Final Report

A Study of Federal Land-Use Planning in Energy-Impacted Areas

The Decker-Birney Planning Unit in Montana

Prepared for

U.S. Environmental Protection Agency
Washington, D.C.
(WA75-R451)

December 1, 1977

Contract No. 68-01-3588
60109A

Woodward-Clyde Consultants
Three Embarcadero Center, Suite 700, San Francisco, CA 94111

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CONTENTS

		Page
ABBREVIATIONS		iii
FIGURES AND TABLES		iv
PREFACE		v
I	INTRODUCTION	1
	Background	1
	Purposes	3
	Scope of Work	3
	Organization of the Report	3
II	SUMMARY OF CONCLUSIONS AND RECOMMENDATIONS	5
	Background	5
	The Study	6
	Conclusions	7
	Recommendations	10
III	SETTING	15
	General Description of Study Area	15
	Natural Resources	19
	Institutional Setting	24
	Institutional Overview	38
IV	BLM MANAGEMENT FRAMEWORK PLAN	43
	Summary and Conclusions	43
	Background	45
	The Decker-Birney Management Framework Plan	54
	Compatibility with Federal and State Environmental Policies	72

		Page
V	REGULATORY/INSTITUTIONAL FRAMEWORK	75
	Overview of Land-Use Management in the Decker-Birney Unit	75
	Implementation of the BLM's MFP Guidelines in the Decker-Birney Area	87
	Key Issues Affecting Implementation of the MFP Recommendations	91
VI	MONITORING SYSTEM FOR THE DECKER-BIRNEY PLANNING UNIT	107
	Justification for Monitoring System	107
	Objective	108
	Approach	108
	Recommended Monitoring System	110
	Relationship Between Monitoring Program and Environmental Baseline Studies	129
	Conclusions	131
BIBLIOGRAPHY		132
APPENDIX A:	PLANT CHECKLIST, DECKER-BIRNEY AREA	A-1
APPENDIX B:	MAMMALS FOUND WITHIN THE BLM MILES CITY DISTRICT	B-1
APPENDIX C:	MANAGEMENT FRAMEWORK PLAN RECOMMENDATIONS FOR THE DECKER-BIRNEY PLANNING UNIT	C-1
APPENDIX D:	DECISION ANALYSIS FOR THE SITING OF NUCLEAR POWER PLANTS — THE RELEVANCE OF MULTIATTRIBUTE UTILITY THEORY	D-1

ABBREVIATIONS

AMP	Allotment Management Plan
ASCS	Agricultural Stabilization and Conservation Service
AUM	Animal Unit Months
BIA	Bureau of Indian Affairs
BLM	Bureau of Land Management
BuRec	U.S. Bureau of Reclamation
COE	U.S. Army Corps of Engineers
EMARS	Energy Minerals Activity Recommendation System
EPA	Environmental Protection Agency
FPC	Federal Power Commission
FWPCA	Federal Water Pollution Control Act
LUDP	Land Use and Development Planning
MELDA	Montana Economic Land Development Act
MEPA	Montana Environmental Protection Act of 1971
MFP	Management Framework Plan
NEPA	National Environmental Policy Act of 1969
NRL	National Resource Lands
OMB	U.S. Office of Management and Budget
SCS	Soil Conservation Service
URA	Unit Resource Analysis
USGS	U.S. Geological Survey
YTAPO	Yellowstone-Tongue Areawide Planning Organization

FIGURES AND TABLES

		Page
Figure		
1	Political Jurisdictions Map of Decker-Birney Planning Unit	22
2	Major Steps of Recommended Monitoring System	111
3	Organization of Monitoring Committee	117
Table		
1	Summary of Temperatures, 1964-1971	18
2	Surface and Subsurface Ownership	21
3-A	Local Agencies with Responsibilities in Decker-Birney Area	39
3-B	State Agencies with Responsibilities in Decker-Birney Area	40
3-C	Federal Agencies with Responsibilities in Decker-Birney Area	41
4	Public Lands in Montana Under Exclusive Jurisdiction of the BLM	48
5	Selected Examples that Illustrate the Relationship Between Proposed Land Uses, Potential Impacts, Key Parameters, and Methods	113
6	Examples of Resources that may be Affected by Proposed Land Uses	115
7	Examples of Federal and State Agencies that have Responsibilities for Affected Resources	118

PREFACE

This report is based on the BLM planning regulations that were current during the development of the Decker-Birney Management Framework Plan (1972-74). Subsequent revisions to these regulations, and the enactment of recent Federal legislation related to land management and to the strip mining of coal, deal with some of the concerns and recommendations contained in this report.

I

INTRODUCTION

BACKGROUND

The Energy Activities Office of the U.S. Environmental Protection Agency (Region VIII) contracted with Woodward-Clyde Consultants in January 1976 to conduct a study of the process and constraints of federal land-use planning in energy-impacted areas. The area selected for study was the Decker-Birney Planning Unit of the Bureau of Land Management's (BLM's) Miles City District in southeastern Montana. The Decker-Birney area is underlain by extensive deposits of low-sulfur, subbituminous coal; the area also has other valuable resources, of which livestock grazing areas and commercial timber stands are notable.

Since 1971, the BLM has not issued any new leases for coal production. In the interim, the bureau has developed a new coal-leasing policy, an environmental impact statement process for coal leasing, leasing regulations, and a planning system to select areas to be offered for lease. With these developments, the bureau has intended to incorporate a competitive coal-leasing program into its multiple-use planning system.

In May 1972, the BLM's Miles City District initiated a resource inventory and preliminary land-use planning program for the Decker-Birney planning unit. One focus of this program was to delineate "mineral recommendation areas" that might be developed in a manner compatible with other resources uses and consistent with state and federal environmental protection objectives. The product of this BLM

effort was a Management Framework Plan (MFP) issued in April 1974. This document contains guidelines and multiple-use recommendations for the management of surface and subsurface resources in the Decker-Birney area. It establishes the context within which future land-use alternatives will be evaluated. In particular, the MFP provides a framework within which a logical and environmentally sound coal-leasing program may be pursued.

Several physical and institutional characteristics of the Decker-Birney area present unusual opportunities to study (1) the BLM planning process and (2) potential constraints to land-use effectiveness, both of which address economic, social, and environmental issues of large-scale energy developments. The area is isolated and largely undeveloped; only a small fraction of the federal coal reserves has been leased. The potential for industrial development in this rural area measures in the billions of dollars, and the potential for environmental and socioeconomic impacts is commensurately large. While it appears that the Decker-Birney unit stands at the threshold of profound change, the nature of this change, to the extent that it will be shaped by the plans and actions of the area's competing institutions, is not easily predicted. The Bureau of Land Management, through its control of coal leasing, assumes a central and instigative role in the area's change. Hence, an understanding of the BLM planning process and its relationship to the area's physical and institutional makeup should provide insights into the nature, direction, and consequences of change.

The successful implementation of the BLM's multiple-use management concept depends on the integration of its efforts with those of other resource and planning jurisdictions within and adjacent to the Decker-Birney area. Numerous other governmental entities are actively engaged in land-use planning for the portions of their jurisdictions that are within or adjacent to the Decker-Birney planning unit. The responsibility for land-use management is not clearly defined among these

entities, and their planning efforts are highly fragmented and largely uncoordinated. These other jurisdictions include several federal agencies, Indian reservations, state governments and their resource agencies, a regional planning organization, and local governmental entities.

PURPOSES

The purposes of the present study are (1) to identify and describe the components and characteristics of the multijurisdictional land-management system in the Decker-Birney area, (2) to review the role of the BLM planning process in this system, and (3) to identify opportunities for and obstacles to achieving environmental protection and enhancement. An additional objective is (4) to recommend a system of environmental impact monitoring that can be implemented within the land-management system, thus increasing the efficiency and effectiveness of resource allocation and environmental protection decisions.

SCOPE OF WORK

The study focuses on the governmental entities that operate within the Decker-Birney Planning Unit, although adjacent jurisdictions (e.g., two Indian reservations and the State of Wyoming) were also considered. Work consisted of collecting data, reviewing the BLM plan, analyzing the regulatory/institutional framework, and developing an impact monitoring system. Data collection was limited to maps and published reports, and analysis was based primarily on materials made available by the state BLM office and the Miles City District of the BLM.

ORGANIZATION OF THE REPORT

This report consists of an introduction, a summary of conclusions and recommendations, a description of the physical and institutional

setting of the Decker-Birney area, a review of the BLM plan, an analysis of multijurisdictional land management in the area, and a description of a recommended impact monitoring system.

II

SUMMARY OF CONCLUSIONS AND RECOMMENDATIONS

BACKGROUND

National goals of energy independence and environmental protection conflict in certain resource-producing regions of the nation, raising serious policy issues. These issues include the tradeoffs between increased energy production and the adverse environmental and social effects this increased activity has on resource-producing regions and their residents.

In response to these issues, governmental agencies at all levels have enacted major environmental legislation in recent years, and their regulatory requirements are becoming increasingly complex and constraining. In addition, numerous court decisions have interpreted environmental evaluation and implementation procedures, and many more cases are pending. These evolving laws and regulations are adding new dimensions to the framework of policies and practices governing today's handling of energy resource development and environmental protection. Concurrently, a growing national demand for energy has hastened an evaluation of the dual role of government, both in expanding the energy resource base and in regulating its development in the interest of environmental protection.

The incremental regulatory expansion in response to conflicts arising from developmental interests and evolving social values, coupled with technological advancement, has precipitated an increased fragmentation of responsibilities and an overlap of authority among governmental

agencies. The result has been that needed development is often delayed, while at times undesirable developments proceed unchecked. The Decker-Birney Planning Unit, located in a region of abundant coal reserves and other natural resources, appears to face this dilemma.

The area's comprehensive plan, developed by the Bureau of Land Management and the U.S. Forest Service in cooperation with the State of Montana, is in principle designed to integrate multijurisdictional land-use planning. The potential exists, however, for each agency participating in the management of the area to seek its own solution in evaluating proposed developments. In that event, the result of separate agency decisions could lead to failure in meeting the overall objectives of the land-use planning program.

