted above, a low-income community of concern is present if the percent of the total low-income population in one or more study area geographies is at or above the low-income threshold compared with the reference area, or it is at or above 50 percent overall. Several EJ communities of concern have been identified for the purposes of this analysis. As shown in **Table 3.9-22** above, the screening identified three Census tracts (08077000500, 08077000602 and 08077001501) within the GJFO and two Census tracts (08045952002 and 08037000503) within the CRVFO with low-income populations that met this criterion. A minority community of concern is present if the percentage of the population identified as belonging to a minority group in a study area is equal to or greater than 50 percent, or it is more than 10 percentage points higher than that of the reference area. This screening identified one Census tract in the CRVFO (08037000503) containing a minority population that met this criterion.

Direct and Indirect Impacts

This section incorporates by reference the methods, assumptions, and impacts for Alternatives A, B, C, and D described in the 2014 and 2015 proposed RMPs/Final EISs (BLM 2014, Social and Economic Conditions, pages 4-790 through 4-792; BLM 2015a, Socioeconomics and Environmental Justice, pages 4-445 through 4-495). Additional information for Alternatives E and F is below. The methods and assumptions also apply to Alternatives E and F.

Alternative E

Nature and Type of Effects

Impacts on identified EJ populations could include those on human health, air quality, water quality, and traditional cultural ways of life, as well as social and economic impacts. These impacts would be the same as those described under the relevant analysis for those resources for the general population; they are summarized in the discussion above.

EJ populations could be impacted should there be a sudden decline in the availability of employment opportunities for workers in these communities, which could result in geographic displacement of the labor force needed to support oil and gas development. Consequently, disparate impacts on EJ populations are possible. EJ populations in areas with the highest development potential could face a greater chance of being impacted compared with those populations that reside outside areas of high development

potential. As previously discussed, the potential decrease in availability or increasing costs of nitrogen-based fertilizers derived as a byproduct of oil production activities could affect the economic viability of certain agricultural commodities, with impacts on agricultural producers including those residing within communities of EJ concern. However, the nature and extent of such effects upon specific communities is difficult to quantify. Moreover, such effects could extend beyond the economy of the four-county study area.

These impacts are contingent on mineral development activity and its effect on housing markets, which cannot be projected at the RMP stage. Thus, these scenarios may not be an accurate portrayal of actual impacts. In addition, these are potential impacts not associated with the actual leasing decision under this supplemental EIS. Site-specific consideration of EJ implications will be considered during subsequent environmental analyses for oil and gas development.

The extent to which existing EJ populations are disproportionately affected by high and adverse human health or environmental impacts depends on whether EJ populations are more likely to be exposed to such impacts or they are more vulnerable to them. The exact level and intensity of impacts cannot be determined in the context of this RMP supplemental EIS. This is because information on future site-specific factors (for example, additional oil and gas well locations and their proximity to potential EJ populations) is not currently available at this planning level of analysis. The degree to which any implementation impacts would disproportionately or adversely affect EJ populations would be determined at the site-specific scale in future NEPA analyses.

Similarly, populations living or working near drilling and development could be exposed to hazardous materials or be affected by local air quality. BMPs applied at the site-specific level as stipulations to future development under any alternative could mitigate some of these impacts on affected populations.

In all future site-specific analyses, the BLM would continue to ensure opportunities for the participation of potentially affected low-income, minority, or tribal populations. If specific disproportionately high and adverse impacts are identified in subsequent NEPA analyses, the CRVFO and the GJFO would encourage members of affected populations to provide input on appropriate modifications to avoid or mitigate effects.

Alternative F

As described above under social and economic conditions, Alternative F would result in effects which would be comparable to Alternative E, but with intensity dependent upon the degree to which lands that would be open to mineral development would differ from Alternative E. Additionally, the extent to which impacts on EJ communities would be disproportionate would depend upon the locality of effects such as displacement of the labor force in these communities.

Cumulative Impacts

The cumulative impacts of past, current, and reasonably foreseeable oil and gas development projects, when combined with other industrial projects in the planning area, could cumulatively affect identified EJ populations throughout the planning area. Due to the uncertainty in specific development locations, the level of contributions to cumulative impacts under each alternative is uncertain. A further site-specific analysis would be required at the project level. This analysis would include an additional examination of the site-specific impacts of management actions on low-income, minority, and tribal populations.

3.10 IRREVERSIBLE AND IRRETRIEVABLE COMMITMENT OF RESOURCES

This section incorporates by reference the 2014 and 2015 proposed RMPs/Final EISs (BLM 2014, Irreversible and Irretrievable Commitment of Resources, pages 4-793; BLM 2015a, Irreversible and Irretrievable Commitment of Resources, pages 4-497 through 4-498).

Section 102(2)(C) of NEPA and 43 CFR 1506.16(a)(4) require a discussion of any irreversible or irretrievable commitments of resources that are involved in the proposal should it be implemented. An irretrievable commitment of a resource is one in which the resource or its use is lost for a period of time (for example, extraction of any locatable mineral ore or oil and gas). An irreversible commitment of a resource is one that cannot be reversed (for example, the extinction of a species or disturbance to protected cultural resources).

Oil and gas production would result in the irreversible and irretrievable loss of that oil and gas resource. In addition, oil and gas development and surface disturbance potentially could have irreversible and irretrievable effects on vegetation and wildlife habitat if reclamation efforts prove unsuccessful. Irreversible effects on soils and water quality also could occur depending on the implementation of mitigation measures and their efficacy. The associated surface disturbance from energy development is reclaimed after the resource is removed. However, surface disturbances from gas storage and for roads are a permanent encumbrance.

3.11 UNAVOIDABLE ADVERSE IMPACTS

This section incorporates by reference the 2014 and 2015 proposed RMPs/Final EISs (BLM 2014, Unavoidable Adverse Impacts, pages 4-794 through 4-795; BLM 2015a, Unavoidable Adverse Impacts, pages 4-496 through 4-497).

Section 102(C) of NEPA requires disclosure of any adverse environmental effects that cannot be avoided should the proposal be implemented. Unavoidable adverse impacts are those that remain following the implementation of mitigation measures or impacts for which there are no mitigation measures.

Surface-disturbing activities such as oil and gas development could result in unavoidable adverse impacts. Approved RMPs would have a variety of NSO and CSU stipulations to mitigate development. There still could be unavoidable impacts. For instance, soil impacts would occur from activities associated with oil and gas development, including compaction from increased vehicle traffic, well pads, and displacement of soils from the construction pipelines and roads. Development also could change vegetation and forage for wildlife and livestock because of well pads and roads.

Chapter 4. Consultation and Coordination

4.1 INTRODUCTION

This chapter describes the public outreach and participation opportunities associated with developing this supplemental EIS. The BLM consulted and coordinated with cooperating agencies, tribal governments, and other stakeholders.

The BLM conducts land use planning in accordance with NEPA requirements, CEQ regulations, and DOI and BLM policies and procedures for implementing NEPA. NEPA and associated laws, regulations, and policies require the BLM to seek public involvement early and throughout the planning process. This is to develop a reasonable range of alternatives and disclose the potential impacts of alternatives.

The BLM involved the public and other agencies by way of *Federal Register* notices, public meetings, individual contacts, media releases, and the project's ePlanning website (below).

