ECOSYSTEM MANAGEMENT & MINE PERMITTING ON PUBLIC LANDS

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ECOSYSTEM MANAGEMENT AND MINE PERMITTING ON PUBLIC LANDS

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ABSTRACT

This report focuses on how ecosystem management will be implemented into public land management and how this may affect the permitting of mining operations in the western U.S.

Numerous federal, state and local agencies are considering ecosystem management as the preferred management alternative. The Forest Service and Bureau of Land Management are the federal agencies most likely to have a direct effect on mine development, with the Environmental Protection Agency and Fish and Wildlife Service having a lesser influence.

Other sections discuss definitional problems, legal foundation for the system, activities of the federal land management agencies, activities within certain states, and finally the implications of the ecosystem management effort on mine permitting.

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1.0 INTRODUCTION

Conflicts which have arisen from multiple-use activities on public lands have resulted in a number of land management agencies considering new strategies to govern the use of public lands. One strategy receiving a great deal of attention is ecosystem management, and while the concept is not new, the implementation of its principles into public land management has just recently been considered. This is becoming an important issue for the mining industry because of the large number of mining operations which are located on the public lands in the western United States. This research will focus on how ecosystem management will be implemented into public land management and how this may affect the permitting of mining operations in the western U.S.

Ecosystem management's popularity among public agencies is far reaching. Presently, 18 federal agencies[1] and several state and local agencies are considering this strategy as the preferred management alternative. The federal agencies which are most likely to have a direct effect on mine development include the U.S. Forest Service (USFS) and the Bureau of Land Management (BLM) and to a lesser extent the Environmental Protection Agency (EPA), and U.S. Fish & Wildlife Service (USFWS). The interaction of the federal agencies will be the primary focus of the report. Activities at the state level will also be addressed for the three states considered.

Problems and activities associated with ecosystem management will be addressed:

Section 2 --definitional problems

Section 3 --legal foundation for the public land management agencies

Section 4 --activities of agencies that may have significant impact on mine permitting.

[1]Eighteen federal agencies reported their ecosystem management activities to the congressional community on March 24, 1994. This primarily involved agencies from the Department of Agriculture and the Department of the Interior but also included the EPA, Department of Defense, Department of Energy, Department of Commerce, National Aeronautics and Space Administration, and the NAtional Science Foundation (Congressional research Service, 1994).

Section 5 --activities at the state level, primarily in Colorado, since it has an organized effort in the ecosystem management area.

Section 6 --implications of the ecosystem management efforts on mine permitting.

2.0 DEFINITIONS OF ECOSYSTEM MANAGEMENT

Management of natural resources on public lands has been redirected in recent years from a very narrow focus of commodity production to a much broader "multiple-use" objective. This new direction has forced public land managers to optimize[2] the many uses and attributes of the public lands rather than maximize a single use of natural resources. The challenge of regulators is to make decisions based on the "tradeoffs" associated with a particular resource use. An example is a wilderness designation which prohibits all future mining operations. The decision to increase preservation results in an opportunity cost of loss production. A goal of public land agencies should be to develop an integrated natural resource management resource uses to be evaluated and compared.

When discussing integrated natural resource management approaches a distinction should be made as to the appropriate viewpoint to be taken. One possibility is an "anthropocentric or human centered" focus. This perspective relies on the proposition that resource values are based solely on human values. An alternative viewpoint is "biocentric or biology centered." The biocentric philosophy is based on the ideal that all organisms in an ecosystem are treated equally. A goal of this viewpoint is to achieve sustainable biospheres on earth of which humans are an integral part but not necessarily dominant. Traditionally, environmental and public land laws have strictly promoted an anthropocentric viewpoint. The introduction of ecosystem management, which will move closer to a biocentric approach, may have significant impacts on natural resource management decisions. One possibility is if ecosystem management strategies

[2]Optimize in this context refers to maximizing all benefits derived from the multiple-uses of the resource in question.

utilize a biocentric viewpoint then it is likely that preservation activities will increase and development activities will decrease. This is a possible result of a biocentric view since a change in philosophy is likely to change the values society assigns different natural resource uses.[3]

2.1 Emerging Definitions

Though a number of different entities are working to precisely define ecosystem management, one clear definition has yet to emerge. This is not only due to the newness of using the strategy in a management application but also because of the different management goals and traditions of the various land management agencies involved. Focusing on the basics of the definition it becomes apparent that a merging of humans and nature is necessary. The word "ecosystem" implies a natural setting while "management" indicates some human intervention into the shaping of the natural environment. Beyond this very simplistic definition further refinement becomes ambiguous.

Many different criteria or terms have been used to describe natural systems, for example, biodiversity, ecosystems, sustainability, *etc.* The term that will be the focus here is ecosystem. Agencies and groups that are involved in the management or use of natural resources have developed their own definition of ecosystem which are based on its intended uses. Three such definitions are:

> ... a community of living plants and animals interacting with each other and with their physical environment (Hamilton, USEPA, 1992).
>
> ... everything living in a particular environment, such as a forest or stream, and the soil, minerals or other physical parts of the environment that effect them (Mining World News, May/June 1993).

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[3]Many argue that a biocentric view is only possible because humans include the preservation of other organisms into their utility functions, therefore, gaining utility or satisfaction from the preservation of other species or organisms. It is then argued that we are still pursuing an anthropocentric view. Resolving this debate, however, is not the objective of this paper.

> ...are biotic communities and their environments. They must exist at any scale from a rotting lot to the whole Earth (USFS, 1992).

While each of these definitions encompasses both biotic and abiotic components, it is clear that the term "ecosystem" does not necessarily refer to any particular geographic area or region. The issue that remains undefined is the boundary of such a system or community. This is especially clear in the USFS definition where an ecosystem could be a "single log or the whole Earth." A clear and well-defined definition is important to the successful implementation of ecosystem management.

As would be expected from the variety of definitions, the potential for confusion in the definition of ecosystem management is also problematic as is evidenced below:

> ...is centered around managing ecological systems rather than individual parts while recognizing that humans and their social, economic, and cultural needs are an integral part of ecosystems (BLM, Colorado, 1993).
>
> ...a process that considers the total environment. It is the skillful use of ecological, economic, social, and managerial principles in managing ecosystems to produce, restore, or sustain ecosystem integrity and diverse conditions, uses, products, values, and services over the long-term (Hamilton, USEPA).
>
> ...means using an ecological approach to achieve the multiple-use management of national forests and grasslands by blending the needs of people and environmental values in such a way that national forests and grasslands represent diverse, healthy, productive, and sustainable ecosystems (US Forest Service, 1992).

All three definitions stress the importance of suing a holistic approach to maintaining ecosystem health while insuring that human needs are accommodated. While this common theme appears in all three definitions there also emerges a difference in how these goals will be achieved. The BLM and EPA definitions focus on redefining boundaries while the USFS advocates a more objective-based approach. One issue which becomes apparent is ecosystems often cross traditional "jurisdictional" boundaries and a working definition will require inter-agency coordination to insure ecological integrity and sustainable resource use. Thus, resolving

the differences in definitions is important in order to decrease the potential for conflict between the various agencies involved in natural resource management.