THE STUDY

This study of land-use planning and management systems in the Decker-Birney area includes the following:

1. Review of the land-use plan developed by the Bureau of Land Management and the U.S. Forest Service, in cooperation with the State of Montana, for the Decker-Birney Planning Unit.
2. Evaluation and documentation of the degree of compatibility and consistency of land-use guidelines with federal/state environmental legislation and regulations.
3. Analysis of the multijurisdictional situation and constraints.
4. Documentation of the process of guideline implementation.
5. Identification of the mechanisms available to enforce the guidelines and implementation policies to ensure the maintenance or enhancement of environmental quality.
6. Development of recommendations to improve the guidelines and implementation policies that ensure the maintenance or enhancement of environmental quality.
7. Recommendations of a system to monitor the environmental impacts, including socioeconomic aspects of plan implementation.

CONCLUSIONS

The land-use plan developed for the Decker-Birney Planning Unit by the Bureau of Land Management and the U.S. Forest Service, in cooperation with the State of Montana, is, in general, a well-organized, step-by-step methodology for developing multiple-use recommendations. This Management Framework Plan (MFP) includes mapping, data gathering, environmental analyses, resource inventories, resource development opportunities, program activity recommendations for individual resources, and multiple-use recommendations based on tradeoffs among individual resource program activity recommendations.

Despite the MFP's sound organization and relative ease of application, this study leads to the conclusion that the MFP is not as effective a tool as it might be for environmental protection and enhancement in the Decker-Birney area. The reasons for its lack of effectiveness are:

1. Of the several major issues described in this study, the issue of governmental preemption — the interlocking roles, jurisdictions, and powers of the various regulatory agencies concerned with the Decker-Birney area's resource development and environmental protection — is the most confusing and frustrating. Often several agencies have the same scope (e.g., the federal NEPA and the Montana MEPA), and in other instances conflicting federal, state, and local duplications create problems of interpreting and administering similar rules in conflicting manners.

   A closely related issue is that often surface rights are under one type of ownership or authority while subsurface rights to the same property are under another ownership or jurisdiction, with both owners employing different procedures, objectives, and planning approaches.

   These issues raise the questions, "Who should be in charge of <u>overall</u> resource management?" and "Who should have the <u>overall</u> authority to coordinate and regulate the management of land and resources?"

2. The BLM may not be the best land-use management agency to implement the full range of MFP recommendations, since the BLM can only implement those portions of the MFP recommendations that affect public lands or federal minerals. In fact, at the time of implementation, other public agencies in the area (i.e., state, county, Indian nations, U.S. Forest Service) may be very active in land-use planning, and may significantly complicate coordination of the MFP recommendations.

3. The BLM planning system does not fully recognize the socioeconomic and secondary impacts that accompany major mineral developments, such as the large numbers of people who immigrate to major coal-producing sites and their related impacts.*

4. The MFP does not adequately deal with local planning objectives, which are essential to effective planning methods. The BLM planning guidelines:*

   - do not include mechanisms for identifying these objectives
   - do not identify a minimum level of achievement for each program objective
   - do not include evaluation criteria, indicators, and standards for evaluating a plan's achievement of BLM objectives
   - do not include mechanisms for identifying those objectives that will be determinants for a specific planning activity.**

5. Public participation is limited to a responsive mode — with the public only given opportunities to comment on selected BLM planning recommendations. Few mechanisms exist for public participation in the identification of local issues, the development of local planning objectives, achievement levels, evaluation criteria, and the identification of values that could be used in the selection of recommendations.*

6. The tradeoff analysis of MFP, Step 2 does not include methods to analyze the benefits and consequences of differing combinations of resource activities. It contains no procedures for evaluating differing combinations of resource activity tradeoffs in terms of planning objectives, local issues, and values. It does not include criteria and standards for systematic

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*Many of these issues are dealt with in the revised planning standards and procedures initiated by BLM in 1975. In addition, the BLM has subsequently pursued socioeconomic and secondary impacts in the forthcoming Northern Powder River Energy EIR, due in early 1978.

**Determinants, as used in this report, mean the main factors that influence a plan's direction, form, timing, activities, and extent.

decision making in the selection of alternative, multiple-use recommendations. It does not document how alternatives are developed, considered, and selected.*

7. While the resource inventory and analysis tasks of the Unit Resource Analysis (URA) seem to function well for their intended use, they are not well-suited for the tradeoff analysis of MFP, Step 2. Additional information is required on social, economic, political and other factors, and on potential impacts of alternative management plans.*

8. Few opportunities exist for the public to comment on and participate in the analysis of competing MFPs. No provisions are made for the description or display of alternative management plans and their impacts for the public's information and review.*

9. Little guidance is provided by BLM on how to convert the MFP recommendations into implementable programs, and on how to implement them.**

10. The MFP is not specific enough in terms of the form and location of specific activities, and their scale, severity, and timing, to effectively protect and enhance the local environment.

11. Some MFP recommendations are difficult to implement. Some policies recommended in the MFP are for actions outside of BLM's jurisdiction with no indication of who should implement them.

12. A major difficulty in implementing the MFP recommendations is the fragmentation of land-use management authority between federal and state regulatory agencies. These powers lack common objectives and common strategies for integrating resource recommendations and environmental protection plans.***

13. Although good examples of ongoing monitoring efforts concerning streamflow, air quality, and reclamation exist, coordinated impact-monitoring mechanisms do not exist to observe and

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*Many of these issues are dealt with in the revised planning standards and procedures initiated by BLM in 1978.

**The BLM has subsequently developed the EMARS and EMRIA systems, the tract selection process, and other guidance needed for a Bureau-initiated mineral leasing program.

***In 1975, a Memorandum of Understanding was signed between the Governor of Montana and the BLM State Director of Montana specifying, among other things, coordination in land use planning and plan implementation.

identify the effects of resource activities on the quality of the environment. This information is needed to redirect these activities and to reduce environmental degradation, and, wherever possible, to enhance environmental quality.

14. MFP recommendations treat environmental enhancement and protection as a category separate from BLM's resource categories, resulting in potential conflicts and duplications. Environmental enhancement and protection recommendations are not well integrated into the overall recommendations.*

15. Current BLM resource inventory practices (URA) produce a great quantity of data that are often too general or not required for decision making, and little data of sufficient detail or focus for this purpose. Specific data needs and the level of detail required should be identified.*

16. The "tunnel vision" approach of URA, Step 4, Analysis and Recordation of all Technically Feasible Management Opportunities, while theoretically sound, may be of limited practical value. The inclusion of social, economic, legal, and other constraints may improve this activity recommendation, and, in fact, is required in the subsequent step of the planning system (MFP, Step 1).

RECOMMENDATIONS

Governmental Preemption

Three major policy options for governmental regulation are available to deal with the question of "Who should have the overall authority to coordinate and regulate?" They are:

1. Federal Control. Federal control exists when national authority preempts state authority, and when tradeoffs among interests are made in favor of national interests. Because of this, social costs of resource development are largely borne by the local residents, while at the same time providing the greatest benefits to the rest of the nation.

2. Shared Responsibility. This option recognizes both state and national authorities, with neither interest predominating. Balancing conflicting interests and authority occurs as a

*Many of these issues are dealt with in the revised planning standards and procedures initiated by BLM in 1978.

result of negotiations between state and national agencies — each restraining the other from imposing the major costs of resource development on the people it represents. In this way, the social costs of resource development in one locality are shared by resource consumers (e.g., energy) throughout the nation. (The system of joint federal and state land-use planning in the State of Alaska may be a good model.)

3. State Control. Here, state authority predominates, including the ability to veto decisions by federal agencies about the use of federal lands. Decisions on tradeoffs are made in favor of state interests. The costs of resource development to local residents are minimized and are placed on consumers throughout the nation. In addition, opportunities exist to shift a substantial part of the state's tax burden onto resource consumers in other states and onto resource-producing companies.

Of these policy options for governmental regulation, the policy of shared responsibility offers the greatest potential for balancing local and national interests. This policy meets the needs and concerns of resource-producing and resource-consuming regions, and satisfies national objectives, all in an equitable manner. The environmental and social burdens of resource development are not placed entirely on residents of the resource-producing regions, but rather, these costs are shared, to some degree, by the rest of the nation, while at the same time meeting national objectives.

Implementation Mechanisms

Regulatory agencies with responsibility for the Decker-Birney area follow to a certain degree the principle of shared responsibility described above. Certain improvements could be made, however, that would increase their effectiveness in implementing the MFP recommendations. These include:*

*Many of the implementation recommendations outlined are dealt with through the BLM planning manuals of 1975, the 1975 cooperative agreement between the Governor of the State of Montana and the BLM State Director of Montana, and the requirement of the Federal Land Policy and Management Act of 1976.

1. Establishing local and regional goals and plans for resource development and environmental protection — with extensive public participation.

2. Coordinating all public agencies so that their activities align with the above goals and plans.

3. Making advance studies and analyses of alternative resource development, facility sites, and tradeoff strategies so that the socioeconomic and environmental consequences of each strategy are known prior to, and incorporated into, policy and decision making. These studies should also be used to prequalify certain sites for specific resource activities that would be compatible with the local environment. Prequalifications should take into account required developmental stipulations and controls.

4. Clarifying roles, authority, and jurisdictions. Current duplications and conflicts need to be sorted out. When resource development may adversely affect local residents, state and local regulations should predominate. Federal agencies should set minimum standards and should monitor state practices for compliance with them. Federal agencies should also provide research and technical assistance and communicate knowledge gained in monitoring resource activities in various states.

5. Developing more efficient federal and state regulatory procedures, in consultation with private industry. State and federal agencies should issue clear guidelines indicating the conditions under which specific resource activities will be permitted. This will reduce the time and frustration involved with making permit applications for specific activities.

6. The state should have a strong advisory role in future leasing programs in which community impacts and reclamation effectiveness are issues. Also, the state should control where power plants are located, since local residents would bear any adverse consequences of their construction and operation. Federal agencies should retain the ability to make decisions about sites that involve federal lands.

7. The state should retain the authority to allocate water for resource activities, deciding on a case-by-case basis, according to the environmental and social effects of each situation, recognizing the cumulative effects involved. Federal agencies should provide research assistance in assessing the consequences of groundwater or surface water withdrawals. The federal government should retain its powers over water allocations in federal reservoirs and lands for possible use in resource development.

