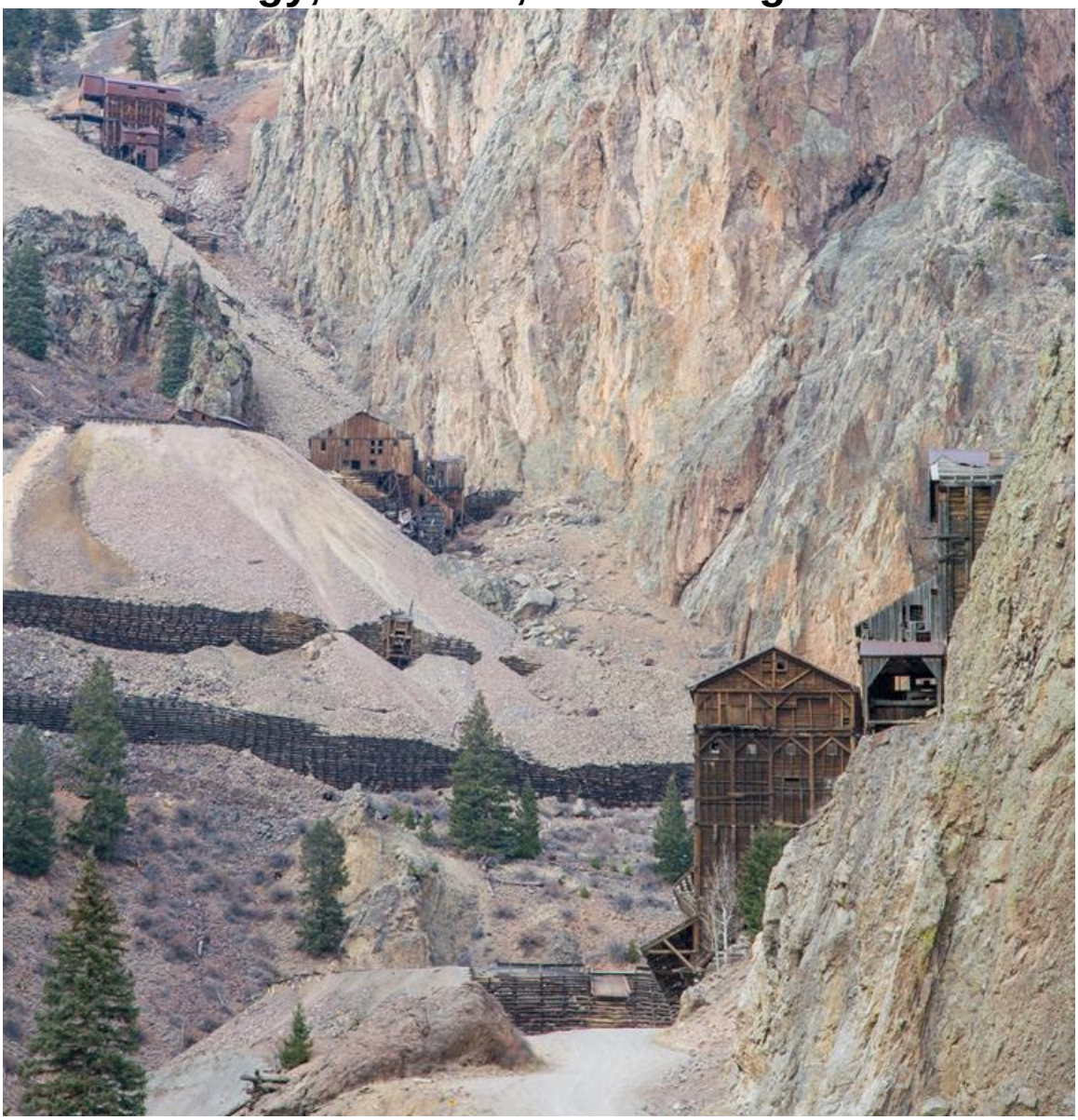
Rio Grande National Forest – Assessment 10
Energy, Minerals, and Geologic Hazards



Contents

Introduction 2
Locatable minerals 2
Salable Minerals 2
Leasable Minerals 3
Renewable Energy 3
Information Sources and Gaps 3
Scale of Analysis 4
Existing Forest Plan Direction 4
Renewable Energy: 4
Locatable Minerals: 4
Mineral Materials (Salable Minerals): 4
Oil, Gas and Other Leasable Minerals: 4
Renewable Energy Resources - Projections, Potential, and Trends 5
Solar: 6
Hydroelectric: 6
Wind: 6
Geothermal: 6
Woody Biomass: 7
Transmission Corridors 7
Ecological Integrity and Species Diversity 7
Social and Economic Sustainability 7
Management Concerns 8
Nonrenewable Energy and Mineral Resources 8
Previous Decisions Related to Energy and Minerals 8
Existing Activity and Facilities 8
Mining Hazards 9
Noncommercial Mineral Collecting Activities 9
Projections, Potential and Trends 9
Coal Resources 9
Ecological Integrity and Species Diversity 10
Social and Economical Sustainability 10
Management Concerns 10
Geologic Hazards 10
Summary / Conclusion 10

