INTRODUCTION

The following section deals with locatable minerals, mineral materials, and solid leasable minerals.

Within the planning area, mineral resource has been significant in the past. Current resource estimates indicate valuable reserves within portions of the planning area. Major solid-minerals activity is primarily restricted to the Slick Rock area (Dove Creek/BLM). Minor activity may occur on a small scale in the Silverton (BLM), Rico (USFS), and La Plata (USFS) areas of the SJPL.

The BLM and the USFS manage mineral-related activities consistent with multiple-use management principles. The exploration, development, and production of solid-minerals resources is integrated with the use, conservation, and protection of other resources.

LEGAL AND ADMINISTRATIVE FRAMEWORK

LAWS

- ***The United States Mining Laws of 1872***: This act allows exploration, development, and production of minerals from mining claims on public lands.
- ***The Organic Administration Act of 1897***: This act extends the operation of the U.S. Mining Laws to USFS lands reserved from the public domain.
- ***The Mineral Leasing Act of 1920***: This act establishes the leasing system for the exploration and development of coal, phosphate, sodium, oil shale, oil, and gas.
- ***The Department of Agriculture Organic Act of 1944***: This act provides for the protection and management of resources of USFS lands.
- ***The Mineral Leasing Act for Acquired Lands of 1947***: This act extends the provisions of the mineral leasing laws to the mineral estate on lands acquired by the Federal government, and requires the consent of the Secretary of the Interior (BLM) or Agriculture (USFS) prior to leasing.
- ***The Common Varieties of Mineral Materials Act of 1947***: This act authorizes disposal of common variety minerals. It also allows free use by government agencies, municipalities, and nonprofit organizations.
- ***The Multiple Use Mining Act of 1955***: This act allows the sale of mineral materials (including sand and gravel) and provides direction for the multiple uses of surface resources of mining claims.
- ***The Endangered Species Act of 1973***: This act requires the protection of habitat for endangered species.
- ***The Surface Mining Control and Reclamation Act of 1977***: This act allows the Secretary of Agriculture to enter into agreements with States in order to regulate surface coal-mining operations on USFS lands. It also directs the Secretary of Agriculture to conduct a Coal Unsuitability Assessment in order to determine the suitability of USFS lands for surface coal mining operations.

REGULATIONS AND POLICIES

- ***Title CFR 36, Part 228A***: This requires mining claimants to file an operating plan or notice of intent for proposed mining activities on USFS lands.
- ***Title CFR 36, Part 228C***: This regulates the disposal of common variety mineral materials.
- ***Title CFR 43, Parts 3400, 3600, and 3800***: These provide guidance for the management of coal, mineral materials, and locatable minerals for the BLM.

DESIGN CRITERIA

Management guidelines and design criteria describe the environmental protection measures that would be applied to all of the alternatives at the project level in order to protect, enhance, and, where appropriate, improve resources related to solid minerals. Guidelines and design criteria are presented in Part 3 of Volume II of the DLMP/DEIS.

AFFECTED ENVIRONMENT

EXISTING CONDITIONS AND TRENDS

Federally owned mineral resources are managed under three categories, all with differing sets of laws and regulations:

- ***locatable minerals***: These are subject to claim under the Mining Law of 1872, as amended;
- ***mineral material/common variety***: These are disposable by discretionary direct sale or free use; and
- ***leasable minerals***: These are subject to lease under the Mineral Leasing Act of 1920, as amended).

Most locatable minerals (including precious and base metals, uranium, and certain types of limestone), mineral materials (including sand, gravel, and construction stone), and some leasable minerals (including coal) are extracted by mining methods. Due to the similarity in development techniques and environmental impacts, these minerals are discussed as solid minerals. The non-solid or fluid leasable minerals category includes oil, gas, and geothermal energy. Due to the dissimilarity in development techniques, methods, and environmental impacts, oil, gas, and geothermal energy are discussed in separate sections. The SJPLC conducted an assessment of the potential for occurrence of mineral deposits.(In relation to USFS-administered lands, the results are included in Van Loenen et al. (1997), and summarized in the Solid Minerals, Geothermal Energy, and Fluid Minerals sections in this chapter).

Solid-minerals resource potential is based primarily on the geological setting and the interpretations regarding the likelihood that favorable rocks are present. These interpretations consider the results of previous studies, as well as mining history and production, geochemistry and geophysics, and data from mineral files. The attributes of known ore deposits and mineral occurrences were used to define favorable areas within permissive terrains in the planning area (Van Loenen et al. 1997). Types of solid-minerals deposits by area and current activity are summarized in Table 3.16.1.