8. State and local governments should have the power to tax in order to recover the direct and indirect costs that resource development places on them and on state and local taxpayers. The federal government should limit these taxes to a level that permits state and local cost recovery and so that resource consumers throughout the nation are not required to pay undue costs.

Tradeoffs and Decision Making

The current BLM tradeoff process included in MFP, Step 2 should be modified to provide a clear, step-by-step decision-making process that is documented for future review. This process should clarify techniques for comparing the effects of various combinations of resource activities, criteria, and standards. These techniques should make it possible to evaluate land-use alternatives in relation to planning objectives, and to document the selection process. Recent advances in decision-analysis techniques should be reviewed for their usefulness to this key part of the BLM planning system. See Appendix D, Decision Analysis for the Siting of Nuclear Power Plants — The Relevance of Multiattribute Utility Theory.

Impact Monitoring

A coordinated impact monitoring program should be initiated to guide resource management programs. See Section VI, Monitoring System for the Decker-Birney Planning Unit.

Resource Inventories and Data Gathering

BLM resource-inventory and data-gathering tasks should focus on the issues related to the specific programs in which they operate. Improving the data-gathering effort may require first identifying the data areas that are critical to the program issues, and which therefore will require more extensive data-gathering activities and more detailed information.

Urbanization

The planning system must be sensitive to the potentials for urbanization near mineral development sites, including socioeconomic impacts and the primary and secondary impacts of large numbers of people who will relocate to these areas. This issue, while not recognized in the study, was recognized in the environmental assessment record prepared for the Decker-Birney planning document.

III

SETTING

GENERAL DESCRIPTION OF STUDY AREA

The Decker-Birney study area encompasses roughly 900,000 acres of land situated in a region containing significant portions of three southeastern Montana counties: Big Horn, Powder River, and Rosebud.

Prominent physical features of the Decker-Birney study area are river valleys and rugged buttes. Principal valleys are associated with the Tongue River, Otter Creek, and Rosebud Creek drainages. These drainages divide the region in a north-south direction. King Mountain, Poker Jim Butte, Wild Hog Butte, and Horse Creek Butte are located in the northeastern section of the Decker-Birney area. The Tongue River Reservoir is located in the southwestern portion of the study area. Elevations in the study area range from 2900 to 4300 feet above mean sea level (MSL).

The topography of the Decker-Birney study area includes broad, rolling uplands, sharply eroded mountainous terrain and badlands, and two flat-bottomed valleys. The Tongue River and Otter Creek meander through these valleys towards the northeast. A transition zone of badland topography divides the upland plain from the flood plains. Roughly 75 percent of the area has been geologically eroded into a broken terrain, a process that can be accelerated by grazing and/or man-made disturbances. This broken terrain is a valuable winter shelter for both livestock and wildlife. Farming is generally confined to river bottoms because of the dry climate and the rough terrain.

Hydrology

The Tongue River and Rosebud Creek are the two streams responsible for transporting and receiving water and sediment in the Decker-Birney study area. Both streams meander, flow generally northward, and empty into the Yellowstone River. Drainage from the Tongue River accounts for approximately 90 percent of the total drainage from the study area.

Located on the eastern boundary of the Decker-Birney area is Otter Creek, which intersects the Tongue River one-half mile northwest of Ashland. Drainage from Otter Creek accounts for roughly 20 percent of the Tongue River drainage within the study area boundaries. Rosebud Creek accounts for 10 percent of the total drainage in the Decker-Birney study area and drains to its northwest corner. Rosebud Creek intersects the Yellowstone River 32 miles upstream from the Tongue River and Yellowstone River confluence.

Vegetation

The vegetation found in the planning unit can be divided into five major associations:

- grassland association – found on upland plateaus; separates higher elevations
- big sagebrush and shrub association – dispersed throughout the entire planning unit; found primarily at low to middle elevations
- ponderosa pine association – well-stocked and intermixed with a variety of vegetation types; generally found on north-, west-, and southwest-facing slopes; occupies all exposures in long, narrow valleys
- pine woodland association – considered the transition between the ponderosa pine and big sagebrush-shrub associations at higher elevations. On some sites, the slopes are very steep and the terrain is rough and broken. At lower elevations, it caps hills and the head coulees,* extends along drainage ways, and grades into grass and shrub types

*In this report, "coulees" refers to canyons.

- broadleaf association — normally found along perennial streams, primarily along the Tongue River and Rosebud Creek

A breakdown of the species of plants in the study area is given in the appendix. The preceding information and the vegetation species listed in Appendix A were taken from the physical profile section of the BLM Decker-Birney Resource Study.

Soils

Ten major soil associations occur in the Decker-Birney study area. The name and acreage of each are included in the following list, taken from the soils section of the BLM Decker-Birney Environmental Analysis Record #1.

Association	Acreage
Thedalund-Midway	271,490
Wibax-Thedalune-Spearman	195,800
Ringling-Searing-Anegord	54,780
Wayden-Regent-Shale Outcrop	5,170
Kyle-Midway-Cabba	54,440
Ringling-Cabba-Midway	25,490
Haverson-Glenberg	54,230
Elso-Midway-Thurlow	158,100
Midway-Thurlow	26,590
Ringling-Fergus-Relan	52,620
Total Acres	898,710

Climate

The climate of the Decker-Birney study area can be classified as semiarid and is typical of the northern Great Plains region. The broad seasonal temperature fluctuations indicate cold winters and hot summers with high evapotranspiration rates. Moderately strong winds are common during spring and fall, and thunderstorms are common in summer. Table 1

Table 1. SUMMARY OF TEMPERATURES, 1964-1971

Station	Maximum (°F)	Minimum (°F)	Average Maximum (°F)	Average Minimum (°F)	Average Number of Days 32°F or Above
Birney	107	-45	102	-33	110
Busby	105	-43	101	-35	97
Kirby	104	-46	99	-32	82
Lame Deer	109	-38	103	-31	112
Moorhead	107	-37	103	-29	113
Otter	110	-32	101	-21	127
Sonnette	104	-41	101	-29	105

Source: Unit Resource Analysis, Decker-Birney Unit, Miles City District, U.S. Department of the Interior, Bureau of Land Management, 1972.

is a temperature summary taken from the BLM physical profile section of the Decker-Birney Resource Study.

NATURAL RESOURCES

Cultural History

The Decker-Birney Planning Unit contains land that the Crow and Cheyenne Indians fought to retain from the encroachment of the white man in the 1870s. The most famous battle was at Little Big Horn, where General Custer and his men were annihilated. The Cheyenne Indian Reservation is in northern Rosebud County, and the Crow Indian Reservation is in the southwestern portion of Big Horn County. Numerous Indian archaeological and historical sites that have contributed to the area's overall culture have been inventoried in the Decker-Birney study area.

Demography

The three major communities within the Decker-Birney study area are Ashland (population 200), Birney (population 13), and Decker (population 30)*. The major trading center in the vicinity is Sheridan, Wyoming, located 30 miles southwest, with a population of 11,561 people. Hardin (population 2733) and Miles City (population 9023), Montana, are used as trading centers to a more limited extent.

The total population in the Decker-Birney study area is estimated at 1000. This figure was derived from a 1972 BLM study, which indicated that there are 219 ranch families or households in the region.

The planning area adjoins two Indian reservations along portions of its western boundaries: the Northern Cheyenne and Crow reservations. Approximately 6800 Indians are now residing in these reservations and are using facilities in the Decker-Birney study area. Therefore, the study area has been heavily influenced by Indian cultural values.

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*From BLM Preliminary Population Study of 1972.

Land Use and Economic Activity

The livelihood of the study area's inhabitants depends primarily on the livestock and agricultural production of the land, distantly followed by mineral extraction and timber production. This is partly because of Indian cultural influence and because the area's recreational and social development is geared to a self-reliant, small-town atmosphere.

Land Ownership. The surface and subsurface ownership of the Decker-Birney study area is summarized in Table 2. The table was taken from the Bureau of Land Management's Decker-Birney Summary Report. Approximately 39 percent of the planning area (359,333 acres) is underlain with strippable coal. Of this, roughly 285,000 acres is composed of superior and economic reserves containing 15 billion tons suitable for extraction under current strip-mining practices. Of the federal mineral estate that comprises 88 percent of the Decker-Birney area, only 2 percent of the acreage has been leased. This is partly due to the recent moratorium on new coal leases and the land ownership structure of the study site. This leaves open most of the planning options for the natural resources found in the study area.

Political Boundaries. The term "political boundaries" refers to county, Indian, and national forest lines that define federal, local, and state government jurisdictions. The study area includes significant portions of Big Horn, Powder River, and Rosebud Counties, part of the Custer National Forest, and part of the BLM's Miles City District. Figure 1 illustrates the political boundaries of the Decker-Birney Planning Unit.

Resource Categories

The following paragraphs summarize the BLM resource categories in the Decker-Birney area. The data were taken from the BLM's Decker-Birney Resource Study Summary Report, and describe conditions in 1974.

Table 2. SURFACE AND SUBSURFACE OWNERSHIP

Ownership	Surface Estate (Acres)	% of Total	Mineral Estate (Acres)	% of Total
BLM	78,673	9%	626,480	70%
Forest Service	153,496	17%	162,477	18%
State	48,000	5%	48,000	5%
Private	618,540	69%	61,752	7%

Source: Decker-Birney Resource Study Summary Report, Bureau of Land Management and U.S. Forest Service, April 1974.