Another common theme expressed is the need for a long-term planning horizon. This presents a separate challenge because ecosystem management is based on the scientific principle that ecosystems are dynamic, complex, and inherently unstable. Thus, any working management plan must accommodate not only a changing natural environment but also changing human needs. This requires that natural resource policies be designed at an appropriate temporal and spatial scale to meet human needs without impairing the integrity of the natural systems and processes.

2.2 Ecosystem Management Criteria

Public land laws established by Congress have outlined a number of goals and objectives which are to be addressed in natural resource management decisions. Clawson (1975) formally grouped a number of legal requirements and other rational into five separate criteria. Loomis (1993) then discusses how these criteria can be integrated into public land management decision making. The importance of these criteria becomes apparent when analyzing disputes over natural resource decisions. Often differences in reference (criteria) used to evaluate options are at the heart of conflicts surrounding natural resource development options. Defining consistent criteria to be utilized by different management entities will be important in a successful ecosystem management strategy.

The five criteria which can be used in evaluating public land alternatives are:

- physical and biological feasibility;
- economic efficiency;
- distributional equity;
- social and cultural acceptability; and
- administrative feasibility (Loomis, 1993).

While these general criteria have been developed from legal mandates of existing public land laws it is important to keep in mind that different agencies have varying levels of flexibility

when utilizing these decision criteria. This stems from the organic mandates that govern agency actions. Examples are the USFS and the BLM whose very broad multiple-use management strategies differ significantly from the National Park Service which has very limited uses for lands under their control. Thus, distinct agencies using similar criteria to evaluate resource management decisions can result in dramatic differences.

Physical and biological feasibility is a fundamental criterium for ecosystem management. The focus of this principle insures that management alternatives must be within the capability of an ecosystem. Factors such as physical, chemical, and biological attributes impose limits on the type of activities which ecosystems can support. Knowledge of these factors should focus on stock and flow variables of renewable and nonrenewable resources in managed areas. Factors which should be considered include inventories of a variety of resources (soils, minerals, wildlife, etc.) as well as natural rates of change of the resources. Information on these factors can then be integrated into planning and management strategies.

The economic efficiency criteria relates to the benefits and costs to society of a management strategy. Thus, if a regulator determines that an action is biologically feasible it is then logical to consider if an action will create more social benefits than costs.[4] This criterium requires benefits and costs to both consumers and producers be considered. An example is the development of a mining project. The appropriate analysis of the mine development should consider not only the market value of a mineral minus development and production costs but also resource uses foregone if the deposit is developed. The evaluation of benefits and costs to society requires values of market and non-market goods be evaluated.

While an efficiency measure determines the number of benefits and costs which a project may generate for society, the analysis does not consider distributional issues. Thus, management planning and decision making must also consider equity measures. Once the aggregate benefits

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[4]Economic benefits are broadly defined as increases in social benefits (market and non-market goods) to both producers and consumers. Costs include both financial (i.e. cash) and opportunity costs (other benefits foregone) of a resource use.

and costs to society are determined, agencies can analyze their distributional effects. Distribution of benefits and costs can be shown in a variety of ways including by income group, age, race, employment or geographical distribution. Analysis using this criterium is important because a democratic society entitles its members to be informed of the consequences of different public-funded actions. Additionally, if benefits and costs of two separate actions are similar, society may prefer one which does not disportionately place costs on certain segments of society (Loomis, 1993).

Social and cultural considerations must also be considered by public land management agencies. This has been promulgated by both the courts and the political process. A variable which measures social and cultural impacts must be dynamic in nature to take into account changing social values.[5] An example is the environmental movement which has succeeded in promoting alternative uses for public lands besides commodity production over the last twenty years. Managers must consider how decisions will affect social norms not only with present generations but in the future. A method for determining social and cultural considerations in management and planning decisions is to have the public actively involved in the process. This allows agencies to gain insight from interested parties on how a project will affect social and cultural values.

A final criterium which should be used to evaluate any management project is operational and administrative feasibility. Budgets and personnel are constraints managers are constantly facing. A project which meets other criteria already discussed may not be feasible if an agency lacks the operational resources necessary for its administration. Related to this are the constraints placed on agencies by legislative mandates. These administrative constraints include a number of public land laws as well as environmental laws. Managers must also balance these requirements with those already discussed.

2.3 Ecoregions

[5]A variable of this type must also consider the uncertainty associated with resource use.

Another major issue surrounding the development of ecosystem management as a viable technique is the appropriate scale of areas to be managed. One proposed method to deal with this problem is the development of *ecoregions*. The idea of using ecoregions was first developed by Crowley (1967) with the generally accepted definition "a region of homogeneity in ecological systems or in relationships between organisms and their environments" (EPA, 1989). The attraction of using ecoregions as a tool in management decisions is that the technique divides or classifies natural resources into homogenous[6] units. The use of ecoregions has been promoted by a number of legislative actions (i.e., CWA and NEPA) which require agencies to submit reports to Congress on the state of national resources (EPA, 1989). A number of agencies have already instituted the use of ecoregions into their planning and management while many others are considering their use as a tool in an ecosystem management strategy.

A major catalyst for using ecoregions has emerged in the analysis of surface water standards. Traditionally regulation of surface water quality has relied on chemical and toxicological standards placed on point source polluters. This focus is now shifting to one of regulating the quality of receiving waters using ambient standards. Regulators can use ecoregions to analyze the appropriateness of national standards. Ecoregional analysis can be especially useful when analyzing where standards are not achievable even in a minimal impacted stream. Additionally, the analysis may determine areas where standards are not stringent enough. The use of ecoregions in water quality management can aid regulators in setting standards which are dependent on ecological attributes in specific areas.[7]

While ecoregion mapping can be used for a variety of resource management assessments a number of attributes contribute to their suitability. These include the level of resolution, degree of thematic specificity, and precision of regional boundaries. The level of resolution relates to the ability to distinguish patterns at various scales (EPA, 1989). Resolution of a

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[6]The degree of homogeneity of a particular area in this context is determined be the characteristics used to define the region.

[7]Arkansas, Ohio and Minnesota have adopted a regional framework for setting chemical and biological criteria to supplement traditional water quality management (EPA, 1989).

particular ecoregion will affect the accuracy of an evaluation of resources in a management decision. For instance, decisions on national environmental problems would utilize a more generalized prospective such as satellite images. In contrast, projects on small scale would be more effective using a small scale, possibly ground-level refinement. The degree of resolution will be determined by the specific goal of the management decision. The focus of the management decision will determine the appropriate scale of the ecoregions to be utilized.

Ecoregions must also be defined by a degree of thematic specificity. This again will be dependent on the management decision which ecoregion maps will aid. Ecoregions can be defined with a broad basis such as terrestrial and aquatic surveys or on a much narrower scale such as the distribution of single feature effects (i.e., vegetation types, soil nutrient concentrations, or hardness of surface waters) (EPA, 1989). The use of regional-based maps may be appropriate for a wide variety of uses (e.g., management of water resources), however, maps with narrower themes may be utilized in site specific projects (e.g., mining projects).

