

The following section supplements the analysis found in Chapter Three, [Section 3.3 - Water](#) of the Draft EIS “Impacts related to Mining, Oil and Gas Development and Mining Reclamation” beginning on page 3.56.

GROUNDWATER BACKGROUND

The GSGP is a lithologic unit within the Paradox Formation, which is part of the Pennsylvanian age Hermosa Group. The Paradox Formation was created through repeated marine flooding and desiccation; and consists of limestone, dolostone, black shale, anhydrite, halite, and other salts (USGS, 1992). Groundwater resources in the Paradox Basin consist of two bedrock aquifers: an upper Mesozoic sandstone aquifer system and a lower Paleozoic carbonate aquifer system, as well as shallow groundwater resources located in the quaternary alluvium (Topper et al., 2003). Additionally, the Paradox Basin contains many developed and undeveloped seeps and springs. The salts of the Paradox Formation serve as a confining layer separating the upper Mesozoic and the Paleozoic aquifer systems (USGS, 1983a; USGS, 1983b).

The water of the Paradox Formation is brinish or saline with chloride concentrations ranging from 62,440 to 115,400 mg/L, and total dissolved solids ranging from 6,730 to 381,436 mg/L, (USGS, 1983a; USGS, 1983b). The Paradox Formation produces no usable water (USGS, 1983a; USGS, 1983b). The current State of Colorado and United States EPA secondary maximum contaminant levels for chloride and TDS in public drinking water are 250 mg/L and 500 mg/L respectively (5CCR 1003-1; 40 CFR §143.2).

In the Paradox Basin, groundwater wells for domestic and municipal use are placed in quaternary alluvium or the shallow Mesozoic sandstone aquifers. Average municipal and domestic well depth is 179 feet, and 90% of wells are completed to depths shallower than 350 feet (Topper et al., 2003). Existing gas wells in the area have an average depth of 4,400 feet, oil wells average approximately 1,000 feet deep.

DIRECT AND INDIRECT IMPACTS

Impacts to groundwater from projected oil and gas development within the GSGP may occur assuming that the high potential unleased lands are leased and developed. Each of the alternatives represent a major increase in projected development; however, the differences between each alternative are minor and of less consequence. For Alternatives A through D, the difference in the number of projected wells within the GSGP is less than three percent (23 wells). Consequently, there is not a substantial difference between the alternatives in terms of the effects on groundwater resources, with the exception of the No Lease Alternative. The No Lease Alternative would have no direct or indirect impacts from gas development, as it would not make any additional lands available for lease.

Primary groundwater concerns for gas development in the GSGP area encompass two broad categories. The first concern is reduced groundwater quantity due to consumptive use during well drilling, well completion, and well operation. The second concern is the potential for reduced water quality due to hydraulic fracturing, subsurface reinjection, and surface spills of produced water or flow back fluids.

Under Alternatives A through D, roughly 8,100 ac-ft of freshwater would be consumed for the drilling and completion of approximately 970 wells (See Table S-3.3.1). Purchase of this water would be required from

private sources off Federal lands; consequently, the direct and indirect effects on groundwater resources on BLM and USFS lands are unknown due to the lack of specific project proposals at this time.

Table S-3.3.1 - Ac-ft of Water for the Drilling and Completion of Wells on Currently Leased and Unleased Federal Lands in the Gothic Shale Gas Play Area

Alternative		Alternative A	Alternative B	Alternative C	Alternative D	No Lease Alternative
USFS	Leased	916	916	916	916	916
	Unleased	3,803	3,672	3,607	3,738	0
BLM	Leased	2,012	2,012	2,012	2,012	2,012
	Unleased	1,500	1,500	1,500	1,500	0
Total		8,232	8,101	8,035	8,166	2,928

During the production of gas water is typically removed from producing intervals. This water is referred to as “produced” water. Based on the low water yield of the Paradox Formation, as well as the large vertical separation and confining layers between groundwater wells and the GSGP (>4,000’), the extraction of produced water should not directly or indirectly impact the quantity of groundwater available for domestic and municipal uses.