4.2 PUBLIC SCOPING

Public scoping initiated public participation in the planning process for the supplemental EIS. Detailed information about public scoping can be found in the Colorado River Valley and Grand Junction Field Offices Supplemental EIS Scoping Report, which can be found on the project's ePlanning website.

4.2.1 Notice of Intent and Cooperating Agency Solicitation

Public scoping for this supplemental EIS began on June 23, 2022, with publication of the NOI in the *Federal Register* (*Federal Register* Volume 87, No. 120, June 23, 2022). The NOI informed the public of the BLM's intent to prepare a supplemental EIS to the 2014 CRVFO Final EIS and the 2015 GJFO Final EIS in response to the court order and settlement agreement for the CRVFO and to the remand of the GJFO ROD. The BLM posted the NOI on the project's ePlanning website (below). The BLM also solicited comments from known interested parties via US mail. Scoping ended on July 25, 2022.

On June 23, 2022, the BLM met with cooperating agencies to introduce the project. The BLM solicited comments from cooperating agencies during meetings on June 23 and July 14, 2022.

4.2.2 ePlanning Website

The BLM provides the public with information on the project's ePlanning website at: <https://eplanning.blm.gov/eplanning-ui/project/2016085/530>. The ePlanning website includes background documents and maps, GIS data files, public meeting information, and contact information.

4.2.3 Scoping Meetings

The BLM held virtual public scoping meetings on July 12 and 13, 2022. The virtual meetings included a PowerPoint presentation describing the purpose of the supplemental EIS, the approach, a preliminary new alternative, and opportunities for public involvement. Materials presented and additional information are on the project's ePlanning website.

4.2.4 Scoping Comments Received

The BLM received 44 unique written submissions with 495 substantive comments. The BLM also received 760 form letters, and two form letters with additional text. The largest number of comments were related

to alternatives, fluid minerals, climate change, lands with wilderness characteristics, air quality, socioeconomics, EJ, and special designations. Detailed information can be found in the scoping report on the project's ePlanning website.

4.3 FUTURE PUBLIC INVOLVEMENT

Public participation will be ongoing throughout the remainder of the supplemental EIS development. One substantial part of the process is providing an opportunity for the public to comment on this draft supplemental EIS during the comment period. In the final supplemental EIS, the BLM will respond to all substantive comments received during the 90-day public comment period. The BLM will issue the ROD after the release of the final supplemental EIS, the governor's consistency review, and any resolution of protests received on the final supplemental EIS.

4.4 TRIBAL CONSULTATION

Consultation with Native American tribes is part of the NEPA process and it is a requirement of FLPMA. The BLM invited the tribes to be cooperating agencies on February 24, 2022, and they asked for comments during the scoping period. On April 12, 2022, the BLM sent letters to the three Ute tribes -- Ute Mountain Ute Tribe, Southern Ute Tribe, and Ute Indian Tribe (Uinta and Ouray Reservation) -- initiating government-to-government consultation. Face-to-face consultation was conducted on April 19, 2022 and October 12, 2022.

The Southern Ute Indian Tribe and the Ute Indian Tribe requested additional information during the consultation. The BLM responded to the request and incorporated comments and information received from the tribes into the supplemental EIS. The BLM will provide tribes with copies of the draft supplemental EIS and final supplemental EIS. The BLM also will provide copies of the ROD/approved RMP.

4.5 COOPERATING AGENCIES

The BLM is the lead agency for the supplemental EIS. On February 24, 2022, the BLM wrote to 53 local governments, state agencies, and federal agencies inviting them to participate as cooperating agencies for the supplemental EIS. Twelve entities agreed to participate as cooperating agencies.

On February 28, the BLM wrote to the three tribal governments inviting them to participate as cooperating agencies for the supplemental EIS. No tribal governments formally agreed to participate as a cooperating agency.

The BLM is engaging with twelve cooperating agencies while producing this supplemental EIS. Cooperating agencies include six counties (Garfield, Mesa, Delta, Eagle, Rio Blanco, and Pitkin), two communities (Town of Eagle and Town of Parachute), two state agencies (Colorado Department of Natural Resources [including Colorado Parks and Wildlife and Colorado Oil and Gas Conservation Commission] and Colorado Department of Public Health and Environment), and two federal agencies (US Bureau of Reclamation and US Forest Service).

The BLM held cooperating agency meetings throughout the process thus far, and they will continue to meet with cooperating agencies throughout preparation of the final supplemental EIS.

4.6 COLORADO STATE HISTORIC PRESERVATION OFFICE CONSULTATION

The BLM will initiate Section 106 consultation with the SHPO under the NHPA to identify and protect cultural resources in the decision area. The BLM will continue to coordinate with the SHPO through the final supplemental EIS.

4.7 US FISH AND WILDLIFE SERVICE CONSULTATION

Note: This section will be completed as consultation is determined necessary or while in progress.

4.8 LIST OF PREPARERS

Table 4.8-1 lists the BLM staff that prepared the draft supplemental EIS.

Table 4.8-1. BLM Contributors

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Erin Jones	UCRD	NEPA review
Eric Coulter	UCRD	Public Affairs
Larry Sandoval	CRVFO	NEPA review
Allen Crockett	CRVFO	NEPA Team Lead, ACECs, Coal, Fish and Wildlife, Forestry, Oil Shale, Public Health and Safety, Special Status Species (Fish and Wildlife), Transportation Facilities, and Wildland Fire Management
Greg Wolfgang	GJFO	NEPA review
Christina Stark	GJFO	NEPA review
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Colin Brady	CRVFO	Vegetation
Vanessa Caranese	CRVFO	Groundwater, Oil and Gas, Paleontological Resources
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Jeremy Spetter	Upper Colorado River Interagency Fire Management Unit	Forestry and Wildland Fire Management
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Contractor staff (EMPSi) prepared the socioeconomic and EJ sections with the BLM direction. Contractor staff edited and formatted the supplemental EIS (**Table 4.8-2**).

Table 4.8-2. EMPSi Contributors

Name	Role
Josh Schnabel	Socioeconomics and Environmental Justice
Kate Krebs	Contractor Lead, Coordinated Editing, Formatting, and 508 compliance
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Appendix A. Acronyms and Abbreviations

ACEC	area of critical environmental concern
AEO	Annual Energy Outlook
AERMOD	American Meteorological Society/Environmental Protection Agency Regulatory Model
AIM	assessment, inventory, and monitoring
AR6	Sixth Assessment Report
AU	analytical unit
AUM	animal unit month
BLM	United States Department of the Interior, Bureau of Land Management
BLM-administered lands	surface acres administered by the Bureau of Land Management
BMP	best management practice
BOR	United States Department of the Interior, Bureau of Reclamation
CARMMS	BLM Colorado Air Resource Management Modeling Study
CARPP	Comprehensive Air Resource Protection Protocol
CDPHE	Colorado Department of Public Health and Environment
CEQ	Council on Environmental Quality
CFR	Code of Federal Regulations
CO ₂	carbon dioxide
CO _{2e}	carbon dioxide equivalent
COA	condition of approval
COGCC	Colorado Oil and Gas Conservation Commission
CPW	Colorado Parks and Wildlife (formerly CDOW [Colorado Division of Wildlife])
CSU	controlled surface use
CRCT	Colorado River cutthroat trout
CRVFO	Colorado River Valley Field Office
CSO	Colorado State Office
DOI	United States Department of the Interior
EIA	United States Energy Information Agency
EIS	environmental impact statement
EJ	environmental justice
EO	executive order
EPA	United States Environmental Protection Agency
ERMA	extensive recreation management area
ESA	Endangered Species Act of 1973
FAR	functioning at risk
FLPMA	Federal Land Policy and Management Act of 1976, as amended
Forest Service	United States Forest Service
Geothermal PEIS	Programmatic EIS for Geothermal Leasing in the Western US
GHG	greenhouse gas
GIS	geographic information system