Table 3.16.1 – SJPL Areas Favorable for Solid Minerals and Mineral Activity

AREA	MINERAL TYPE	CURRENT ACTIVITY
Slick Rock/Dove Creek Uravan Mineral Belt	Uranium, vanadium	Mining claims, exploration, development
Rico-Dunton	Gold, silver, lead, zinc, copper	No current activity
Graysill	Vanadium	No current activity
La Plata	Gold, silver, lead, copper	Minor placer-mining activity
Silverton	Gold, silver, lead, zinc, copper	Minor lode mining activity
Needle Mountains	Gold, silver, copper, uranium	No current activity
Chimney Rock (Durango KRCRA)	Coal	No current activity
SJPL-wide	Mineral materials: glacial deposits, talus slopes, road cuts, rock glaciers, fossil gravel terraces	Small-scale activity across SJPL

High to moderate solid-minerals potential also occurs within the Lizard Head Wilderness (Mount Wilson/ Navajo Basin area), the Weminuche Wilderness Area (Piedra headwaters area), and the South San Juan Wilderness Area (Quartz Creek area) (Van Loenen et al. 1997). These areas, however, are withdrawn from mineral entry under the terms of the Wilderness Act of 1964, and cannot be claimed or developed unless there are valid existing rights.

Mineral activity that is considered "recreational" in nature consists of exploration for, and recovery of, gold using hand-panning and small-diameter (less than 4-inch diameter intake) suction dredging equipment. This activity typically does not result in environmental impacts, and does not result in filing and development of mining claims. Small-diameter suction dredging in active stream channels is excluded from U.S. Army Corps of Engineers Section 404 permit requirements. These operations are typically not bonded, and are monitored by the agency with jurisdiction over the affected land. The planning area averages approximately three such operations each year (typically during summer).

Locatable Minerals

Historically, mineral exploration and development have played key roles in defining the character and landscape pattern within the planning area. The subregion is especially well endowed with locatable mineral resources. World-class deposits of precious and base metals occur along a northeast-to-southwest trend (from Aspen through Silverton, and Telluride southward to the La Plata Mountains). These deposits include massive sulfides, vein, and metallic replacement deposits largely associated with Tertiary volcanic centers.

Prospecting and mining in the San Juan Mountains dates back more than 120 years. The first recorded discovery of gold in this region was in 1848, in the Silverton area. This was followed by discoveries in the Durango and Rico areas in the 1860s. Mining of placer gold began in Summitville and Silverton in 1870, and along the La Plata River in 1873. Following a treaty with the Ute Indian Tribe in 1874, most of what is now the planning area was officially opened for mineral prospecting. Lode deposits of gold and silver were discovered, and mined, from 1875 through 1900 in the Rico, La Plata, Needle Mountains, and Silverton areas.

During the mid-1890s, depletion of easily mined reserves, as well as the the collapse of silver prices in 1893, resulted in most mining operations closing down. At the same time, workers developed coal deposits, which provided an important energy resource to mining and other industries, agriculture, and domestic needs. A new spike in metal mining and production occurred from 1900 to 1910, and continued at varying levels until the closure of gold mines by the government during World War II. After the war, new technologies and the growing economy spurred renewed mining within the region.

Most solid-mineral sites are historic and not currently active. Where these sites are on private land within the planning area (as a result of patenting of mining claims), they are of particular concern to SJPLC management. Streams influenced by mining on these sites carry sedimentation and contamination downstream across the planning area and beyond (See the Water section in this chapter).

Mining Claim Density

Mining claim density provides an important measure of historic and current interest in areas having potential for both lode and placer minerals, as summarized in Table 3.16.1.

Placer Claims

The distribution of open (currently filed) placer claims indicates areas that are most likely to be affected (impacted) by placer mining disturbance. Most claims are associated with alluvial deposits along stream channels and valley bottoms. Large-scale development of alluvium may have profound impacts on hydrology and valley-bottom morphology. The current level of development on placer claims is low. There are 38 claims containing approximately 1,821 acres of valley bottoms along Mineral Creek and the Animas River (downstream from Silverton), Cascade Creek (below the La Plata Mountains), and Dolores River (downstream from Rico).

Closed placer claims have been terminated, abandoned, or are otherwise no longer subject to development. There are 655 closed claims in the same geographic trends as open placer claims. The presence of current, or historical, claims does not directly indicate disturbance at any level; it merely indicates the possibility of disturbance. Many of the current and closed claims show no disturbance. Even so, the patterns highlight areas deserving of attention and monitoring, and point to areas with likely historic, current, and foreseeable future disturbance.

Lode Claims

Placer claims are almost entirely filed for the extraction of gold. Lode claims cover many types of mineral commodity within the planning area. Lode claim distributions, like placer claim distributions, are strong indicators of historic and potential interest and mining activity. The planning area has 486 open lode claims associated with a variety of geological settings and mineral types. Approximateley one-half of these claims are concentrated in the same areas as those for placer claims discussed above (Silverton, the La Plata Mountains, and Rico). They involvie the valley bottoms, as well as the headwaters areas, which are the sources of the precious minerals concentrated in the downstream placer claims.