A third important aspect of ecoregions which is important is that boundaries and descriptions are often not discrete (EPA, 1989). Regional boundaries represent zones of transition from one homogeneous unit to the next. The zones can be somewhat abrupt, possibly a couple of miles in width to gradual which can be several miles in width. Variation of environmental features will affect both regional boundaries and descriptions. Regional descriptions of environmental resources demonstrate typical characteristics of the region. However, these general features are not expected to be present in all areas of a region. While these regional maps are important to conceptualizing a regional area's distinction it would not be appropriate to use with a site-specific project.

2.4 Summary

Several issues are identified as potential challenges for developing a workable ecosystem management definitions plan for public land management activities including:

- ecosystems cut across traditional boundaries so institutions will have to incorporate interagency cooperation;
- successful ecosystem management requires an improved understanding of the scientific knowledge of dynamic natural systems;
- biological diversity as a goal of ecosystem management must be instituted in a manner which protects species on a regional basis;
- ecosystem management goals must determine the appropriate level of public participation; and
- management strategies must promote sustainable resource development which will insure economic viability without impairing natural processes.

3.0 INSTITUTIONAL FRAMEWORK FOR ECOSYSTEM MANAGEMENT

The two federal land management agencies which have the most interaction with mining companies are the USFS and the BLM. Both agencies are now involved in a number of activities which are aimed at actively using ecosystem management as a tool in managing public lands under their jurisdiction. While statutory mandates of each agency do not restrict the agencies from employing ecosystem management techniques, a number of obstacles must be overcome. First, as discussed above, the politically determined boundaries of each agency do not follow ecosystem management boundary principles. Second, though most statutory laws governing the use of public lands promote a "multiple-use" ideal, traditionally, natural resource policies have evolved into separate legal regimes which govern the management and production of individual resources such as timber, minerals and energy.

A number of laws which have been passed in the last twenty-five years are beginning to break down traditional boundaries and excessive legal compartmentalization (Keiter, 1994). These include the National Environmental Policy Act (NEPA), the Endangered Species Act (ESA), National Forest Management Act (NFMA), and the Federal Land Policy and

Management Act (FLPMA). These relatively new statutes are requiring land management agencies to take a much broader prospective when analyzing natural resource development on public lands. This broader prospective was designed to include other considerations such as aesthetics, biological diversity and recreational values. These statutes are all trying to address the increased competition for scarce resources of the public domain and how to allocate them appropriately to satisfy not only present needs but those of future generations.

3.1 National Environmental Policy Act

A statute which has emerged as an important cornerstone of natural resource laws governing public lands is the National Environmental Policy Act (NEPA). The statute, which has been instrumental in the federal decision making process, may also become an important component in ecosystem management. The major requirement of NEPA is that federal agencies prepare an Environmental Impact Statement (EIS) if a major federal action may significantly affect the "human environment." The institutional process for preparing an EIS, which was developed by the Council of Environmental Quality (CEQ), encompasses a number of ecosystem principles. The institutional structure of NEPA may serve as an important vehicle for policies which would use ecosystem management to guide natural resource development decisions.

Aspects of NEPA which reflects ecosystem principles include:

- provisions for interagency cooperation;
- a requirement that analysis include cumulative environmental impacts;
- a requirement that analysis consider the impacts of a decision on the biological diversity of an area; and
- an analysis must include the effect on other values, especially aesthetic considerations when the environmental impacts are being considered.

The strength of NEPA as an ecosystem management tool is that the statute requires federal agencies to analyze their actions from an ecological perspective. The short coming is that the statute is procedural in nature and does not require agencies to insure that ecological resources are protected. Additionally, the law does not give agencies the ability to extend mitigation

measures beyond their jurisdictional boundaries.[8]

One provision within NEPA which may be most helpful to agencies trying to implement ecosystem management is the provision which requires interagency coordination. NEPA specifically requires agencies to consult with other affected agencies when preparing an EIS. Procedural requirements state that a "lead agency" be identified which will coordinate the preparation of all NEPA documents. The lead agency is required to consult with all cooperating agencies which have expertise in the development activity or the area where a proposal will take place. This has become a very important part of development activities in the jurisdictionally fragmented western public lands which often include a number of different agencies.

The interagency facilitation under NEPA also requires a lead agency to consult affected agencies early in the environmental review process and that an EIS include a discussion of any possible conflicts between affected agencies. This includes not only federal agencies but any state and local agencies which may be affected by a development activity.[9] The well established procedural requirements under NEPA for interagency consultation provide a forum for interagency cooperation for ecosystem management. However, the statute does not mandate meaningful coordination among agencies. As a result, agencies do not have to incorporate any comments and concerns of the other agencies in a final EIS but only that the concerns are addressed.

Another provision of NEPA which incorporates an important ecosystem principle is the requirement that decision makers consider cumulative effects of a proposed action. NEPA defines cumulative impacts as "the incremental impact of an action when added to other past, present, and reasonably foreseeable future actions regardless of what agency . . . or person

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[8]Agencies are required to consider the impacts beyond jurisdictional boundaries, however.

[9]Though NEPA's principal jurisdiction involves the actions of federal agencies, there are instances where state and local governments may become involved in the process. A state or local agency which has jurisdiction by law or special expertise with respect to any environmental impact of the proposed action can also be designated a cooperating agency. This is dependent on the lead agency's approval.

undertakes such other actions" (40 C.F.R § 1508.7 (1988)). The provision requires agencies to consider development activities as a whole rather than a number of discrete or segmented decisions. Additionally, the analysis must be completed prior to any course of action being chosen. The provision also allows the analysis to consider the full extent of ecological ramifications of a development proposal beyond any jurisdictional boundaries.

While NEPA has a strong component requires decision makers to consider cumulative impacts, in practice, analyses usually fail to consider impacts beyond immediately surrounding areas. This is a result of both agencies and the courts reluctance to expand the scope of the NEPA analysis (Keiter, 1994). This is despite the results of scientific research which suggests that important ecosystem regions are interconnected.[10] However, these trends appear to be changing with NEPA legislation only playing a tangential role. Other statutes such as the National Forest Management Act and the Endangered Species Act, and political pressure seems to be having a more significant influence on encouraging federal agencies to take a more holistic view of development activities. These latest developments may also encourage courts to use the cumulative impacts of NEPA to insure that federal agencies consider the ecological implications of resource development activities.

Language contained in NEPA also requires agencies to consider biological diversity. This requirement is an integral part of ecosystem management and could serve as an important tool for decision makers. The provision is broadly defined and requires federal agencies to "maintain, wherever possible, an environment which supports diversity and variety of individual choice" (42 U.S.C. § 4331(b)(4) 1982 & Supp. 1987). At the present time neither the courts nor CEQ has given specific legal standards to this provision and as a result it has not become an important part of the environmental review process. This appears to be changing and there are indications that Congress may obligate federal agencies to consider biodiversity in their analysis of federal projects which may make this provision much more important when preparing NEPA

[10]Examples which are often cited include the Greater Yellowstone area, the southern Utah desert, and the ancient forests of the Northwest.

documents (Keiter, 1994).[11]

A final area where NEPA can play a significant role in integrating ecosystem management into federal decisions is with alternative resource values. The objectives of public participation requirements of NEPA allow a number of alternative values of public lands to be considered. NEPA requires that decision makers insure "aesthetically and culturally pleasing surroundings" and to "preserve important historic, cultural and natural aspects of our national heritage" (42 U.S.C §4331 (b)(2) & (4)(1982 & Supp. 1987)). CEQ has specifically addressed these concerns in requirements for environmental impact analysis. Additionally, the courts have found NEPA violations when aesthetic values are not considered in specific EISs for development activities. While the provision has had significant impact on specific development projects, the requirement is still only procedural so CEQ regulations will be satisfied if aesthetic values are considered rather than protected.