Hydraulic fracturing would be used to increase gas production from gas bearing formations. While the exact composition of hydraulic fracturing fluids is proprietary, the majority is fresh water. Minor constituents (<5%) typically include: biocide, acid, KCl, gelling and breaker agents, scale and corrosion inhibitors, pH chemicals, friction reducers, and surfactants. While these constituents compose a minor fraction of the fracturing fluids, some additives are known to have adverse human health effects, even in small concentrations (Colburn et al., 2010). Additional research on the effects of hydraulic fracturing on groundwater is being conducted by the EPA, with results expected in 2012. During well completion, a portion of the injected hydraulic fracturing fluids is returned to the surface as flow back fluids. Flow back fluids contain fracing materials mentioned above, as well as constituents derived from the target formation, such as hydrocarbons, salts and minerals.

Due to the large vertical separation between groundwater supply wells and the GSGP (>4,000’), as well as the presence of confining layers, it is unlikely that hydraulic fracturing would result in the contamination of useable groundwater resources by means of contaminant movement through the intervening formations. For the same reason, it is also unlikely that hydraulic fracturing would result in vertical migration of saline groundwater from the lower Paleozoic carbonate aquifer systems upwards into the upper Mesozoic sandstone aquifer systems.

The most likely means by which hydraulic fracturing fluids or saline water could migrate into the upper Mesozoic sandstone aquifers would be through vertical migration along damaged or poorly constructed well bore holes, or if fracturing extends into zones of geologic weakness, such as fractures and faults that are conduits to other zones (USGS, 1996; P. Leschak, personal communication, September 10, 2010). The potential for short term impacts, related to the vertical migration of hydraulic fracturing fluids and groundwater from the lower Paleozoic aquifer, would be mitigated through the implementation of the standards and guides listed in the Draft LMP, and those discussed later in this section. Additionally, BLM oil and gas regulations require operators to isolate freshwater-bearing and other usable water containing 5,000 ppm or less of dissolved solids and other mineral-bearing formation and protect them from contamination [43 CFR 3162.5-2(d)]. Implementation of these regulations, best management practices

(BMPs) and the plan standards and guidelines are effective in preventing vertical migration of saline water and hydraulic fracturing fluids (P. Leschak, personal communication, September 10, 2010).

Options for the disposal of produced water and flow back fluids typically consist of temporary pit or tank storage and subsequent transport to an offsite treatment facility, or injection into deep permeable subsurface target formations of poor water quality. With onsite tank or pit storage, there would be some risk of contaminating shallow groundwater resources by leakage or spills. The potential for leakage or spills from these pits would be mitigated with the implementation of BMPs and on-site monitoring to ensure that BMPs and pit design requirements are being properly implemented. Requirements include lining storage pits with plastic, and berming to provide several feet of freeboard. BMPs 15.1 and 15.2 of Forest Service Handbook (FSH) 2,500.25 would be applied to ensure new sources of chemical pollutants do not reach groundwater (USFS, 2006). Other requirements include locating vehicle and service areas, chemical storage and use, and dump areas on gentle upland sites, citing facilities away from springs, seeps and streams, and preventing entrainment into water sources. Chemicals and containers would be disposed of in State-certified disposal areas. Berms and trenches would be installed around the storage pits, well pads, and around chemical storage and use areas. Any waste material or disturbed areas would be revegetated, and equipment would be inspected daily for leaking chemicals. These measures would be effective in preventing the contamination of groundwater resources.

Reinjection of produced water and flow back fluids into target formations is the typical method of disposing of waste fluids. This practice results in gradually increasing pressures within a specified radius from the injection well. Pressure increases are a function injection rate and the thickness and permeability of the target formation. EPA and Colorado regulations require injection wells be operated in a manner that injection pressures do not induce fracturing in the target formation, thereby confining injected water in the target zone. The Underground Injection Control program which regulates water injection, delegated from the EPA to the State of Colorado, requires that injections not “manifest themselves in shallow aquifers or useable groundwater supplies.” Groundwater supply wells have a large vertical separation (thousands of feet) from potentially targeted formations; consequently, mixing between injected and native water would not affect exploitable or useable groundwater resources.

New Standards and Guidelines

The following standards and guidelines are *new and in addition* to those published in the Draft LMP, [Part Three](#) on pages 251 and 252. These standards and guidelines have been developed to minimize impacts from projected GSGP and other oil and gas development activities on SJPL.

WATER STANDARDS

- A. Closed loop, pitless drilling systems (i.e., self contained drilling systems) must be utilized.

