

LIVESTOCK IMPACTS FOR MANAGEMENT OF RECLAIMED LAND AT NAVAJO MINE: THE DECISION-MAKING PROCESS¹

by

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Abstract. Livestock grazing is the post-mining use for reclaimed land at Navajo Mine, a large surface coal mine on the Navajo Nation in northwest New Mexico. The Navajo Mine Grazing Management Program (GMP) uses holistic management on approximately 2,083 ha of reclaimed land to plan for final liability release and return of the land to the Navajo Nation, and to minimize the potential for post-release liability. The GMP began in 1991 to establish that livestock grazing on the reclaimed land is sustainable. Assuming that sustainability requires alternatives to conventional land management practices, the GMP created a Management Team consisting of company staff, local, Navajo Nation, and Federal government officials, and technical advisors. Community members contributed to the formation of a holistic goal for the GMP that articulates their values and their desire for sustainable grazing. Major decisions (e.g., artificial insemination, water supply, supplemental feed) are tested against the goal. Biological changes in the land and the grazing animals are monitored daily to provide early feedback to managers, and annually to document the results of grazing. To date, the land has shown resilience to grazing and the animals have generally prospered. Community participation in the GMP and public statements of support by local officials indicate that the GMP's strategy is likely to succeed.

Additional Key Words: arid land reclamation, decision-making process, holistic management, livestock grazing.

Introduction

When we are talking about...sustainable development...we must not lose the forest for the trees by trying to quantify everything...I think it is the decision-support systems, the decision-making processes of society, and the transparency and participation of these decision-making process that are more likely to lead to better solutions for development than simply a methodology that can be put into a computer which will churn out results.
Ashok Khosla (quoted in Trzyna 1995)

Land reclaimed after surface coal mining at Navajo Mine in northwest New Mexico will eventually be returned to the Navajo Nation, which will make it available for livestock grazing to local Navajos under a permit system. The process of turning over reclaimed mined land on the Navajo

Nation is virtually without a formal precedent. Although the regulatory authority for Navajo Mine is the Federal Office of Surface Mining (OSM), and Federal rules address bond release and some aspects of the return of leased land, no specific procedures for each step of the return process are codified in Federal or Navajo Nation law, and at least eight separate regulatory agencies spanning three levels of government (local, Navajo Nation, and Federal) each claim some responsibility and authority for part of the return process. All agencies involved in the return of the land have indicated that acceptance of the land by local grazing permittees, and by officials of the local Navajo Nation Chapter, will be necessary before the land officially reverts to the control of the Navajo Nation.

No mining company has to date demonstrated that livestock grazing can be sustained on land reclaimed after coal surface mining on the Navajo Nation. In addition to plant community characteristics (cover, production, diversity, etc.) identified in the literature and regulations of reclamation as indicators of reclamation success, at Navajo Mine reclamation success will depend upon the ability of local Navajo grazing permittees to sustain livestock grazing on the reclaimed land after reclamation is complete. To reduce the potential for claims of reclamation failure after bond release and the return of the land to the Navajo Nation, Navajo Mine owner and operator BHP Minerals (BHP)

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decided that grazing must be shown to be sustainable.

The complexity of the legal, cultural, and ecological dimensions of establishing the post-mining land use and demonstrating the sustainability of grazing on reclaimed land led the company in 1991 to employ the Holistic Resource Management Model (Savory 1988) to create and direct the Navajo Mine Grazing Management Program (GMP). Holistic management provides a framework for GMP activities that includes interested community members, along with mining company and government officials, in a process of collaborative decision-making to reach a specific goal. Over the long term, the GMP process will facilitate the determination by those same community members (who will eventually have grazing permits), by the Navajo Nation, and by Federal regulatory agencies, that the reclaimed land is capable of sustainable livestock grazing, and that BHP can be released from liability for the land.

Navajo Mine

Navajo Mine is a surface mine that produces approximately 8 million tons annually of sub-bituminous, late-Cretaceous coal for electricity generation. Production began in 1963 on a leasehold of approximately 13,522 ha of the Navajo Indian Reservation in northwest New Mexico, U.S.A. Large-scale land reclamation began in 1975, and will continue for the life of the mine. To date, there are approximately 2,083 ha of land reclaimed for livestock grazing by the ecological construction of a community of native grasses, forbs, and shrubs (Navajo Mine 1989).

