United States Department of Agriculture
Forest Service

Mineral and Geologic Resources Report

Colville National Forest Plan Revision

Draft Environmental Impact Statement

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Mineral and Geologic Resources

Affected Environment

United States Mining laws classify mineral commodities into three distinct groups: locatable, leasable, and salable. Forest Service control or discretion over the disposal of various mineral commodities ranges from a minimum with locatable minerals to a maximum with salable minerals.

Locatable minerals include most metals and many non-metals (e.g., barite, fluorite, and gypsum). Most federal lands not withdrawn from mineral entry are available for the exploration and development of locatable minerals by any U.S. citizen under provisions of the 1872 Mining Law, as amended. Mineral operators are entitled to reasonable access to these lands including, where reasonable and necessary, roaded entry. Forest Service control of such activities is limited to minimizing surface impacts and is accomplished via an environmental analysis of individual proposals (36 CFR 228 Subpart A).

Leasable minerals are specific mineral resources identified by the Mineral Leasing Act of 1920, as amended, the Mineral Leasing Act for Acquired Lands of August 7, 1947, the Geothermal Steam Act of December 24, 1970, as amended, and the Federal Coal Leasing Amendments Act of August 4, 1976. Leasable minerals include oil and gas, coal, oil shale, and geothermal resources, as well as sodium, potassium, phosphate, and a few others. On acquired lands these minerals, as well as those that are normally locatable, are leased under the Leasing Act for Acquired Lands, August 7, 1947. Forest Service regulations for Oil and Gas Resources are found at 36 CFR 228 Subpart E.

Salable minerals, also known as common variety minerals or mineral materials, include sand, gravel, stone, and some other widely available mineral materials, as described in the Materials Act of July 31, 1947. Forest Service regulations for these minerals are found at 36 CFR 228 Subpart C.

It is Forest Service policy for minerals resource management to foster and encourage private enterprise in the development of economically sound and stable industries, and in the orderly and economic development of domestic resources to help assure satisfaction of industrial, security, and environmental needs.

The Colville National Forest has a geological environment favorable to the occurrence of mineral deposits (See Map 1 – Appendix A). Minerals occurring in most Colville National Forest system lands are federally owned however, there are many outstanding or reserved mineral rights. Private parties acting on their rights to outstanding mineral interests can potentially limit or impair the Forest Service from managing the surface of the land for the purposes for which they were acquired. Three percent of the total forest is withdrawn from mineral entry because it is wilderness. Other areas of the Forest such as administrative sites, Research Natural Areas, Seed Orchards, or recreation areas may also be withdrawn from mineral entry.

Locatable Minerals

Locatable minerals are those valuable deposits subject to exploration and development under the General Mining Law of 1872 and its amendments. Commonly, these minerals are referred to as hardrock minerals. The Forest Service and BLM (Bureau of Land Management) cooperate in managing this resource; the Forest Service manages the surface resources that may be impacted by mining activities, and the BLM manages the minerals. Potential for lead and zinc, limestone, and silica predominates in the

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Metaline and Northport mining districts, while copper, silver, dolomite, and silica are more common in the Chewelah, Loon Lake, and Newport areas. Limestone, dolomite, and silica may be subject to disposal as locatable or salable minerals depending on the nature, chemical composition, and use of the material. Precious metals are most important in mining districts near Republic and Orient, especially gold. Gold exploration mining in the Republic area has increased since the 1990s. The western Okanogan Highlands region has produced more than 3 million ounces of gold and almost 15 million ounces of silver from predominately the Republic Mining District. (USDI 2011) Uranium potential is greatest in the Kettle Range and in the Selkirk Mountains east of Colville and Chewelah. Small-scale minerals activities (panning, sluicing, dredging, and rock/mineral collecting) are usually for non-commercial purposes.

The Colville has approximately 744 mining claims covering 14,980 acres. The vast majority of those claims are lode claims with only a few placer claims. In general, mineral activity on the Forest is relatively minor in scope given the size and scale of the National Forest. As of 1988, the Forest had two hundred and fifty-five patented mining claims, covering 4,340 acres. Current locatable mineral activities on the Forest primarily include claim staking, prospecting, exploration, limited mining for select commodities. This level of activity is expected to continue. Locatable mineral activities have included both metallic and nonmetallic minerals. Because of the relatively low potential for leasable minerals, development of important energy minerals is unlikely. One exception may be uranium (which is locatable, not leasable).

There would be continued interest in commercial and small-scale minerals activities, especially if the prices of gold, silver, and other precious metals or base metals increase. Projecting long-term demand for any specific mineral commodity is difficult because domestic demand is influenced by many factors such as economic and geopolitical trends, some of which are national and international in scale.