WATER GUIDELINES

- B. As a general practice nontoxic fluid, additives, and other materials should be used for drilling.
- C. Exploration and production waste should be buried using BMPs that meet state regulations 9-10-4, or exploration and production waste should be disposed of in such a manner as to not inhibit reclamation success of the site.
- D. Operators should utilize proven technologies for the recycling of fresh water, drilling fluids and produced water for reuse in drilling and completion operations or other beneficial purposes whenever possible.

- E. As individual fields are developed, centralized liquid gathering systems should be utilized for the delivery and gathering of drilling, completion, and produced fluids such as fresh water, waste/produced water, and condensate.
- F. Water Management Plans should be included in Plans of Development.

CUMULATIVE IMPACTS

The Paradox Basin GSGP area is approximately 646,000 acres. Approximately 57 percent of GSGP development is projected to occur on the Federal mineral estate, with the remainder occurring on State and private lands. Total federal and non-federal development for the time period 2009 through 2023 is anticipated to be approximately 1,800 new wells, which will join the roughly 300 existing wells in the GSGP area (RFD Addendum, 2009). Figure 6 of the 2009 RFD Addendum shows the spatial extent, land ownership, and existing wells within the GSGP Area.

The cumulative effects analysis encompasses the GSGP area shown in Chapter One, and the time period of 2009 through 2023. These spatial and temporal boundaries were chosen to reflect the approximate time and geographic extent of the projected development. These boundaries reflect the assumption that the influences and potential effects outside of the GSGP Area (horizontal) will be minimal compared to the potential sub-surface effects, and that the sub-surface effects may be evident soon after development.

The potential cumulative effects for gas development in the GSGP area are the same as those discussed in the analysis of the direct and indirect effects (effects from future development on lands currently leased), consisting of reduced groundwater quantity due to consumptive use during well drilling, well completion, and well operation, and reduced water quality due to hydraulic fracturing; subsurface reinjection; and surface spills of produced water or flow back fluids. Under all of the alternatives, the potential impacts would increase due to the increase in projected gas development as a result of the GSGP. Alternatives A through D are very similar in the cumulative effects on groundwater resources, not showing any measureable difference between each alternative. While development on leased lands is projected to result in approximately 35% more well pads, roads and acres of disturbance, the potential impacts would be the same as development on unleased lands, because they will be subjected to similar mitigation measures based on the standards and guidelines of the Draft LMP, Part Three (see [Design Criteria](#) for a listing of these mitigation measures).

Water used for well drilling, completion, and operation on the Federal mineral estate is assumed to come from off site. Due to the lack of specific project proposals, the effects on groundwater resources on Federal lands are unknown. However, water used for these operations on State and private lands will likely come from ground or surface water sources within the analysis area. The withdrawal of groundwater resources from the study area has the potential to place pressure on existing domestic, municipal, and agricultural groundwater uses at a time period when municipal demand for water is expected to grow (CWCB, 2010).

Development on State and private lands would be subjected to similar BMPs as utilized on Federal mineral estate same, with the possible exception of some of the design criteria, standards and guidelines that are proposed in the Draft EIS and this Supplement. Generally, the same practices that apply to federal wells apply to non-federal wells as dictated by industry BMPs and Colorado Oil and Gas Conservation Commission (COGCC) requirements. State rules and regulations make groundwater protection mandatory. Since the regulations regarding reinjection of produced water and flow back fluids are the same as those that apply to Federal, State, and private lands, groundwater protection and cumulative groundwater effects are the same as the direct and indirect effects previously discussed.

Surface Water Background

If not mitigated, gas development in the GSGP Area could potentially result in a broad range of watershed effects. The principal effects include increased erosion and sedimentation due to ground disturbance from the construction of new roads, well pads, pipelines, compressor stations and other ancillary facilities. Many of these facilities are considered to be long-term sources of ground disturbance, each of which would have the potential to increase erosion and sediment transport to surface waters.

Among the facilities constructed, roads are considered to have the highest potential for being major long-term sources of sediment in forest watersheds (Megahan and Kidd, 1972; Reid and Dunne, 1984). With their construction and operation unmitigated, roads can alter stream hydrology in numerous ways. Increased stream discharge, alteration of peak flow timing, and modification of a stream's normal sediment loads can all occur where roads are associated with stream drainages. These modifications would typically occur as a result of an increase in the amount of impervious surface area in a watershed, and/or by the interception of surface runoff by the road, which results in increased sediment transport and concentration of runoff. The increase in flow quantity and sediment loads could modify stream channel morphology and degrade water quality. As a result, non-compliance with water quality criteria and standards could occur as well as degradation and impacts to related aquatic resources. Additional road-related effects can also include modification of floodplain function and modification to riparian habitat, as well as altering, or preventing, fish passage.

