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Caves, Cliffs and Talus Slopes Addendum Specialist Report

Forest Plan Revision Draft Environmental Impact Statement (DEIS)

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Preface

The information in this specialist report reflects analysis that was completed prior to and in conjunction with the completion of the Draft Environmental Impact Statement (DEIS) for the revision of the 1987 Coconino National Forest Land Management Plan (the Plan). The primary purpose of specialist reports associated with the DEIS is to provide detailed information to assist in the preparation of the DEIS. As the DEIS was prepared, review-driven edits to the broader DEIS resulted in modifications to some of the information contained in some of the specialist reports. As a result, some reports no longer contain information and analysis that was updated through an interdisciplinary review process and is included in the DEIS in its entirety. This specialist report retains the additional information on the environmental consequences that was not included in the summarized information in the DEIS. However, analysis and information for this resource that is included in its entirety in the DEIS is not duplicated in this report. Efforts have been made to ensure that the retained information in the specialist reports is consistent with the DEIS. If inconsistencies exist between specialist reports and the DEIS, the DEIS should be regarded as the most current, accurate source of analysis.

Executive Summary

This specialist report evaluates and discloses the potential environmental consequences on Geologic Resources focusing on Caves, Cliffs and Talus Slopes that may result with the adoption of a revised land management plan. It examines, in detail, four different alternatives for revising the 1987 Coconino National Forest Land Management Plan (1987 Plan).

The forest has many caves most of which are only well known by local cavers. Two types of caves are found on the forest, lava tube caves and caves found in karst and pseudokarst terrain such as in the Verde Formation sediments. Most of the lava tube caves are found on the Flagstaff Ranger District associated with basaltic lava flows. Caves developed in karst terrain are found on the Mogollon Rim, Flagstaff, and the Red Rock District and are developed in the Kaibab Limestone Formation. Sinkholes are found in the surficial bedrock in the Sedona area which formed from the collapse of large water fill underground cave systems developed in the Redwall Limestone (Lindberg 2010). There are even caves located in the Verde Valley associated with the Verde Valley Formation sediments.

To date, the forest has documentation that six caves have been nominated as significant caves (Forest Service, 2011). One of the significant caves is the Lava River Cave which is a recreational cave that is open to the public. The six significant caves variously meet the criteria for significance on the basis of their geologic/mineralogic/paleontologic values, biota, cultural values, hydrological values, recreational, educational or scientific values. Local cavers have also offered limited information to forest staff on cave resources and there are many more caves and cave resources known on the forest by the caving groups.

The forest has many various types of cliff resources. Examples of cliffs include Jacks Canyon climbing area on the Mogollon Rim, the many canyons of streams draining the Mogollon Rim plateau such as East Clear Creek, Barbershop Canyon, West Clear Creek, Fossil Creek and others. There are other canyon areas in the Verde Valley and Sedona area including Oak Creek Canyon, Sycamore Canyon and others. Most of these canyons are incised in sedimentary bedrock. Other cliff resources may be found in canyons cut through basalt lava flows such as Jacks Canyon in Upper Beaver Creek watershed and in volcanic depressions such as Stoneman Lake. Cliffs provide important habitat for birds to roost and to nest. In addition, there are several plant species that grow on cliffs and ledges.

Talus slopes occur on all three districts. Examples of talus slopes occur above the tree line on the San Francisco Peaks, on basaltic cinder cones in the eastern part of the San Francisco Volcanic field, as sedimentary and basaltic talus in Oak Creek Canyon, as basaltic talus slopes below mesas such as at Chavez Pass and on the flanks of Hackberry Mountain.

Talus slopes can be devoid of vegetation or sparsely vegetated. Rare plants and animals are associated with talus deposits. Disturbance from recreation or management activities can destabilize the talus slopes and alter the habitat.

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Introduction

This addendum specialist report describes pertinent law and regulation and Forest Management policy and the Affected Environment to Geologic Resources specifically, Caves, Cliffs and Talus Slopes (CCT) that may result with the adoption of a revised land management plan. Environmental Consequences of four different alternatives for revising the 1987 Coconino National Forest Land Management Plan (1987 Plan) are found in the EIS in Chapter 3, Biophysical Features Section.