Leasable Minerals

Federally-owned, leasable minerals include fossil fuels and geothermal resources. These minerals are subject to exploration and development under leases, permits, or licenses granted by the Secretary of Interior with Forest Service consent. Only one portion of the Forest, running north and south of the town of Republic along the Sanpoil, Curlew, and Kettle river valleys is identified as having a moderate potential for oil and gas (USDI 2011) There is no or very low potential on the forest for the occurrence of geothermal and coal resources (USDI 2011). Currently there are no active mineral leases or pending lease applications on the Forest.

Demand, like locatable minerals, is influenced by economic and geopolitical factors. While the United States has increased domestic production, most of the development has been in other parts of the country, where there is greater mineral potential and permitting, development and production costs are lower or there is less risk on investment return. This is likely to continue. As there is no or very low potential for geothermal and coal resources on the Forest, demand would be filled elsewhere.

Salable Minerals

Saleable mineral materials, or common varieties, are generally deposits of sand, clay, gravel, and stone that are used for road surfacing and building materials. Disposal of these materials is by mineral material permit or contract, and is at the discretion of the Forest Service. Saleable minerals production and use is mainly for public works and Forest roads maintenance and construction. However, private parties may also purchase saleable minerals from the Forest. Salable mineral materials, particularly sand, gravel and stone, are widely available throughout the Forest. Demand for saleable minerals is expected to grow with increased land development.

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Affects to Minerals

The major influence of other resource management direction on minerals is their effect on access. This varies from no access in areas withdrawn from mineral entry, to high accessibility in general forest areas. Generally, prospecting and early exploration activities have little effect on other resources because of greater flexibility of access and equipment use at that stage. Actual mineral extraction may have minimal to great interaction with other resources, depending upon the location, the mineral being removed, and the process and type of equipment used. For example, a small underground mine, shipping ore directly to an existing offsite mill or smelter without processing and located in a general forest area, would have few effects. On the other hand, a large open pit mine and milling operation, located in wildlife habitat could potentially have a much greater effect on other resources.

Geologic Resources

There are paleontological or fossil resources on the Forest that are managed in accordance with the Paleontological Resources Preservation Act of 2009; implementing regulations are found at Title 36 Code of Federal Regulations 291 (36 CFR 291). Paleontological resources are protected from loss due to threat, vandalism, or the natural elements through responsible planning, management, partnerships with qualified museums and other institutions, and collaboration with Forest Service law enforcement.

Groundwater is the Nation's principle reserve of fresh water. Ground water on National Forest System (NFS) lands is a major contributor to flow in many streams and rivers, provides clean drinking water to local communities, and supports groundwater-dependent ecosystems. The Forest recognizes the importance of managing groundwater resources in a wise and sustainable manner in accordance with the Forest Service national groundwater policy outlined in Forest Service Manual 2880.

Geologic hazards include events such as flooding, mass wasting, seismicity, ground subsidence, reactive soils, volcanic eruptions, toxicity associated with mineralization, acid mine drainage, and naturally occurring hazardous minerals and gases (e.g. asbestos, uranium, radon). Geologic hazards on NFS lands are managed to ensure protection of public safety, health, property, and the environment by using qualified geologists for the recognition, inventory, analysis, and interpretation of those hazards, and the integration of that information into forest and project planning, design, construction, maintenance, and monitoring activities, reviews of proposals, permits, approvals, concurrences, and recommendations for uses of NFS lands.

Caves and cave ecosystems are protected and maintained in accordance with Federal law. Caves of importance can be nominated for Significant Cave eligibility in accordance with the Federal Cave Resource Protection Act of 1988 and 36 CFR 290 due to things like unique geologic/hydrologic conditions or important sensitive biota that inhabits the cave. No caves on the Colville National Forest have been nominated for Significant Cave status.

The geologic resources and hazards outlined above are inventoried, evaluated, and managed on both a landscape level and as part of project specific design and analysis. Project design includes avoidance, mitigation or monitoring procedures necessary to protect geologic resources or address geologic hazards.

Relevant Laws, Regulations, and Policies that Apply

In addition to laws mentioned in the National and Regional Direction and Guidance in the Introduction of the DEIS, the following apply specifically to Minerals.

Federal Cave Resource Protection Act of 1988 – authorizes use and protection of paleontological resources found in caves on National Forest System land.

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General Mining Law of 1872 – allows exploration, development, and production of minerals from mining claims on public lands.

Mineral Land Leasing Act of 1920 - made deposits of coal, phosphate, potassium, gilsonite, sodium, oil, oil shale, and gas owned by the United States subject to disposition by leasing. The BLM was made responsible for leasing under this Act.

Mineral Leasing Act for Acquired Lands of 1947 – extends the provisions of the mineral leasing laws to federally-owned mineral deposits on acquired NFS lands and requires the consent of the Secretary of Agriculture prior to leasing.