While NEPA incorporates a number of important ecosystem principles into the environmental analysis process the success of using the statute as a vehicle for promoting ecosystem management on the public lands has yet to be achieved. This is mainly because the statute is primarily procedural so decision makers are only required to *consider* ecological impacts of development activities. This may be changing, however, with NEPA becoming an important cornerstone of ecosystem management on the public lands.

3.2 Endangered Species Act

The Endangered Species Act (ESA) of 1973 is designed to protect threatened and endangered species and their habitat from harm. Administration of the statute is the responsibility of the USFWS which participates with other land management agencies as a cooperating agency on a number of development projects. The act's provisions for species

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[11]Biodiversity has already been included in other areas of public land law. Specifically, NFMA requires the Forest Service to "provide for diversity of plant and animal communities based on the suitability and capability of the specific land area in order to meet overall multiple-use objectives" (16 U.S.C. §1604(g)(3)(B) (1988)).

preservation and habitat protection are both integral parts of ecosystem management so the statute may play a prominent role in instituting the strategy to public land management.

ESA is initiated when a species becomes listed by USFWS. Once a species is listed and its habitat is designated, the act prohibits:

- all actions that constitute a "takings"[12] of an endangered or threatened species; and
- federal agency actions that result in destruction or adverse modification of habitat of a listed species.

The act also establishes a process by which federal agencies proposing an action which may harm an endangered species must consult with the USFWS. If an action may potentially affect a listed species, federal agencies are required to provide biological assessment of the proposed actions. The USFWS will then prepare a biological opinion which will determine if an action can occur given the impacts on the relevant species and/or its habitat.

ESA has established the use of ecosystem principles in the protection of endangered species. This is largely because the act establishes statutory requirements for species and habitat protection which cross jurisdictional boundaries. Specifically, the act relies on conservation biology principles to promote species health and protection. An example is a "habitat-based" zoning system procedure to reduce habitat fragmentation. The statute, in an attempt to promote this ecosystem principle, also includes procedures to institute initiatives by interagency committees. This is an example of an institutional process which is utilizing ecosystem management.

The shortcomings of the act are that it does not protect ecosystems but individual species which is not an accepted ecosystem management technique. This goes against the basic idea that an ecosystem management ensures a rich diversity between species and equal treatment of all species (Keiter, 1994). Thus, the protection of individual species is a necessary but not sufficient ecosystem management principle.

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[12]Takings is broadly defined to mean "harass, harm, pursue, hunt, shoot, wound, kill, trap, capture, or collect" (16 USCA § 1531 (19)).

3.3 Multiple-Use Principles and the Bureau of Land Management

The formation of the BLM in the mid 1940's was primarily for the purpose of regulating grazing and extractive resource activities. The agency was originally modeled similarly to the existing USFS with a decentralized structure composed of an office in Washington, D.C. and several regional and district offices.[13] One of the immediate problems of the new agency was to manage millions of acres for natural resource use by implementing conflicting mandates under a number of different statutes.[14] These conflicting goals of the agency led original management to consider using a multiple-use approach even though the agency lacked the legal authority to institute this principle into management strategies.

The BLM had its first formal mandate which promoted a multiple-use objective with the enactment of the Classification and Multiple-Use Act of 1964. The statute followed the lead of the USFS's Multiple-Use, Sustained Yield Act of 1960. The mandate required the BLM to consider wildlife, recreation, and water resources as well as the traditional emphasis of livestock, mining and land disposal (Loomis, 1993). The requirement was rather limited because the agency continued to follow a dominate use strategy though they did consider alternative uses. The statute provided a temporary mandate for the agency which lasted until 1970 when the act expired.

A permanent multiple-use principle was mandated by the Federal Land Policy and Management Act (FLPMA) of 1976. The statute was the result of a long debate over the reconciliation of the hundreds of laws which governed the use of the public lands under the jurisdiction of the BLM. The act specifically states that public lands should be managed in a manner that "protects the quality of scientific, scenic, historical, ecological, environmental, air and atmospheric, water resource, and archeological values" (43 U.S.C § 1701(A)(8)). The act

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[13]The agency has changed since original conception to include a Washington D.C. office; district offices and a state office in each of the western states.

[14]The agency was originally the remnants of the General Land Office, which included all federal mineral leasing programs and the Grazing Service which managed grazing activities under the Taylor Grazing Act.

also defines "multiple-use" which includes a provision to include both current and future uses of the public lands. Similar to NFMA, FLPMA requires the BLM to use an interdisciplinary research approach to land management planning which includes coordination with other federal, state and local agencies (Keiter, 1994).

Other important provisions of FLPMA which support ecosystem management are the consideration of critical environmental areas and wilderness review. FLPMA requires the agency to give priority to identifying and protecting "areas of critical environmental concern." This includes a number of special management requirements to protect environmental resources. Additionally, the strict enforcement of the act's wilderness review provision requires the BLM to protect from impairment a number of roadless wilderness areas within the BLM's jurisdiction. While the BLM has traditionally focused on commodity production activities, FLPMA clearly gives the agency the ability to employ ecosystem management in land use decisions.

3.4 Multiple-Use Statutes and the U.S. Forest Service

Institutional requirements governing the activities of the USFS appear to best promote the ideals of ecosystem management. This was first promulgated by the Multiple-Use Sustained Yield Act of 1960 which defined multiple-use as "harmonious and coordinated management of the various resources, each with the other, without the impairment of productivity of the land, with consideration being given to the relative values of various resources, and not necessarily the combination of uses that will give the greatest dollar return or the greatest unit output" (Coggins and Wilkinson, 1987). Additionally, a number of ecosystem management principles have been defined in the National Forest Management Act (NFMA) of 1976 which placed significant planning obligations for national forest use on the agency. The most significant of these is the only explicit federal statutory reference to "biodiversity." The provision, which is used as a basis for the USFS's population regulation incorporates biological considerations to ensure the health of the national forests. While this biodiversity standard is viewed by many as a

procedural requirement[15] it has had dramatic impacts on some resource development activities.[16]

Other important provisions within NFMA which satisfy ecosystem management principles are the interdisciplinary planning and management requirement and a public participation requirement. NFMA specifically requires the agency to use an interdisciplinary approach to national forest planning to promote other activities besides commodity production activities. Additionally, NFMA strongly promotes the use of active public participation in forest planning. This is designed to insure that public values are considered when determining resource management goals. These statutes clearly indicate that the USFS has the ability to promote and use ecosystem management as a viable resource planning tool.