GJFO	Grand Junction Field Office
GWP	global warming potential
HAP	hazardous air pollutant
HR	House of Representatives
I-70	Interstate 70
IEO	International Energy Outlook
IMPLAN	impact analysis for planning
IPCC	Intergovernmental Panel on Climate Change
IRA	Inflation Reduction Act of 2022
IWG	Interagency Working Group on the Social Cost of Greenhouse Gases
LAU	lynx analysis unit
LBCWHR	Little Book Cliffs Wild Horse Range
LHA	land health assessment
MAGICC	Model for the Assessment of Greenhouse Gas Induced Climate Change
MMI	multi-metric index
Mt	megatonnes (1 million metric tons)
NEPA	National Environmental Policy Act of 1969, as amended
NF	nonfunctional or not functioning
NHPA	National Historic Preservation Act of 1966
NOI	notice of intent
NPA	national programmatic agreement
NRCS	United States Department of Agriculture, Natural Resources Conservation Service
NRHP	National Register of Historic Places
NSO	no surface occupancy or surface-disturbing activities
NWSRS	National Wild and Scenic Rivers System
OHV	off-highway vehicle
ONRR	United States Department of the Interior, Office of Natural Resources Revenue
ORV	outstandingly remarkable value
PBO	programmatic biological opinion
PEIS	programmatic environmental impact statement
PFC	proper functioning condition (land health)
PILT	payment in lieu of taxes
RFD	reasonable foreseeable development
RMP	resource management plan
ROD	record of decision
ROW	right-of-way (lands and realty)
SC-GHG	social cost of greenhouse gases
SHPO	State Historic Preservation Office
SRMA	special recreation management area
SSA	species' status assessment

SSP	shared socioeconomic pathway
SWA	State wildlife area
TL	timing limitation (seasonal restriction)
UCRD	Upper Colorado River District
US	United States
USC	United States Code
USFWS	United States Department of the Interior, Fish and Wildlife Service
USGS	United States Geological Survey
VRI	visual resource inventory
VRM	visual resource management
WEO	World Energy Outlook
WSA	wilderness study area
WSR	wild and scenic river

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Appendix B. State of Colorado's 303 (D) List of Impaired Waters and Monitoring and Evaluation List in the CRVFO Planning Area

WBID	Segment Description	Portion	Colorado's Monitoring & Evaluation Parameter(s)	Clean Water Act Section 303(d) Impairment	303(d) Priority
Lower Colorado River Basin					
COLCLC01	Main stem of the Colorado River from the confluence with the Roaring Fork River to immediately below the confluence with Rifle Creek	Colorado River from Paradise Creek to below the confluence with Rifle Creek	Sediment	Temperature, Arsenic (Total)	H/L
		Colorado River from Roaring Fork to Paradise Creek	Sediment, Chloride	Temperature, Arsenic (Total)	H/L
COLCLC02a	Main stem of the Colorado River from immediately below the confluence with Rifle Creek to immediately above the confluence of Rapid Creek	All	Sediment	Arsenic (Total)	L
COLCLC04a	All tributaries, including wetlands, to the Colorado River from the confluence with the Roaring Fork River to a point immediately below the confluence with Parachute Creek, except for the specific listings in Segments 4b, 4c, 4d, 4e, 5, 6, 7a, 7b, 8, 9a, 9c, 10, 11a - h, and 12a	Tributaries to Colorado River, Roaring Fork to Parachute Creek, except for Mamm Creek and Alkali Creek	Temperature, total Phosphorus, Sulfate	Selenium (Dissolved)	M
		Mamm Creek and its east, middle, and west Mamm Creek tributaries from the sources to the confluence with the Colorado River	Temperature, Total Phosphorus, Selenium (Total)	Sulfate, Selenium (Dissolved), Macroinvertebrates	L/M/M
		South Canyon Creek sections above hot springs	Sulfate, Total Phosphorus	Iron (Total), Selenium (Dissolved)	H/M
COLCLC04b	South Canyon Hot Springs	All	Dissolved Oxygen, Lead (Dissolved)	N/A	N/A

B. State of Colorado's 303 (D) List of Impaired Waters and Monitoring and Evaluation List in the CRVFO Planning Area

WBID	Segment Description	Portion	Colorado's Monitoring & Evaluation Parameter(s)	Clean Water Act Section 303(d) Impairment	303(d) Priority
COLCLC04c	The main stem of South Canyon Creek from the South Canyon Hot Springs to the confluence with the Colorado River	South Canyon Creek from South Canyon Hot Springs to the Colorado River	<i>E. Coli</i> (May-October), Iron (Total)	Arsenic (Total)	L
COLCLC04e	Main stem of Dry Creek including all tributaries and wetlands from the source to immediately above the Last Chance Ditch	All	Cadmium (Dissolved), Copper (Dissolved), Selenium (Dissolved)	N/A	N/A
COLCLC07a	Main stem of Mitchell, Canyon, Elk, Garfield, Beaver, and Cache Creeks, including all tributaries and wetlands, from the boundary of the White River National Forest to their confluences with the Colorado River. Battlement Creek from the most downstream boundary of the BLM-administered lands to the confluence with the Colorado River.	Garfield Creek and its tributaries from the headwaters to the confluence with the Colorado River	Iron (Total)	N/A	N/A
		Elk Creek and its tributaries from the White River National Forest boundary to the confluence with the Colorado River	N/A	Cadmium (Total)	L
COLCLC07b	Main stem of Divide Creek, including all tributaries and wetlands, from the boundary of the White River National Forest to the confluence with the Colorado River	All	Arsenic (Total)	N/A	N/A
COLCLC10	West Rifle Creek, including all tributaries and wetlands, from the source to Rifle Gap Reservoir. East Rifle Creek, including all tributaries and wetlands, from the White River National Forest boundary to Rifle Gap Reservoir. Rifle Creek, including all tributaries and wetlands, from Rifle Gap Reservoir to the confluence with the Colorado River.	East Rifle Creek from the White River National Forest boundary to Rifle Gap Reservoir. Rifle Creek from Rifle Gap Reservoir to the Colorado River	<i>E. coli</i>	Arsenic (Total), Macroinvertebrates	L/H
		West Rifle Creek and tributaries	<i>E. coli</i>	Iron (Total), Arsenic (Total)	H/L