Mineral Material Act of 1947 – authorizes disposal of common variety minerals. It also allows free use to government agencies, municipalities, and non-profit organizations.

Mining and Minerals Policy Act of 1970 – states that it is the continuing policy of the federal government to foster and encourage private enterprise in the development of economically sound and stable domestic mining and mineral resources.

Multiple Use Mining Act of 1955 – allows the sale of mineral materials such as sand and gravel and provides direction for the multiple use of surface resources of mining claims.

Paleontological Resources Act of 2009 - Provides for the management and protection of paleontological resources on Federal land using scientific principles and expertise.

Regulation and Policy

Code of Federal Regulations at 36 CFR 228, subpart A - provides rules and procedures for use of National Forest System lands for locatable minerals.

Code of Federal Regulations at 36 CFR 228, subpart C – provides rules and procedures for use of National Forest System lands for mineral materials (sand, gravel, stone, etc.).

Code of Federal Regulations at 36 CFR 251, subpart B – provides direction for managing special uses including paleontological resources.

Code of Federal Regulations at 36 CFR 291 – provides rules and procedures for management of paleontological resources using scientific principles and expertise; describes prohibited activities and associated civil and/or criminal penalties.

Forest Service Manual (FSM) 2800 – provides policy and procedures on mineral and geologic resources. Includes locatable minerals (FSM 2810); leasable minerals (FSM 2820); reserved and outstanding mineral rights (FSM 2830); reclamation of lands disturbed by mineral activities (FSM 2840); management and disposal of mineral materials (FSM 2850); prospecting and mineral collecting (FSM 2860); and geologic resources and services (FSM 2880).

Environmental Consequences of Alternatives–Minerals

Methodology

Assumptions

- Regardless of the alternative, mineral operations have to comply with federal and state laws and regulations. These include but are not limited to laws such as Clean Water Act, or Endangered

Species Act. Locatable minerals can be developed per the direction in the 1872 Mining Law, Forest Service regulations at 36 CFR 228A, and other pertinent laws and regulation on all areas of the Colville National Forest not withdrawn from locatable mineral entry.

- Geologic resources would be managed in accordance with the Paleontological Resources Protection Act of 2009 and Forest Service implementing regulations found at 36 CFR 291. Groundwater is managed in accordance with the Forest Service national groundwater policy outlined in Forest Service Manual 2880. Caves and cave ecosystems are protected and maintained in accordance with Federal law (Federal Cave Resource Protection Act of 1988 and 36 CFR 290.) The Forest's geologic resources are inventoried, evaluated, and managed on both a landscape level and as part of projects to protect geologic resources regardless of the alternatives.

Methods of Analysis

Risks to mineral resource operations are identified. The major influence of other resource management direction on minerals is their effect on access. The level of risk is assessed by alternative using percent of the Forest allocated to a management area that is associated with the risk, either increasing or decreasing effects.

Spatial and Temporal Context for Effects Analysis

The spatial affected environment for direct and indirect effects is the lands administered by the Colville National Forest. Effects are analyzed over the life of the forest plan, which is expected to be 15 years.

Past, Present, and Foreseeable Activities Relevant to Cumulative Effects Analysis

The affected environment for cumulative effects includes the Confederated Tribes of the Colville Reservation lands, Kalispel Tribe Reservation lands, lands administered by the Idaho Panhandle National Forests; other federal and state lands; and lands of other ownerships adjacent to the Colville National Forest boundaries.

Key Indicators

The following indicators are used to evaluate effects on mineral resources of each alternative. They are appropriate because they address risks to mineral resources from motorized recreation trails, road access, and Recommended Wilderness (RW). Geologic resources are protected as described in the assumptions and were not a part of the significant issues, so are not addressed in the effects analysis. The other significant issues are also addressed; however, they have little impact to mineral resources so effects indicators are not identified.

Table 1–Evaluation criteria and key indicators for Mineral Resources

Issue	Evaluation Criteria	Key Indicator
Motorized Recreation Trails	Evaluate the access for possible mineral operations	*Percent of total forest acreage allocated to Backcountry Non-motorized management area by alternative*
Road Access	Evaluate the access for possible mineral operations	*Desired road density or cap on road miles for each alternative*
Recommended Wilderness	Evaluate the access for possible mineral operations	*Percent of total forest acreage in Recommended Wilderness management areas*

Issue	Evaluation Criteria	Key Indicator
		Qualitative description of low, moderate, and high mineral potential that intersects with RW

Effects of No Action Alternative - Minerals

This is the current Colville Forest Plan as amended. No Action means the current management direction would continue.