To assess the potential impacts, watersheds on the SJNF have been classified using physical and ecological characteristics in a process called the Aquatic, Riparian, and Wetland Ecosystem Assessment (Winters et al., 2005). Some watersheds on the SJPL are highly sensitive to land management activities such as road construction, grazing, and timber harvest. Cluster 4r watersheds (Table S-3.3.2) are among the most sensitive watershed type found on the SJPL. This cluster is dominated by high-gradient streams with a mixed snowmelt and rainfall flow regime that produces moderate to high yields of both coarse and fine sediment. The rain- and snow-driven conditions would produce a significant amount of sediment if exposed during periods of increased runoff.

The other watershed cluster on the SJPL most sensitive to land management activities is cluster 6r (Table S-3.3.2). The streams in this cluster are underlain by rock units formed by predominantly non-igneous processes that produce moderate to high yields of both coarse and fine sediment. This cluster is influenced dramatically by sediment produced upstream in other watersheds. Sediment deposition could influence stream-bank stability and over-widen channels where deposition occurs. Braiding of the stream channel can be realized in low-gradient channels where deposition occurs from upstream. These areas have a predominantly rain-driven hydrologic regime and erosive parent material. This cluster is also sensitive to land disturbance activities that alter the surface hydrology. Four municipalities (Mancos, Cortez, Dolores, and Dove Creek) obtain water from watersheds that are located wholly or partially in the GSGP area.

Table S-3.3.2 - Summary of Watersheds within the GSGP Area Most Sensitive to Anthropogenic Disturbances (Appendix J, SJPL Draft LMP)

Hydrologic Unit Code boundary (HUC) 6 Name	Cluster
Chicken Creek	4r
Beaver Creek-Trail Canyon	4r
Stapleton Valley	4r
House Creek	4r
Dolores Canyon-Lake Canyon	4r
Upper Dolores River-Italian Creek	4r
McPhee Reservoir-Dolores River	4r
Dolores River-Salter Canyon	4r
McPhee Reservoir-Beaver Creek Inlet	4r
Spruce Water Canyon	4r
Dolores Canyon-Cabin Creek	4r
Pine Arroyo	4r
Brumley Valley	6r
Disappointment Valley-Wild Horse Reservoir	6r

DIRECT AND INDIRECT IMPACTS

The activity driving watershed impacts of the alternatives is the threefold increase in number of wells (from the Draft EIS projection) as a result of the GSGP development. Comparatively, between alternatives there is little difference between the number of wells projected, but the alternatives do differ in terms of the amount of erosion-prone area protected by a NSO stipulation. Increasing the acres managed by a NSO stipulation would move well drilling activities off of steep slopes and highly erosive soils to other areas that are less sensitive to disturbance. With that, Alternatives B, C, and D, which have more acres of NSO, would be less impactful than Alternative A.

Lease requirements that address surface water resource protection include: controlled surface use (CSU), NSO, and standard lease terms (see Draft LMP/EIS, [Appendix H](#) for a complete set of stipulations). These stipulations are designed to avoid development on slopes greater than 40%, to protect perennial water impoundments and streams, and to protect riparian areas and wetlands by moving oil and gas exploration and development beyond the riparian vegetation zone. The NSO stipulation would also be used to avoid wetlands, floodplains, water influence zones, and fens, all of which are easily disturbed and susceptible to adverse changes in hydrologic function. The alternatives also have environmental protection measures that place upper limits on motorized road densities, which should not exceed stated road densities in 6th level Hydrologic Unit Codes (HUCs).

Watershed impacts would also be mitigated through the application of BMPs. BMPs are a proven effective set of practices for preventing or minimizing impacts to hydrologic resources (USDA Forest Service, 2006; Schuler and Briggs, 2000; Seyedbagheri, 1996). BMPs consist of road design requirements and construction techniques to minimize sediment discharge to streams, lakes and wetlands, and standards for maintaining road stability to control erosion (Region 2 Soil and Water Conservation Handbook 2509.25; BMPs 13.3, 13.4 and 13.5, USDA Forest Service, 2006).