An important area that does not include placer claims is the Uravan mineral belt along the Dolores River (in the Slick Rock and Dove Creek areas), which hosts important sandstone-based deposits of uranium and vanadium. These deposits were the object of significant development activity in the 1950s and 1960s, which lead to an economic boom at that time. The boom influenced the growth of important Colorado Plateau communities including Cortez, Durango, Grand Junction, and Moab.

The remainder of the lode claims are scattered across the planning area, and are typically isolated historical exploration or small-development mining operations.

In descending order of number of claims filed, the most important locatable mineral commodities claimed are uranium, vanadium, base metal (lead, copper, and zinc), silver, and gold. Historically, base and precious metals were the most valuable of the locatable minerals. Today, however, they represent only a modest part of the current activity. The growing level of interest in uranium indicates the importance of energy development in the region today. Vanadium, likewise, is of modern interest, as a critical metal for hardening steel.

Deposits of uranium and vanadium (recovered as a by-product of uranium refining) were discovered and mined in the 1950s at the Graysill (Rico) area and at the Slick Rock/Dove Creek area (driven by the nuclear arms race and the growth of the domestic nuclear energy program and nuclear medicine). By the mid-1970s, environmental regulations, the Three Mile Island accident, and the slow-down in the arms race, reduced the demand for uranium. By the end of the Cold War, most uranium mining had ceased. Recent interest in nuclear power generation, as well as other demands, have kept the interest for uranium alive in the Slick Rock/Dove Creek area (locally known as the Uravan Mineral Belt). As of January 2007, there were an estimated 500 mining claims filed within the planning area for uranium and vanadium.

Limestone valuable for chemical and industrial use is locatable. No development is currently active within the plannin area; however, deposits of suitable limestone occur throughout the planning area. The Animas River Valley contains the most significant, and most accessible, resources. Historic proposals to mine this material led to the withdrawal of deposits in order to protect scenic values along the U.S. Highway 550 corridor. Demand for limestone for use as a chemical scrubber for coal-fired power plants may increase, unless technology replaces limestone's usefulness. If limestone remains valuable for this purpose, proposals for mining of limestone in the Animas Valley may be filed.

Other solid minerals, including coal and mineral materials (gravel and stone), are extracted by mining methods. They are not, however, subject to claim under the Mining Law. Coal deposits are developed under a Federal leasing program. Mineral materials are disposed of under discretionary sale authority, and are discussed below. The SJPLC may request that the Department of Interior institute formal withdrawal from locatable mineral entry if mineral development would conflict with the management area (MA), or for other management reasons. Within the DLMP/DEIS, some areas are recommended for land designations that would require withdrawal (including Wilderness Area designation); however, the DLMP/DEIS does not request the withdrawal process to be initiated. There are currently no pending requests for withdrawal of SJPLC-administered lands. Withdrawal is a function of the SJPLC lands program (See the Lands and Realty section in this chapter).

Mineral Materials

Mineral materials, also referred to as "Salable" and "Common Variety" minerals, are generally low-value deposits of sand, clay, and stone. These materials are used for building materials, aggregate, bulk fill, rip-rap, road surfacing, decoration, and landscaping. Disposal of these materials is discretionary; the public does not have a statutory right to these materials.

Deposits of limestone and aggregates were developed in order to build railroads, roads, and provide a source for concrete along with clay for brick and ceramics. Today, common variety mineral (including sand and gravel) development continues to be important in the subregion, as well as in the surrounding western states.
The SJPLC has conducted an assessment of the potential for occurrence of mineral material deposits (Van Loenen et al. 1997), as summarized below.

Unlike most locatable minerals, mineral material resources occur as a result of erosion, deposition, or exposure of widespread geological formations (rock types or layers). Common sites for natural concentrations of small to large amounts of such materials are canyon walls, stream channels, talus slopes, landslides, ancient river terraces, glacial moraines, and floodplains. Road cuts, quarries, and pits increase the amount of material available for extraction.

Areas with known resources, or areas that are favorable for resources of sand and gravel, may contain materials that are ready for use; or that are suitable for screening, washing, or crushing in order to meet size or fine-material requirements. Areas of Quaternary Age alluvium, colluvium and glacial drift, as well as areas of river terrace deposits, contain sand and gravel suitable for use with minimal treatment. Talus slopes of late Cretaceous and Tertiary Age igneous rock produce material suitable for crushing, lightweight aggregate, and dimension stone. Late Cretaceous and Tertiary Age igneous intrusives produce dimension stone and large aggregate. Late Cretaceous sedimentary rock produces dimension stone and aggregates.