This report will discuss the affected environment for caves, cliffs and talus slopes on the forest and environmental consequences of the alternatives analyzed. Please see other separate specialist reports for Minerals and Energy, Geologic Resources, and Paleontology Resources for analyses of these resources. This report is very limited in scope. Caves, cliffs and talus slopes are biophysical features of the forest that overlap with other resources, namely hydrology, wildlife, botany, recreation and heritage resources. Groundwater resources are addressed in the Water and Watershed Specialist Report; wildlife resources are addressed in the Wildlife Specialist Report; botanical resources are addressed in the Botany Specialist Report; recreation resources are addressed in the Recreation Specialist Report and heritage resources are addressed in the Heritage Specialist Report.

Relevant Laws, Regulations, and Policy that Apply

All alternatives are designed to guide the Coconino NF's management activities in meeting all applicable Federal and State laws, regulations, and policies. The following is a list of key policies, laws and regulations that guide geologic resource management as applicable to the Forest.

Federal Laws and Regulations

Federal Cave Resources Protection Act of 1988, 16 U.S.C. 4301-4309. The act is to secure, protect and preserve significant caves on Federal lands for the perpetual use, enjoyment and benefit of all people and to foster increased cooperation and exchange of information between governmental authorities and those who utilize caves located on Federal lands for scientific, education, or recreational purposes.

CFR Title 36: Parks, Forest and Public Property, Part 290 Cave Resources Management. June 17, 1994. These are the implementing regulations applying to cave management on National Forest System lands.

Forest Service Manuals and Handbooks

FSM 2800 Minerals and Geology

Chapter 2880 Geologic Resources, Hazards and Services – extensively discusses management of cave and karst resources and their ecosystems.

FSM 2300 Recreation, Wilderness and related Resource Management

Chapter 2356 Cave Management. Policy and direction relating to cave management. Pages 12-18.

Methodology and Analysis Process

Scope of Analysis and Units of Measure

The analysis focuses on the consequences of managing the existing resources of caves, cliffs and talus slopes on the forest. These features are generally described using information from available literature and from internal forest service documents. Because by law, cave information is confidential, information will not be disclosed that could be used to determine the location of caves on the forest except for the one designated recreational cave, the Lava River Cave. The names of caves designated as significant or potentially significant will not be disclosed because some of the names could provide location information Management concerns with CCT are also identified.

The alternatives are compared on the basis of how they would protect and preserve the geologic and biophysical features and conserve the scientific values of the areas. This will be a qualitative analysis.

Revision Topics and Issues Addressed in this Analysis

The land management plan provides a programmatic framework that guides site-specific actions but does not authorize, fund or carry out any project activity. There are implications or longer term environmental consequences of managing the forest under this programmatic framework. The focus of this environmental analysis is on the consequences of the alternatives on the desired conditions for the geological and botanical special area resources.

Revision Topics

The Analysis of the Management Situation (AMS) (Forest Service 2011) and the Ecological Sustainability Report (ESR) (Forest Service 2011) both described rock features including canyons, cliffs, caves, and talus slopes as features associated with special or rare plant and animal species. Both documents disclosed that these rock features are threatened by various recreational activities including rock climbing, and caving, as well as management activities including road construction, mining activities and vandalism. These threats could alter habitat which may prevent plant establishment, destroy plants or individuals or affect the survival of talus snails. Roosts on cliffs and roosts in caves may become unsuitable for bats and nesting habitat can be modified or removed. Caving can modify surface features, temperature and humidity levels which in turn modifies the environment for plants and animals. The geologic features of the CCT can be altered, removed or destabilized by recreational or management activities. (AMS, p. 36; ESR Table 47, p. 127).

Issues and Concerns

To date, there have been no specific public comments related to management of caves, cliffs or talus slopes. Arizona caving organizations have expressed interest in the Forest's revision to the land management plan in 2013.

Assumptions

The following assumptions have been made as part of this analysis:

Forest Plan

- The land management plan provides a programmatic framework for future site-specific actions.
- Land management plans do not have direct effects. They do not authorize or mandate any site-specific projects or activities (including ground-disturbing actions).
- Land management plans may have implications, or environmental consequences, of managing the forests under a programmatic framework.
- The plan decisions (desired conditions, objectives, standards, guidelines, management areas, monitoring) will be followed when planning or implementing site-specific projects and activities.
- Laws, regulations, and policies will be followed when planning or implementing site-specific projects and activities.
- Monitoring will occur and the land management plan will be amended, as needed.
- We will be funded similar to past budget levels (past 5 years).
- The planning timeframe is 15 years; other timeframes may be analyzed depending on the resource (usually a discussion of anticipated trends into the future).