Alternatives A Through D

Alternative A represents the continuation of current BLM and USFS leasing decisions. Alternative A would utilize existing lease requirements to protect hydrologic systems. Alternative A has the largest number of acres available for leasing, the highest number of acres assigned standard lease terms, and the fewest acres assigned NSO (Table S-3.3.3).

Table S-3.3.3 - Summary of Key Salient Points for Proposed Alternatives*

	Alternative A	Alternative B	Alternative C	Alternative D	No Lease Alternative
Total San Juan Public Lands in the Paradox Basin	649,263	649,263	649,263	649,263	649,263
Available for Leasing (BLM and USFS)	393,526	379,627	379,615	379,627	0
Standard Lease Terms (BLM and USFS)	280,868	121,461	104,206	121,564	0
Acres of NSO (BLM and USFS)	45,844	88,793	94,487	87,873	0

*These totals represent the combined total acreages for both the USFS and BLM.

Under Alternative A, wells on currently unleased lands are expected to result in approximately 2,100 acres of disturbance, with 254 of those acres being the result of non-producing wells. Under Alternatives A through D, wells on existing leases are projected to disturb approximately 1,160 acres, with 140 of those acres coming from non-producing wells.

The potential impacts to surface water resources come from four potential sources: short-term increases in erosion and sedimentation due to well pad and road construction; long-term increases in sedimentation and erosion due to road usage and maintenance; the contamination of surface water resources due to leakage or spills of produced water and flow back fluids; and the potential that GSGP wells will require extensive amounts of freshwater, negatively impacting surface water supplies. The potential short-term effects of road and well pad construction would be mitigated through the use of lease stipulations (Standard, CSU, and NSO), as well as BMPs 13.3, 13.4, and 13.5 of FSH 2509.25. These management practices include road and well pad location guidelines as well as techniques that have proven effective in managing erosion and sediment during construction projects.

During well drilling, fracturing, and completion, it is estimated that a total of 634 round trips would be required to haul water and materials to each well. In the short-term, this number of haul trips would cause elevated levels of wear and tear on the roads, resulting in pulverization of gravels and other natural material used in road surfacing. Pulverization could result in high levels of dust, which would function as a sediment source. Roads under these conditions would be susceptible to sediment runoff, especially during heavy localized rainfall which is common during the summer monsoon season. Although BMPs and other mitigating measures would be implemented, increased erosion and sediment introduction to surface waters could result. The magnitude and extent of these expected increases would be influenced by watershed sensitivity to anthropogenic activities, existing levels anthropogenic activity influence within a watershed, the rate and pace of development, the presence of saline soils, and cluster type.

Watersheds within cluster 4r produce moderate to high yields of coarse and fine grained sediment. The rain and snow-driven conditions within the watersheds would produce significant amounts of sediment, if exposed during periods of increased runoff. Watersheds dominated by cluster 6r are also sensitive to anthropogenic activities that alter surface hydrology. Chicken Creek, Beaver Creek-Trail Canyon, Stapleton Valley, House Creek, Dolores Canyon-Lake Canyon, and McPhee Reservoir-Dolores River watersheds

would be the most susceptible to large impacts on hydrologically related resources due to anthropogenic activities (Table S-3.3.1).

Watersheds identified as having potential salinity issues are summarized in the bullets below and found in the Draft LMP/EIS, [Appendix K](#). These watersheds have been determined to contain 50% or more of the Mancos or Lewis Shales. Disappointment Valley-Wild Horse Reservoir, Dolores Canyon-Lake Canyon, Dolores River-Salter Canyon, Pine Arroyo, Spruce Water Canyon and Upper Dolores River-Italian Creek all have existing road densities of over 2.0 mi/sq. mile. As roads interrupt and concentrate overland flow, these areas would be most susceptible to increased erosion and sediment transportation. Development in these watersheds would result in increased contributions of sediment and saline material to the Upper Colorado River, along with increased potential for altering stream and related aquatic habitats.

- Lower Plateau Creek
- Ryman Creek
- Upper Beaver Creek
- Upper Cherry Creek
- Weber Canyon
- Stinking Springs Canyon

Long-term impacts due to well pads would be mitigated to some extent by interim reclamation which would occur after well completion; this would minimize the contributions of these areas as long-term chronic sources of sediment. Additionally, COGCC rule 1002(f) establishes requirements for storm water management that would reduce long-term sources of sediment. Periodically, additional short-term increases in potential sediment and erosion would occur as road and well maintenance activities were conducted. These long-term effects would be mitigated using the same leasing stipulations, BMPs, and COGCC rules previously discussed.