The environment is typical of the Great Basin desert scrub land of the southern Colorado Plateau (Dick-Peddie 1993). The mine is located at 36°37'N latitude, 108°29'W longitude, at an elevation of approximately 1654 m. The growing season averages 150 days. Annual precipitation for the period 1973 - 1992 ranged from a low of 90.7 mm in 1976 to a high of 372.1 mm in 1986, with an average of 204.5 mm (Navajo Mine 1989). Approximately 50% of annual precipitation falls between July and October (SCS 1989).

Holistic Management of Grazing

In holistic management, the first step is to define the whole to be managed. The whole consists

of the land, the people connected to that land, and the wealth of those people. Navajo Mine is part of a region of over 100,000 hectares of rangeland, most of which is used for livestock grazing. The people include BHP company officials, local Navajo citizens, representatives of Navajo Nation and Federal government agencies with jurisdiction over mine reclamation, and advisors in range science, ecology, and holistic management. The GMP Management Team, which includes interested individuals from all of those groups, began meeting monthly in January 1991, to discuss cultural, economic, ecological, and legal issues pertinent to the return of reclaimed mined land and the creation of a sustainable livestock grazing economy on that land. Although the membership of the group has changed over the years, the monthly meetings continue.

In early 1992, after a year of monthly informational meetings to discuss the holistic management process, the GMP Team met in an open forum with many additional members of the community to create a temporary holistic goal. Conventional wisdom maintains that people of very different backgrounds and beliefs (e.g., mining engineers, Federal regulatory specialists, and indigenous graziers) will not agree on how to manage land. However, experience with holistic management shows that a diverse group tends to develop cohesion once it is apparent that there are common objectives among people who may never have considered such a possibility.

The holistic goal is the most important element of holistic management, because it unifies the values and desires of the people involved, and it is used in the management process to test all major decisions. It is temporary, or emerging, because of the recognition that people and circumstances change over time, and the group always has the opportunity to revise the goal in light of new developments.

The usual procedure in holistic management is to have a single goal of three parts. The first part includes cultural values, or the quality of life sought by the participants. The second part describes the kinds of economic and biological production appropriate for supporting those values. The third part is a vision of how the land should look in the future, 5 to 10 years from now, given the production requirements and the expressed human values.

Despite the diversity of the group at the Navajo Mine, the GMP Team found agreement on the holistic goal by beginning with descriptions of our personal cultural values. For example, the goal includes these statements from people who attended the January 1992 Management Team meeting:

- "Meet human needs for food, shelter, warmth";
- "Maintain traditional Navajo values with the freedom to adapt and change";
- "Avoid conflict over land use";
- "Build human relations on the basis of trust";
- "Enjoy peace and quiet, a pleasing landscape, and abundant wildlife."

Once the quality of life statements were expressed, the group was able to more easily resolve differences of opinion over production activities, because the discussion evolved from a shared goal, based on shared values, which had been arrived at collaboratively.

The production part of the goal expresses the need to meet legal requirements for a sustainable ecosystem, as well as the desire to keep both the Mine and the community economically viable. Statements in this part of the goal include:

- "Produce a healthy ecosystem of native vegetation, stable soil, diverse wildlife";
- "Produce profit from livestock, minerals, crops, and tourism, consistent with the entire goal."

The vision of the future landscape, which is the resource base that ultimately must support the desired production activities, is expressed thus:

- "Return the landscape to the approximate original (before mining) contour, with varied life forms (shrubs, trees, grasses, forbs)";
- "Establish effective water and nutrient cycles";
- "Create a long-term management plan to guide future land improvements such as water, fences, roads."

The GMP's holistic goal is a collaborative commitment to change by all the participants in the group. It is neither static nor comprehensive, because it must change over time. Recognition of this inevitable change is a key part of holistic management, because it creates a built-in need to plan for change.