Summary of Effects of No Action Alternative

Access is the main factor affecting minerals operations. The current forest plan limits minerals operations in old forest management areas and riparian habitat conservation areas. It also excludes saleable mineral operations from non-motorized management areas, research natural areas (RNA), ski areas, the recreation/wildlife management area 3B, and old growth management areas (MA-1). In addition, the current forest plan recommends mineral withdrawal for RNAs. The Salmo-Priest wilderness area is withdrawn from mineral entry, which accounts for three percent of the total forest area. Wildlife, riparian, and old forest management requirements may add time and costs to mineral operations.

Direct and Indirect Effects

Old Forest Management

Effects on Minerals from Old Forest Management

Currently the forest plan includes management areas that emphasize managing for old forest habitats. Saleable mineral activities are not allowed in these areas. Mineral resource exploration and development would include reasonable requirements to protect old growth wildlife habitat. Old forest management emphasis can increase the time and costs of mineral operations, by imposing limits on mineral operation to protect and maintain old forests. The effect of these management restrictions on mineral activities is minimal as they apply to three percent of the total forest area.

Motorized Recreation Trails

Effects on Minerals from Motorized Recreation

The major influence of other resource management direction on minerals is their effect on access. About twelve percent of the forest is in a backcountry non-motorized type of management area. Due to budget trends, the motorized trail system is likely to see small additions in the future so current access would continue but not meaningfully increase. For saleable minerals, a non-motorized designation essentially eliminates the opportunity to exploit mineral materials as the current forest plan excludes these areas from saleable minerals disposal. For locatable and leasable minerals, motorized access on existing, open forest system roads/trails, road/trail reconstruction, or new road/trail construction can still be permitted in designated non-motorized areas through the applicable regulatory processes.

Access

Effects on Minerals from Road Density

The major influence of other resource management direction on minerals is their effect on access. Current road density direction would continue. Today there is about 4,000 miles of National Forest

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System roads and about 80 percent of the forest is suitable for road construction. The current forest plan includes standards and guidelines that limit road densities to between 0.4 to 2 miles per square mile in deer and elk winter range; grizzly bear habitat areas; and lynx habitat. Outside of these habitats, the forest plan doesn't set an upper limit on road density. Today the average National Forest System road densities in 12th field watersheds range from a low of 0.33 to a high of 4.45 miles per square mile on National Forest System lands. Due to budget trends, the total miles of National Forest System roads are expected to remain the same or decrease slightly over the next 10 years.

Access for saleable mineral materials would continue at current levels or be slightly less. For locatable and leasable minerals, road decommissioning to achieve road density standards may limit motorized access on existing, open forest system roads during initial prospecting and exploration activities in places. However, alternative means of access are possible and road reconstruction or new construction can always be proposed and approved in accordance with applicable regulations. Proposed road reconstruction or new road construction in management areas with road densities at or above standards would require amendments to the Forest Plan which can increase permitting timelines and costs.

Recommended Wilderness Areas

Effects on minerals from Recommended Wilderness (RW)

Under the current Forest Plan there is no RW on the Forest. Currently 3 percent of the Forest is allocated to wilderness and withdrawn from mineral entry. Research Natural Areas, also to be withdrawn, account for 0.4 percent of the total forest area. The current forest plan has a minerals standard that directs the Forest to minimize the acres withdrawn for mineral entry to that necessary for protecting dedicated areas such as developed recreation sites, wilderness, Research Natural Areas, and administrative sites. (FEIS, 4-57)

Wildlife

Effects on Minerals from Wildlife

Wildlife direction can result in timing restrictions and avoidance of specific sites for wildlife protection, for minerals activities. Measures can vary by the type of mineral operation and location. The effect can be to increase time to permit and approve plans of operation and cost of mineral operations, but would not be known until projects are developed. Protection of wildlife and compliance with ESA is required of all mineral operations. This would continue.

Riparian and Aquatic Resource Management

Effects on Minerals from riparian and aquatic resource management

Direction limiting location of facilities or types of operations can have the effect to increase time to permit, approve plan of operations, and cost of mineral operations. The extent of effects can vary by the type of mineral operation and location, which is unknowable until site-specific projects are developed. Protection of water quality and compliance with the Clean Water Act is required of mineral operations. The current forest plan does address mineral operations in relation to riparian and aquatic resources. Minerals operations in Riparian Habitat Conservation Areas (RHCA) directs operators to take all practicable measures to maintain, protect, and rehabilitate fish and wildlife habitat that may be affected by the operations. Surface occupancy for leasable minerals and saleable mineral operations are limited to those operations that meet riparian objectives and alternative locations are not available. This would continue.

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Effects Common to All Action Alternatives - Minerals

Alternatives Proposed Action, O, B, R, and P would result in the following common conditions.

Summary of Effects Common to All Action Alternatives

Old Forest Management and Timber Production

Effects on Minerals from Old Forest Management

The effects of vegetation management are the same for all alternatives. It is not expected that any of the vegetation direction would adversely or positively affects minerals to any degree.