B. State of Colorado's 303 (D) List of Impaired Waters and Monitoring and Evaluation List in the CRVFO Planning Area

WBID	Segment Description	Portion	Colorado's Monitoring & Evaluation Parameter(s)	Clean Water Act Section 303(d) Impairment	303(d) Priority
COLCLC11c	Main stem of Parachute Creek from the confluence of the West and East Forks to the confluence with the Colorado River. All tributaries and wetlands to Parachute Creek on the west side of Parachute Creek from the confluence to the East and West Forks to the confluence with the Colorado River.	All	N/A	Arsenic (Total)	H
COLCLC20	Rifle Gap Reservoir, Harvey Gap Reservoir, and Vega Reservoir	Rifle Gap Reservoir	N/A	Fish (Mercury), Arsenic (Total)	H/H
		Harvey Gap Reservoir	N/A	Temperature, Arsenic (Total)	H/H
Upper Colorado River Basin					
COUCEA02	Main stem of the Eagle River from the source to the compressor house bridge at Belden	Main stem of the Eagle River from the source to Peterson Creek	N/A	Arsenic (Total)	H
		Eagle River below Peterson Creek to compressor house bridge at Belden	N/A	Zinc (Dissolved), Copper (Dissolved), Arsenic (Total)	H/H/H
COUCEA03	All tributaries to the Eagle River, including wetlands, from the source to the compressor house bridge at Belden, except for the specific listing in Segment 4 and those waters included in Segment 1	All	N/A	Arsenic (Total)	L
COUCEA05a	Main stem of the Eagle River from the compressor house bridge at Belden to a point immediately above the Highway 24 Bridge near Tigiwon Road	Main stem of the Eagle River from the compressor house bridge in Belden to a point located 600 feet upstream of Rock Creek	N/A	Arsenic (Total)	H
		Main stem of the Eagle River from a point located 600 feet upstream of Rock Creek to a point immediately above the Highway 24 Bridge near Tigiwon Road	N/A	Iron (Dissolved), Cadmium (Dissolved), Arsenic (Total)	L/H/H

B. State of Colorado's 303 (D) List of Impaired Waters and Monitoring and Evaluation List in the CRVFO Planning Area

WBID	Segment Description	Portion	Colorado's Monitoring & Evaluation Parameter(s)	Clean Water Act Section 303(d) Impairment	303(d) Priority
COUCEA05b	Main stem of the Eagle River from a point immediately above the Highway 24 Bridge near Tigiwon Road to a point immediately above the confluence with Martin Creek	All	N/A	Arsenic (Total)	H
COUCEA05c	Main stem of the Eagle River from a point immediately above Martin Creek to a point immediately above the confluence with Gore Creek	All	N/A	Arsenic (Total), Iron (Dissolved)	H/H
COUCEA06	All tributaries to the Eagle River, including all wetlands, from the compressor house bridge at Belden to a point immediately below the confluence with Lake Creek, except for the specific listings in Segments 1, 7a, 7b, and 8	Lake Creek from below the confluence with East and West Lake Creek to the mouth	N/A	Arsenic (Total), Macroinvertebrates (Provisional)	L/L
		Beaver Creek from the confluence with Wayne Creek to the mouth	N/A	Arsenic (Total), Macroinvertebrates (Provisional)	L/L
		Red Sandstone Creek from the USFS boundary to the north side of I-70 Frontage Road	N/A	Arsenic (Total)	L
		Red Sandstone Creek from the north side of I-70 Frontage Road to the confluence with Gore Creek	N/A	Arsenic (Total), Macroinvertebrates (Provisional)	L/L
		Black Gore Creek adjacent to I-70 above Miller Creek.	N/A	Arsenic (Total), Macroinvertebrates	H/H
		Rock Creek from the source to the confluence with the Eagle River	N/A	Arsenic (Total), Zinc (Dissolved), Copper (Dissolved), Cadmium (Dissolved)	L/H/H/H

B. State of Colorado's 303 (D) List of Impaired Waters and Monitoring and Evaluation List in the CRVFO Planning Area

WBID	Segment Description	Portion	Colorado's Monitoring & Evaluation Parameter(s)	Clean Water Act Section 303(d) Impairment	303(d) Priority
COUCEA06 (cont.)	(cont.)	All tributaries to the Eagle River, including all wetlands, from above the compressor house bridge at Belden (39.526879, -106.394950) to a point immediately below the confluence with Lake Creek, except for the specific listings in Segments: 1, 7a, 7b, and 8. With other exceptions to Black Gore and Rock Creek.	N/A	Arsenic (Total)	L
		Black Gore Creek from a point immediately below its confluence with Miller Creek to a point immediately above its confluence with Timber Creek.	N/A	Arsenic (Total), Sediment	L/H
		Black Gore Creek from a point immediately below its confluence with Timber Creek to the confluence with Gore Creek	N/A	Arsenic (Total)	L
COUCEA07a	Main stem of Cross Creek from the source to a point immediately below the Minturn Middle School, except for those waters included in Segment I	All	Copper (Dissolved)	N/A	N/A
COUCEA08	Main stem of Gore Creek from the confluence with Black Gore Creek to the confluence with the Eagle River	All	N/A	Macroinvertebrates (Provisional), Arsenic (Total)	L/L
COUCEA09a	Main stem of the Eagle River from Gore Creek to a point immediately below the confluence with Squaw Creek	Eagle River from Gore Creek to the confluence with Berry Creek	N/A	Arsenic (Total)	L
		Eagle River from the confluence with Berry Creek to the confluence with Squaw Creek	N/A	Arsenic (Total)	L
		Eagle River from Squaw Creek to Ute Creek	N/A	Arsenic (Total)	L
		Eagle River from Ute Creek to Rube Creek	N/A	Arsenic (Total)	H

B. State of Colorado's 303 (D) List of Impaired Waters and Monitoring and Evaluation List in the CRVFO Planning Area

WBID	Segment Description	Portion	Colorado's Monitoring & Evaluation Parameter(s)	Clean Water Act Section 303(d) Impairment	303(d) Priority
COUCEA09c	Main stem of the Eagle River from a point immediately below the confluence with Rube Creek to the confluence with the Colorado River	Main stem of the Eagle River from a point immediately below the confluence with Rube Creek to Warren Gulch (39.6785, -106.7645).	Nitrite	Arsenic (Total)	L
		Main stem of the Eagle River from a point immediately below the confluence with Warren Gulch (39.6785, -106.7645) to the confluence with the Colorado River	N/A	Nitrite, Arsenic (Total)	H/L
COUCEA10a	All tributaries to the Eagle River, including all wetlands, from a point immediately below the confluence with Lake Creek to the confluence with the Colorado River, except for specific listings in Segments 10b, 11, and 12, and those waters included in Segment 1	All tributaries to the Eagle River, including all wetlands, from a point immediately below the confluence with Lake Creek to the confluence with the Colorado River, except for specific listings in Segments 10b, 11, and 12, and those waters included in Segment 1	Dissolved Oxygen	N/A	N/A
		Eby Creek and tributaries	Selenium (Dissolved), Arsenic (Total)	Sulfate	L
COUCEA12	Main stem of Brush Creek, from the source to the confluence with the Eagle River, including the East and West Forks	All	Dissolved Oxygen	N/A	N/A
COUCRF02	Main stem of the Roaring Fork River, including all tributaries and wetlands, from the source to a point immediately below the confluence with Hunter Creek, except for those tributaries included in Segment 1	All	Copper (Dissolved)	N/A	N/A