Large boulders are found throughout the planning area in stream deposits, glacial drift, and till, landslides, and floodplains. Most are found at higher elevations, and those closest to existing roads are primary targets for purchase.

Mineral materials constitute an administrative class largely made up of sand and gravel borrow pits and large-scale operations. These operations are typically correlated to roadways and valley bottom settings with alluvial deposits.

Currently, the planning area has approximately 20 active sand and gravel sites. Due to the informal nature of many borrow pits, and to the lack of reporting, it is likely that this number does not include all sites. Most mineral materials are collected from road cuts, stream channel banks, or alluvial deposits; therefore, the sites typically are located in valley bottoms. Ute Creek, the Animas River, and San Juan River above Pagosa Springs have active sites.

SOLID LEASABLE MINERALS

Uranium

The U.S. Department of Energy (DOE) leases several tracts of withdrawn public land within the planning area (the Slick Rock, and a portion of the Paradox Lease Tract areas) for uranium and vanadium mining (Uranium Leasing Program Environmental Assessment, US DOE, July 2007). The DOE estimated the reasonably foreseeable development level for its lease tracts over a 15-year period (the equivalent of the San Juan LMP implementation period) at 42 new and 1 existing mining operation, with a total of approximately 420 acres of surface disturbance spread across all proposed and current lease tracts. The SJPLC-administered lease tracts currently have 31 acres of disturbance related to active operations, which is approximately 7% of the total DOE lease tract disturbance. The DOE did not project disturbance figures for individual lease tracts; however, it is reasonable to assume an additional 160 acres of disturbance over the LMP period for the planning area lease tracts.

Coal

Within the planning area, coal occurs along the margins of the Paradox and San Juan Basins. These outcrops are of late Cretaceous and early Tertiary Age.

Coal has been produced in Colorado, New Mexico, and Utah since the middle of the Nineteenth Century. Due to the expansion of the railroads in the region, coal production in Colorado expanded to become the largest in the West. Production in all three States grew from the turn of the Twentieth Century, to a peak prior to the Great Depression. Production tapered off through the war years and 1950s, with a resurgence beginning in the 1970s. Historically, small underground and surface mines that support local markets followed the northern edge of the San Juan Basin between Durango east to Pagosa Springs (more or less along the U.S. Highway 160 corridor). These mines, and related prospects, are largely abandoned. There are currently six coal mines operating in, or adjacent to, the planning area. Four of these are located immediately west of Durango; two are located between Durango and the Piedra River. More recently, large-scale mines have been developed in the region outside of the planning area in order to feed regional power generation needs. Of the 56 regional coal mining sites, these constitute major operations with significant disturbance of surface and subsurface systems.

Coal Unsuitability Assessment

Under the terms of the Surface Mining Control and Reclamation Act of 1977 (SMCRA), the San Juan National Forest (SJNF) conducted a Coal Unsuitability Assessment in order to determine the suitability of certain USFS lands for surface coal mining leasing and development operations. Twenty Unsuitability Criteria and appropriate Exceptions and Exemptions were applied to the Durango and Menefee Known Recoverable Coal Resource Areas (KRCRAs), as identified by the U.S. Geological Survey. The results defined a portion of the Durango KRCRA as suitable for surface coal-mining operations, and were included in the 1983 SJNF Land and Resource Management Plan. (The results of that assessment are incorporated herein by reference.) One surface coal mine was in application for lease extension and surface coal mining operational approval (Chimney Rock Coal Mine). Operations were conducted on both USFS and BLM lands. In 1985, operations at the mine were terminated, and the mine site has since been reclaimed.

Trends

The trends noted in previous LMPs have not changed dramatically, except for the renewed interest in uranium/vanadium mining (both as locatable mining claims and as DOE uranium leases) driven by energy and military demand. However, changes in pricing factors may rapidly alter the level of interest in development of most mineral commodities. A substantial increase in demand for minerals may increase the filing and development of mining claims in established mining districts and areas once considered marginal. This, in turn, would result in increased conflict with other land and resource values and uses; initiate new administrative, political, and legal issues in choosing management priorities; generate public concerns over changing management; place economic pressures on managers and local communities; place local values against regional or national needs; and generate demands to answer all of these concerns within a short time period.

Locatable minerals are subject to claim and development under the Mining Law. Management options are often limited once claims are filed on valuable mineral deposits. It is also difficult to plan for, or prepare to deal with, the demands for locatable mineral development. This is because it cannot be known with certainty when claims will be filed and development plans proposed.

In areas where land managers have determined that the potential value of the mineral estate does not justify the environmental impacts of development, the surface management agency may propose withdrawal of the land from operation of the Mining Law. In withdrawn areas where claims exist, the agency may challenge the validity of the claims. When Plans of Operation for mining claims are proposed, the agency would review and approve those Plans, with appropriate environmental protection measures applied and monitored for compliance.