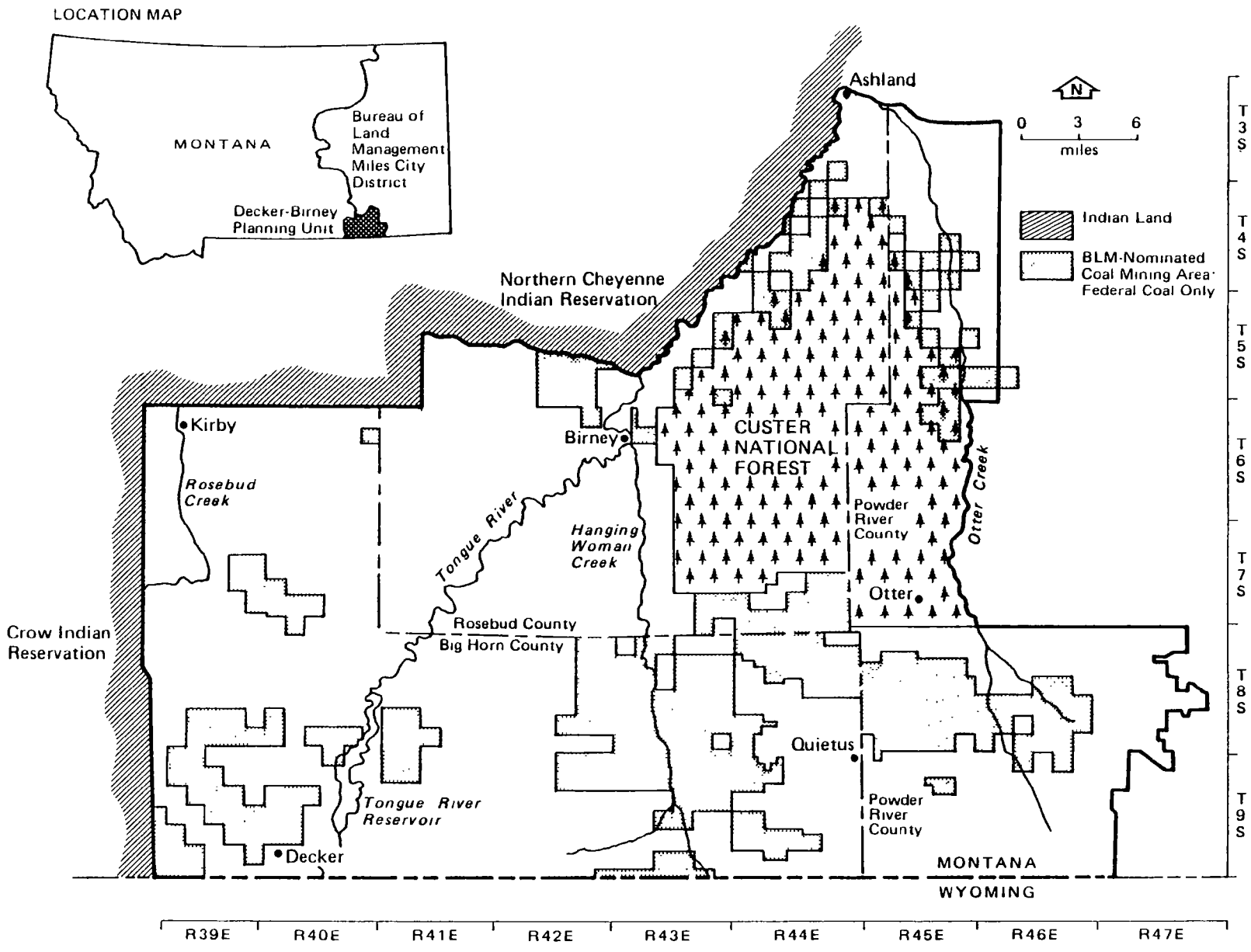

Figure 1. POLITICAL JURISDICTIONS MAP OF DECKER-BIRNEY PLANNING UNIT

Livestock. Two hundred nineteen families were engaged in 106 livestock operations, with a total of 27,000 cattle and 2700 sheep. The annual gross from the livestock operations was $3 million. The 800,569 acres used for livestock forage are divided as follows:

Private	525,900 acres
Forest Service	153,496 acres
BLM	78,673 acres
State	800,569 acres

Minerals. Sixteen billion tons of strippable coal, with a Btu range of 7800 to 9700 and seam thicknesses of 11 to 72 feet, underlie 39 percent (359,333 acres) of the planning unit. Of this, 15 billion tons (285,000 acres or 30 percent of the study area) represent superior and economic reserves.

Eighty oil and gas wells have been drilled. Six had noncommercial show of gas and two had noncommercial show of oil. Low-key oil and gas activity may not depict actual potential.

Recreation. Recreational opportunities include the enjoyment of scenic geological features and historical and archaeological sites, hunting, fishing, and water sports. Specific areas in the Decker-Birney area are listed under Institutional Setting in this section.

Timber. The following table summarizes the pertinent information on timber production in the Decker-Birney study area.

Timber Production	Saw Timber	Poles, posts, etc.
Acres	40,148	8,495
Volume	100,370 tbf*	14,893 tbf
Volume Sold	None	< 10 tbf/yr

*tbf = 1000 board feet.

Watershed. The following table summarizes the watershed erosion conditions in the study area.

Watershed Erosion Condition	Acres	Percent of Study Area
Stable	31,360	3.5
Moderate	758,892	84.8
Severe	104,960	11.7

The Decker-Birney study area lies in the Yellowstone Subbasin and the Tongue River is the watershed. The Missouri River is the ultimate recipient of all the drainage in the area. This watershed is typical of semiarid regions. Grazing and vehicular traffic and other man-caused disturbances have accelerated considerably the area's natural erosion processes. Most watershed improvement was intended to facilitate livestock management; watershed improvement itself was secondary.

Wildlife Habitat. The study area supports populations of antelope, mule deer, white-tailed deer, and a wide variety of upland birds, waterfowl, fish, and fur-bearers. See Appendix B for special listings.

INSTITUTIONAL SETTING

This section outlines the various federal, state, and local agencies involved in governing the national resource lands and federal mineral estates in the Decker-Birney study area, their responsibilities, and their land-use management functions.

Federal Agencies

Twelve federal agencies are involved in governing the resources in the Decker-Birney study area. Their jurisdictions are roughly defined by the unit's cultural heritage and natural resources. As noted on the political boundaries map (Figure 1), navigable waterways, a national

forest, two Indian reservations, and abundant mineral reserves are located within the study area. Many federal laws protect and control these resources. Federal agencies committed to the Decker-Birney study area are described in the following paragraphs.

Natural Resource Management Agencies. Two federal agencies are responsible for establishing a multiple-use planning system for the timber and mineral resources within the Decker-Birney study area: the United States Forest Service, responsible for Custer National Forest, and the Bureau of Land Management, responsible for national resource lands and the federal mineral estate.

Bureau of Land Management. The jurisdiction of the Bureau of Land Management includes the entire Decker-Birney Planning Unit because it is underlain by extensive mineral (coal) deposits. BLM governmental and administrative responsibilities include the classification and/or disposal of federal lands, mineral leasing, and general land management via a multiple-use planning system. The BLM multiple-use planning system is roughly six years old. It was initiated in response to the Classification and Multiple Use Act of 1964 and the program planning and budgeting system emphasis in the mid-1960s. The Bureau of Land Management Land Use and Development Planning (LUDP) system for national resource lands and federal mineral estates considers the following major resources in preparing a multiple-use resource management framework plan (MFP):

- lands
- minerals
- livestock
- timber
- wildlife
- recreation
- watershed

Because BLM is a permit-issuing agency, it can direct and control the development of its lands. Direct controls are exercised by granting permits for specific uses on national resource lands and by controlling land exchanges and access. In addition, the Bureau of Land Management can indirectly control non-BLM surface land through its mineral leasing and lease stipulations programs. However, these indirect controls can sometimes be preempted by state land-use management agencies.

U.S. Forest Service. The Ashland Division of the U.S. Forest Service has jurisdiction over Custer National Forest, located in the Decker-Birney study area (in Powder River and Rosebud counties). Its governmental and administrative responsibilities include general administration of national forest lands, management of timber resources, and development of land-use management plans based on a multiple-use planning system for Custer National Forest. These activities describe the National Forest Service's response to the Multiple-Use Sustained Yield Act directives of 1960 and its planning obligations under the Wilderness Act, the Wild and Scenic Rivers Act, and NEPA.

The land-use management function of the U.S. Forest Service in the Decker-Birney study area is to develop comprehensive plans for Custer National Forest and multiple-use management schemes for these resources:

- timber
- livestock
- watershed
- recreation
- wildlife
- wilderness areas

The U.S. Forest Service is an agency of the Department of Agriculture and is also a permit-issuing federal agency. Thus, it ensures that timber development and other resource uses are consistent with its own multiple-use management plan. It does so by issuing use permits, by

by limiting access to the forest, by regulating resource production, and by stipulating a user's rights in a permit.

Public Works Agencies. Two federal agencies are responsible for developing the water resources in the Decker-Birney study area for the benefit of the immediate and surrounding populations: the U.S. Bureau of Reclamation (BuRec) and the U.S. Army Corps of Engineers (ACE). Historically, BuRec's primary purpose has been to develop irrigation systems. However, reclamation projects often include hydroelectric power components that produce power for sale or lease; provide water supplies for industrial and municipal purposes; and benefit navigation, flood control, recreation, and wildlife and fish preservation. The purposes of these reclamation projects overlap with those of the U.S. Army Corps of Engineers' multipurpose public works programs. However, the ACE's primary jurisdiction is over interstate navigable waterways, their maintenance and development, and water quality control. The Corps has no direct jurisdiction over irrigation projects.

U.S. Bureau of Reclamation. The governmental and administrative responsibilities of the U.S. Bureau of Reclamation include the development of irrigation and water power sources, except where this is accomplished by State agencies. BuRec was created in 1902 with the passage of the Reclamation Act and reports to the Secretary of the Interior.

U.S. Army Corps of Engineers. In the Decker-Birney study area the Army Corps of Engineers has jurisdiction over the Tongue River, an interstate navigable waterway. The agency's governmental and administrative duties there entail construction of flood-control projects and development of the Tongue River for navigation and power. The agency's land-use management functions there, in addition to those mentioned previously, include control of hydraulic mining debris. Its land-use control systems

include determination of facilities placement (a single-use allocation like that of the Bureau of Reclamation), issuance of permits for channel modifications or impoundments, and regulation and storage of streamflows. The Army Corps of Engineers has been accountable for public works projects since the Flood Control Act of 1936. It reports to the Secretary of Defense, and coordinates with the Secretary of the Interior.