B. State of Colorado's 303 (D) List of Impaired Waters and Monitoring and Evaluation List in the CRVFO Planning Area

WBID	Segment Description	Portion	Colorado's Monitoring & Evaluation Parameter(s)	Clean Water Act Section 303(d) Impairment	303(d) Priority
COUCRF03a	Main stem of the Roaring Fork River, from a point immediately below the confluence with Hunter Creek, to a point immediately below the confluence with the Frying Pan River. All tributaries to the Roaring Fork River, including wetlands, from a point immediately below the confluence with Hunter Creek to the confluence with the Colorado River, except for those tributaries included in Segment 1, 3b, 3d, and 4-10b.	Roaring Fork from the confluence with Hunter Creek to the confluence of Trentaz Gulch	Arsenic (Total)	N/A	N/A
		West Sopris Creek and tributaries	Arsenic (Total)	N/A	N/A
		Capitol Creek	Arsenic (Total)	N/A	N/A
		Cattle Creek from Fisher Creek to the mouth	Arsenic (Total)	N/A	N/A
		Main stem of the Roaring Fork River, from a point immediately below the confluence with Trentaz Gulch, to a point immediately below the confluence with the Frying Pan River. All tributaries to the Roaring Fork River, including wetlands, from a point immediately below the confluence with Hunter Creek to the confluence with the Colorado River, except for those tributaries included in Segments: 1, 3b, 3d, 4-10b, West Sopris, Capital, Roaring Fork, Cattle Creek, and Three Mile Creek portions	Arsenic (Total)	N/A	N/A
		Three Mile Creek, including all tributaries, from the source to the Roaring Fork River	Temperature	N/A	N/A
		Landis Creek from the Hopkins Ditch (39.522138, -107.223479) to its confluence with Red Canyon	Iron (Total)	N/A	N/A
COUCRF03b	Main stem of Red Canyon and all tributaries and wetlands from the source to the confluence with the Roaring Fork River, except for Landis Creek from its source to the Hopkins Ditch Diversion				

B. State of Colorado's 303 (D) List of Impaired Waters and Monitoring and Evaluation List in the CRVFO Planning Area

WBID	Segment Description	Portion	Colorado's Monitoring & Evaluation Parameter(s)	Clean Water Act Section 303(d) Impairment	303(d) Priority
COUCRF03c	Main stem of the Roaring Fork River from a point immediately below the confluence with the Frying Pan River to the confluence with the Colorado River	Roaring Fork below the confluence with the Crystal River to the mouth	N/A	Temperature	H
		Roaring Fork River from the Frying Pan River to the Crystal River	N/A	Temperature	H
COUCRF03d	Main stem of Cattle Creek, including all tributaries and wetlands, from the source to the most downstream White River National Forest boundary	Cattle Creek from Bowers Gulch to the most downstream White River National Forest boundary	N/A	Macroinvertebrates (Provisional)	L
COUCRF07	All tributaries to the Frying Pan River, including all wetlands, except for those tributaries included in Segment I	South Fork Frying Pan River from the transbasin diversion to the confluence with an unnamed tributary (39.251280N, -106.594420W)	N/A	Macroinvertebrates (Provisional)	H
COUCRF12	All lake and reservoir tributaries to the Roaring Fork River, except for specific listings in Segment I I	Ruedi Reservoir	N/A	Arsenic (Total)	L
COUCUC03	Main stem of the Colorado River from the outlet of Lake Granby to the confluence with Roaring Fork River	Colorado River from Gore Canyon to Derby Creek	N/A	Temperature	H

Source: CDPHE 2021b

Appendix C. State of Colorado's 303 (D) List of Impaired Waters and Monitoring and Evaluation List in the GJFO Planning Area

Waterbody ID	Segment Description	Portion	Colorado's Monitoring & Evaluation Parameter(s)	Clean Water Act Section 303(d) Impairment	303(d) Priority
Lower Colorado River Basin					
COLCLC02a	Main stem of the Colorado River from immediately below the confluence with Rifle Creek to immediately above the confluence of Rapid Creek	All	Sediment	Arsenic (Total)	L
COLCLC02b	Main stem of the Colorado River from a point immediately above the confluence with Rapid Creek to immediately above the confluence of the Gunnison River	Main stem of the Colorado River from Rapid Creek to Gunnison River except for the Humphrey Backwater area Humphrey Backwater area	Sediment Sediment, Manganese (Dissolved), Nitrite, Sulfate	N/A Arsenic (Total), Selenium (Dissolved)	N/A L/H
COLCLC03	Main stem of the Colorado River from immediately above the confluence of the Gunnison River to the Colorado-Utah state line	All	N/A	Iron (Total)	H
COLCLC13a	All tributaries to the Colorado River, including wetlands, from a point immediately below the confluence of Roan Creek to the Colorado/Utah border, except for the specific listings in Segments 13b through 19.	Sulphur Gulch and tributaries	Copper (Dissolved), Iron (Total), Lead (Dissolved), Selenium (Dissolved)	N/A	N/A

C. State of Colorado's 303 (D) List of Impaired Waters and Monitoring and Evaluation List in the GJFO Planning Area

Waterbody ID	Segment Description	Portion	Colorado's Monitoring & Evaluation Parameter(s)	Clean Water Act Section 303(d) Impairment	303(d) Priority
COLCLC13b	All tributaries to the Colorado River, including wetlands, from the Government Highline Canal Diversion to a point immediately below Salt Creek, and downgradient from the: Government Highline Canal, Orchard Mesa Canal No. 2, Orchard Mesa Drain, Stub Ditch, and northeast Colorado National Monument boundary	Salt Creek and tributaries below the lake and reservoir, including Mack Wash	N/A	Sediment, Selenium (Dissolved), Iron (Total)	L/M/M
		Adobe Creek, Leach Creek, and tributaries below canal	N/A	<i>E. coli</i> , Selenium (Dissolved), Iron (Total)	H/M/M
		Indian Wash	NA	Selenium (Dissolved), Iron (Total)	M/M
		Unnamed tributary to the Colorado River from its source to its confluence with the Colorado River near 39.081, - 108.592	<i>E. coli</i>	Selenium (Dissolved), Iron (Total)	M/M
		All tributaries to the Colorado River from Government Highline Canal Diversion to below Salt Creek, and downgradient from: Government Highline Canal, Orchard Mesa Canal No. 2, Orchard Mesa Drain, Stub Ditch and northeast Colorado National Monument boundary, except: Salt, Adobe, Leach Creeks, Indian Wash, Unnamed Tributary, and Mack Wash	<i>E. coli</i>	Selenium (Dissolved), Iron (Total)	M/M
COLCLC14b	Clear Creek, including all tributaries and wetlands, from a point immediately below the confluence with Tom Creek to the confluence with Roan Creek. Roan Creek, including all tributaries and wetlands, from a point immediately above the confluence with Clear Creek to a point immediately below the confluence with Kimball Creek	All	Iron (Total), <i>E. coli</i>	N/A	N/A