3.5 Summary

A number of laws have been passed in the last thirty years which contain language constituting ecosystem management principles. This is most prevalent with public land laws such as NFMA and FLPMA which were passed in 1976. While these statutes appear to provide the legal structure necessary to institute ecosystem management on public lands governed by the BLM and USFS a number of obstacles still remain. First, federal agencies have traditionally been rewarded for achieving goals based on commodity production (Hamilton, 1994).[17] This has resulted in a number of separate legal regimes which govern the management and production of individual resources such as timber, minerals and energy. Additionally, a law such as the General Mining Law of 1872 gives miners vested rights which may curtail an agency's ability to

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[15]There are indications from case law that the provision can be satisfied if forest planners simply "consider" the impacts of a development activity on species diversity. This does not require the Forest Service to insure that species diversity is protected and can have quite a different impact on the success of ecosystem management (Keiter, 1994).

[16]A method developed by the Forest Service to measure the ecological health of a national forest is an "indicator species". The most famous indicator species which was used as a basis for curtailing timber harvesting is the Spotted Owl in the Pacific Northwest. This case indicates the provision's ability to protect regional ecosystems.

[17]In the case of the Forest Service, the congressional appropriations process ties agency budgets to timber production. Thus, regulators are reluctant to consider ecological considerations over congressionally mandated production goals (Keiter, 1994).

institute ecosystem management principles. These obstacles provide some uncertainty as to how aggressively federal land agencies will institute ecosystem management into resource development decisions.

4.0 ECOSYSTEM ACTIVITIES - FEDERAL AGENCIES

The importance of public land management in the U.S. is highlighted by the fact that nearly one third of the lands in the country are part of the public domain. This is especially true in the western U.S. where public lands comprise over two-thirds of some state's total area. Decisions which are made concerning the management of natural resources on the public lands can thus have dramatic effects on local, national and even global economies and environments. The two federal agencies that are responsible for the management of the majority of public lands are the BLM and the USFS which are responsible for the management of 70% of the public lands in the U.S. (Gana, 1991).

The USFS and the BLM are also the agencies which will be responsible for analyzing the impacts of the majority of mine development projects on public lands. This is not only the result of the large number of acres the two agencies control in the west but also to the unique opportunity made available to hard-rock mining claims on public lands established by the Mining Law of 1872. Examples of the land areas controlled by the two agencies in states where mining has an important influence is given in Table 1. Most dramatic of these areas is Nevada where 82 percent of the state is controlled by federal land agencies. Thus, the introduction of ecosystem management as a natural resource development tool has the potential to have dramatic effects on mining in many areas in the western U.S.

4.1 Bureau of Land Management

The BLM is actively employing ecosystem management as a viable tool to aid in the decision making process for lands under their jurisdiction. The agency, like many other public

Table 1. Public Land Holdings in Colorado, Montana and Nevada (000's)

State	Total Acreage[a]	% Owned by Federal Govt	National Forest Lands[b]		BLM Lands[a]	
			%	Acres	%	Acres
West[c]	1,118,430	54.7%	15%	163,104	23.9%	267,428
Colorado	66,486	34.1%	22%	14,444	12.5%	8309
Montana	93,271	27.7%	18%	16,796	8.7%	8067
Nevada	70,264	82.3%	8%	5,743	68%	47,999

[a] Totals are from 1989 due to data gathering problems in 1990, tables 4 & 5.

[b] Totals are for 1990 from the U.S. Statistical Abstract, 1992. table 1132.

[c] The west is defined as Alaska, Arizona, California, Colorado, Idaho, Montana, Nevada, New Mexico, Oregon, Utah, Washington, and Wyoming.

source: Public Land Statistics, 1991 & U.S. Statistical Abstract, 1992.

land authorities, has traditionally focused on the production of commodities and commercial use of natural resources. The management strategies were designed to expedite the development, extraction and/or production of resources on public lands. Other uses and values were treated as constraints in this management scheme. The result of this long standing management strategy is the agency has been divided along functional lines which reflect commodity production. This resulted in lack of internal and external coordination with other land management agencies.

The BLM is also observing how this single view management objective has affected many communities whose economies have been closely tied to public land use. These communities are often adversely affected by ecological degradation.[18] Agency observation indicates that "poor forest and rangeland health, degraded riparian areas, and inferior aquatic habitats can threaten species' viability, resource productivity, and ultimately, the overall sustainability of ecological systems" (BLM, 1994). The goal of the BLM when implementing ecosystem management is to reduce these adverse effects by making better informed

[18]Declining timber and commercial and recreational fishing industries in the Pacific Northwest are examples of economic repercussions and social displacement which can accompany ecological degradation.

development decisions which consider the "relationship between land management activities, site capability, social and economic demands and ecological health and sustainability" (BLM, 1994).

A recent BLM document (BLM, 1994) outlines the introduction of ecosystem management using nine separate principles. These include:

- sustain the productivity and diversity of ecological systems;
- collection and utilization of the best available scientific information;
- actively involve the public in the planning process as well as coordination with other federal, state, local and private landowners;
- determine desired future ecosystem conditions based on historic, ecologic, economic, and social considerations;
- work to minimize and repair impacts to the land;
- adopt an interdisciplinary approach to land management;
- base planning and management on long-term horizons and goals;
- reconnect isolated parts of the landscape; and
- practice adaptive management (BLM, 1994).

The agency feels that using these nine principles will insure that ecosystem management will be instituted in a manner which is consistent with FLPMA. The agency is hoping that by using this type of approach it will ensure that tradeoff decisions on resource allocation will be made in the most objective manner.

The BLM has proposed instituting ecosystem management in a manner which will sustain productivity and diversity of ecological systems. The focus is consistent with the overall objective of public land management to conserve, maintain and restore the ecological integrity of the land. This must be accomplished in a manner that insures those human values such commodity production within the limits of ecological sustainability. This will be quite a challenging task given the dynamic nature of both ecological systems and human wants and needs.

One of the biggest goals of the BLM is to increase the availability of sound scientific information which can be used to make decisions within an ecosystem management framework. The agency is lacking critical baseline information on historic and present conditions in a

number of areas under their jurisdiction. An effort is underway to collect information pertaining to biological, physical, and economic aspects of BLM lands. Additionally, the agency plans to cooperate with researchers, other government agencies, and industry to share results from ongoing research, technology development and monitoring efforts to determine appropriate local, landscape, and regional management strategies (BLM, 1994). The activities will not only focus on providing information which will aid in making objective decisions on future development activities but also decisions on methodologies to restore damaged ecosystems. Sound scientific information is a cornerstone to sound ecosystem management so this objective will be a priority for the agency.

One method employed by the BLM to aid in information gathering is the use of Geographic Information System (GIS). This will consist of an automated system for data in the use of ecosystem management of lands under their jurisdiction. This vast data base will provide information on a number of aspects of land areas which will be accessible to regulators and public inquiries. Within the overall objective the agency is in the process of developing a "master plan" which will guide a number of specific activities. Examples include components such as the Automated Land and Mineral Record System (ALMRS) and the Automated Resource Data (ARD) and Geographic Coordinate Data Base (GCDB) (Hamilton, 1994). The primary purpose of ALMRS is to provide information on land status and authorizations which includes data on land status and mineral records. ARD will include a number of different categories which include: resource values, management concerns, land characteristics, topography, transportation, and basic cultural features. GCDB will integrate legal land parcels data which are defined by the Public Land Survey System.