Caves, Cliffs and Talus Slopes

- The forest will follow the significant cave nomination process, complete annual reporting of cave management activities, and more caves may be nominated as significant in the future by the Forest Supervisor.

Summary of Alternatives

Four alternatives are analyzed in detail in this Specialist Report: Alternatives A through D. Alternative A is the current 1987 Coconino National Forest Plan as amended (Forest Service 1987) and Alternative B is the Preferred Alternative/Proposed Action, drafted over the past several years and refined with several periods of internal and informal public feedback. Alternative C considers increases in the amount of wilderness and special areas, as well as increased opportunities for quiet semi-primitive recreation, while Alternative D considers slightly fewer restrictions than Alternatives B and C on human access and use of the Forest and its resources.

The following summaries of the alternatives focus on the components that may have consequences on management of caves, cliffs and talus features.

Alternative A, 1987 Plan

Sections pertaining to Caves and Cave Management of "1987 Plan" are found in the supporting documents folder associated with this report. The Federal Cave Resource Protection Act (FCRPA) came in law in 1988. Amendment 9 of the Coconino Forest Plan was approved in 1992 and expanded the goals, standards and guidelines for cave management to be consistent with FCRPA. The Coconino Forest plan was not amended further for cave management to be compliant with the implementing regulations which were codified in 1994. However, management direction is to follow changes in regulations as they occur over time.

Alternative B, Modified Proposed Plan

Forestwide desired conditions, guidelines, standards and management approaches for Biophysical Features consisting of CCT are found in the Forest Plan that accompanies the EIS. The proposed revised forest plan is the preferred alternative. It would provide strategic, program-level guidance for managing the Forest and its natural resources over the next 10 to 15 years. Within the Biophysical Features section of the plan, desired conditions are presented to guide management of these resources and various standards, guidelines and management approaches are described.

Alternative C

The Forest proposes Alternative C to be responsive to public recommendations for more wilderness areas on the Forest, as well as other special and management areas to provide additional protection to botanical and wildlife resources. This alternative is the same as Alternative B with respect to the Biophysical Features of CCT.

Alternative D

Alternative D is different from Alternative B and C in that it allows mechanized recreation (e.g., bikes) on designated trails in botanical and geological areas and proposed no new wilderness areas. Otherwise this alternative is the same as Alternative B with respect to the Biophysical Features of CCT.

Description of Affected Environment

Defintions

Cave: The definition of a cave is as follows from the Federal Cave Resources Protection Act. The term "cave" means any naturally occurring void, cavity, recess or system of interconnected passages which occurs beneath the surface of the earth or within a cliff or ledge (including any cave resource therein, but not including any vug, mine, tunnel, aqueduct, or other manmade excavation) and which is large enough to permit an individual to enter, whether or not the entrance is naturally formed or manmade. Such term shall include any natural pit, sinkhole, or other feature which is an extension of the entrance.

Cave Ecosystem: All ground-water recharge and discharge areas connected to a cave, both discrete and diffuse, and the intermediary aquifers or flow paths; air flow into and out of the cave; vegetation, fauna, and aquatic communities in or linked to the cave; and all other cave resources. Cave ecosystems can be sensitive to changes in the temperature or chemical composition of the water or air. Some examples of the types of cave ecosystems include: karst, pseudokarst, lava tubes, ice caves, river undercuts, and erosional features.

Cave Resource. Any material or substance occurring in caves, including but not limited to, those which are biotic, cultural, mineralogic, paleontologic, geologic, and hydrologic.

Cliff: a very steep vertical or overhanging face of rock

Karst. Terrain created by the chemical solution of the bedrock, including carbonate rocks, gypsum, and to a minor extent on other rocks, and characterized by disrupted surface drainage, abundant enclosed depressions, and a well-developed system of underground drainage systems, which may include caves. The term "pseudokarst" is sometimes used to distinguish karst terrain formed on non-carbonate bedrock, such as sandstone.