List of Figures

Figure 1. Map of oil and gas leasing potential 5
Figure 2. Abandoned mines on the Rio Grande National Forest 11
Figure 3. Coal mining Districts of Colorado with coal mines represented as yellow dots. There are no coal mines on the Rio Grande National Forest. 12

DRAFT

Introduction

The 2012 Planning Rule requires us to assess available information about renewable and nonrenewable energy, minerals, and geologic hazards on the forest, as outlined in Forest Service Handbook 1909.12, Chapter 10, Section 13.5. Energy sources evaluated in this assessment include oil and gas, geothermal, hydropower, wind and biomass resources on the forest. Mineral resources evaluated include locatable or hard-rock mineral deposits, such as silver, as well as mineral materials, including gravel and river rock. This assessment will also evaluate the current condition of abandoned mines and natural geologic hazards on the forest.

Starting with the General Mining Law of 1872, a string of federal laws govern energy and minerals activity on federal lands. Many of these laws predate the USDA Forest Service and allow for minimal management discretion at the forest level. The 1872 Mining Law set forth the principles of discovery, possession, and other conditions for "hard rock" minerals on lands reserved from the public domain for National Forest purposes. The Organic Act of 1897 provided for the continuing right to conduct mining activities on National Forest System lands. The Mineral Lands Leasing Act of 1920 addressed leasable minerals and gave authority to the Secretary of the Interior to lease National Forest System lands. The Multiple-Use Sustained Yield Act of 1960 directed National Forests to consider the relative values of all resources, including mineral resources, and the Federal On-shore Oil and Gas Leasing Reform Act of 1987 gave the Forest Service new authority by allowing the Forest Service to conduct a leasing analysis and decide which lands were available and authorized for leasing.

Locatable minerals

Locatable minerals are those valuable deposits subject to exploration and production under the US General Mining Law of 1872 and its amendments. Locatable minerals are called "hard rock" minerals and may include deposits of iron, gold, silver, lead, zinc, copper, and molybdenum. The Forest Service is the surface-management agency and is responsible for protecting surface values during mineral extraction activities. For leasable and locatable minerals, the Bureau of Land Management (BLM), manages and makes decisions on the mineral estate and is a cooperating agency in this environmental analysis.

By law, citizens have the right to explore for, claim, and mine mineral deposits on federally owned lands, subject to the U.S. Mining Law. Through an agreement with the BLM, the Forest Service administers mining activities on Forest lands. The Forest Service approves and administers exploration and mining through Operating Plans, to assure reclamation and protection of other valuable surface resources.

Under this strict legal guidance, the 1996 Forest Plan considered many potential uses and activities related to energy, minerals and geologic hazards, mostly focused on the historic hard-rock mining on parts of the forest near Creede, Bonanza and Summitville. Since 1996, hard rock mining activity has ebbed and flowed, but may be on the rise again. For example, in 2008 a resurgence in the price of silver prompted exploration by Rio Grande Silver of historic silver veins above Creede, Colorado, leaking in 2013 and employing more than 90 people. Although this exploration is on hold as of 2015, Rio Grande Silver’s plan of operation remains active and they continue to express an interest in bringing silver mining back to Creede, which might require upgrades of transmission corridors which cross the forest to reach the mine.

Salable Minerals

Salable minerals include common-variety minerals such as sand, gravel, hard rock for crushing, and landscaping materials to name a few. Salable minerals are used internally by the Forest Service or permitted by the Forest Service for private use through sales and permits.

DRAFT

Leasable Minerals

The only known leasable minerals within the Rio Grande National Forest are oil and gas. Development potential within the Forest is low. The 1996 Plan estimated that up to 23 wells would be drilled over the next 10 years on land managed by the Rio Grande National Forest directly disturbing up to 129 acres of National Forest System land. The Bureau of Land Management predicted up to 17 wells would be drilled within the San Luis Resource Area (now the San Luis Valley Field Office). Resource stipulations were developed and included in the 1996 plan to sufficiently protect the resources of the Rio Grande National Forest. Five exploratory wells were drilled on the Forest prior to 1996, but none have been drilled since. There is evidence of hydrocarbons in the exploratory wells, but none have economically recoverable deposits. More than 140,000 acres of mostly National Forest System land were nominated for lease in 2008 and 2009, but were deferred primarily due to the need for the BLM to conduct a leasing analysis on National Forest System lands. It is unknown at this time when this analysis will be conducted. While industry has expressed interest in exploring for oil and gas in the upper Rio Grande, it is unknown whether there are economically recoverable oil and gas deposits below lands managed by the Rio Grande National Forest.