Mineral materials are subject to disposal at the discretion of SJPLC; the public does not have a statutory right to demand development. SJPLC management options are, therefore, broad. Planning for development of mineral material sites can be undertaken independent of outside pressure, and phased in in order to meet demand as it grows. Demands for new types of mineral materials (such as boulders for river renovation projects) can be assessed before these resources are removed.

In areas where land managers have determined that the potential value of the mineral material does not justify the environmental impacts of development, the agency may preclude any development, or accept and consider development proposals on a case-by-case basis. The SJPLC may approve Plans of Operation for mineral material development, with appropriate environmental protection measures applied and monitored for compliance, or may deny such Plans.

Coal is disposed of under the Federal coal leasing program. The SJPLC must review and approve issuance of leases for coal development. Although it cannot be known with certainty when lease applications would be filed and development plans proposed, the SJPLC can schedule the required analysis process in order to accommodate the workload, as needed.

In areas where land managers have determined that the potential value of the coal estate does not justify the environmental impacts of development, the agency may deny applications for coal leases, thereby precluding any development. When Plans of Operation for existing leases are proposed, the agency would review and approve those Plans, with appropriate environmental protection measures applied and monitored for compliance.

Locatable Minerals

The demand for mineral resources is driven by price, which, in turn, is governed by improvements in technology of exploration, production, refining, transportation, manufacture, and use; changes in lifestyle; changes in regulation and availability of land and access; changes in patterns of supply and demand (both domestically and internationally); and changes in broad national policy areas (including military conflict, security, and strategic reserves). The planning area has reserves of precious metals used for industrial, cosmetic, and investment purposes; as well as base metals (copper, lead, zinc, molybdenum, tin, tungsten, bismuth, and tellurium) used for a variety of industrial purposes. The planning area has reserves of uranium used for domestic power generation, medicine, and weapons; as well as vanadium used in steel production. Currently, important locatable mineral interests within the planning area are limited to uranium and vanadium (in the Dove Creek area). The increasing interest in nuclear power generation, as well as the need for vanadium (a by-product of uranium development), for modern energy, air, and space, power, and weapons technology, are likely to rapidly increase the demand for uranium exploration, development, and processing. Demand for limestone for use as a chemical scrubber for coal-fired power plants may increase, unless technology replaces limestone's usefulness. If limestone remains valuable for this purpose, proposals for mining of limestone in the Animas Valley may be filed.

A growing "recreational" interest in gold exists throughout the planning area. Gold prices are now about double what they were for the previous decade, and the leisure industry (coupled with powerful improvements in metal-detection technology), have spurred on the hobby "prospector."

Recent increases in copper demand domestically, and the continued growth of demand overseas for base metal reserves may result in increased domestic exploration and production (once prices rise enough to of-fset the increasing costs of environmental protection).

Mineral Materials

Within the planning area, demand for small amounts of hand-collected decorative and landscape stone can be met. The competition for gravel and aggregate may likely result in more development of quarries and pits within the planning area, as well as on adjacent private lands (and preference for planning area reserves to be used only for local, State, and Federal road agencies).

Increasing construction in all area communities is creating a growing demand for aggregate and fill materials, as well as for decorative and landscaping stone. The building of new roads, and the maintenance and improvement of existing roads, may create increasing demand for aggregate for asphalt and cement and gravel for road surfaces. Large boulders are a growing target for purchase (for landscaping and river improvement projects). Prices charged for all mineral materials are low, and a new series of appraisals is needed in order to adjust prices to meet current economics.

SOLID LEASABLE MINERALS

Uranium

The DOE has issued a decision (July 2007) to expand its uranium leasing program to reactivate currently inactive lease tracts. This would increase the areas subject to potential uranium/vanadium mining activity within the planning area by approximately 120%. The DOE does not project that mining would occur on all potential lease tracts; however, the primary limiting factor cited by the DOE to expanded uranium/vanadium mining is the lack of regional milling capacity.

Coal

In relation to the planning area, Durango is the only area with current coal production, which is expected to continue or increase. As new coal-fired power plants are built in the region, greater demand for production from existing mines, and possibly the development of new mines, may occur. However, lack of rail lines and small reserves in the eastern (Pagosa) portion of the planning area may limit the potential for significant expansion. There is low potential for small, local markets to redevelop. Coal use for home and small business heating is not likely to increase without significant improvements in environmental protection technology and cost-competitiveness. This may limit the potential for small mining operations to resume operations.

Within the Durango and Menefee KRCRAs, it is unlikely that formerly developed coal deposits would be in demand for renewed development. Substantial new coal deposits are not likely to be discovered or proposed for development.