Karst Resources. The elements of a karst landscape, commonly characterized by losing streams, sinkholes, collapse features, caves, or springs. These may not only be physical features, but may also relate to karst ground-water systems, system(s) function, and biological significance to the vegetative, wildlife, and aquatic communities.

Significant Cave. A cave located on NFS lands that meets the criteria in Title 36, Code of Federal Regulations, sections 290(c) or 290(d) (36 CFR 290 (c) or (d)), and has been designated in accordance with section 290.3(e).

Talus: A deposit of large angular fragments of physically weathered bedrock, usually at the base of a cliff or steep slope. Scree and rubble are also used synonymously with talus.

Talus Slope: is the term used for specific reference to the surface of the talus. A Talus slope is a steep, concave slope where rubble is deposited. Also known as a debris slope.

Caves and Cave Resources

The forest has many caves most of which are only well known by local cavers. Two types of caves are found on the forest, lava tube caves and caves found in karst and pseudokarst terrain such as in the Verde Formation sediments. Most of the lava tube caves are found on the Flagstaff Ranger District

associated with basaltic lava flows. Caves developed in karst terrain are found on the Mogollon Rim, Flagstaff, and the Red Rock District and are developed in the Kaibab Limestone Formation. Sinkholes are found in the surficial bedrock in the Sedona area which formed from the collapse of large water fill underground cave systems developed in the Redwall Limestone (Lindberg 2010). There are even caves located in the Verde Valley associated with the Verde Valley Formation sediments.

To date, the forest has documentation that six caves have been nominated as significant caves (Forest Service, 2011). One of the significant caves is the Lava River Cave which is a recreational cave that is open to the public. The six significant caves variously meet the criteria for significance on the basis of their geologic/mineralogic/paleontologic values, biota, cultural values, hydrologic values, recreational, educational or scientific values. Another seven caves are known in the files and some have a resource evaluation report written for them. However, nomination forms are missing or absent and documentation that a significant cave decision is lacking for these caves. To date, the forest has information on more than 50 caves across the forest. Local cavers have also offered information to forest staff on cave resources and there are many more caves and cave resources known on the forest by the caving groups. The Forest is engaged with caving groups on the management of some specific caves and information is being shared at the current time. There is great interest in how the Forest will address cave management in its revised Forest Plan.

Forest wildlife biologists periodically monitor caves for bat use. White Nose Syndrome (WNS) is a condition associated with the deaths of over a million bats in the U.S. and Canada since its discovery in the winter of 2006-2007 in New York State. A fungus, *Geomyces destructans*, is considered the primary casual agent of WNS. This fungus thrives in cold and humid conditions of caves and mines, which provide prime hibernating habitat for many bat species. It is suspected that the fungus is spreading through bat to bat, bat to cave, and/or human transmission into cave environments. Bats exhibit WNS with a skin infection in the form of a white fungus on their muzzles and wings. However, bats affected with WNS do not always have the characteristic white fungal growth, but may display abnormal behavior in and outside of their hibernacula. It is hypothesized that bats affected by WNS arouse from hibernation more frequently, and/or for longer periods than normal, and are prematurely expending the fat reserves they rely on for winter survival. This expenditure of fat reserves is suspected of killing the bats when they are not able to feed as they emerge from the caves/mines in the winter. (Forest Service Memo, March 25, 2011, White Nose Syndrome Handbook).

In 2010, *Geomyces destructans*, the fungus associated with WNS was found on the Cave myotis bats in western Oklahoma, bringing the fungus within 250 miles of New Mexico. Both New Mexico and Arizona have a diverse bat fauna that includes 28 species, almost half of which hibernate to some degree during the winter. Therefore, it is important to take actions to reduce or prevent the spread of the disease, begin efforts to gather information regarding hibernacula and bat use, and begin surveillance efforts to identify any new areas containing WNS. (Forest Service Memo, March 25, 2011, White Nose Syndrome Handbook).

In response, the Southwestern Region began working with our federal, state, and private partners during the summer of 2010 to begin addressing this critically important issue. Interagency WNS Response and Communications plans have been finalized for the state of New Mexico. Furthermore, the Region is working with the state of Arizona to develop similar plans at this time. Several Forests within the Region have begun working to increase public awareness, collect information on bat hibernacula, and initiate surveillance efforts for signs of the fungus or the associated disease (Forest Service Memo, March 25, 2011, White Nose Syndrome Handbook).