One of the main principles of ecosystem management is that humans are major factors of the ecosystem and human needs should be the major objectives of any planning activity. The BLM realizes the importance of the human component and will actively involve the public in the planning process. The main focus of BLM pertaining to this principle will be in the formation of a number of partnerships between the agency and other government entities, private land owners, and Native American tribes. These partnerships will be formed with the purpose of solving

multi-jurisdictional conflicts which are likely to develop with the introduction of ecosystem management. Additionally, information from all interested and affected parties will be sought in the development of appropriate management strategies. This will be especially important in areas where BLM lands are intermingled with other land holdings in many areas in the western U.S.

Another major goal which the agency is proposing is to determine the future ecosystem conditions. The purpose of this objective is to provide information so that ecosystem integrity can be protected in the future. Aspects which will be considered when determining future ecosystem conditions include ecological, economic, social, and political factors. Information on these factors will be used to determine the appropriate resource and service uses of the public lands now and in the future.

Multiple-use principles of the public land agencies have forced decision makers to determine the best use of a land parcel from a number of activities which may not be compatible. The conflicting uses have resulted in areas which are no longer suitable for alternative uses and have led to the degradation of ecosystem processes. One of the goals of the BLM is to use ecosystem management to reduce ecosystem fragmentation and degradation and to maintain the ecological health and diversity of the land. This will require all land disturbing activities[19] to include rehabilitation provisions which protect the diversity and integrity of ecosystems over the long term.

The traditional management regime of the BLM has resulted in the agency being divided along functional lines pertaining primarily to commodity production and commercial use of natural resources. The compartmentalization of the agency has isolated the different program groups into their own interest or expertise. A major goal of the agency is to promote a more interdisciplinary approach to land management. The use of ecosystem management by the

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[19]This includes such activities as grazing, mining, timber harvesting, right-of-way developments, and recreation activities (BLM.1994).

agency will require the different divisions[20] to establish common objectives and goals for the management of lands within their jurisdiction.

A major principle of ecosystem management is that planning is conducted on long-term horizons. The BLM will introduce a long-term planning horizon and goals which will focus on ecological objectives. The agency will attempt to identify these ecological goals as measurable and quantifiable objectives. Once these ecological goals are identified then short-term political and commercial objectives can be integrated for specific areas. The agency hopes that by introducing a long-term planning horizon then site-specific and landscape conditions will be at a desired level and the health of specific ecosystems will be improved (BLM, 1994).

Another goal of the BLM by introducing ecosystem management is to reconnect isolated parts of the landscape. The objective is a management focus which involves treating separate areas in a more holistic manner. For example, the agency plans on managing upland areas by considering the effects on riparian areas, surface waters and ground waters. This holistic view will enable the agency to incorporate important ecosystem management principles into development decisions.

The final principle which the agency will employ when introducing ecosystem management is adaptive management strategies. This will insure that decisions will take into account changing ecological conditions as well as human needs and wants. Management decisions will integrate monitoring and inventory information. The agency will then be able to determine how management decisions are affecting the dynamic nature of ecological health. This will involve using the data to clearly describe baseline resource levels which can be used to determine the effects of management decisions. For example, if the acceptable baseline levels are exceeded, activities will be delayed, canceled or modified until the ecosystem is restored.

The agency understands the importance of the monitoring results on management

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[20]This includes range, forestry, minerals, wildlife and fisheries, and recreation divisions.

decisions and as a result will consult with other relevant agencies on appropriate methods and techniques to be utilized. Additionally, the agency will attempt wherever possible to coordinate with other agencies so monitoring activities can take place across jurisdictional boundaries. The goal of this activity is to insure that the health of ecosystems is maintained. Thus, the agency will employ monitoring and inventory activities which will ensure that: management direction is implemented; management direction is effective; and management assumptions about ecological conditions and their response to treatments remain valid over time (BLM, 1994).

4.1.1 Ecosystem Management Programs

The BLM is now actively involved in a number of projects which are implementing ecosystem management principles. Four important projects include:

- California Bioregions;
- Bring Back the Natives;
- Pacific Salmon and Steelhead Recovery Strategy (PACFISH); and
- Neotropical Migratory Birds (Partners in Flight) (BLM, 1994).

These projects are examples of how the BLM is cooperating with other government entities as well as private organizations to promote ecosystem management principles.

The California Bioregions project is a coordinated effort between the BLM and other federal, state and county governments to promote biodiversity. The agency entered a cooperating agreement with the other agencies by signing a Memorandum of Understanding (MOU) which was designed to promote a statewide biodiversity planning strategy. The focus of the MOU is to coordinate the actions of land management agencies so that the "natural heritage of each major bioregion in California" is conserved while maintaining economic growth and development over a long-term planning horizon (BLM, 1994).

The Bring Back the Natives project was initiated in 1991 and involves 67 federal, state, local and private entities which are directing thirty projects designed to benefit a variety of aquatic species and wildlife. The project is expected to grow in 1994 to include fifty projects in

14 western states. The focus of this project is to use coordination, water shed management, and improved land use practices to restore and improve aquatic as well as riparian habitats (BLM, 1994).

Another project, which began in March 1993, involves the BLM and USFS in a joint effort to conserve and restore anadromous salmonoid habitats on the public lands. The effort known as PACFISH, is patterned after the aquatic principles of the Forest Ecosystem Management Assessment Team Plan which are used to rejuvenate and conserve Pacific salmon and steelhead habitats and associated watersheds in the west. The two objectives of the project are to integrate sound scientific information with site specific management direction to protect associated watersheds.

The BLM is also involved in an international project, Neotropical Migratory Birds, with the objective of protecting migratory birds and their habitats. The project involves a number of agencies from the U.S., Canada, Mexico, the Caribbean, and Central and South America.[21] The efforts of active parties have led to the establishment of national, regional, state and physiographic working groups. These groups are responsible for organizing monitoring, research, and public education efforts focused on neotropical birds and their habitats. The groups also help in coordinating management efforts for the migratory birds.

4.1.2 Summary

The BLM is actively instituting ecosystem management techniques into public land management activities. The success of this strategy will require the agency to make some fundamental changes in the traditional management strategies. The results of these actions will likely be a national management policy which is initiated in the D.C. office with activities in different states having similarly functioning management programs. This centralized strategy

[21]In 1993 this included 14 federal agencies, 55 state and provincial fish and wildlife agencies, 34 nongovernmental organizations and 14 private companies in the Western Hemisphere (BLM, 1994).

may be dramatically different from other land management agencies which function much more autonomously than the BLM. Whatever direction the BLM ecosystem management program finally takes will likely affect a wide range of public land activities given the amount of land area the agency has under their jurisdiction. However, from a mine operator's perspective, the requirements from one location to the next should remain somewhat similar.

4.2 U.S. Forest Service

The USFS is the second largest public land management agency in the federal government, responsible for the management of more than 192 million acres (Loomis, 1993). The organizational structure of the USFS is quite different from that of the BLM. The USFS headquarters is located in Washington, D.C. The lands of the USFS are then divided into nine regions with a regional forester in charge of each region. Within each region there are generally several forests, each with a forest supervisor. The forest supervisors have significant discretion over the management of their particular forest due to the decentralized nature of the agency. This structure has a significant impact on the implementation of the principles of ecosystem management.