Once the goal was established, the GMP Management Team developed a plan that would lead to permanent livestock grazing on the reclaimed land. Given the controversy that surrounds grazing on the Navajo Nation (and throughout the West), and because of the assumption by some that livestock grazing has only negative effects on land, the Team decided to bring large herds of sheep, goats, and cattle to graze intensively on very small controlled areas for limited periods of time, so as to demonstrate the effects of a "worst-case scenario." The preliminary results of these trials showed that the reclaimed land could withstand impacts of a large herd, as long as the time the herd spent on the land was carefully managed and sufficient time was allowed for the plant community to recover from grazing.

By 1994, the decision was made to begin large-scale livestock grazing at Navajo Mine. Like all major decisions, this one was tested by the GMP Management Team using the holistic management testing guidelines. In this process, the Team asked the following questions (the answers the Team developed follow in parentheses after each question).

- Is it consistent with all the parts of the goal? (yes)
- Is there a weak link in our chain of thinking that is not addressed by this decision? (no)
- Does this decision address a cause (yes) or an effect (no)?
- What is the source of the wealth or energy to be used? (Initially, the wealth and energy comes from external sources; eventually it will be internal, that is, derived from the land itself.)
- Is this particular use appropriate? (yes)
- Is this decision consistent with our values?(yes)
- Will it harm others? (no)

Of course, not all of the testing criteria apply in all management situations, so the Team has the flexibility to use only the appropriate criteria. By these criteria, the decision to begin planned grazing passed and was implemented through the GMP.

One of the powerful biological learnings that evolved with holistic management is based upon the observation that properly controlled herds of livestock can, in some arid and semi-arid environments, be managed so as to facilitate nutrient and water cycling and enhance ecosystem function (Savory 1988). This use of livestock as a tool is

governed by a biological planning process that is a key component of holistic management, hence the reference to "planned grazing."

To prepare a grazing plan, the Team first conducts an open brainstorming meeting, at which everyone is encouraged to identify any factor that could benefit, or hinder, the proposed grazing. The Team considered many factors, including:

The source of livestock (the decision to borrow from local graziers, in order to involve them in the decision-making process, was tested, and it passed);

The probable condition of the animals and the fact that veterinary care would have to be available;

The complexities of managing livestock around ongoing mining operations;

The need for security to protect livestock from feral dogs;

Sources, and means of delivery, of water;

How to avoid interfering with nesting wild birds in some pastures and riparian areas during particular months of each year.

With the factors identified, the Team next evaluated the ecosystem, estimated the condition and amount of available forage, and completed an approximate calendar for the grazing season, to specify how and where the herd would move and the time required to allow plants to recover from grazing, so as to avoid overgrazing and maintain the health of the animals.

Unlike some rotational grazing systems, planned grazing does not fix ahead of time a specific number of days for grazing in each pasture. Instead, an estimated number of days of forage available for grazing in each pasture is indicated on the plan, and the herders or managers are expected to use that number as a guide, to be modified according to forage condition, weather, animal health, and other factors.

Monitoring is essential to every land management scheme, and the GMP Monitoring Program reflects the importance attached to monitoring. The informal daily monitoring described above provides early warning of impending problems for herders and managers. In addition, formal annual vegetation monitoring, under the supervision of GMP Team members who are range scientists, is done for purposes of legal documentation.

Holistic management also provides for monitoring of the social context in which the land is being managed. At Navajo Mine, meetings are held periodically with members of the community to discuss issues not directly related to grazing. The GMP is identified by members of the local community as highly desirable, and several local graziers who are not yet participating have expressed the desire to participate by contributing animals from their herds. In addition, local Navajo Nation leaders have repeatedly expressed appreciation for the ability that the GMP gives them to contribute to their community by participating directly in the process of collaborative decision-making.

The results to date of GMP biological monitoring show that planned grazing of reclaimed lands is ecologically viable (Wood et. al. 1997). Results of biological monitoring after planned grazing has been under way for at least three years will be more indicative of long-term trends. There is now a permanent herd of approximately 50 cattle at Navajo Mine, and planned grazing will probably become a routine part of the land reclamation process. Once the land is returned to the Navajo Nation and local graziers, they will be solely responsible for management. Our expectation is that, with several years of experience in the GMP behind them, they will retain and employ what they learn from holistic management.

Sustainable Livestock Grazing on Reclaimed Lands

From a holistic perspective, the concept of sustainable development inextricably links human cultural and biological heritage. While there are many definitions of sustainability, a common one that places the subject in the context of change at the community level is that found in Caring for the Earth (IUCN 1991):

Sustainable development means improving the quality of human life while living within the carrying capacity of supporting ecosystems.