Wildlife

Effects on Minerals from Wildlife

Wildlife direction in all alternatives could result in timing restrictions and avoidance of specific sites for wildlife protection, for minerals activities. Measures can vary by the type of mineral operation and location. The effect can be to increase time to permit and cost of mineral operations, but would not be known until projects are developed. Protection of wildlife and compliance with ESA is required of mineral operations under any alternative.

Riparian and Aquatic Resource Management

Effects on Minerals from riparian and aquatic resource management

Direction limiting location of facilities or types of operations can have the effect to increase time to permitting, plan of operation approval, and cost of mineral operations. Effects can vary by the type of mineral operation and location. The extent and duration of effects is unknowable until site-specific projects are developed. All of the action alternatives have riparian management areas with plan direction that addresses mineral operations. The Proposed Action and alternative R include a guideline that limits locating mine wastes in RMAs, that is not included in other action alternatives. This would have a minimal effect on mineral operations. Since protection of water quality and compliance with the Clean Water Act is required of mineral operations in all alternatives, the difference in effects from riparian and aquatic resource management across alternatives is minimal.

Summary of Effects of the Action Alternatives - Minerals

Access: Access by motorized recreation trails and roads are a factor for saleable minerals exploration and exploitation. When considered along with the amount of land allocated to RW, the B and R put the largest total amount of the forest into allocations (BCNM and RW) that don't allow roads or motorized trails. Alternatives B and R would have the highest effect on access for saleable minerals.

For locatable and leasable minerals, lower road densities or lack of motorized trails can increase time and costs during initial prospecting and exploration activities. Motorized access on existing roads and trails or proposed road/trail reconstruction/construction could still be approved in non-motorized areas for leasable operations, so long as the management area does not have a No Surface Occupancy or Controlled Surface Use suitability determination, and for all locatable operations on lands open to mineral entry.

Mineral Withdrawal: Wilderness recommendation alone removes lands from consideration for leasing and saleable mineral materials use. Mining claims and active locatable operations in RW would not be affected until the area is designated as wilderness by Congress. Alternatives B and R allocate the highest

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amount of the forest to recommended wilderness, which would withdraw the most land from mineral entry.

Indirect Effects of Action Alternatives

Motorized Recreation Trails

Effects on Minerals from Motorized Recreation

For saleable minerals, a non-motorized designation essentially eliminates the opportunity to exploit mineral materials. Areas allocated to Backcountry Non-motorized (BCNM) management areas vary across the alternatives as shown in Table 2. Alternative O allocates the highest amount of land to a BCNM allocation. However, when considered along with the amount of land allocated to RW, the B and R alternatives put the largest total amount of the forest into allocations (BCNM and RW) that do not allow roads or motorized trails. Alternatives B and R would have the highest effect on access for saleable minerals.

For locatable and leasable minerals, an increase in non-motorized management area acreage can limit motorized access on existing, open forest system roads and trails for initial prospecting and exploration activities that may not otherwise require Forest Service regulatory approvals. Motorized access on existing roads and trails or proposed road/trail reconstruction/construction could still be approved in non-motorized areas for leasable operations, so long as the management area does not have a No Surface Occupancy or Controlled Surface Use suitability determination, and for all locatable operations on lands open to mineral entry.

Table 2–Backcountry Non-motorized Management Area – percent of total forest acres

	Alternative			
Proposed Action	**O**	**B**	**R**	**P**
8	16	Less than 1 %	2	14

Access

Effects on Minerals from Road Density

The major influence of other resource management direction on minerals is their effect on access. For saleable minerals, a lower road density can adversely affects opportunity to exploit mineral materials due to less open roads on the landscape. Alternatives R and P have the lowest road densities and would limit access the most.

For locatable and leasable minerals, lower road densities or road decommissioning to achieve lower road density standards can decrease existing motorized access on open forest system roads during initial prospecting and exploration activities that may not otherwise require Forest Service regulatory approvals. However, alternative means of reasonable access are possible and use of existing but closed roads and road reconstruction/construction can be proposed and approved for mineral operations in accordance with applicable regulations. Proposed road reconstruction or new road construction in management areas with road densities at or above standards would require amendments to the forest plan, which can increase permitting timelines and costs for mineral operations.