DIRECT AND INDIRECT IMPACTS

The environmental impacts related to the development of mineral resources would result primarily from their different methods of extraction. Solid minerals are developed by mining methods, either surface (collecting, quarrying, and open pit mining) or subsurface (underground mining). Fluid minerals (including oil and gas and geothermal energy) are developed by drilling. The two development and extraction techniques produce different types of surface effects (impacts); therefore, they are discussed under separate sections of this chapter. The expected environmental impacts related to current and projected solid-minerals development activity levels within the planning area are discussed in detail in specific resource program sections of this chapter. This section considers the impacts of implementation of other resource activities on the SJPLC solid-minerals program.

Under each alternative, impacts are quantified based on the number of acres of land, which are restricted (requiring higher costs) or are not available for solid-minerals operations (including mine and support facilities, pits, stockpile and equipment storage areas, mills, waste sites), or for construction and use of access roads. Unlike most fluid minerals (including oil and gas), development impacts (including numerous individual well sites, connecting road systems, multiple support facilities, and pipeline networks spread over hundreds to thousands of acres), typical impacts related to solid-minerals development would be concentrated at the mine or mill facility. This would require one or two access roads, one utility corridor, and few, if any, disturbed areas away from the mine or mill. Future solid-minerals activity cannot be predicted as to specific location, scale, or timing; therefore, the most reasonable way to estimate the impacts of alternatives on this potential future activity would be to consider the amount of land which is restricted or unavailable for possible use.

General Impacts

Impacts to the solid-minerals program resulting from the implementation of the alternatives would be closure of areas to mineral activity (through formal withdrawal or administrative closure) and increased operating costs (through limitations on road construction and use, facility placement, and operational constraints). These impacts may result from the requirements imposed by other resource programs, and from the implementation of the specific MA direction. Although MA direction does not change current law or regulation for development of solid minerals within the planning area, it may impact, in some cases, the accessibility of lands for solid-minerals development. Some MA allocations would recommend changes to current land status that would, if implemented later, change the accessibility of lands for solid-minerals development. These changes would not automatically result from the implementation of any of the alternatives.

The opportunity to explore for, and produce, solid minerals on public lands may also be impacted by limiting or restricting motor vehicle access on existing roads and precluding new road construction. Recommendations that result in withdrawal of lands from availability for locatable mineral development or leases for coal, if later implemented, may would preclude the exploration and potential development of economic mineral resources, which would, in turn, result in lost Federal revenues and associated reduced returns to counties and States. Alternatives A through D would vary, depending upon the acres allocated to various MAs. MA 1s and MA 5s would be the predominant MAs applied to management of the planning area, followed by MA 3s. MA 1s and MA 3s would be the most restrictive, recommending land management or land designations that would result in withdrawal or closure of these areas to solid-minerals development or would require limits or prohibitions on road access. MA 2s would require specific management plans that may impose site-specific closures or restrictions on solid-minerals activity. MA 4s would require that solid-minerals activity be compatible with MA requirements, and may impose unacceptable site-specific costs. MA 5s and MA 7s would generally be compatible with solid-minerals development. Locatable mineral withdrawal would not be implemented by any of the alternatives; rather, proposed withdrawals would be subject to further analysis and decision processes. The alternatives would also not affect existing mineral leases or solid-minerals operations already approved. Table 3.16.2 summarizes the impacts on the SJPLC solid-minerals program by alternative.

This estimate of impacts would be considered in conjunction with areas where solid-minerals potential is known, or is suspected, to exist. Lands may be unavailable for solid-mineral activity, as noted above; however, if the mineral resource does not exist on those lands, any possible impacts from limiting access to those lands may be minor or negligible. The areas most likely to be impacted by the implementation of any of the alternatives (because of potential for solid-minerals resources being present) are described in Table 3.16.1. The Slick Rock/Dove Creek area has a high potential for continued to increased uranium and vanadium mining and milling activity. The Dolores and West Dolores River corridors, the Rico/Dunton area, the La Plata Mountains, and the Silverton area have low to moderate potential for renewed precious and base metal development activity, the Graysill and Elk Park areas have low potential for renewed exploration activity for uranium and vanadium. Market prices, commodity supply and demand, and technological advances may influence future interest in exploration, development, and production. Salable mineral sources occur throughout the planning area. The demand for gravel may increase as campgrounds and public and county roads are improved. (Sources to meet expected private needs are available outside of the public lands.)

The following table lists the acres of land with moderate to high potential for solid locatable and leasable mineral occurrence, coupled with alternative management that would prohibit or restrict development of those resources, if fully implemented. For this analysis, it is assumed that land designations recommended by any of the alternatives that would occur in the future (or are outside the authority of the SJPLC) would be implemented as recommended by the SJPLC. (For example, designation of additional Wilderness Area would not lie within SJPLC authority, and SJPLC recommendations for additional Wilderness Areas may never be acted upon; however, this analysis assumes that such designation would occur within the planning period and that the recommended Wilderness Areas additions would be withdrawn from mineral entry and development).