C. State of Colorado's 303 (D) List of Impaired Waters and Monitoring and Evaluation List in the GJFO Planning Area

Waterbody ID	Segment Description	Portion	Colorado's Monitoring & Evaluation Parameter(s)	Clean Water Act Section 303(d) Impairment	303(d) Priority
COLCLC14c	Main stem of Roan Creek, including all tributaries and wetlands, from a point immediately below the confluence with Kimball Creek to the confluence with the Colorado River	North, South, and main stem of Dry Fork, including tributaries	Arsenic (Total)	Manganese (Dissolved), Selenium (Dissolved)	L/L
		Roan Creek and tributaries, including: Conn Cr, Logan Wash, Bloat Gulch, and Gibler Gulch	Arsenic (Total)	Manganese (Dissolved), Iron (Total)	L/H
COLCLC15a	Main stem of Plateau Creek from its source to the inlet of Vega Reservoir. All tributaries and wetlands to Plateau Creek from its source to a point immediately above the confluence with Buzzard Creek. Kimball Creek, Grove Creek, Big Creek, Cottonwood Creek, Bull Creek, Spring Creek, Coon Creek, and Mesa Creek, including all wetlands and tributaries, from their sources to their confluences with Plateau Creek. The main stem of Buzzard Creek, including all tributaries and wetlands, within the Grand Mesa National Forest.	All	Iron (Total)	Arsenic (Total)	L
COLCLC15c	Main stem of Plateau Creek from the outlet of Vega Reservoir to a point immediately below the confluence with Buzzard Creek	All	N/A	Arsenic (Total)	L
COLCLC15d	Main stem of Buzzard Creek from the Grand Mesa National Forest boundary to its confluence with Plateau Creek	All	N/A	Arsenic (Total)	L
COLCLC16	Plateau Creek, including all tributaries and wetlands, from a point immediately below the confluence with Buzzard Creek, to the confluence with the Colorado River, excluding specific listings in segment 15	All	Iron (Total)	N/A	N/A

C. State of Colorado's 303 (D) List of Impaired Waters and Monitoring and Evaluation List in the GJFO Planning Area

Waterbody ID	Segment Description	Portion	Colorado's Monitoring & Evaluation Parameter(s)	Clean Water Act Section 303(d) Impairment	303(d) Priority
COLCLC17a	Main stem of Rapid Creek, including all tributaries and wetlands, from its source to a point immediately below the confluence with Cottonwood Creek including Kruzen Springs	Rapid Creek, including all tributaries and wetlands, from its source to below the confluence with Cottonwood Creek (39.130512, -108.301028), including Kruzen Springs	N/A	Arsenic (Total)	L
COLCLC19	All lake and reservoir tributaries to the Colorado River from a point immediately below the confluence of the Colorado River and Parachute Creek to the Colorado-Utah border, except for specific listings in segments 9b, 13c, 20, and 21. This segment includes Highline Reservoir.	West Lake in James M. Robb Colorado River State Park	N/A	Selenium (Dissolved)	H
COLCLC20	Rifle Gap Reservoir, Harvey Gap Reservoir, and Vega Reservoir	Vega Reservoir	N/A	Arsenic (Total)	H
Gunnison River Basin					
COGULG02	Main stem of the Gunnison River from Highway 65 (38.772574, -108.002634) to the confluence with the Colorado River	Main stem of the Gunnison River from a point immediately above the confluence with the Uncompahgre River to the confluence with the Colorado River.	Sediment	<i>E. coli</i> , Sulfate, Arsenic (Total)	H/L/L
COGULG04a	All tributaries to the Gunnison River, including all wetlands which are not within National Forest boundaries, from the outlet of Crystal Reservoir to the confluence with the Colorado River, except for specific listings in the North Fork of the Gunnison River sub-basin, the Uncompahgre River sub-basin, and in Segments: 3, 4b, 4c, 5a, 5b, 6a, 6b, 6c, 7, 8a, 8b, 10, and 12.	Whitewater Creek from below Brandon Ditch to the confluence with the Gunnison River	N/A	Manganese (Dissolved), Sulfate	L/L
		All tributaries to the Gunnison River, including all wetlands, to which a TMDL does apply and which they are not within National Forest boundaries, from the outlet of Crystal Reservoir to the confluence with the Colorado River, except for: specific listings in the North Fork of the Gunnison River sub-basin, Uncompahgre River sub-basin, Segments (3, 4b, 4c, 5 through 8b, 10a, 10b, and 12), Cummings Gulch, Whitewater Creek below Brandon Ditch, Wells Gulch, and Peach Valley Creek.	Iron (Total), <i>E. coli</i>	N/A	N/A

C. State of Colorado's 303 (D) List of Impaired Waters and Monitoring and Evaluation List in the GJFO Planning Area

Waterbody ID	Segment Description	Portion	Colorado's Monitoring & Evaluation Parameter(s)	Clean Water Act Section 303(d) Impairment	303(d) Priority
COGULG04b	All tributaries to Reeder, Hollenbeck, and Juniata Reservoirs, and the main stem of Kannah Creek below the point of diversion for public water supply (38.961321, -108.229830)	All tributaries to Reeder, Hollenbeck and Juniata Reservoirs, excluding Kannah Creek.	Iron (Total)	N/A	N/A
		Main stem of Kannah Creek below the point of diversion for public water system (38.961321, -108.229830)	Iron (Total)	N/A	N/A
COGULG06a	Main stem of Escalante Creek from the National Forest boundary to the Delta/Montrose County line (38.668215, -108.328144); main stem of Little Dominguez from the National Forest boundary to Big Dominguez Creek; main stem of Big Dominguez from the National Forest boundary to the Gunnison River.	Main stem of Escalante Creek from the National Forest boundary to the Delta County line; main stem of Little Dominguez from the National Forest boundary to Big Dominguez Creek; main stem of Big Dominguez from the National Forest boundary to the Gunnison River.	<i>E. coli</i>	N/A	N/A
COGULG16	All lakes and reservoirs that are tributaries to the Gunnison River, from the outlet of Crystal Reservoir to the confluence with the Colorado River, and not within National Forest boundaries, excluding the listings in the North Fork of the Gunnison sub-basin, the Uncompahgre River sub-basin, and Segments 9, 13, and 19. This segment includes: Poison Springs Reservoir, Dry Fork Reservoir, Delta Reservoir, Winkler Reservoir, Desert Reservoir, Alkali Reservoir, Cheney Reservoir, Juniata Reservoir, Hallenbeck Reservoir, Reeder Reservoir, Enochs Lake, Gobbo Reservoir, Schrader Reservoir, and King Reservoir.	Maggio Ponds	Arsenic (Total)	N/A	N/A
		Peters Ponds 1, 2, 3, and 4.	Selenium (Dissolved)	N/A	N/A

C. State of Colorado's 303 (D) List of Impaired Waters and Monitoring and Evaluation List in the GJFO Planning Area

Waterbody ID	Segment Description	Portion	Colorado's Monitoring & Evaluation Parameter(s)	Clean Water Act Section 303(d) Impairment	303(d) Priority
COGULD05	Main stem of West Creek from the source to the confluence with the Dolores River. Roc Creek, including all tributaries and wetlands from the Manti-La Sal National Forest boundary to the confluence with the Dolores River. La Sal Creek, including all tributaries and wetlands, from the Utah/Colorado border to the confluence with the Dolores River. Mesa Creek, including all tributaries and wetlands, from the Uncompahgre National Forest boundary to the confluence with the Dolores River.	Main stem of West Creek from the source to the confluence with the Dolores River	N/A	Arsenic (Total)	L

Source: CDPHE 2021b

Appendix D. Wells Forgone and Average Annual Economic Effects Per Well from Forgone Well Development

The CRVFO Proposed RMP/Final EIS assumes 5,318 wells potentially could be drilled over a 20-year period. The GJFO Proposed RMP/Final EIS assumes 3,940 wells potentially could be drilled over a 20-year period. The potential number of wells reduced (forgone) because of restrictions by alternative is shown in the following table. **Table D-1** shows the total for the combined field offices over a 20-year period and the number per year.