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Table 3–Upper limit of desired road density or road miles

	Alternative			
Proposed Action	**O**	**B**	**R**	**P**
2-3 miles per square mile. Applicable in Focused Restoration (Active Restoration B) and General Restoration (Active Restoration C)	Cap USFS road miles at current level. Applicable forest wide.	Cap USFS road miles at current level. Applicable forest-wide.	1-2 miles per square mile. Applicable in Focused and General Restoration	1-2 miles per square mile. Applicable in Focused and General Restoration

Recommended Wilderness Areas

Effects on minerals from Recommended Wilderness

Currently 3 percent of the Forest is in designated wilderness. Until Congress decides to designate the recommended wilderness areas as Wilderness, they remain open to mineral entry under the U.S. Mining and Mineral Leasing Laws. Persons prospecting, locating and developing mineral resources in NFS lands under the 1872 Mining law have a right of access for those purposes. Requests for access to mining claims located in RW would be processed according to existing authorities, regulations and policy. The claimants access (road or trail, motorized or non-motorized) would be specified in a Plan of Operations submitted to the District Ranger. The Forest Service is not obligated to approve or issue a permit regulating access if the proposed means or modes of transport are not reasonably necessary for the work to be performed for prospecting, location, or mineral development. Access is not authorized until the District Ranger signs the Operating Plan.

If the RW areas become congressionally designated wilderness, those areas would be withdrawn and closed to mineral entry under the U.S. Mining and Mineral Leasing Laws, subject to valid existing rights. Any known or currently undiscovered mineral deposits in congressionally designated wilderness areas would be foregone and not available for exploitation to support domestic or global demand unless another act of Congress makes them available. Mining claims with valid existing rights in designated wilderness could continue to operate in a logical, sequential development scenario, including mining.

After formal wilderness designation, the Forest Service would conduct valid existing rights determinations before approving most proposed locatable activities in Wilderness. Alternatives B and R allocate the highest amount of the forest to recommended wilderness which, if selected and later designated by Congress, would withdraw the most land from mineral entry.

Research Natural Areas and the wild segment of wild and scenic rivers are to be withdrawn from mineral entry also. The proposed action includes a recommendation for a segment of a wild river, so the effects of additional mineral withdrawals come from possible wilderness and wild river designations by Congress.

Wilderness recommendation alone removes lands from consideration for leasing and saleable mineral materials use.

Table 4–Recommended Wilderness – percent of total forest acres

	Alternative			
Proposed Action	**O**	**B**	**R**	**P**
9	1	20	19	5

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Cumulative Effects - Minerals

Mineral development on privately owned lands is discretionary with the landowners. Lands managed by Washington State agencies and the USDI, Bureau of Land Management have minerals generally available by lease or location. National Parks are withdrawn from mineral entry, so they have no mineral activities. Adjacent National Forests have the same management direction as Colville NF for minerals activities. Leasable, locatable, and saleable activities would continue on adjacent federal and state lands. The level of mineral activities would depend on market prices and mineral potential, same as the National Forest. Leasable mineral exploration for oil and gas on lands outside the Forest and within the Columbia Basin was active in the early 2000s and has since tapered off. There are no current geothermal leases on the other National Forests, Confederated Tribes of the Colville reservation lands, or BLM high potential lands. Locatable mineral claims are filed Ferry, Pend Oreille, and Stevens counties. There has been no marked increase in activity over the last ten years, even with increased prices of precious and base metals.

Adjacent lands have not recently made or intend to make major changes in management of motorized recreation, road density, and RW. There are no past, present, or reasonably foreseeable actions that would add to the direct and indirect effects described.

Environmental Consequences of Alternatives–Geologic Resources

Effects of No Action Alternative – Geologic Resources

This is the current Colville Forest Plan as amended. No Action means the current management direction would continue.

Paleontological Resources

Paleontological or fossil resources on the Forest are managed in accordance with the Paleontological Resources Preservation Act of 2009 and implementing regulations found at 36 CFR 291. Bedrock or sediments ranging in age from late Precambrian age to Pleistocene have the potential to contain paleontological resources, and surface disturbing activities in these areas may negatively impact paleontological resources. The areas of the Forest containing Precambrian and Pleistocene deposits have been mapped during a Pacific Northwest Region – Forest Service effort several years ago (see Map 2 – Appendix A).

Groundwater

Groundwater is the Nation's principle reserve of fresh water. Ground water on National Forest System (NFS) lands is a major contributor to flow in many streams and rivers, provides clean drinking water to local communities, and supports groundwater-dependent ecosystems. The Forest recognizes the importance of managing groundwater resources in a wise and sustainable manner in accordance with the Forest Service national groundwater policy outlined in Forest Service Manual 2880. See the forest Hydrology report for additional information on the Forest's management of groundwater.

Geologic Hazards

Geologic hazards include events such as flooding, mass wasting, seismicity, ground subsidence, reactive soils, volcanic eruptions, toxicity associated with mineralization, acid mine drainage, and naturally occurring hazardous minerals and gases (e.g. asbestos, uranium, radon). Geologic hazards on NFS lands are managed to ensure protection of public safety, health, property, and the environment. Qualified

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Forest Service geologists are consulted for the recognition, inventory, analysis, and interpretation of geologic hazards, and that information is integrated into forest and project planning, design, construction, maintenance, and monitoring activities, reviews of proposals, permits, approvals, concurrences, and recommendations for uses of NFS lands.