Enforcement Agencies. Two federal enforcement agencies are charged with regulating and preserving (by licensing and issuing permit stipulations) the natural resources of the Decker-Birney study area. These agencies are the Environmental Protection Agency (EPA) and the U.S. Geological Survey (USGS).

The Environmental Protection Agency. The EPA enforces the Federal Water Pollution Control Act (FWPCA) in the Decker-Birney unit. The FWPCA establishes a permit system by which a permit for discharging pollutants into navigable water (in this case the Tongue River) is issued only after the federal requirements of the FWPCA's amendments are satisfied. The EPA, under NEPA, can also comment on environmental impact statements for coal development (i.e., strip mining) plans in the unit. The EPA indirectly controls land use by reviewing such stipulations before any development or resource extraction can be initiated. The agency was established by President Nixon under Reorganization Plan No. 3 of 1970.

U.S. Geological Survey. The primary responsibility of the USGS in the study area is the technical examination and mapping of the federal mineral estate and the unit's federal lands. The USGS inventories mineral and water resources, classifies lands, and authors environmental impact analyses. In coal mining operations, such as the ones found in

include control of hydraulic mining debris. Its land-use control systems include determination of facilities placement (a single-use allocation like that of the Bureau of Reclamation), issuance of permits for channel modifications or impoundments, and regulation and storage of streamflows. The Army Corps of Engineers has been accountable for public works projects since the Flood Control Act of 1936 and reports to both the Secretary of Defense and the Secretary of the Interior.

Enforcement Agencies. Two federal enforcement agencies are charged with regulating and preserving (by licensing and issuing permit stipulations) the natural resources of the Decker-Birney study area. These agencies are the Environmental Protection Agency (EPA) and the U.S. Geological Survey (USGS).

The Environmental Protection Agency. The EPA's principal governmental and administrative role in the Decker-Birney unit is to enforce the Federal Water Pollution Control Act (FWPCA) and the National Environmental Policy Act (NEPA), EPA's 1970 enabling legislation. The FWPCA establishes a permit system by which a permit for discharging pollutants into navigable water (in this case the Tongue River) is issued only after the federal requirements of the FWPCA's amendments are satisfied. The EPA, under NEPA, can also require a private industry to submit an environmental impact statement for coal development (i.e., strip mining) plans in the unit. The EPA indirectly controls land use by ensuring that such stipulations are met before any development or resource extraction can be initiated.

U.S. Geological Survey. The primary responsibility of the USGS in the study area is the technical examination and mapping of the federal mineral estate and the unit's federal lands. The USGS inventories mineral and water resources, classifies lands, and authors environmental impact analyses. In coal mining operations, such as the ones found in

the Decker-Birney unit, the USGS enforces operating and safety regulations, which are directed almost entirely towards the safety of the miner. The agency was created by Congress in 1879 and reports to the Secretary of the Interior.

Licensing Agencies. The Federal Power Commission (FPC) is the only licensing agency that has an active, functional jurisdiction in the Decker-Birney area. Its responsibility there is to license and control the hydraulic power generation and transmission resources on the navigable waterways used in interstate commerce. The FPC's land-use management functions are: (1) to regulate energy development on federal lands, and (2) to supervise and inspect hydroelectric projects to ensure management of water-power resources for beneficial purposes (e.g., recreation, irrigation, and other public uses). The FPC was created in 1935 by the Federal Power Act and reports to the Secretary of the Interior.

Service Agencies. Two federal service agencies have province in the Decker-Birney study area: the Soil Conservation Service (SCS) and the Agricultural Stabilization and Conservation Service (ASCS).

Soil Conservation Service. The SCS is responsible for soil and water conservation. It provides technical and financial assistance to local and state governments for flood control, drainage, and irrigation improvement projects on a cost-share basis. By so doing, the SCS exercises its land-use management functions, including stream-flow regulation, wildlife, recreation, and municipal and industrial use of private lands. However, the program is limited to watershed and sub-watershed areas not exceeding 250,000 acres and not including any single structure with a flood-water detention capacity of more than 5000 acre-feet or a total capacity of 25,000 acre-feet. The only land-use control the SCS employs is a method of single-use allocations, i.e., facilities

placement contracts. The Soil Conservation Service, an agency within the U.S. Department of Agriculture, was created under the Soil Conservation Act of 1935.

Agricultural Stabilization and Conservation Service. In the Decker-Birney study area, the ASCS awards grants-in-aid for cropland adjustment and conversion and for implementation of small-scale water and soil conservation projects. The ASCS was created by the Soil Conservation Act of 1936 and reports to the Secretary of Agriculture. It controls land use by limiting funds for financing small-scale soil, water, and wildlife conservation projects.

Indian Agencies

One federal agency and two Indian nations have specific responsibilities for the well-being of the two Indian tribes surrounding the Decker-Birney study area. They are the Bureau of Indian Affairs (BIA), the Crow Indian Nation, and the Northern Cheyenne Indian Nation.

Bureau of Indian Affairs. The functional jurisdiction of the Bureau of Indian Affairs in the study area is over the Crow and Northern Cheyenne nations. The agency's governmental and administrative duties are to implement federal programs directed toward the native American populations. The BIA's land-use management functions are to administer lands, allotments, and resource allocations, and it is responsible for the management of livestock, timber, recreation, and watershed resources. The BIA controls land use through its use-permit system. The Bureau of Indian Affairs was created in the War Department in 1824 and was transferred to the Department of the Interior when it was established in 1849. The Snyder Act of 1921 provided substantive law for appropriations covering the conduct of activities by the Bureau of Indian Affairs. The scope and character of the authorizations contained in this act were broadened by the Indian Reorganization Act of 1934.

Crow and Northern Cheyenne Indian Nations. Both the Crow and the Northern Cheyenne Indian nations have semiautonomous forms of government. Both are responsible to their tribal councils and to the Secretary of the Interior. Their land-use management systems employ comprehensive land-use planning (controlled by area zoning), use permits, and access control. The Crow Indian Nation was created by the Organic Act of 1868, Section 15, Statute 652. The Northern Cheyenne Indian Nation was created by the Organic Act of 1884.

State Agencies

Eight Montana agencies have governmental jurisdiction in the Decker-Birney study area. Six of these are state departments that regulate the development or use of the unit's natural resources by taxation or permit or licensing power. Three of these departments have specific divisions to implement the state's natural resource policies. The two other state agencies function as advisory councils to the state legislature and the governor. These eight agencies are:

- Department of Revenue
- Department of State Lands
- Bureau of Mines and Geology
- Department of Natural Resources and Conservation
- Department of Fish and Game
- Department of Health and Environmental Sciences
- Environmental Quality Council
- Governor's Office: Energy Advisory Council

Department of Revenue. The Department of Revenue controls the taxation, classification, and assessment of all land in Montana. This department's jurisdiction includes the Decker-Birney study area, which is especially important because the three county governments of the study area are general-purpose governments that are solely financed by this department.

The department's land-use management functions, then, include comprehensive land classification and the limitation of land uses through taxation. The Department of Revenue exercises these functions and related policies as mandated by the Montana Economic Land Development Act (MELDA) by the following means: single-tax classification, preferential assessment, and land-use dedications and exemptions.

MELDA, passed in 1975, is an innovative response to political pressure on the state to develop its mineral resources. An excerpt (page 309) follows.

> *This act . . . is designed to meet Montana's needs in a unique way; by reducing the need for zoning and other land control measures and placing our future development under a free market system controlled not by land regulation, but by economics. Specific goals are:*
>
> 1. *to protect prime agricultural land . . .*
> 2. *to encourage urban growth in an inward pattern, rather than sprawl development . . .*
> 3. *to guide industrial and commercial development in Montana . . .*
> 4. *in general, to provide for Montana a land use directional policy which will not regulate our future but rather motivate it into a pattern of desirable economic growth based on the development of private enterprise.*

Because the Decker-Birney study area is underlain with almost inexhaustible coal deposits, the Montana Department of Revenue (together with the U.S. Bureau of Land Management, which owns the mineral rights to that same area) will play a significant role in the area's development.

Department of State Lands. The Department of State Lands is responsible for administering 48,000 acres of both surface and mineral estate lands in the Decker-Birney study area (5 percent of the total acreage).

Two divisions of this department are answerable for reclamation and leasing activities in the Decker-Birney study area. They are the Reclamation Division and the Land Leasing Division.

Reclamation Division. The Reclamation Division is responsible for administering water resources on state lands in the Decker-Birney unit, primarily the Tongue River Reservoir and the state lands adjacent to it. The Reclamation Division's land-use management function there is to implement state reclamation laws for coal mining. It does so by requiring private companies to meet state water quality standards; however, the department has no permit or licensing powers.

Land Leasing Division. The Land Leasing Division has charge of all the state lands' resources. In the Decker-Birney unit this would apply to sections 16 and 36 of each township and to those lands not managed by the Reclamation Division. The Land Leasing Division exercises land-use control by issuing licenses for exploration for and development of surface and/or subsurface minerals.

Bureau of Mines and Geology. The Bureau of Mines and Geology is responsible for surveying mineral resources. It has no regulatory functions. The bureau evaluates and compiles studies of the state's various deposits and releases the studies to the general public.

Department of Natural Resources and Conservation. This department is accountable for Montana's natural resources. Within the department is a water resources board that has jurisdiction in the Decker-Birney unit.

Water Resources Board. The purpose of the Water Resources Board is to develop and manage state waters and to administer the state's groundwater code. The board is directly responsible for issuing water permits, awarding water rights, and contracting water for irrigation.

In doing so, the board can inventory the amount of water that is contracted, its quality, and its source, in order to make plans for further water development, flood management, and utility siting and to make accurate environmental assessments of these plans.

Within the Decker-Birney unit, the Board has complete control over the Tongue River Reservoir.

Environmental Quality Council. The Environmental Quality Council functions as an advisory board to the state legislature and to the governor. The council is also a watchdog agency, receiving and reviewing environmental impact statements; however, it has no regulatory functions. The nine-member council receives affidavits and contributes to the state's environmental decision-making process. The council was created in 1971, with the passage of the Montana Environmental Policy Act.

Governor's Office: Energy Advisory Council. The Energy Advisory Council has no land-use regulatory functions in the Decker-Birney unit, but it plays a key role in the state's energy policy. The council evaluates the state's energy/mineral resources and proposes regulatory policies to the governor and legislature.