Table D-1. Number of Wells Forgone from the Potential Over 20 Years and Per Year

	A	B	C	D	E	F
CRVFO	0	56	56	0	58	76
GJFO	0	3	369	5	541	703
Total	0	59	425	5	599	779
Per Year	0	2.95	21.25	.25	29.95	38.94

Table D-2 describes the average annual economic effects per well from forgone well development using 2022 dollars. The table is for the combined CRVFO and GJFO decision areas. The effects of reduced oil and gas production in terms of forgone employment from foreseeable fluid mineral development annually would be approximately 11 jobs (most of which would be attributable to indirect employment)¹⁵ per well. Losses in total labor income¹⁶ per well annually would be approximately \$516,000. The total value added¹⁷ that would be forgone on an annual basis per well would be approximately \$748,000. (See **Section 3.9.2, Social and Economic Conditions**, for additional information.)

Table D-2. Combined CRVFO and GJFO Average Annual Economic Effects per Well from Forgone Well Development (2022 dollars) under All Alternatives

Indicator	Total Annual Contributions (Drilling and Completion per Well)	A		B		C		D		E		F	
		Total Annual Contributions (Drilling and Completion for All Wells)	Total for 20-Year Period (Drilling and Completion for All Wells)	Total Annual Contributions (Drilling and Completion for All Wells)	Total for 20-Year Period (Drilling and Completion for All Wells)	Total Annual Contributions (Drilling and Completion for All Wells)	Total for 20-Year Period (Drilling and Completion for All Wells)	Total Annual Contributions (Drilling and Completion for All Wells)	Total for 20-Year Period (Drilling and Completion for All Wells)	Total Annual Contributions (Drilling and Completion for All Wells)	Total for 20-Year Period (Drilling and Completion for All Wells)	Total Annual Contributions (Drilling and Completion for All Wells)	Total for 20-Year Period (Drilling and Completion for All Wells)
Employment	11	0	0	33	657	237	4,732	3	56	333	6,669	433	8,670
Labor Income (\$)	516,255	0	0	1,522,953	30,459,069	10,970,428	219,408,550	129,064	2,581,277	15,461,850	309,236,992	20,100,404	402,008,089
Value Added (\$)	748,119	0	0	2,206,951	44,139,026	15,897,530	317,950,608	187,030	3,740,595	22,406,166	448,123,327	29,128,016	582,560,326
Total Output (\$)	2,287,910	0	0	6,749,335	134,986,696	48,618,090	972,361,793	571,978	11,439,551	68,522,908	1,370,458,150	89,079,780	1,781,595,596

¹⁵Note: Employment numbers represent employment over a one-year timeframe and no permanent employment. Additionally, this analysis does not assess net jobs, rather it presents total or gross jobs that would be supported by the forecast level of development. A person employed during project construction could, for example, have been employed elsewhere in the state beforehand, and, as a result, not all gross jobs represent a net additional job. A net jobs analysis would subtract job losses in other areas from the direct job gains of the new project to identify only the net increase in jobs.

¹⁶Labor income is defined as the sum of employee compensation (wages and benefits) and proprietor income. It represents the total value of all forms of employment income paid throughout a defined economy during a specified period of time.

¹⁷Value added is equivalent to the industry's contribution to gross domestic product. It represents the difference between output and the cost of intermediate inputs throughout a defined economy during a specified time period. It equals gross output (sales or receipts and other operating income, plus inventory change) minus intermediate inputs (consumption of goods and services purchased from other industries or imported). Total value added over the 20-year period is the sum of value added for each 5-year increment.

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Appendix E. Economic Modeling Technical Approach

The following provides an overview of the approach to economic modeling used to support the socioeconomic analysis for the supplemental EIS covering the BLM RMP for the Colorado River Valley and Grand Junction Field Offices in western Colorado. In addition to a description of model inputs and rationale regarding how they were derived, modeled results are also presented. The economic region was defined as the following four counties within the State of Colorado: Eagle, Garfield, Mesa and Pitkin Counties. The proposed action was analyzed. It would entail the closure of areas with no known, very low/low, or medium potential for oil and gas development. To support the analysis of socioeconomic impacts within the supplemental EIS, an input-output model, Impact Analysis for Planning (IMPLAN), was utilized. The model provides a quantitative representation of the production relationships between individual economic sectors. It was used to simulate economic effects on local economies from implementation of the action. Model inputs included direct pending in the oil and gas sector-related spending that would be forgone under the proposed action. Resulting in estimated local economic impacts by alternative that were presented in the analysis in the supplemental EIS.

PRODUCTION ESTIMATES

Production estimates were derived from EIA-reported reference case oil and gas supply for the lower 48 and onshore category in the Rocky Mountain region. High and low crude oil and natural gas production values for Garfield County, specifically, were used as benchmarks against which to develop a range of expected production for each 5-year increment over the 20-year planning period for the four-county study area.

DEVELOPMENT ESTIMATES

Approximate per-well development costs were derived based on industry sources (who provided estimated costs for vertical or directional wells). By examining estimates of reasonably foreseeable development in the two reasonable foreseeable developments (RFD) for the decision area, a total of 599 wells, was estimated to be forgone over the 20-year period 2009 to 2028 as a result of the proposed action to close areas with no-known, low, and medium oil or gas potential to future oil/gas leasing. Extrapolating the annual average well development number of 29.9 wells per year to the 20-year period 2023 to 2042 would yield the same number. Therefore, it is estimated that the potential development of a total of 599 new oil and gas wells would be forgone as a result of the proposed action under Alternative E. Given that IMPLAN is a linear model, and assuming that Alternative F would result in further reductions in federal lands available to oil and gas development, a multiplier may be applied to the modeled results, which would yield a change in economic impacts proportional to the change in lands available for mineral production.

ECONOMIC SECTOR ATTRIBUTION OF COSTS

Per well costs for well drilling and completion activities were compiled from previous socioeconomic analyses and an attribution of development costs per sector was undertaken. These costs are provided in **Table E-1** below.

Table E-1. Per-Well Costs for Well Drilling and Completion Activities (2022 dollars)

Activity	Per-Well Cost / (% of Total Cost)	
	Drilling	Completion
Site preparation	\$41,851 / (7%)	\$29,894 / (5%)
Drilling Rig	\$59,788 / (10%)	\$65,766 / (11%)
Support & Engineering Services	\$322,853 / (54%)	\$239,150 / (40%)
Consumables & Tangibles	\$107,618 / (18%)	\$89,681 / (15%)
Proppant	—	\$89,681 / (15%)
Equipment Rental	\$23,915 / (4%)	\$47,830 / (8%)
Transportation	\$17,936 / (3%)	\$35,873 / (6%)
Communication	—	—
Legal	\$23,915 / (4%)	—

IMPLAN MODEL INPUTS

Once sector-specific costs were determined on a per-well basis for all drilling and completion activities, costs were input into the model and the four-county area encompassing Eagle, Garfield, Mesa and Pitkin Counties was identified as an appropriate geography for capturing modeling economic effects of closing federal lands to mineral entry under the proposed action. **Table E-2** details the specific industry sectors, which were ascribed to each of the well drilling and completion activities based on the associated raw materials, labor force type, and other contributing elements necessary to support the industrial activity.