Planning at the forest level is based upon the requirements specified in the NFMA. The forest planning requirements identified in the NFMA are:

- identification of issues, concerns, and opportunities (ICOs);
- development of planning criteria;
- collection of data and information necessary to address ICOs;
- analysis of the management situation (AMS);
- formulation of alternatives;
- estimation of effects of each alternative;
- evaluation of alternatives;
- selection of a preferred alternative (proposed Forest Plan);
- plan implementation; and
- monitoring and evaluation of the plan (Loomis, 1993).

The primary management objective incorporated into forest plans has focused on timber harvesting. However, since passage of the Multiple-Use, Sustained-Yield Act of 1960, forest

plans have addressed issues of managing the lands for outdoor recreation, range, watershed protection, and fish and wildlife purposes, as well as timber harvesting (Coggins & Wilkinson, 1986). Integrating the principles of ecosystem management into the institutional structure of the USFS forest planning system will not require significant institutional change.

The role of ecosystem management as a management objective at the USFS was institutionalized in a memo from the USFS Chief Dale Robertson on June 4, 1992 that declared that ecosystem management is the "Forest Service way" and that the "Forest Service is committed to using an ecological approach in the future management of national forests and grasslands." The new head of the USFS, Jack Ward Thomas, has reinforced this commitment to ecosystem management as a way of doing business, and emphasized that ecosystem management is "evolutionary, not revolutionary." The impact of this commitment, however, can differ significantly from location to location. Due to the variety of definitions of ecosystem available, implementation of ecosystem management principles could take on various forms.

Although the tools used by the USFS are similar to those of the BLM, the management decisions may differ significantly. Another important aspect that differentiates the USFS from the BLM planning process is the use of mathematical modeling tools such as FORPLAN and IMPLAN.[22] These models are used to implement forest planning requirements under NFMA. The impact of these models on the implementation of ecosystem management and mine permitting could be significant.

4.2.1 Ecosystem Management Programs

The USFS has established numerous programs for implementing ecosystem management into the decision making process at the national and forest management level. At the national level a "Reinvention Team" was established to recommend organizational changes that would

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[22]FORPLAN is a linear programming model and IMPLAN is an input-output model used by the USFS for planning purposes.

help to meet the needs of ecosystem management.[23] The USFS directed their field teams to develop action plans for implementing ecosystem management in September 1992. As a result of this activity, ecosystem management has been institutionalized as a way of doing business instead of just talk.

The USFS is also actively involved in numerous interagency programs which are designed to provide consistency and agreement on the definition of ecosystem management and how it should be implemented. As a leader in the area of ecosystem management the USFS was a co-founder of the Interagency Ecosystem Management Coordination Group for sharing information, coordinating projects, and developing new ideas. According to information from the USFS, their activities extend beyond interactions with other federal agencies to state and private groups and international organizations. As mentioned above, the USFS is involved in numerous projects with the BLM, such as PACFISH and the Partners in Flight programs.

A primary tool used by the USFS, similar to BLM, is GIS. GIS is being used in the following manner:

- forest Plan monitoring and maintenance;
- assessing timber salvage recovery options and impacts related to resource management after a natural disaster;
- wildlife habitat mapping, including potential endangered species habitat analysis;
- river corridor analysis;
- landscape analysis; and
- watershed analysis including soil stability analysis and wetlands assessment (CRS, 1994).

Using GIS technology in forest planning has the potential to significantly impact mine permitting. Each of these activities can be used to determine the environmental impact of a mining project on USFS lands. However, GIS mapping and monitoring are currently being used in many areas and the changes may only be in the area of relating the information into management objectives. Other technologies being used to aid in the implementation of ecosystem management are remote sensing, image processing, global positioning systems, and

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[23]This team was created as a response to Vice-President Gore's National Performance Review.

imaging technology.

4.2.2 Summary

The impact that the implementation of ecosystem management by the USFS will have on mine permitting is difficult to predict. As mentioned above, the flexibility that each forest supervisor has been given regarding the activities on their respective forest allows for a wide range of possible scenarios for implementation of the same ecosystem management objectives. One point that is certain, however, is that a mine project will need to consider the environmental impacts of the proposed project in a more holistic manner.

4.3 Other Federal Agencies

A number of other federal agencies are now actively pursuing ecosystem management as a viable tool in resource development activities. Two agencies, whose activities often affect mine development includes the Environmental Protection Agency (EPA) and the U.S. Fish & Wildlife Service. These agencies are not considered land management agencies so their influence on how ecosystem management principles are implemented is likely to be tangential in nature.[24] However, at times the actions of both these entities have been significant on mine development activities so it is important to review the activities of the agencies concerning ecosystem management strategies to determine possible impacts on future mine development activities.

4.3.1 U.S. Environmental Protection Agency

The EPA is now in the process of integrating ecosystem principles into a number of agency run programs. The introduction of a more holistic view will allow the agency to further

[24]The USF&WS does manage a number of areas in the National Wildlife Refuge System, however, mining is not permitted in these areas. Thus, the decisions made by the USF&WS on land management decisions will only affected mine development tangentially.

its expertise in a number of areas such as risk assessment, media protection and pollution reduction. The agency's unique legislative mandates allow for the protection of habitats through risk reduction of chemicals and wastes. This gives the agency an opportunity to play a significant role in the introduction of ecosystem management into federally run programs.

The most likely area for the EPA to play a role in the development of ecosystem management is with information management and sharing. This is because of the expertise the agency holds in areas such as risk assessment and management but also with programs designed to determine ecosystem status and trends such as the Environmental Monitoring and Assessment Program (EMAP) (Serfis, 1994). EMAP is a nationally based monitoring system is designed to integrate information from a number of sources with the goal of documenting current conditions of ecological resources, understanding why conditions exist, and predicting what conditions will exist in the future (Serfis, 1994). This will allow administrators to determine how management decisions will affect ecosystem health over a long-term planning horizon. Additionally, the agency is helping to develop ecoregion maps which can be used in natural resource management and planning (see figures 1 and 2).

4.3.2 U.S. Fish & Wildlife Service

The USFWS is also involved in a number of activities which are designed to integrate ecosystem management principles. This includes activities on the 91 million acres of land nation wide under the agency's jurisdiction.[25] The agency also has a number of other responsibilities, most notably requirements under ESA. The agency has issued a concept document which defines ecosystem management as "protecting or restoring the function, structure, and species composition of an ecosystem, recognizing that all components are interrelated" (Young, 1994). One of the main activities of the agency is the implementation of watershed-based ecosystem units which are devised to organize activities nationwide and set ecosystem-wide goals and

[25]This includes designated areas within the National Wildlife Refuge System such as Wilderness Preservation Areas, Wild and Scenic Rivers, Research Natural Areas, Wetlands and International Importance, and Shorebird Reserves (Young, 1994).

objectives of each unit.