Renewable Energy

One new trend since the 1996 Forest Plan is the push towards renewable energy development on public lands. Although this trend might not drive a specific need for change to the previous plan, it may drive transmission line development on the forest. For example, the San Luis Valley has been identified as a region with tremendous solar energy potential by the National Renewable Energy Laboratory and now provides a significant source of renewable electricity to customers of Xcel Energy and the San Luis Valley Rural Electric Cooperative. This additional development risks maxing out existing transmission corridors leaving the San Luis Valley over Poncha Pass, and any additional development in the next twenty years might prompt a new transmission line conversation over RGNF lands.

Information Sources and Gaps

- Public input from public meeting in Creede, Colorado in June 2015
- Rio Grande National Forest staff
- Colorado State Geologic Map, Tweto, 1979
- *Oil and Gas Resource Potential and Projected Exploration and Development Activity in the RGNF, Colorado (Holm and Dersch, 1994*, hereafter called the R2 RFD Report)
- Bureau of Land Management Resource Management Plan Amendment for Solar Energy Development in Six Southwestern States
- 2013 San Luis Valley Comprehensive Economic Development Strategy, Economic Development Administration
- Bureau of Land Management San Luis Valley/Taos Plateau Study:
  Landscape Assessment and Solar Regional Mitigation Strategy
- Alamosa County Land Use Department
- San Luis Valley Rural Electric Coop CEO Loren Howard
- Map of abandoned mines on the Forest
- Utility Corridors in the San Luis Valley

DRAFT

- Map(s) of all dams of the Rio Grande National Forest
- Rio Grande Reservoir Multi-Use Enlargement Study
- Gaps in suitability analysis for renewable energy production

Scale of Analysis

The spatial scale of analysis, or "plan area" for this assessment includes all lands contained within the Rio Grande National Forest, regardless of ownership or jurisdiction. When discussing the broader landscape, this assessment primarily focuses on Hinsdale, Mineral, Rio Grande, Saguache, Alamosa, Conejos and Costilla counties, known regionally as the San Luis Valley, as well as small portions of San Juan and Archuleta counties. When discussing the economic scale of analysis for energy and mineral uses on the Rio Grande National Forest, the plan area expands to municipalities served by renewable energy produced in the San Luis Valley, which includes the Tri-State and Xcel Energy service areas.

Existing Forest Plan Direction

The 1996 Forest Plan provides direction on suitability and surface occupancy stipulations but defers to the laws that strictly govern energy production and mineral extraction activity on National Forest System lands. These include the 1872 Mining Law, the Mineral Leasing Act of 1920, the Federal On-Shore Oil and Gas Leasing Reform Act of 1987, the Materials Act of 1955 and the Mining Claim Patenting Moratorium from October 1, 1994. Below is a brief summary of forest plan direction related to these activities.

Renewable Energy:

The suitability of areas for renewable energy production, such as solar, wind, or geothermal, is a new topic not covered in the current Forest Plan.

Locatable Minerals:

The process to authorize mining of locatable minerals such as silver, gold and copper is governed by the 1872 Mining Act. However, the 1996 Forest Plan does provide reasonable surface occupancy standards and guidelines.

Mineral Materials (Salable Minerals):

The mineral materials category was developed fully with the Materials Act of 1955. This act split out common variety minerals like sand and gravel to name a couple from the 1872 Mining Law. Since that time the Forest Service can provide members of the public with permits to remove these common variety minerals.

Oil, Gas and Other Leasable Minerals:

A Forest Plan does not authorize oil, gas or other leasable mineral activity. Instead, it identifies what lands may be suitable (Figure 1) and which standards and guidelines might apply. A separate Forest Service decision would authorize the BLM to lease specific parcels under certain stipulations. These two decisions (the Forest Plan suitability decision and the oil and gas authorization decision) have sometimes been done at the same time. However, to simplify this forest planning process, specific oil and gas decisions for the Rio Grande will be done later. Where the estate is split; with the surface lands managed by the forest, and the subsurface mineral rights privately owned; surface management will be decided by the Forest Service in consultation with the mineral owner and operator to resemble as closely as possible the policies used for federal minerals.