Department of Fish and Game. At this time the Department of Fish and Game does not directly administer any lands in the Decker-Birney area, but it does establish and enforce hunting, trapping, and fishing regulations.

Department of Health and Environmental Sciences. The Department of Health and Environmental Sciences oversees two bureaus that enforce air and water quality standards: the Air Quality Bureau and the Water Quality Bureau.

Air Quality Bureau. The Air Quality Bureau establishes air quality policy and enforces state ambient air quality standards. Because of the nature of strip-mining operations, the bureau measures the air quality before development (background) and tests air quality monitors before and during use (measuring source). This is done in order to prevent "significant deterioration of air quality." The bureau controls land use by awarding and issuing permits for facility development.

Water Quality Bureau. The Water Quality Bureau is in charge of establishing water quality policy and enforcing state water quality standards. The bureau's primary area of jurisdiction in the Decker-Birney unit is the Tongue River and the Tongue River Reservoir. The bureau controls land development by granting permits for operating and modifying wastewater disposal systems, sewage discharges, and industrial wastes into the state's waters.

Local Agencies

Seven local government entities exercise political authority in the Decker-Birney study area. Six of the seven are county bodies, and the other is a regional body that represents five counties. They are the Big Horn County Commission, the Powder River County Commission, the Rosebud County Commission, three conservation districts (Big Horn County, Powder River County, and Rosebud County), and the Yellowstone-Tongue Areawide Planning Organization (representing Big Horn, Carter, Custer, Powder River, and Rosebud counties). If the cities in the study area were incorporated, they too would have political domain within the Decker-Birney area.

Big Horn, Powder River, and Rosebud Counties. Large adjoining portions of these three counties are located within the Decker-Birney unit. The governmental and administrative duties of each of these counties are identical. They are general-purpose forms of government that administer

certain services through their county commissions and the state law. Their land-use management functions include land classification and some limited developmental regulation (except for Powder River County, which has comprehensive development regulations). The counties' land-use controls vary. Big Horn County utilizes single-tax classification and subdivision regulations, Rosebud County employs the same land-use control methods as Big Horn County, in addition to spot zoning and issuing of specific-use permits. Powder River County controls its land-use development by employing single land-use classifications, proposed single-district zoning and conditional-use permits; and by enforcing subdivision regulations. These three county commissions report to the Montana Department of Revenue on land classification and taxation matters.

Big Horn, Powder River, and Rosebud County Conservation Districts. These districts were created in 1976 by the Montana State Constitution National Streambed and Land Preservation Act. The districts are responsible for the administration of the law by which they were created. Their land-use management functions include flood control, control of impoundments, and diversions of streams, and they control land use by awarding permits for impoundments and stream diversions. The conservation districts are responsible to the State Soil Conservation Committee and the Army Corps of Engineers.

Yellowstone-Tongue Areawide Planning Organization. The Yellowstone-Tongue Areawide Planning Organization (YTAPO) is a regional planning organization that has the assigned responsibility of studying and recommending improvements for regional wastewater management and water quality for Big Horn, Carter, Custer, Powder River, and Rosebud counties under Section 208 of the Areawide Wastewater Management Program. Its land-use management functions are:

- to coordinate regional wastewater management
- to develop performance standards for point-source discharges
- to develop non-point-source pollution abatement measures
- to promote governmental coordination for environmental quality improvement

Its land-use control systems include enforcing land-use plans and reviewing performance standards, discharge permits, contracts for service between local jurisdictions, and utility extensions. This agency is responsible to each county. It is also responsible to the Environmental Protection Agency for the Areawide Wastewater Management Program.

INSTITUTIONAL OVERVIEW

Table 3 describes the local, state, and federal agencies with responsibilities in the Decker-Birney area. It includes descriptions of their jurisdictions, responsibilities, land-use management functions, land-use controls, enabling legislation, and the governmental unit to whom they are responsible.

Table 3-A. LOCAL AGENCIES WITH RESPONSIBILITIES IN DECKER-BIRNEY AREA

Agency	Jurisdiction	Governmental/ Administrative Responsibilities	Land-Use Management Functions	Land-Use Controls	Enabling Legislation	Reports to
Big Horn County Commission	Big Horn County	General government, provision of certain services, administration of state law, land-use management	Land classification, partial development regulation	Single-tax classification, subdivision regulations	Montana State Constitution	Montana State Department of Revenue
Powder River County Commission	Powder River County	General government, provision of certain services, administration of state law, land-use management	Land classification, partial development regulation	Single-tax classification, subdivision regulations, spot zoning, specific-use permits	Montana State Constitution	Montana State Department of Revenue
Rosebud County Commission	Rosebud County	General government, provision of certain services, administration of state law, land-use management	Land classification, comprehensive development classification	Single-tax classification, single district zoning, conditional-use permits, subdivision regulations, development contracts (surface mining only)	Montana State Constitution	Montana State Department of Revenue
Big Horn County Conservation District	County, exclusive of federal, state, or Indian lands	Administration of Montana Natural Streambed and Land Preservation Act	Flood control, control of impoundments and stream diversions	Permits for impoundments or stream diversions	Montana State Constitution Natural Streambed and Land Preservation Act, 76-101 through 219, RCM	Soil Conservation Service, U.S. Army Corps of Engineers
Powder River County Conservation District	County, exclusive of federal, state, or Indian lands	Administration of Montana Natural Streambed and Land Preservation Act	Flood control, control of impoundments and stream diversions	Permits for impoundments or stream diversions	Montana State Constitution Natural Streambed and Land Preservation Act, 76-101 through 219, RCM	Soil Conservation Service, U.S. Army Corps of Engineers
Rosebud County Conservation District	County, exclusive of federal, state, or Indian lands	Administration of Montana Natural Streambed and Land Preservation Act	Flood control, control of impoundments and stream diversions	Permits for impoundments or stream diversions	Montana State Constitution Natural Streambed and Land Preservation Act, 76-101 through 219, RCM	Soil Conservation Service, U.S. Army Corps of Engineers
Yellowstone-Tongue Area-wide Planning Organization	Big Horn, Carter, Custer, Powder River, and Rosebud counties	Regional wastewater management and water quality	Functional coordination of regional wastewater management, development of performance standards for point-source discharges, development of non-point-source pollution abatement measures, governmental coordination to promote environmental quality	Performance standards, discharge permits, interlocal contracts for surface provision, utilities extensions, enforceable land-use plans (functional limited uses)	Section 208, FWPCA amendments of 1972, county-enabling statutes or resolutions	State Executive

Table 3-B. STATE AGENCIES WITH RESPONSIBILITIES IN DECKER-BIRNEY AREA

Agency	Jurisdiction	Governmental/ Administrative Responsibilities	Land-Use Management Functions	Land-Use Controls	Enabling Legislation	Reports to
Department of Revenue	State of Montana	Taxation, classification, assessment	Comprehensive land classification, control of land uses through taxation	Single-tax classification, preferential assessment, land-use dedications, exemptions	Montana Economic Land Development Act, 1973	State Executive
Department of State Lands	Montana's state lands					
Reclamation Division		Administration of water resources on state lands	Administers state reclamation laws for coal mining, monitors water quality	Requires private companies to meet state water-quality standards	Montana Strip and Underground Mine Reclamation Act, Open Cut Mining Act, Hardrock Law	Governor
Land Leasing Division		Administration of state land resources	Administers state-owned land, sections 16 and 36 of each township	Issues leases for surface and/or subsurface minerals	22 Feb 1889, 25 Stat 676, Montana 1972 Constitution, Art 10, Sec 441, Chapter 4, Title 81, RCM, 1947	Governor
Bureau of Mines and Geology	State of Montana	Survey of mineral resources and associated functions	No regulatory functions; is a public service agency whose purpose is to assist in developing the state's mineral resources and conduct field studies of Montana' geology and mineral deposits		Montana Constitution	Governor
Department of Natural Resources and Conservation	State of Montana					
Water Resources Board	Tongue River Reservoir	Development and management of state waters, administration of groundwater code	Flood management, utility siting, utilization planning, environmental assessment, water resource development	Issues water permits, awards water rights, contracts irrigators	Montana Water Resources Act of 1973, Montana Water Use Act, 1971	Governor, Board of Natural Resources
Department of Fish and Game	State of Montana	Development and management of fisheries, and wildlife and game management	Does not directly administer any lands in the Decker-Birney area other than establishing and enforcing hunting, trapping, and fishing regulations		Montana Constitution	Governor
Department of Health and Environmental Sciences	State of Montana					
Air Quality Bureau		Air pollution control, air quality policies	Enforces state ambient air quality standards by measuring "background" (before development), testing monitors, and measuring source to prevent significant deterioration of air quality	Issues facility permits, monitors air quality, approves equipment (monitoring devices)	Montana Clean Air Act, 1975	Governor
Water Quality Bureau		Water quality control, water quality policies	Enforces water quality standards, monitors quality of state waters	Issues permits to modify or operate a disposal system into state waters, sewage discharge, and industrial wastes	Montana Water Pollution Control Law, 1973	Governor
Environmental Quality Council	State of Montana	Advisory council and watchdog agency	No regulatory functions; receives affidavits, has input into decision-making process, receives and reviews impact statements		Montana Environmental Policy Act, 1971	Montana State Legislature
Governor's Office: Energy Advisory Council	State of Montana	Energy studies and policies	No regulatory functions; evaluates information to propose policy to the governor's office		Montana Constitution	Governor