The WNS handbook has been prepared to assist forests in taking steps to address WNS. This handbook includes sections on decontamination protocols, emergency closure orders, tribal considerations, abandoned mine lands considerations, surveillance, working with partners, communication tools, and National Wildlife Health Center submission guidelines.

The Forest Service has a Memorandum of Understanding (MOU) with the Cave Research Foundation as of 2010 (Cave Research Foundation and Forest Service MOU, 2010). The Forest Service has had a long standing relationship with this organization prior to the MOU. The purpose of this MOU is foster cooperation to achieve more effective and efficient management and study of caves, and to establish a framework upon which the CRF and the Forest Service may cooperatively conduct scientific research, mapping and interpretive activities on forests. In 2011, the Forest Service entered into a MOU with the National speleological Society for Cave and Karst Management (FS Agreement No. 11-MU-11132424-018. The purpose of this MOU is to establish a framework on which the NSS and the Forest Service may cooperatively plan and accomplish mutually beneficial work projects or activities in the management of cave and karst resources. The MOU acknowledges that the Forest Service relies on volunteers from organizations interested in cave and karst resources, mostly members of NSS to provide manpower and expertise needed to protect and manage cave and karst resources.

Jacks Canyon Climbing Area

The Forest has worked in the past with various caving groups including the Central Arizona Grotto, Northern Arizona Grotto, Escabrosa Grotto, Cave Research Foundation, Bat Conservation International, Arizona Regional Association of the National Speleological Association, American Cave Conservation Association, and the Arizona State Game and Fish Department (Forest Service, Decision Memo for Cave Management Goals and Standards/Guidelines, Coconino National Forest, December 22, 1992).

The Amendment 9 Decision Memo and a footnote in the Forest Plan references the "Coconino National Forest Cave Resource Management Guide" (Coconino National Forest 1992). This document contains guidance on cave inventory monitoring, general administration, cave ethics, cave management techniques, maintenance of confidential cave information and other topics. The various individual resource evaluation reports written on several individual significant caves contains management guidance for that specific cave and its resources. Though there are several resource evaluation reports written up on several of the caves, the forest is lacking an up to date, revised and comprehensive cave management plan written and developed for the forest.

Review of the forest's cave records indicated that local cavers conduct their own use and impact monitoring of some caves. Sign in sheets are present within some caves as well. When impacts are noted cavers have contacted the Forest Service and described the impacts. The impacts noted in the files have been vegetation removal at cave entrances and sedimentation from nearby roads from bar or relief ditches and refuse within caves. Graffiti and trash at a well-known cave has also been removed by a cave group in cooperation with the forest.

Jacks Canyon Upper Beaver Creek

Cliffs

The forest has many various types of cliff resources. Examples of cliffs include Jacks Canyon climbing area on the Mogollon Rim, the many

canyons of streams draining the Mogollon Rim plateau such as East Clear Creek, Barbershop Canyon, West Clear Creek, Fossil Creek and others. There are other canyon areas in the Verde Valley and Sedona area including Oak Creek Canyon, Sycamore Canyon and others. Most of these canyons are incised in sedimentary bedrock. Other cliff resources may be found in canyons cut through basalt lava flows such as Jacks Canyon in Upper Beaver Creek watershed and in volcanic depressions such as Stoneman Lake.

Cliffs provide important habitat for birds to roost and to nest. In addition, there are several plant species that grow on cliffs and ledges.

Talus and Talus Slopes

Talus slopes occur on all three districts. Examples of talus slopes occur above the tree line on the San Francisco Peaks, on basaltic cinder cones in the eastern part of the San Francisco Volcanic field, as sedimentary and basaltic talus in Oak Creek Canyon, as basaltic talus slopes below mesas such as at Chavez Pass and on the flanks of Hackberry Mountain. Talus slopes can be devoid of vegetation or sparsely vegetated. Rare plants and animals are associated with talus deposits. Disturbance from recreation or management activities can destabilize the talus slopes and alter the habitat.