Land management actions or recommendations that are proposed within existing withdrawn lands (such as designated Wilderness Areas) are not considered. This is because the implementation of those proposed new designations would have no impact on lands already withdrawn. Similarly, those land management actions or recommendations under the alterative that do not impact areas with moderate to high potential for the occurrence of solid-mineral resources (see Table 3.16.1) are not considered. The impacts related to those management actions or recommendations may be minor to negligible. MA 4 (recreation emphasis) and MA 8 (developed areas) are linear features or encompass relatively small areas and include few areas with moderate to high solid-minerals potential; therefore, their imapcts on the solid-minerals resource may be negligible.

Table 3.16.2 – Environmental Effects to Solid Minerals by Alternative

	Alternative A (no-action alternative)	Alternative B (preferred alternative)	Alternative C	Alternative D
Proposed withdrawal areas with moderate to high potential				
Proposed wilderness additions	0	53,527	145,819	0
Proposed RNAs	0	70,000	70,000	0
Suitable WSRs	5,747	10,362	5,919	0
Total proposed withdrawal acres				
Wildlife and fisheries	0	133,889	221,738	0
Sage-grouse total acres	0	77,566	82,953	78,871

"Proposed withdrawal acres" include only those proposed designations or areas outside of existing Wilderness Areas, the Piedra Area, and existing RNAs. "Sage-grouse acres" include lek sites and nesting habitat.

Under all of the alternatives, the impacts to salable mineral materials would be proportional to the number of acres restricted or recommended for closure to mineral activity (since development of these solid-minerals resources is discretionary in the planning area). Impacts to locatable minerals (those solid minerals subject to claim under the Mining Law) may be similarly proportional under all of the alternatives. Unlike mineral materials, which occur throughout the planning area, important deposits of locatable solid minerals are unlikely to occur outside of the areas identified in Table 3.16.1; therefore, impacts to this resource under any of the alternatives may be minor. Impacts to leasable (DOE withdrawn lease tract) uranium/vanadium would not vary by alternative (since these lease tracts are administered by DOE and are not subject to any of the alternatives). Impacts to locatable (USFS and BLM land) uranium/vanadium may be proportional with the acres listed for sage-grouse (since the most important uranium/vanadium deposits are in the same geographic area). As noted above, these impacts are not intended to be read as absolute numbers; rather, they serve to indicate the relative restrictive nature of each alternative.

DLMP/DEIS Alternatives: In summary, based on the total acres of the various management actions designations that could limit the development of solid minerals, Alternative C may result in moderate to minor impacts, followed by Alternatives B, D and A, all with minor to negligible impacts.

Impacts Related to Wilderness Area Management

Impacts related to Wilderness Area management may be the possible closure of designated areas to solid-minerals operations. Wilderness Areas are withdrawn by law from all forms of mineral exploration and development. The measurable indicator of impacts would be the number of acres allocated to MA 1s (proposed Wilderness Area) that contain areas of moderate or high potential for occurrence of solid minerals. These areas carry an assumption of closure by withdrawal or administrative action from solid mineral exploration and development. Although withdrawal may not occur without further environmental analysis and decision-making, it is assumed that withdrawal would be implemented, as recommended by the SJPLC. BLM WSAs in the Slick Rock/Dove Creek area would not impact future uranium and vanadium activity (since these areas are open to mineral development).

DLMP/DEIS Alternatives: Alternative C may result in moderate to minor impacts on solid minerals (due to Wilderness Area management), followed by minor impacts under Alternative B. Alternatives A and D may result in no impacts.

Impacts Related to New Research Natural Area (RNA) Designations
Impacts related to new RNA designations may be the possible closure of areas to solid-minerals operations. The proposed Grizzly Peak and Hermosa RNAs may impact areas with moderate potential for precious and base metal locatable mineral activity.

The measurable indicator of impacts would be the number of acres allocated to proposed RNAs (because RNA designation carries an assumption of closure by withdrawal from solid-minerals exploration and development). Withdrawal would not occur without further environmental analysis and decision-making; therefore, it is assumed that withdrawal would be implemented, as recommended by the SJPLC.

DLMP/DEIS Alternatives: Alternatives B and C may result in minor impacts to solid minerals (due to new RNA designations). Alternatives A and D may result in no impacts.

Impacts Related to Wild and Scenic River (WSR) Designations
Under the Wild and Scenic Rivers (WSR) program, designation of river segments as recreational or scenic do not carry constraints on locatable solid-mineral activity; however, designation of a river segment as a WSR would carry an assumption that the segment would be withdrawn from mineral activity. Impacts related to WSR designations may be the closure of areas to solid-minerals operations. Designation of segments of the upper Dolores River may impact lands with high potential for uranium, vanadium, and precious metal resources. DOE uranium lease tracts in this river corridor would not be impacted. The Hermosa River, and tributaries, have moderate potential for precious and base metal occurrences, although there is no current activity.
The measurable indicator of impacts would be the number of miles allocated to suitable WSR designation. Although withdrawal would not occur without further environmental analysis and decision-making, it is assumed that withdrawal would be implemented, as recommended by SJPLC.