Table 3-C. FEDERAL AGENCIES WITH RESPONSIBILITIES IN DECKER-BIRNEY AREA

Agency	Jurisdiction	Governmental/ Administrative Responsibilities	Land-Use Management Functions	Land-Use Controls	Enabling Legislation	Reports to
Bureau of Land Management	Decker-Birney Unit	Administration of natural resource lands and federal mineral estate, classification of and disposal of federal lands; mineral leasing and land-use management of federal lands	Land-use management and planning for national resource lands and federal mineral estates; multiple-use resource management for lands, minerals, livestock, timber, wildlife, recreation, and watershed	Direct controls, permits on NRL, land exchanges, access control of non-BLM surface through minerals leasing and lease stipulations	President's Reorganization Plan of 1946, Sections 402, 403, numerous statutes and executive orders	Secretary of the Department of the Interior
U.S. Forest Service	Ashland Division, Custer National Forest	Administration of national forest lands; management of timber resources; land-use management	Comprehensive planning of national forest lands, multiple-use management of resources listed above, except lands and minerals and including wilderness	Use permits, access control, timber sales and stipulations	30 Stat. 11; 16 USC (1897)	Secretary of the Department of Agriculture
U.S. Bureau of Reclamation	Decker-Birney Unit	Water development for irrigation and power	Management of certain water resources for irrigation, power generation, municipal and industrial uses, fisheries, recreation, wildlife, and flood control	Access control, resource allocations, sales of water and power facilities placement (single-use allocations)	Reclamation Act of 1902	Secretary of the Department of the Interior
U.S. Army Corps of Engineers	Navigable waterways: Tongue River	Development of water for navigation and power; flood control	Planning and construction of improvements to navigable streams and channels, flood control, multiple-use projects, control of hydraulic mining debris	Facilities placement (single-use allocations) permits for channel modification or impoundments, regulation and storage of stream flows	Flood Control Act of 1936, 1944	Secretary of the Defense, Secretary of the Department of the Interior
Environmental Protection Agency	Functional	Administration of the Federal Water Pollution Control Act, NEPA, and associated environmental statutes	Enforces FWPCA Comments on EIS	Issues discharge permits	Reorganization Plan No. 3 of 1970	The President
U.S. Geological Survey	Functional	Survey of federal mineral estates; survey and mapping of national territory, associated studies	Inventories mineral and water resources, conducts survey and environmental impact analyses; classifies land	Land classification, permit supervision for power projects (functional responsibility for single-use allocations	20 Stat. 377, 43 USC 1879	Secretary of the Department of the Interior

Table 3-C. (Continued)

Agency	Jurisdiction	Governmental/ Administrative Responsibilities	Land-Use Management Functions	Land-Use Controls	Enabling Legislation	Reports to
Federal Power Commission	Functional	Licensing and control of water power, its generation and transmission, resources on navigable streams or used in interstate commerce	Administration of power site withdrawals on federal lands, supervision and inspection of hydroelectric projects to ensure management of water power resources for beneficial uses, including recreation	Issues licenses, use permits, and leases	Federal Power Act of 1935	Secretary of the Department of the Interior
Soil Conservation Service	Functional	Water and soil conservation, technical assistance and financial aid to local and state governments	Planning and financing flood control projects, drainage, irrigation, stream-flow regulation, wildlife, recreation, and municipal/industrial use, NTE 25,000 AF	Facilities placement contracts (single-use allocations)	Soil Conservation Act of 1935	Secretary of the Department of Agriculture
Agricultural Stabilization and Conservation Service	Functional	Awards grants-in-aid for cropland adjustment and conversion and for implementation of small-scale water and soil conservation	Financing of small-scale soil, water, and wildlife conservation projects	Funding	Soil Conservation Act of 1936	Secretary of the Department of Agriculture
Bureau of Indian Affairs	Crow and Northern Cheyenne	Administration of federal programs to native American populations	Administration of Indian lands, allotments, allocations, functional responsibility for livestock, timber, recreation, and watershed management	Use permits	Act July 9, 1832 Chapter 174, Sec 1, 4 Stat 564	Secretary of the Department of the Interior
Crow Indian Nation	Crow Indian Reservation	General government, semiautonomous	Comprehensive land-use planning	Zoning, use permits, access control	Organic Act, 15 Stat 652 (1868)	Tribal Council, Secretary of the Department of the Interior
Northern Cheyenne Indian Nation	Northern Cheyenne Indian Reservation	General government, semiautonomous	Comprehensive land-use planning	Zoning, use permits, access control	Organic Act, EO 26-Nov (1884)	Tribal Council, Secretary of the Department of the Interior

IV

BLM MANAGEMENT FRAMEWORK PLAN

SUMMARY AND CONCLUSIONS

This section of the report describes the Decker-Birney Management Framework Plan and the process that produced it. It includes observations on issues related to implementing the MFP, and its compatibility with state and federal environmental policies.

The BLM's Management Framework Plan for the Decker-Birney area is a general document that identifies areas in which coal development will be allowed to take place, identifies areas in which some other resource activities will be allowed to take place (watershed, recreation, wildlife habitat), and sets forth general principles for multiple-use management in the rest of the area.

Coal development is clearly the most significant resource use contemplated in the MFP. Even though the plan identifies all areas that might be leased, it does not address the specific activities that may take place in specific locations. For example, if all of the recommended coal resources (as identified in the MFP, some 6.5 billion tons) were mined simultaneously for export, a worker influx on the order of 5000 to 8000 persons might result. On the other hand, a coal-development scenario that included a much reduced level of mining in combination with several power plants, gas plants, and pipelines could be associated with a worker influx several times greater, occurring in a precipitous, erratic, and wildly fluctuating manner. The ranges, types, and significance of environmental and socioeconomic impacts associated with the

former scenario are not sensibly compared in the MFP to those associated with the latter scenario. This is to say that knowledge of the approximate locations where coal development will take place does not give a clue to the location, type, severity, or significance of impacts that may result.

The other resources considered in the BLM's MFP (timber, wildlife, watershed, forage, recreation, and lands) can probably be managed successfully to meet economic and environmental protection objectives. However, the consequences of developing these resources pale when contrasted to the scale of impacts associated with coal development.

A study focusing on the MFP can identify the structure and process for generalized resource planning in the Decker-Birney area, and it can discuss the types of impacts associated with different resource uses. It cannot address specific impacts in terms of scale, severity, or timing — the MFP does not provide an appropriate basis for this type of analysis.

Areas of specific EPA interest — air and water quality, socioeconomic impact, etc. — depend heavily on the form and location of specific coal activities (export mine, power or gas plant, etc.). The BLM's MFP does not indicate where, at what level, or when specific activities will occur — this is the subject matter of the Energy Minerals Activity Recommendation Systems (EMARS). Hence, if the EPA questions the appropriateness or adequacy of the efforts in the area of its Areawide Planning Organization (APO), or the prospects for environmental degradation in the area, or the relevance of its input to EIS review, the agency cannot expect specific answers from a study of the MFP.

While, for the reasons described above, a review of the Decker-Birney MFP may have limited value in determining the adequacy of environmental protection in the study area, it will be valuable for subsequent detailed investigations of the potential impacts of specific land-use proposals.

BACKGROUND

Brief History of BLM

The following excerpt from the National Resource Lands Digest 1975-76* provides an excellent overview of the BLM's history.

> *The General Land Office and the Grazing Service were combined in 1946 to form the Bureau of Land Management. As an agency of the U.S. Department of the Interior, BLM is responsible for nearly 474 million acres of the Nation's public lands.*
>
> *As a multiple-use manager of more than half of all Federally-owned lands, BLM seeks balanced management of these lands and their resources. In addition to the land itself, these resources include minerals such as coal, oil and gas, plus forests, range vegetation, recreation, wildlife, and water. The Bureau's objective is to carry out the best possible mix of resource management practices for the long-term benefit of the land, its resources, and the public.*
>
> *While the Bureau's work is administered from headquarters in Washington, D.C., State offices in 10 western states and Alaska exercise jurisdiction over National Resource Lands (NRL) in their respective states. National Resource Lands in these states are further divided, administratively, into districts. Each district is then divided into resource areas. The 343 permanent and part-time employees assigned to BLM's Montana organization are responsible for management of 8,141,498 surface acres in Montana, 68,442 acres in North Dakota, and 276,295 acres in South Dakota.*
>
> *At the present time, BLM district offices are located at Billings, Miles City, Malta, Lewistown, Missoula, and Dillon. The Bureau also maintains a project office at Dickinson, N.D. and a resource area office at Belle Fourche, S.D.*

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*U.S. Department of the Interior: Bureau of Land Management, National Resource Lands Digest 1975-76, Montana, North Dakota, South Dakota, pp. 8-10.

The Malta District, stretching across north-central Montana between the Canadian border and the Missouri River, is primarily a region of rolling rangelands and river "breaks." Range management and wildlife habitat improvements are among the more significant district programs. Intensive grazing management shows great promise for improved livestock and wildlife forage and cover plants. The many acres of prime wildlife habitat on National Resource Lands in the Malta District offer one of Montana's best opportunities for the big game, bird, and waterfowl hunter, along with "blue ribbon" fishing in the many prairie ponds. The Little Rockies area provides the camper with excellent campground facilities.

Extending from Wyoming to the Canadian border and encompassing National Resource Lands in North Dakota and South Dakota, the Miles City District varies from the pine-covered "exemption area" in the northern Black Hills to stark badlands along the lower Yellowstone River, and from the mineral rich region of southeastern Montana to the grassy plains of western North Dakota. Although predominantly ranching country, the district has some of Montana's finest big game and upland bird hunting. The Federal mineral estate within the district reaches astronomical proportions. More than half of Montana's 30+ billion tons of strippable coal is Federally owned and most of it is in the Miles City District. The logical development of this valuable resource along with safeguards against undue surface damage presents a major challenge for Bureau officials at district and state office levels.

The Billings District covers south-central Montana, including most of the upper Yellowstone River drainage. Within this area, the district manages 371,644 surface acres and 800,249 subsurface acres. The Pryor Mountains, about 50 miles south of Billings, were homeland to early man. Cooperative archaeological surveys with the Forest Service and National Park Service have delineated significant sites in the Pryors and surrounding area. The Pryor Mountain Wild Horse Range, established on National Resource Lands in 1968, is home to about 140 wild horses that eke out an existence in this harshly beautiful area.

The Lewistown District occupies Montana's heartland, representing "Charlie Russell Country" at its best. Primarily a region of rolling rangelands punctuated by small but dramatic mountain ranges, the district features some

of Montana's finest ranching country, ghost towns, excellent hunting and fishing, and the strangely eroded "breaks" area of the Missouri River. The rugged, timbered breaks coupled with a "lightning belt" location makes Lewistown District a critical fire area. Aerial observers operating out of Lewistown provide detection service for major portions of three districts. Early detection, slurry bombers and quick initial attack by helicopter transported crews are used to keep acreage burned by wildfire to a minimum.