Caves and Cave Ecosystems

Caves and cave ecosystems are protected and maintained in accordance with Federal law. Caves of importance can be nominated for Significant Cave eligibility in accordance with the Federal Cave Resource Protection Act of 1988 and 36 CFR 290 due to things like unique geologic/hydrologic conditions or important sensitive biota that inhabits the cave. There is one known cave on the Colville National Forest (Pocahontas Cave), and a few suspected but unverified caves. No caves on the Colville National Forest have been nominated for Significant Cave status.

The geologic resources and hazards outlined above are inventoried, evaluated, and managed on both a landscape level and as part of project specific design and analysis. Project design includes avoidance, mitigation or monitoring procedures necessary to protect geologic resources or address geologic hazards.

Effects Common to All Action Alternatives – Geologic Resources

Alternatives Proposed Action, O, B, R, and P would result in the following common conditions.

It is not expected that any of the Action Alternatives would adversely or positively affect geologic resources to any degree. Management of these resources would continue in accordance with applicable law, policy and direction.

The adoption of any action alternative would not change the management of geologic resources and hazards. The geologic resources and hazards would continue to be inventoried, evaluated, and managed on both a landscape level and as part of project specific design and analysis. Project design includes avoidance, mitigation, or monitoring procedures necessary to protect geologic resources, address geologic hazards, and provide for public safety.