Environmental Consequences and Cumulative Effects

The land management plan provides a programmatic framework that guides site-specific actions but does not authorize, fund, or carryout any project or activity. Because the land management plan does not authorize or mandate any site-specific projects or activities (including ground-disturbing actions), there can be no direct effects. However, there may be implications, or long-term environmental consequences, of managing the forests under this programmatic framework.

Please see Chapter 3 of the EIS, section on Biophysical Features for a detailed description of the Environmental Consequences and Cumulative Effects of the alternatives.

Volcanic basalt talus on lower slopes of a mountain of the San Francisco peaks

Relationship of Short-Term Uses and Long-Term Productivity

Factors to evaluate under NEPA include irreversible or irretrievable commitment of resources, short-term versus long-term, and any adverse environmental impacts that cannot be avoided (40 CFR 1502.16).

Unavoidable Adverse Impacts

The land management plan provides a programmatic framework that guides site-specific actions but does not authorize, fund, or carryout any project or activity. Before any ground-disturbing actions take place, they must be authorized in a subsequent environmental analysis. Therefore, none of the alternatives cause unavoidable adverse impacts. Mechanisms are in place to monitor and use adaptive management principles in order to help alleviate any unanticipated impacts that need to be addressed singularly or cumulatively.

Irreversible and Irretrievable Commitment of Resources

The land management plan provides a programmatic framework that guides site-specific actions but does not authorize, fund, or carryout any project or activity. Because the land management plan does not authorize or mandate any ground disturbing actions, none of the alternatives cause an irreversible or irretrievable commitment of resources.

Adaptive Management

All alternatives assume the use of adaptive management principles. Forest Service decisions are made as part of an ongoing process. The land management plan identifies a monitoring program. Monitoring the results of actions will provide a flow of information that may indicate the needs to change a course of action or the land management plan. Scientific findings and the needs of society may also indicate the need to adapt resource management to new information.

Monitoring of significant caves or biophysical features is a management approach to determine visitor impacts and the conditions of key resources. Biophysical features are evaluated continually as to how week they are meeting desired conditions. Throughout the life of the forest plan, the forest will evaluate any new or ongoing impacts that conflict with the desired conditions for biophysical features. Environmental analysis and appropriate NEPA would be used to assess impacts. The line officer has various options to relieve impacts which include but are not limited to: administrative actions such as area or cave closures; road maintenance, closure or decommissioning; or various recreational use restrictions. Projects or management actions that could affect or impact biophysical features would be analyzed and any necessary mitigation would be developed at the site specific level with the approval of the line officer.

Climate Change

Climate change could affect the distribution of vegetation in general by affecting biotic and abiotic factors and by increasing the extent and severity of disturbances (USDA, Forest Service 2010) under all alternatives. Rare and sensitive species may be especially vulnerable because they often need specific habitat components such as specialized microclimate conditions or water which are not widely available or could fluctuate. This could negatively affect their abilities to migrate to suitable areas as environmental conditions change. Water availability may decrease in some areas affecting the cave ecosystem and hydrology while temperatures generally increase. Flood severity may also increase and there could be a subsequent increase in erosion rates and this could cause sedimentation into caves. These processes may be slow and not generally noticeable. However, there may be large changes in ecosystem structure and species composition of plant communities due to increasing temperatures and altered precipitation cycles which may affect habitats on talus slopes and cliffs more than within caves.

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U.S. Code, 16 U.S.C. 4301-4309 Federal Cave Resources Protection Act of 1988.

Education and Professional Experience

I have a Bachelors of Arts degree in Anthropology from Occidental College, in Los Angeles, CA and have studied undergraduate level geology at Occidental College and Washington State University, in Pullman, WA for a combined total of more than 4 years. I have a Master of Science degree in geology from Oregon State University (1988). My professional experience totals 23 years, including more than 17 years working as a geologist for the Forest Service and the Army Corps of Engineers, and more than 6 years working at a NEPA Specialist/Partnership Coordinator. My geologic area of expertise in is landslide mapping and hazard assessment, watershed analysis and restoration, abandoned mine reclamation and minerals administration. I am a registered Geologist in Oregon (#G1170) and California (#6565), and a registered Engineering Geologist in California (# 2313). I have been a contributing author on several unpublished internal Forest Service studies, and have been a senior or contributing author on some short scientific publications relating to geology and forest management and mine reclamation.