Two fluid waste streams are generated from GSGP development. First, a portion of the injected hydraulic fracturing fluid is returned to the surface as flow back fluid. The constituents of hydraulic fracturing and flow back fluids are discussed in the groundwater portion of this Supplement. Second, groundwater associated with the producing interval is returned to the surface as produced water. Flow back fluids and produced water are required to be stored on site temporarily, prior to treatment and/or disposal. Options for temporary storage include tanks and bermed open pits.

Potential impacts associated with these temporary tanks and pits include surface water contamination due to spills or leakage. These potential impacts and important groundwater and surface water protection measures are discussed in the groundwater section above. The same measures that apply to groundwater protection apply to surface water.

It is assumed that all water associated with gas development and production would have to be purchased and trucked into the project area; water would not be obtained from water sources on public land. Since water would be trucked in from elsewhere, there would be no change to existing consumptive use of surface water on Federal lands. The projected water use for Alternative A is not significantly different from what is projected for Alternatives B through D. As a result, there is no difference in the direct and indirect effects of consumptive water usage for the different alternatives.

The number of acres available for leasing in the GSGP area, the acreage offered under standard lease terms, and the acreage subjected to the NSO leasing stipulation are similar between Alternatives B, C, and D. Consequently, the potential long and short-term effects are likely to be very similar with respect to erosion, sedimentation, and surface water contamination. Alternative A would have the highest potential due to the acreage that would be made available under standard lease terms. Note that due to the narrow geographic scope of this Supplement (GSGP area only), this analysis is based on a subset of the complete, reasonable range of management alternatives developed for the entire planning area as presented jointly in this

Supplement and the Draft LMP/EIS; therefore, the range of proposed management presented in this Supplement does not represent the full range of alternatives or impacts.

No Lease Alternative

Under the No Lease Alternative, all acres not already withdrawn from leasing by law would be made administratively not available for leasing, while development on existing leases would be allowed to continue. By removing currently unleased lands from potential development, the No Lease Alternative would substantially reduce the potential for negative impacts to surface water resources.

CUMULATIVE IMPACTS

Watershed cumulative effects include the total impacts of runoff, erosion, sediment or water yield, and water quality that results from the incremental impact of a proposed action, when added to other past, present and reasonably foreseeable future actions occurring within the same natural drainage basin, or watershed. The cumulative effects area for analysis of water impacts encompasses the boundaries of the 6th level watersheds which have a portion, or all of their area, located within the GSGP area. This analysis includes not only development on the federal mineral estate (unleased and leased lands), but also development on State and private lands.

It is likely that development in the GSGP area could result in increased sedimentation and erosion, increased potential for surface water contamination from spills or leakage of produced water and flow back fluids, and impacts to surface water quality due to deposition of atmospheric pollution. Since the proposed development is not yet site specific, it is impossible to rigorously analyze the potential effects. However, the mitigation measures discussed in the preceding sections would likely allow all alternatives to comply with the Clean Water Act.

Approximately 2,500 acres are projected for ground surface disturbance on State and private lands. Potential impacts to surface water resources would be the same as on lands administered by the SJPL. The potential short and long-term direct and indirect effects associated with development on State and private lands would be the same for all Alternatives. Consequently, the differences in the cumulative effects between Alternatives A through D would result from differences in development on the Federal mineral estate.

Approximately 1,786 acres of ground disturbance is projected to occur from future gas shale and conventional gas development on federal mineral estate lands currently held under lease. The potential cumulative impacts will be the same for development on currently leased lands as described above for the unleased lands, as the currently leased lands will be subjected to similar mitigation measures based on the standards and guidelines of the Draft LMP, Part Three (see [Design Criteria](#)).

Based on the analysis in the direct and indirect section, the cumulative effects of Alternatives B through D would be similar, and the cumulative effects of Alternative A would be similar in type, but greater in magnitude than those of Alternatives B through D because Alternative A projects the greatest amount of acres of disturbance. As described in the direct and indirect section, the No Lease Alternative would not make any new lands available for lease and thus all the cumulative impacts would be from federal mineral estate lands currently held under lease and development on private and state lands.