DRAFT

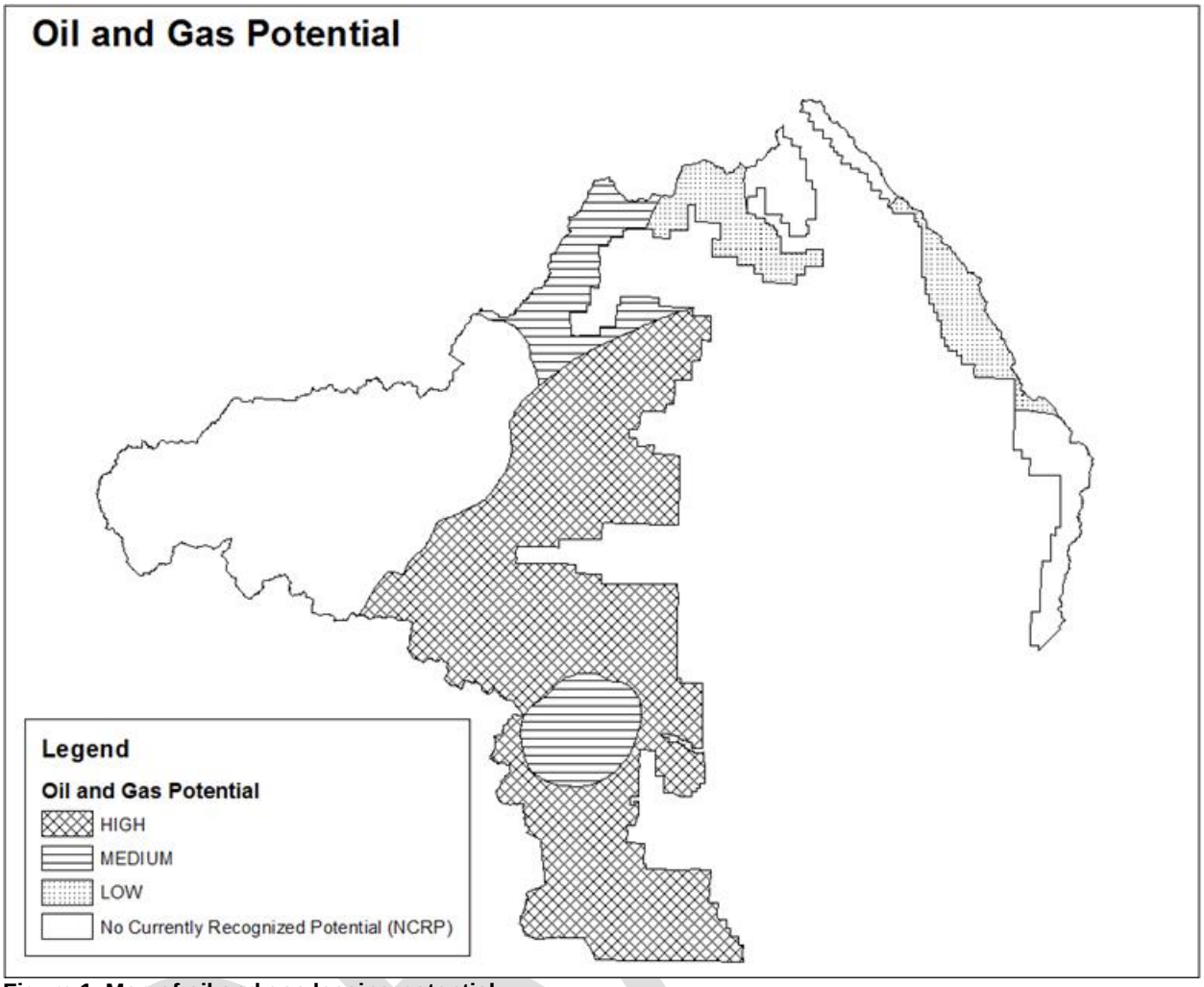


Figure 1. Map of oil and gas leasing potential

Renewable Energy Resources - Projections, Potential, and Trends

The past ten years has seen increased interest at the local, state and national level in exploring renewable energy development on public and private lands, including solar, wind, geothermal, woody biomass and hydroelectric power. Colorado voters authorized a Renewable Portfolio Standard in 2004 which initially required publicly traded utilities such as Xcel Energy to generate at least 15 percent of their electricity from renewable energy sources by 2020. That percentage has since increased and now applies to Rural Electric Associations, including San Luis Valley Rural Electric Cooperative which service many communities that border Rio Grande National Forest lands. This Colorado Renewable Portfolio Standard as well as federal agency direction geared towards energy savings and climate change resiliency have driven interest in exploring hydroelectric and woody biomass studies directly connected to Rio Grande National Forest System lands, as well as solar and wind studies on the neighboring valley floor which might require additional transmission lines developed on Rio Grande National Forest System lands. It is anticipated that the state government will update Colorado's renewable energy portfolio within the next 20 years so the Rio Grande National Forest needs to consider potential renewable energy projects on National Forest System lands.

Solar:

At this time there is no solar energy development on the Rio Grande National Forest since commercial solar operations generally won't lay panels in areas greater than a 5 percent slope. There has been, however, significant development in the plan area since 1996. The National Renewable Energy Lab identified the San Luis Valley in the early 2000s as a region with high solar energy potential due to its elevation, number of sunny days and low humidity. This recommendation attracted industry to the region at the same time as the Colorado Renewable Portfolio Standard offered incentives for industry to invest in the technology, and as of 2015, there are four utility-scale solar plants in Alamosa County generating 87.2 megawatts power to 15,000 Xcel Energy households. Two more facilities are permitted for development in the near future.