Table E-2. Well Drilling and Completion Activities and Associated IMPLAN Sectors

Activity	Industry Sector (IMPLAN Code)	Description
Site preparation	264	Oil and gas field machinery and equipment manufacturing
Drilling Rig		
Support & Engineering Services	446	Funds, trusts, and other financial vehicles
Consumables & Tangibles	36	Support activities for oil and gas operations
Proppant	214	Miscellaneous nonmetallic mineral products manufacturing
Equipment Rental	20	Oil and gas extraction
Transportation	515	Commercial and industrial machinery and equipment repair and maintenance
Communication		
Legal	446	Funds, trusts, and other financial vehicles

MODELED RESULTS

Several economic indicators were modeled for the effect of forgone contributions on the economy from the proposed reduction in federal lands available for mineral production. These include: employment; labor income; value added; and total output. **Table E-3** displays modeled economic effects in the form of forgone contributions to the economy from the proposed reduction. Results obtained from modeling indicate that the proposed removal of approximately 599 wells would result in an estimated loss of up to 11 jobs (most of which would be attributable to indirect employment)¹⁸ and \$2.2 million in total economic contributions per well, per year, over the 20-year planning timeframe.

¹⁸Note: Employment numbers represent employment over a one-year timeframe and not permanent employment. Additionally, this analysis does not assess net jobs, rather it presents total or gross jobs that would be supported by

Table E-3. Modeled Economic Effects per Well from Forgone Well Development (2022 dollars)

Indicator	Total Annual Contributions (Drilling and Completion, per well)	Total Annual Contributions (Drilling and Completion, all wells)	Total for 20-Year Period (Drilling and Completion, all wells)
Employment	11	333	6,669
Labor Income	\$516,255	\$15,461,850	\$309,236,992
Value Added	\$748,119	\$22,406,166	\$448,123,327
Total Output	\$2,287,910	\$68,522,908	\$1,370,458,150

The calculation of economic effects associated with forgone mineral production utilized projections published in the EIA’s annual analysis of domestic mineral production. Both high and low projections for each county for both oil (in bbls) and gas (in mcf) were obtained from the EIA, from which 5-year averages were drawn to estimate projected losses in production. Specifically, forecast high and low crude oil and natural gas production values for Garfield County, were used as benchmarks against which to develop expected production for each 5-year increment over the 20-year planning period and for the four-county study area. These forecast production estimates were derived from oil and gas supply data reported by the EIA for the lower 48 states, onshore category, in the Rocky Mountain region. **Figure E-1** illustrates the method for calculating these average production losses for one of the four five-year periods.

Total County Projections - Oil - High O&G Supply (bbls)					
GARFIELD	1,348,980.73	1,617,244.40	1,832,147.86	1,931,312.25	1,986,523.86
MESA	83,467.13	100,065.74	113,362.72	119,498.44	122,914.62
RIO BLANCO	4,003,247.72	4,799,349.46	5,437,098.98	5,731,380.14	5,895,226.61
5-Year Average (Garfield):	1,506,461.55 (bbls)				
Total County Projections - Oil - Low O&G Supply (bbls)					
GARFIELD	1,340,234.44	1,260,500.58	1,255,468.45	1,253,021.19	1,239,181.76
MESA	82,925.96	77,992.49	77,681.13	77,529.71	76,673.41
RIO BLANCO	3,977,292.14	3,740,673.21	3,725,739.80	3,718,477.29	3,677,407.26

Figure E-1. Calculation of Estimated Annual Projected Production Losses (2023 to 2027)

To obtain estimates of forgone revenues, the 2021 Henry Hub Spot Price per mcf of natural gas (\$3.96) and the Lower 48 states reference case wellhead price per barrel for crude oil (\$67.00) was assigned to production estimates for each of the 5-year periods. **Figure E-2** illustrates the method for calculating these estimates of forgone revenues over the 20-year timeframe.

the forecast level of development. A person employed during project construction could, for example, have been employed elsewhere in the state beforehand, and, as a result, not all gross jobs represent a net additional job. A net jobs analysis would subtract job losses in other areas from the direct job gains of the new project to identify only the net increase in jobs.

Period	Average annual production (oil) - bbls	Average annual production (gas) - mcf	Annual Revenue (oil) (2021\$)	Annual Revenue (gas) (2021\$)	Total Annual Revenues (2021\$)	Apply assumption that 10% of production revenues are spent locally
2023–2027	1,506,461.55	418,444,861.36	\$100,932,923.90	\$1,658,445,882.54	\$1,759,378,806.43	\$175,937,880.64
2028–2032	1,646,758.78	446,754,630.57	\$110,332,837.97	\$1,770,647,571.50	\$1,880,980,409.47	\$188,098,040.95
2033–2037	1,702,201.34	438,103,212.43	\$114,047,489.93	\$1,736,358,922.94	\$1,850,406,412.87	\$185,040,641.29
2038–2042	1,742,381.09	436,762,468.08	\$116,739,533.28	\$1,731,045,075.98	\$1,847,784,609.27	\$184,778,460.93
			Multiplier is \$67.00 (in 2021\$). Source: EIA, 2022 (Average oil price per bbl [Lower 48 reference case wellhead price barrel, Gulf	Multiplier is \$3.96 (in 2021\$). Source: EIA, 2022 (Average gas price per mcf [Henry Hub Spot Price])		

Figure E-2. Calculation of Estimated Annual Revenue Losses from Forgone Production

This method yielded the finding that effects Alternative E on the economy. This would be from a reduction in foreseeable fluid mineral production that would be more than \$43 million in direct labor income over the 20-year timeframe from 2023 to 2042 as displayed in **Table E-4**, which represents results obtained from modeling, by applying unit prices for commodities to a range of future production estimates.

Table E-4. Average Annual Economic Effects 2023–2042 (from Forgone Fluid Mineral Production) (2022 dollars)

Impact Period and Type	Employment	Labor Income	Value Added
2023–2027			
Direct Effect	398	\$40,789,851	\$16,394,891
Indirect Effect	400	\$31,503,733	\$42,225,005
Induced Effect	271	\$12,841,777	\$24,262,686
Total Effect	1,069	\$85,135,361	\$82,882,582
2028–2032			
Direct Effect	425	\$43,609,091	\$17,528,044
Indirect Effect	428	\$33,681,152	\$45,143,437
Induced Effect	290	\$13,729,352	\$25,939,631
Total Effect	1,143	\$91,019,595	\$88,611,112
2033–2037			
Direct Effect	418	\$42,900,256	\$17,243,138
Indirect Effect	421	\$33,133,689	\$44,409,663
Induced Effect	285	\$13,506,191	\$25,518,001
Total Effect	1,125	\$89,540,136	\$87,170,802
2038–2042			
Direct Effect	418	\$42,839,472	\$17,218,707
Indirect Effect	420	\$33,086,742	\$44,346,740
Induced Effect	285	\$13,487,055	\$25,481,845
Total Effect	1,123	\$89,413,268	\$87,047,291

Note: Future IMPLAN projections assume no major structural changes in the economies being studied.