The holistic goal of the Navajo Mine GMP includes statements that identify what community members want to improve the quality of their own lives. Among the productive activities in which they will be engaged to accomplish that improvement is the grazing of their livestock on the reclaimed lands. Therefore, it is essential that grazing be managed so that it can be supported by the ecosystem, and the connection between maintaining the health of the

ecosystem and improvement of the quality of life is clear.

A sustainable community is more than the sum of its members and their endeavors: It functions on the basis of the cultural values of its members (e.g., including their desires for an improved quality of life), and the economic and biological production (e.g., healthy animals grazing on healthy land) necessary to support those values, along with a shared vision of the desired future condition of the land. Ultimately, community decision-making about land management determines the extent to which the community is sustainable.

It is at the level of the human community, defined as "a group of people living in the same locality and under the same government" (Morris 1979), that land use decision-making has the greatest impact. To be sustainable, a decision making strategy must motivate community members to participate in, and commit to, sustainable land management. In contrast, when they are imposed from the top down, development projects typically provide little incentive for community members to commit to what is required for sustainable land use.

The development of sustainable communities is a major challenge facing the Navajo Nation, where livestock grazing is of great cultural importance. A growing population, and an essentially fixed and deteriorating land base, combine to produce a strong demand for efforts to improve the condition of the land while contributing to the social and economic well-being of communities. With its emphasis on the long-term sustainability of grazing on the reclaimed land, the decision-making process of holistic management as practiced by the Navajo Mine GMP, could be an important component of sustainable development in the Navajo Nation.

In particular, the GMP experience could address one of the major challenges facing those working to help communities achieve sustainability, namely the development of appropriate monitoring mechanisms to provide useful feedback on decisions. Based on the experience of the GMP, an appropriate monitoring scheme could include the practice of holistic management, including the establishment and use of a temporary holistic goal. As described above, the holistic goal explicitly addresses both human values and the quality of life, as well as the condition of the supporting ecosystem. With such a

goal in place, and a commitment to holistic decision-making, a community has at its disposal the tools it needs to become sustainable. In contrast, without holistic management and a holistic goal, and by continuing to make decisions according to conventional paradigms, sustainable development may be more difficult to achieve.

Conclusion

Planning and management of livestock grazing on land reclaimed following surface coal mining may involve the requirement that grazing be sustainable in order to be deemed an appropriate post-mining land use. Management of grazing can involve a network of legal, cultural, and ecological variables interacting in complex ways that must be accommodated to achieve the specific goal of release from liability. Holistic management, as practiced by the Grazing Management Program at Navajo Mine, offers a formal process for planning and management to achieve sustainable land use that is responsive to human values as well as the legal, economic, and ecological requirements of a surface coal mine. Holistic management employs a collaborative decision-making process that includes and accommodates all individuals and entities with responsibility and authority to determine the ultimate success of reclamation.

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Literature Cited

- Dick-Peddie, W.A. 1993. New Mexico vegetation past, present, future. U. of New Mexico Press, Albuquerque, NM, USA.
- IUCN-The World Conservation Union. 1991. Caring for the earth. IUCN, Gland, Switzerland.

- Morris, W. ed. 1979. American heritage dictionary of the English language. Houghton Mifflin Co., Boston, MA, USA.
- Navajo Mine. 1989. Surface mining control and reclamation act permanent program permit. BHP Minerals, Fruitland, NM, USA.
- Savory, A. 1988. Holistic resource management. Island Press, Covelo, CA, USA.
- Trzyna, T.C., ed. 1995. A sustainable world. International Center for the Environment and Public Policy, Sacramento, CA, USA.
- USDA Soil Conservation Service. 1989. Four corners area climate data summary for BHP-UTAH, Inc. SCS Plant Materials Center, Los Lunas, NM, USA.
- Wood, M.K., B.A. Buchanan, and O.J. Estrada. 1997. Livestock grazing for management of reclaimed land at Navajo Mine: Vegetation response. Paper for presentation at the 1997 National Meeting of the American Society for Surface Mining and Reclamation, Austin, Texas.