At the federal level, the Bureau of Land Management (BLM) also completed a Programmatic Environmental Impact in October 2012 which identified four solar energy zones in the San Luis Valley, one which borders Rio Grande National Forest System lands. National Forest System lands were later included in a related San Luis Valley and Taos Plateau Study, Landscape Assessment and Mitigation Strategy, in case the identified solar energy zones are developed.

Hydroelectric:

According to the San Luis Valley Comprehensive Development Strategy, "hydropower has a long history in the San Luis Valley with several small hydro systems currently in use. Most notably is a grid-tied 310-kW system on the Humphreys family's Wagon Wheel Ranch near Creede, brought online in July 2011 and bordering Rio Grande National Forest System lands. The Orient Land Trust at Valley View Hot Springs also borders Rio Grande National Forest System lands and uses a smaller system, 93kW, to provide off-the-grid power to cabins and other buildings". There are currently no hydroelectric facilities on the forest itself. A recent study regarding the rehabilitation of Rio Grande Reservoir and Santa Maria dams in Hinsdale and Mineral Counties indicates potential for hydroelectric power generation in the future. The forest is currently engaged in a land exchange process with the San Luis Valley Irrigation District which owns the Rio Grande Reservoir dam; once complete, the land exchange would clarify private ownership of the dam spillway and neighboring lands and may reopen the discussion of hydroelectric generation and related transmission at the facility.

Wind:

There are currently no wind facilities on the Rio Grande National Forest. Recent studies near Findley Gulch on neighboring Bureau of Land Management lands in Saguache County did not identify wind resources significant to sustain a project.

Geothermal:

There are currently no geothermal facilities on the Rio Grande National Forest. Following the passage of the Energy Policy Act of 2005, the Bureau of Land Management and U.S. Forest Service completed a study of geothermal leasing in the western United States in 2008. Although the San Luis Resource Area was analyzed, the BLM did not include the area in its 2008 decision, so in 2010 the BLM began a local environmental analysis to understand the issues and concerns related to geothermal energy leasing in the Valley. That analysis was completed in October of 2012 and identifies public lands with the potential for geothermal development and provides a list of the stipulations to be applied to any future leases. That decision amended the 1991 BLM San Luis Valley Resource Area Management Plan and to date, the BLM has not received any lease nominations for public lands in the San Luis Valley.

The 2013 San Luis Valley Comprehensive Development Strategy identified an abundance of shallow geothermal resources in the San Luis Valley "used for bathing and recreation, heating buildings with

DRAFT

direct heat as well as ground source heat pumps, aquaculture, and some horticulture. Low-grade resources up to 200 degrees Fahrenheit exist throughout much of the San Luis Valley in connection with the Rio Grande Rift. The depth of the source determines the temperature of the flow with the warmest flows coming from the greatest depths. Water temperatures around 200 degrees can be found at 5,000 feet with some up-flows occurring at 2,000 feet. Depths of 8,000 to 10,000 feet can yield temperatures as high as 300 degrees, suitable for electrical power generation".

Woody Biomass:

There are currently no woody biomass facilities on the Rio Grande National Forest. Since 1996, interest has grown and technology has improved related to developing this renewable resource as part of removing salvage timber off the forest. Following the West Fork Fire in 2013, Creede and Mineral County informally investigated the feasibility of a hosting a biochar-production facility but as of 2015, there are still no active projects on the forest or in adjacent communities.

Transmission Corridors

Identify existing energy transmission corridors and the potential need for new transmission corridors.

Despite recent efforts to develop a redundant transmission loop out of the region, the San Luis Valley remains radially-fed by one transmission line corridor which enters and leaves the valley over Poncha Pass in northern Saguache County. This corridor crosses Bureau of Land Management lands adjacent to the Rio Grande National Forest. Xcel Energy and Tri-State Generation and Transmission have investigated efforts for a redundant corridor out of the region since 2008 but so far, none of the routes studied would cross the Rio Grande National Forest. The previous routes studied went east over private land in Costilla County or south across private and BLM land in Conejos County. As of October 2015, neither of those routes have proven to be feasible due to cost and opposition from private landowners so another potential route could cross the Rio Grande National Forest to provide redundancy. Economic factors and improvements in grid technology would be factors in any new route study.

The forest does anticipate a possible upgrade of an existing corridor between South Fork and Creede if Rio Grande Silver, Inc. re-opens a major mining operation above Creede. Currently, it is the understanding of Rio Grande National Forest managers that they will be able to stay within their approved transmission corridor right of way that runs through the forest.

Ecological Integrity and Species Diversity

Summarize the impacts of renewable energy on ecological integrity and species diversity.

Although there are no active facilities on the Rio Grande National Forest, renewable energy development and production on the San Luis Valley floor and surrounding plan area requires transmission corridors which impact ecological integrity.