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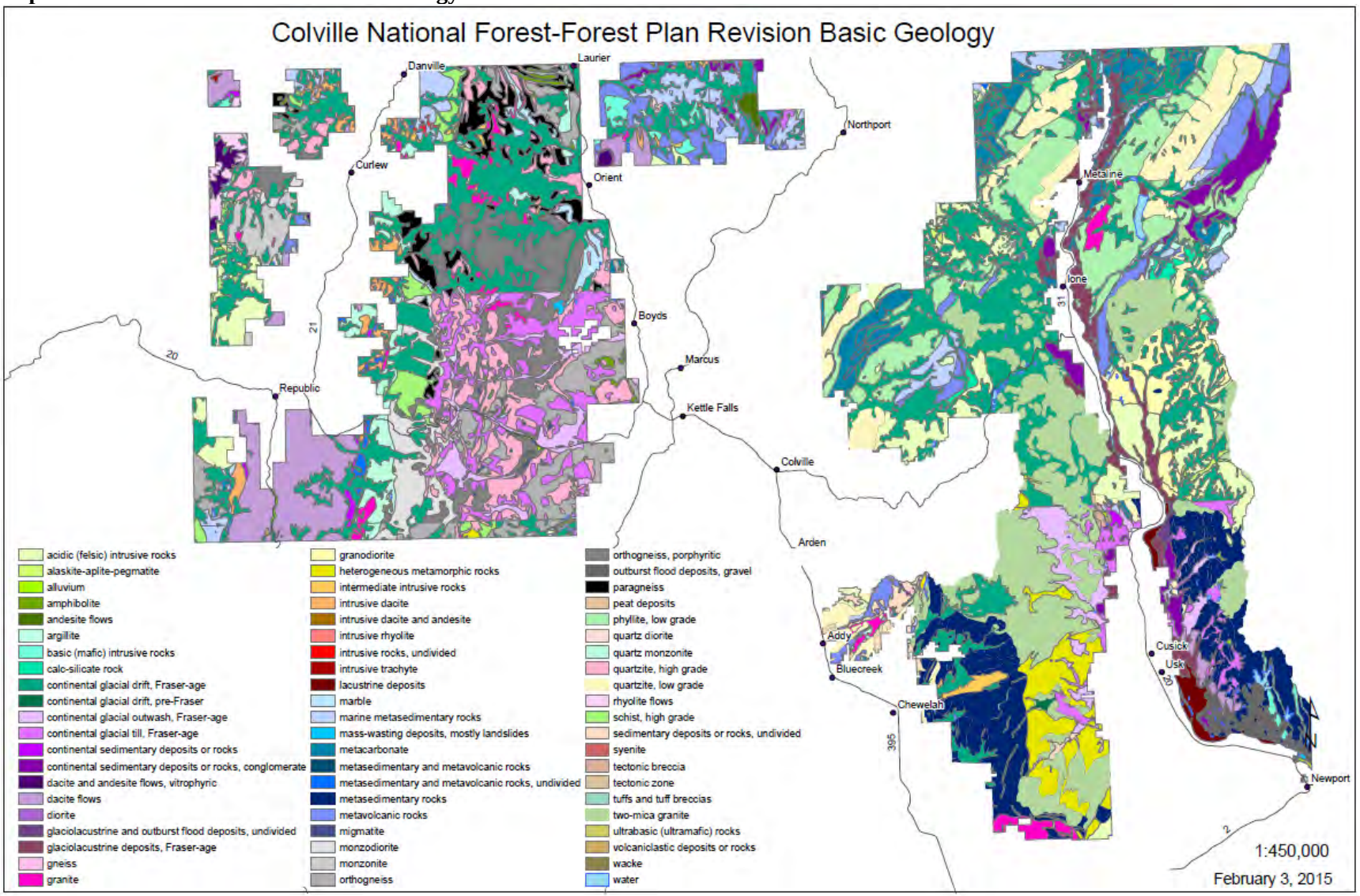
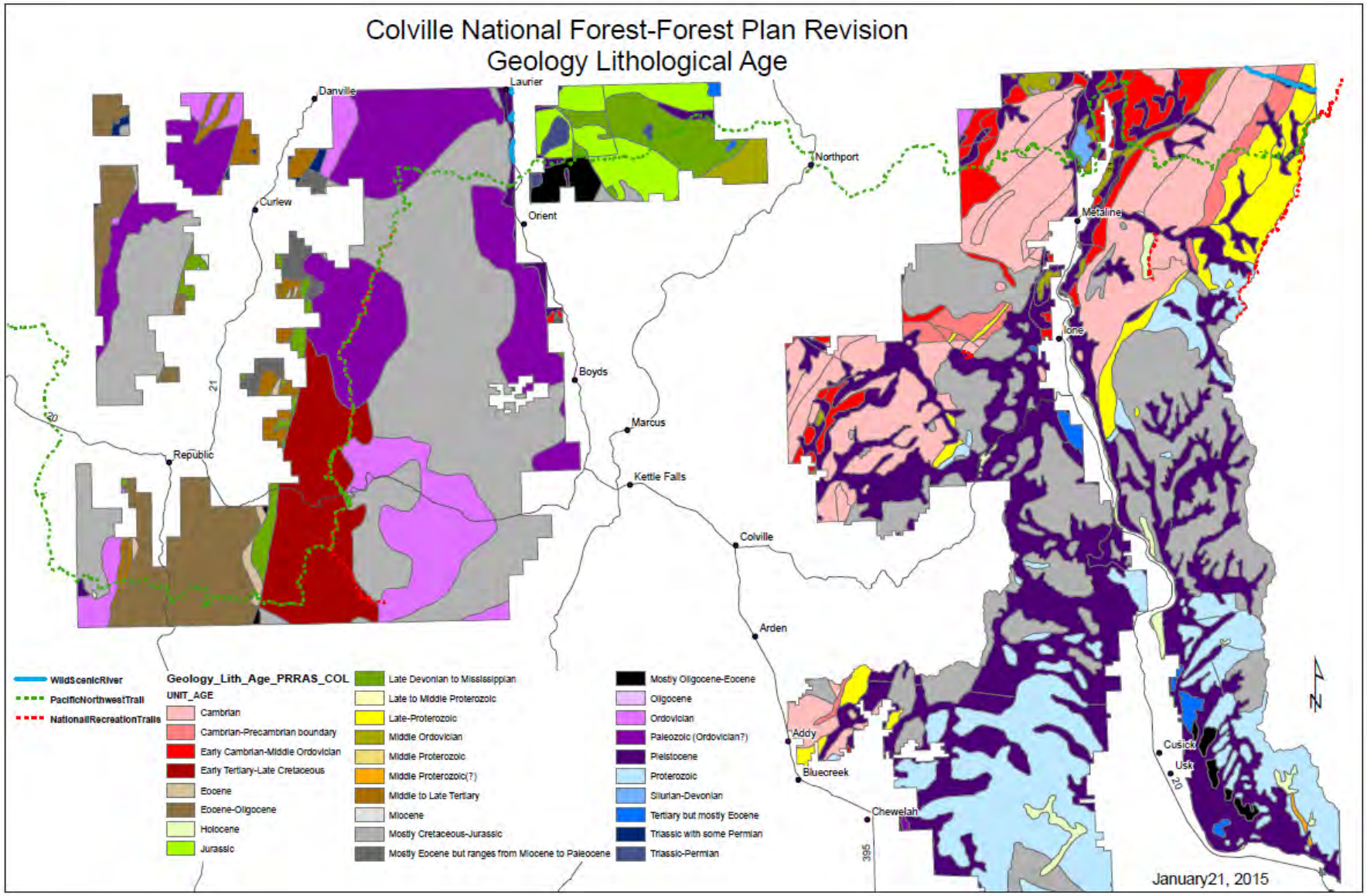
Appendix A - Maps

Map 1: Colville National Forest Basic Geology



Map 2: Geology Lithographic Age



1:400,000