DLMP/DEIS Alternatives: Alternative B may result in minor impacts to solid minerals (due to WSR designation). Alternatives C and A may result in minor to negligible impacts. Alternative D may result in no impacts.

Impact Related to Wildlife and Fisheries Management
Impacts related to wolidfe and fisheries management may be higher operating costs and the possible closure of areas to solid-minerals operations. Wildlife management activities that trigger these impacts would be primarily related to management requirements under the Endangered Species Act (ESA). No areas would be proposed for withdrawal from solid-minerals activity under any of the alternatives in relation to wildlife and fisheries management; however, protective measures applied to exploration and development activities may increase costs. Prevention from, and remediation of, acid mine drainage would be the most important factor for the Silverton area. Sage-grouse habitat protection may impact the development of mining claims in the Slick Rock/ Dove Creek uranium/vanadium resource area. DOE uranium leases would be subject to ESA regulation under any of the alternatives; however, such regulation is not within the management authority of SJPLC. The degree of the impacts would depend upon approved conservation strategies, critical habitat designations, and biological opinions that mandate specific management requirements for solid-minerals exploration and development. These requirements would not be known until specific project proposals are submitted and assessed.

The measurable indicator of impacts would be the number of acres allocated to sage-grouse habitat (see Table 3.16.2). This is because this designation is known and would impact an area of current solid-minerals activity (the Slick Rock/Dove Creek uranium/vanadium area). However, its usefulness is as a comparative indicator of impacts, not as an absolute quantifier. Alternatives that would allocate a greater number of acres to this designation may be considered to require a similar degree of restriction on solid-minerals activity throughout the planning area, for comparison purposes.

DLMP/DEIS Alternatives: Alternatives C, D and B may all result in moderate to minor impacts on solid minerals in relation wildlife and fisheries management. Alternative A may result in no impacts.

Summary of Direct and indirect Impacts by Altnerative

Based on the total acres of the various management actions designations that could limit the development of solid minerals, Alternative C may result in moderate to minor impacts, followed by Alternatives B, D and A, all with minor to negligible impacts.

CUMULATIVE IMPACTS

Cumulative impacts, in relation to the alternatives, would result from a continuation of the same general restrictions on the solid-minerals program as existed in the previous land and resource management plans (USFS 1983; BLM 1985), as well as from the imposition of newer environmental laws and regulations. Table 3.16.2 above summarizes the direct and indirect impacts by alternative; expected cumulative impacts may follow the same pattern by alternative.

Except for the areas identified for precious and base metals and uranium/vanadium in Table 3.16.1, solid-minerals activity is scattered and intermittent in location and timing. Future solid-minerals activity outside of those specific areas would continue this pattern; as previous activities end, others would begin. The general level of activity would remain roughly the same; therefore, the cumulative impacts on the program and resource from implementation of any of the alternatives on lands with low or no potential for solid minerals may be negligible.

For the precious and base metal resource areas identified in Table 3.16.1, the legacy of past activities may exert an influence on future impacts to the solid-minerals program. Acid mine drainage, watershed degradation, tailings and spoils piles, and high road densities exist even where there is no current solid-minerals activity. These past impacts, as well as changes in environmental law, restrictions on new operations and more potential closures to future activities, would be coupled with the higher costs of exploration, development, and reclamation. This may limit the success of new developments and of marginal operations, reducing the long-term supply of these metals to the local economy and to the nation. The additional withdrawals of land from mineral development for WSAs, RNAs, and WSRs would reduce the land base and potential resource recovery for precious and base metals. However, the expected level of future development in these areas is moderate; therefore, the cumulative impacts on the precious and base metal program and resource from the implementation of any of the alternatives may be minor for such areas.

For the uranium/vanadium resource areas identified in Table 3.16.1, historic and current activity may not be a strong influence on future activity. Historic and current activity operates under existing restrictions; implementation of any of the alternatives may only impact future activity. Most historic uranium activity has been cleaned up, or has not left the visible legacy of disturbance that typifies precious metal resource areas (such as Silverton). DOE uranium lease tracts are not subject to any of the alternatives. BLM WSAs would be open to mineral development. SJPL areas open to development would face more stringent restrictions and higher costs than in the past. The cumulative impacts on the uranium/vanadium program and resource may be minor to moderate.

Overall, for the solid-minerals resource, Alternative C may result in moderate to minor cumulative impacts. Alternatives B and D may result in minor impacts. Alternative A may result in negligible cumulative impacts.