Social and Economic Sustainability

Describe the contribution of renewable energy in the plan area to social and economic sustainability. (Ecosystem Services)

As previously discussed, geothermal and solar resources currently contribute significantly to the social and economic sustainability of the plan area. The development of large-scale solar facilities since 2006 provides power to local and state-wide customers, as well as related construction jobs. Shallow geothermal resources are used in aquaculture, heating systems and hot springs spas. Like many rural

DRAFT

communities, each resource is part of an intricate puzzle which pieced together provides stability for an economically vulnerable region. Woody biomass also has potential to contribute but has yet to prove economically feasible.

Management Concerns

Identify any management concerns related to current forest plan direction for renewable energy resources.

As previously discussed, the 1996 Forest Plan does not provide direction regarding the development of renewable resources.

Nonrenewable Energy and Mineral Resources

Identify and evaluate nonrenewable energy resources and mineral resources on the RGNF, including:

- ***Locatable minerals*** **on public domain lands subject to the general mining laws and regulations (36 CFR 228 and 30 U.S.C. 22 et seq.) that include gold, silver, copper, molybdenum, and other minerals with unique properties.**
- ***Energy resources*** **such as oil, natural gas, coal, oil shale, and tar sands.**
- ***Leasable minerals*****, including phosphate, potassium, sodium, sulfur, gilsonite, asphalt, and hardrock minerals on acquired lands where the subsurface is owned by the Federal Government.**
- ***Mineral materials*** **(also referred to as salable minerals) that include common varieties of sand, gravel, stone, and other similar materials.**

Previous Decisions Related to Energy and Minerals

Summarize information on previous decisions related to the Federal mineral estate including oil and gas availability decisions and coal suitability evaluations.

The 1996 Plan estimated that up to 23 wells would be drilled over the next 10 years on land managed by the Rio Grande National Forest directly disturbing up to 129 acres of National Forest System land. The Bureau of Land Management predicted up to 17 wells would be drilled within the San Luis Resource Area (now the San Luis Valley Field Office). Resource stipulations were developed and included in the 1996 plan to sufficiently protect the resources of the Rio Grande National Forest. Five exploratory wells had been drilled on the Forest prior to 1996, but none have been drilled since. There is evidence of hydrocarbons in the exploratory wells, but none have economically recoverable deposits. More than 140,000 acres of mostly National Forest System land were nominated for lease in 2008 and 2009, but were deferred primarily because the BLM needs to conduct a leasing analysis on National Forest System lands. It is unknown at this time when this analysis will be conducted. While industry has expressed interest in exploring for oil and gas in the upper Rio Grande, it is unknown whether there are economically recoverable oil and gas deposits below lands managed by the Rio Grande National Forest.

Existing Activity and Facilities

Describe the current type, extent, and general location of nonrenewable energy and mineral activity and energy facilities in the plan area.

DRAFT

The only major minerals operation on the forest is Rio Grande Silver, Inc. working the Bulldog Mine in Creede. They are currently in temporary abandonment waiting for silver prices to rise. They have been approved for a 5 year extension of their plan of operations.

Mining Hazards

Identify known abandoned mines or mining related hazards in need of reclamation or restoration.

See the attached map of known abandoned mines on the Rio Grande Forest (Figure 2). This map does not specify which features have or have not been reclaimed. It also does not provide any recommendations or prioritization.

Noncommercial Mineral Collecting Activities

Describe noncommercial mineral collecting activities.

The Rio Grande Forest has multiple noncommercial mineral collecting activities. First is recreational rock collecting. The public is allowed to collect up to 50 pounds of rock per day, per person, with a limit of 250 pounds per year.

Casual use is another; members of the public who go out onto the forest lands and use non-mechanized tools to search for minerals fall under this category. They are not required to report their activities to the Forest Service. While our existing forest plan bans this activity within wilderness areas, current regional direction permits it.

Placer dredging allows members of the public to go out to the streams of their choosing and use a small recreational dredge to search for gold. This activity requires submitting a 'Notice of Intent to Placer Dredge' form. The forest will then approve or deny the request. Finally, the offers the public access to community pits for small disposals to locals.

Projections, Potential and Trends

- **Describe the potential for occurrence of nonrenewable energy and mineral resources.**
- **Describe projections of potential of nonrenewable energy and mineral activity or reasonably foreseeable development in the case of oil and gas.**
- **Identify trends in nonrenewable energy and mineral activity in the plan area.**

New technologies will drive what is in demand and what people are searching for. Precious metals like gold and silver will always be in demand. Rare earth deposits are currently a growing industry.

Salable mineral demands at the commercial level are currently met by private businesses. A situation that could change this is if the oil and gas industry moves heavily into the valley. Generally, a company will try to source their gravel for an oil and gas pad within their approved location.

Coal Resources

For plan areas with federal coal resource potential, provide an estimate of the coal development potential from the BLM for the plan assessment (43 CFR 3420.1-4((e)(1)).