Activities of the USFWS which are most likely to affect mining activities are those which are in conjunction with one of the other land management agencies or activities associated with ESA.[26] The agency presently has a number of projects with both the BLM and USFS including a number of committees within the Interagency Ecosystem Management Coordination Group (IEMCG). The group was established to provide a forum where federal agencies can exchange information and brainstorming on how ecosystem management should be integrated into development decisions. One specific committee developed by this group is the Ecological Assessment Committee. USFWS plans on taking a supportive role in this USFS initiative to conduct a national, interagency, ecoregion-based, ecological assessment. The two agencies will cooperate with a number of other government entities with the goal of synthesizing information on current conditions of major national ecosystems, determine how human and naturally occurring events have influenced these conditions, and the trends of future ecological conditions. Another project which the USFWS is involved with the BLM is the Montana Centennial Valley Project. Here the two agencies are working to restore and sustain the valley's unique biological and cultural values.

Activities which are aimed at implementing ecosystem management with the ESA include multiple species listings and recovery planning and implementation. The agency is now using a multiple species listing rather than the more traditionally single species listing. This has already been utilized in Hawaii and California and follows the ecosystem principle that ecosystems should maximize biological diversity. The agency is also trying to introduce ecosystem management principles into recovery planning and implementation. An example is the Desert Spring Complex in Nevada, which includes a number of different species which share similar habitats and are facing similar threats.

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[26]The areas which USFWS is the land management agency are withdrawn from mineral exploration and development so activities in these areas will not be discussed.

The USFWS activities related to ecosystem management are likely to affect mine development in a similar fashion as the activities of the EPA. Both agencies are likely to act as cooperating agencies with the major public land management agencies and with their activities affecting mining in an indirect fashion. It appears that both agencies will serve as major information sources for other agencies especially where their expertise is of importance (i.e., wildlife and chemical). While neither agency appears to be implementing major actions which can affect mine development it is always a possibility that either can become a major influence at a specific site.

5.0 STATE ACTIVITIES

Activities involving ecosystem management are also being organized on state and local levels. One such example is the Colorado Ecosystem Partnership (CEP) which was formed in 1993. The group is a loose association of seven federal agencies, six state agencies and a number of other universities and private organizations.[27] The mission statement of the group indicates that "resource management and protection are ecologically sustainable, economically feasible, and socially acceptable" (Colorado Ecosystem Partnership, 1994). While the goals of this group sound similar to other agencies promoting ecosystem management, their means is somewhat different. The organization will focus on educating local communities on the importance of ecosystem management in local resource development decisions. Specifically this will involve the education of local agencies on how to use a broader prospective in resource development. This is aimed at reducing conflicts which often arise between national and local natural resource needs and objectives.

CEP has identified two principal goals which include:

- create an environment in the state for successful ecosystem management at a

[27]Federal agencies involved include: BLM, USFS, USFWS, EPA, National Park Service, Bureau of Reclamation, and Soil Conservation Service. State agencies include: Department of Natural Resources (Division of Parks and Outdoor Recreation and Division of Wildlife), State Forest Service, Department of Agriculture, State Land Board, Department of Local Affairs (The Colorado Ecosystem Partnership, 1994)

community level; and

- work to support community efforts in ecosystem management (Colorado Ecosystem Partnership, 1994).

The objectives clearly indicate the focus is to promote ecosystem management at a local level. CEP, in identifying these objectives, has indicated institutional as well as human relation changes which will have to be achieved before ecosystem management can be successful at the local level. First, a successful management strategy must include citizens which possess an understanding in ecosystem principles. Second, the decision making process, which must include a number of stakeholders, will require shared responsibility and vision. Finally, government entities and interested parties will employ a broader prospective at the local level which will enable societal views to be considered.

CEP will focus on reaching their objectives of ecosystem management at the local level mainly through educational programs and information and data sharing. Educational programs will include training for agencies and promotion of educational videos (Norris, 1994). Additionally, CEP will use ecosystem management as a framework for promoting environmental awareness and recognition of shared successes (Colorado Ecosystem Partnership, 1994). Informational sharing will focus on two primary objectives. First, CEP will provide information which will promote partnerships. CEP will try to establish partnerships by including opposing views from interested stakeholders with the goal of being able to provide objective evaluation. Additionally, CEP will pool resources when possible to increase the understanding of how ecosystems function. This includes promotion of networking and sharing of information between a variety of institutions and expertise.

Nevada and Montana are in the preliminary stages of defining ecosystem management projects at the state and local levels. Although it is difficult to clearly state what direction these activities will take, it is certain that something will be done in the near future. Other states in the west have been active in the implementation of ecosystem management projects. An example is the state of Oregon where the Oregon Watershed Improvement Coalition has been organized to address the impact of resource use on the quality of watersheds in Oregon.

Numerous other projects have been implemented, or are in the process of being implemented that will have a significant impact on the way mine permitting is currently being conducted. The development of such programs is important to successfully managing the available lands for effective and efficient multiple-use.

6.0 POTENTIAL IMPACTS ON MINE PERMITTING

As the discussion regarding the goals and objectives of ecosystem management expand, several essential components are beginning to be identified. A list of these components is (modified from the *J. of Forestry*, 1994: p. 16):

- a key objective is the maintenance and enhancement of biodiversity;
- protection and enhancement of ecosystem integrity and functions are essential;
- landscape traits are emphasized;
- intensive management is emphasized;
- shift toward species composition; and
- insurance against future ecological change.

Each of these points is important to the permitting of a mining project. The shift to ecosystem management is not expected to have a significant impact on the institutional process of permitting a mine (*e.g.,* the NEPA process), but is expected to affect the content of the required analyses and ability to mine on these lands. Three specific areas may impact mining activities on public lands: 1) land availability; 2) reclamation requirements; and 3) setting environmental standards, particularly water quality standards.

The first issue of land availability is very important to the mining industry. Currently, the Mining Law of 1872 provides access to the public lands for exploration and development. Institutional procedures are available for land management agencies to withdraw lands from access by mining companies. As the application of ecosystem management principles expands in the land management agencies the criteria for land withdrawals may change significantly and the level of mining activity on public lands will be similarly affected. It is not clear that the net impact will be less areas available for mining activities, however, this is a distinct possibility.

Currently, reclamation requirements consider the historical use of the site that has been disturbed and design the reclamation activity according to this baseline. This approach may change under ecosystem management because the baseline use may not be the best or desired use. The principles of ecosystem management will require the land management agency to consider the integration of a reclamation plan with the landscape traits which may extend beyond the boundaries of the project site. Although reclamation requirements vary be state, federal land management agencies require reclamation plans as part of the permitting documentation.

The final issue that may have a significant impact on the level of mining activity on public lands is in the area of environmental standards. Currently, minimum environmental standard are set at the national level by the Environmental Protection Agency. These standards are not dependent on the ecology of the location. Changing to ecosystem management, particularly at the ecoregion level, may result in more site specific, or region specific, standard setting. It is not an unusual situation that the background concentrations of a particular pollutant are greater than the national standard, therefore restricting mining activity at a particular location. Changing to a regional standard setting approach may affect the ability to mine in such locations.

Each of these issues is still in the preliminary phase as ecosystem management principles are just being implemented. However, it is clear that all interested parties need to be heard regarding the impacts of changing the method and philosophy of managing the public lands. For ecosystem management to be successful, participation by all affected parties is a necessary component.

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