There are many coal mines within the state of Colorado but the Rio Grande does not sit within a coal mining district and has no active coal mines within its boundaries. There are also no known coal prospects in the forest. See the attached map of coal mines in Colorado (Figure 3).

DRAFT

Ecological Integrity and Species Diversity

Summarize the impacts of nonrenewable energy and mineral developments on ecological integrity and species diversity.

This response will be coordinated with Assessments 1, 2, 3, and 5.

Social and Economical Sustainability

Describe the contribution of nonrenewable energy and mineral activity in the plan area to social and economic sustainability, including taxes, royalties, and fees (ecosystem services).

This response will be coordinated with Assessment 7.

Management Concerns

Identify any management concerns related to current forest plan direction for nonrenewable energy resources.

Nonrenewable resources are thoroughly covered in the current plan. The main concern should be revising some of the statements in the text of our current plan to comply with regional direction.

Geologic Hazards

- **Identify and evaluate available information about large, broad-scale, and major geologic hazards, including landslides, rock falls, mud flows, debris flows, snow avalanches, earthquakes, karst collapse, volcanoes, flooding, subsidence, acid-producing rock, and naturally occurring gases and minerals, such as asbestos, erionite, radon, and methane.**
- **Identify and evaluate hazardous geologic conditions in proximity to communities, infrastructure, established recreation areas, and other high use areas.**

The main hazards of the forest are avalanches, rock falls and flash flooding.

Summary / Conclusion

The 1996 forest plan comprehensively covers the non-renewable mineral subsets, which have seen no change in legal and regulatory direction since 1996. This direction will remain the same in the new forest plan, although the language may be modified so the concepts are described in plain English, and some guidance amended to comply with regional direction. The major focus of the new plan should be developing management direction for the categories of renewable energy.

DRAFT

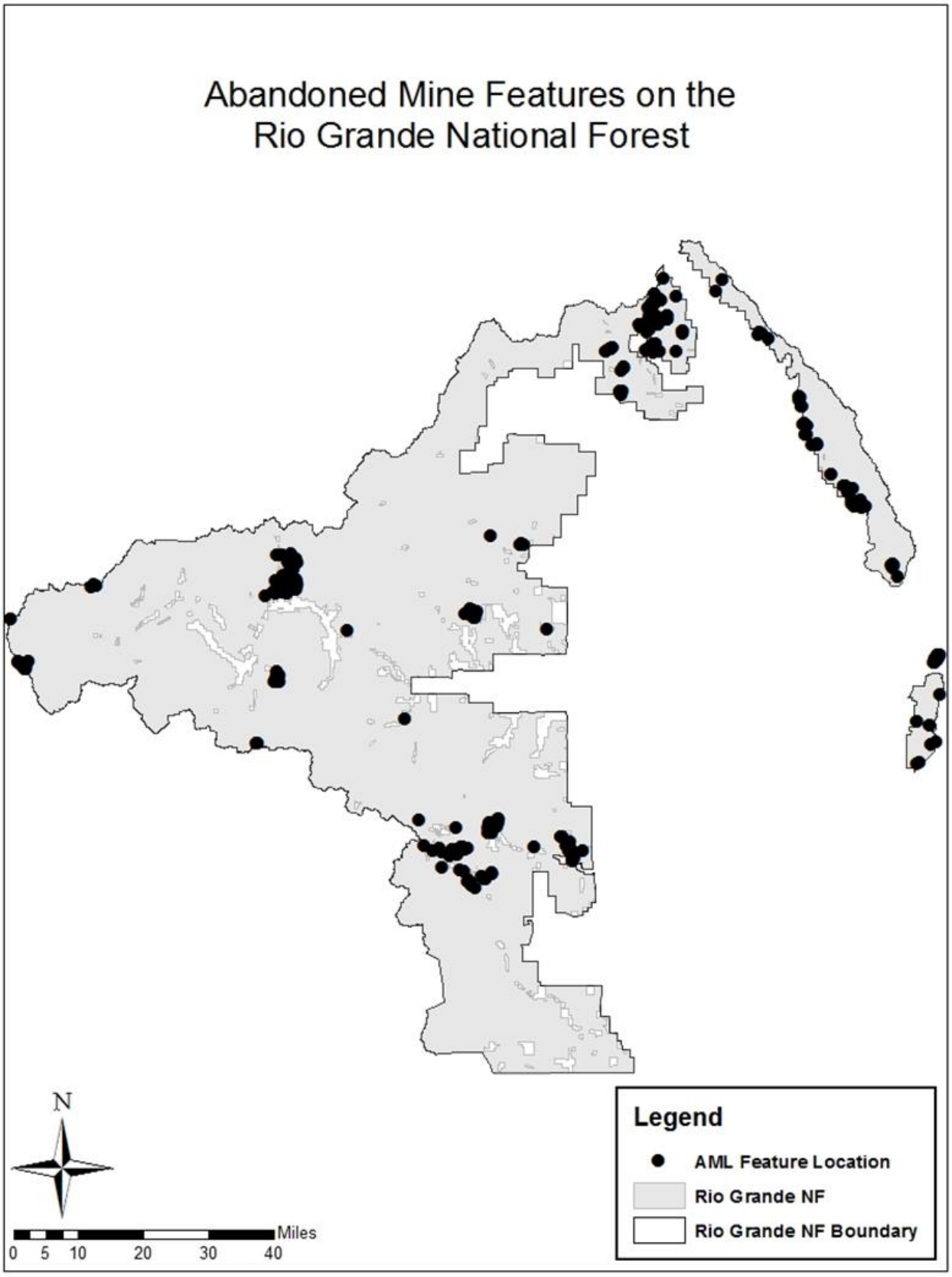


Figure 2. Abandoned mines on the Rio Grande National Forest

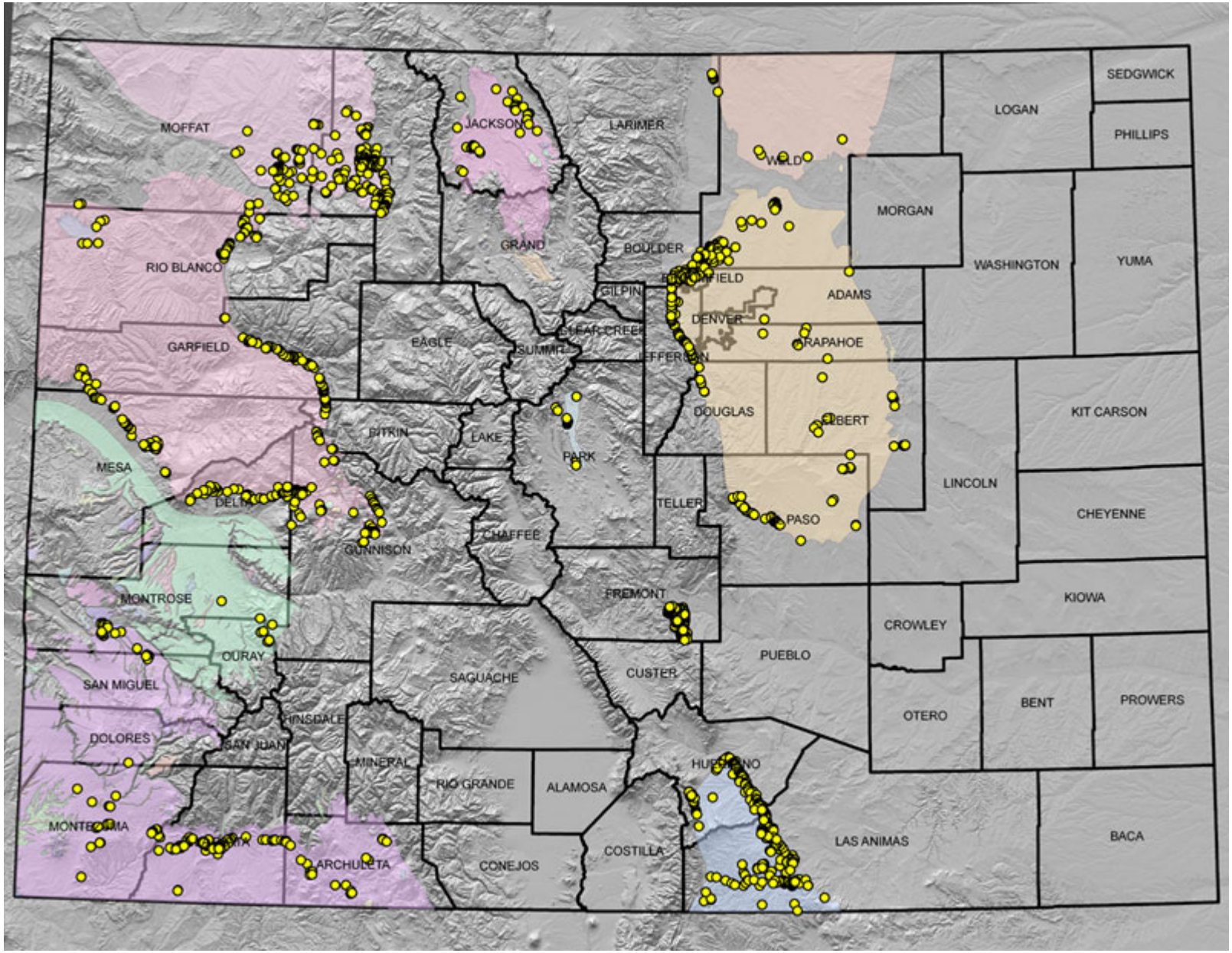


Figure 3. Coal mining Districts of Colorado with coal mines represented as yellow dots. There are no coal mines on the Rio Grande National Forest.