National Resource Lands in the Missoula District produce valuable commercial timber, livestock forage and important habitat for elk, deer, and other wildlife. Outstanding trout streams, such as the nationally famous Rock Creek, snowmobile trails, the historic old ghost town of Garnet which is being preserved through Bureau efforts, and many other recreational opportunities are available on these lands. Numerous recreational-residential subdivisions on private lands within the district are creating management problems on adjacent National Resource Lands. The Helena Fire Center is established each summer to provide quick response to wildfires starting on those resource lands in the eastern part of the district.

The Dillon District occupies seven counties in southwestern Montana, basically the area drained by the upper Missouri River and its tributaries south of Helena. This is "Standing Up Country," a region of broad valleys traversed by world famous trout streams, and a backdrop of majestic mountains. The Dillon District is an important livestock, lumbering, and mining region, and also contains important habitat for elk, deer, moose, antelope, and other wildlife. The snowmobile trails, ski areas, ghost towns, rockhounding, Indian artifacts, historical sites including Montana's first and second territorial capitals at Bannack and Virginia City, attract numerous tourists and outdoor enthusiasts year-round.

Table 4 identifies the extent of public lands under the BLM's exclusive jurisdiction.

Brief History of BLM Planning Activities in the Decker-Birney Area

Current BLM planning activities in the Decker-Birney area began in May 1972 with a compilation of information from many sources about the major natural resources of the area. Information related to the social

Table 4. PUBLIC LANDS IN MONTANA UNDER EXCLUSIVE JURISDICTION OF THE BLM

County	Acreage	County	Acreage
Beaverhead	661,700	McCone	202,696
Big Horn*	27,208	Meagher	10,461
Blaine	459,298	Missoula	25,923
Broadwater	66,883	Musselshell	104,686
Carbon	207,005	Park	13,376
Carter	512,693	Petroleum	337,652
Cascade	25,537	Phillips	1,100,895
Chouteau	111,999	Pondera	1,328
Custer	341,995	Powder River*	258,388
Daniels	200	Powell	78,168
Dawson	67,171	Prairie	450,735
Deer Lodge	5,846	Ravalli	40
Fallon	121,906	Richland	52,902
Fergus	360,564	Roosevelt	4,635
Gallatin	8,611	Rosebud*	233,650
Garfield	516,574	Sheridan	300
Glacier	1,083	Silver Bow	45,186
Golden Valley	8,275	Stillwater	5,716
Granite	47,283	Sweet Grass	16,566
Hill	14,370	Teton	16,956
Jefferson	96,147	Toole	28,023
Judith Basin	14,111	Treasure	11,884
Lewis & Clark	63,617	Valley	1,022,970
Liberty	7,046	Wheatland	2,195
Lincoln	1	Wibaux	25,882
Madison	257,291	Yellowstone	85,801
	TOTAL ACREAGE — 8,141,498		

*Within Decker-Birney planning area.

Source: U.S. Department of the Interior: Bureau of Land Management, National Resource Lands Digest 1975-76, Montana, North Dakota, South Dakota.

and economic issues of the area was also assembled. The data were analyzed, and opportunities for achieving the maximum potential for each resource area were identified. The opportunities were then analyzed in terms of the constraints placed upon them by existing laws, regulations, economic and social factors, and policies. These analyses led to the broad recommendations that are part of Step 1, Activity Recommendations, of the BLM Management Framework Plan. The recommendations were published in December 1973.

Over 700 individuals, special-interest groups, and local agencies were contacted, and informal meetings were held to review existing data and to gather additional information.

Subsequent BLM planning activities in the Decker-Birney area included the tasks of MFP, Step 2, Multiple-Use Analysis. These tasks included comparing all resource recommendations generated during MFP, Step 1 and preparing a set of multiple-use recommendations for resolving or minimizing resource conflicts and overlaps. This work also included supporting analyses for each multiple-use recommendation.

Approximately 215 private landowners were interviewed in order to gather information from local residents with intimate knowledge of the area under study. BLM also initiated a remote-sensing program to inventory and analyze the study area further. BLM and Forest Service resource specialists also made field investigations. Whenever possible, outside experts were engaged to supplement data gathering (e.g., archaeological studies). During this period, authorization was received to initiate soil surveys and water resource studies, and other public agencies participated in them. The Montana Air Quality Bureau has gathered air quality data, and the Montana Energy Advisory Council has developed a socioeconomic analysis. The Step 2 multiple-use recommendations were published in April 1974.

In addition to the above planning activities, an environmental impact statement was prepared for the Decker-Birney Management Framework

Plan and its planning alternatives. This environmental impact statement meets the requirements of the then-current environmental legislation and includes a mailing list of approximately 520 persons.

Description of the BLM Planning System

The Land Use and Development Planning (LUDP) process of the BLM planning system begins with the preparation of a Unit Resource Analysis (URA) for a specific planning unit within a district. The URA is followed by the preparation of a Management Framework Plan (MFP).

Unit Resource Analysis (URA). The Unit Resource Analysis (URA) is the resource-data-information component of the LUDP process and, by definition, is a comprehensive physical resource inventory and analysis of the current production, use, condition, and the resource potential and opportunities within a planning unit, including a profile of environmental values. Its stated objectives are:

- to provide a comprehensive inventory and analysis of resource problems, conditions, uses, production, quality, capabilities, and management potential for use in preparing Management Framework Plans
- to provide summarized resource information of all types on a unit in one place for use in all phases of resource management, including public contact
- to provide a means of achieving continuity in resource-data retention and maintenance*

Management Framework Plan (MFP). Completion of the URA, including the environmental profile and all other informational documents, leads to the preparation of the Management Framework Plan. By definition, the MFP comprises a group of planning decisions for one or more planning units, which indicates the resource values to be protected, establishes uses to be managed and their relative magnitude, and provides a multiple-use

*U.S. Department of the Interior: Bureau of Land Management, Planning System Manual, Section 1605, April 17, 1975.

framework into which more detailed plans (called Program Activity Plans) must fit. Its objectives are:

- to provide a structured method of synthesizing specific resource programs and to support activity proposals with detailed recommendations for land-use management within a designated area
- with managerial approval (based on public input) of the final recommendations, to provide guidance for ongoing bureau action programs and to permit specific resource programs to proceed through more detailed planning and implementation stages*

The BLM planning system defines seven physical resources that are to be inventoried and analyzed in developing the Management Framework Plan. These seven resources are land, minerals, forest products, range, watershed, wildlife habitat, and recreation. The procedure used to evaluate potential management activities for these resources is separate from the procedures for environmental protection or enhancement. Instead, the environment is dealt with as a separate section of the MFP. BLM states that resources and the environment are physically identical, but functionally different. The seven resource categories are related to some ultimate use, while the environment is the place or setting for particular activities by organisms existing within communities.

An "ecological profile" of the planning unit is prepared as a separate step in the Unit Resource Analysis. The purpose of the profile is to describe the ecological communities in the planning unit, evaluate their present conditions and trends, and determine management opportunities either for enhancement and improvement of the environment or protection and maintenance of present conditions. These management opportunities are determined independently from the management goals for other resources.

"Critical environmental areas" within the planning unit are also identified separately in the URA as part of the Planning Area Analysis. The significance of these critical areas to institutions within the

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*U.S. Department of the Interior: Bureau of Land Management, Instruction Memo, 73-38, September 24, 1973.

planning unit and outside it are also described during this step in the BLM planning system.

In the first step of preparing the Management Framework Plan, each activity specialist must modify the resource management opportunities that he or she recommended in the URA so that they comply with BLM program-wide standards (Planning System Manual Section 1602), program activity policy statements (Planning System Manual Section 1603), and the Planning Area Analysis (Planning System Manual Section 1607). The standards set forth in sections 1602 and 1603 include several measures for environmental protection. The standards that are applicable to all BLM management activities are:

- All land-use and resource-management program decisions must be consistent with federal or state air and water quality standards and with public health and safety standards affecting solid-waste disposal and noise abatement
- In all land-use and program decisions, the capacity of ecosystems to sustain themselves and the conditions and requirements of all species within these ecosystems will be fully considered
- In all land-use and program decisions, protection of natural and man-made elements that have aesthetic values of natural beauty, harmony, variety, or uniqueness in the environment will be fully considered
- In all land-use and program decisions, protection of natural and man-made environmental elements that contribute to the cultural heritage of human society or to human understanding of ecological processes will be fully considered
- If there is no cost involved, ecological, aesthetic, or human-interest values will be protected or enhanced through careful design and execution of BLM programs. If preservation or enhancement of these values would result in loss of other resource values or increase in program costs, the long-range cost is compared to the long-range results. Great weight is given to preservation of a wholesome, continually productive environment for future generations

In applying these standards to program activities, BLM personnel are directed to:

- increase their ability to identify and analyze ecosystems and their functions on the ground
- develop procedures for measuring and analyzing the condition of those ecological processes most directly related to management activities
- develop the capability to participate in an interdisciplinary analysis of environmental conditions and impacts resulting from management activities
- apply ecosystem management principles to planning and decision making
- develop management practices that will minimize damage to and, if possible, enhance the environment
- develop and apply stipulations to protect environmental values to guide lessees, permittees, and others who use the public lands

In managing mineral resources, BLM personnel must ensure that damage to the environment and other resources caused by mineral exploration, development, and extraction is minimized and that plans are provided for the rehabilitation of affected lands. In managing for recreation, the overriding consideration in the decision-making process is the preservation and protection of environmental values. At minimum, activities related to watershed management must meet state and federal air and water quality standards. In developing forest products, environmental feasibility is a prerequisite to the adoption of any intensive management practice, no matter how economically attractive the practice is. Stipulations for the protection of environmental quality must be included in all forest-related contracts, leases, and permits. Roads constructed on BLM land must be located and designed to harmonize with the topography, to cause the least damage to the environment, and to avoid immediate proximity to streams, lakeshores, or other rare or valuable environmental features.

Although the Planning System Manual identifies the types of environmental protection measures that are to be used by BLM area and district managers, it does not provide procedural guidelines for implementing

these measures. Interpreting the standards and choosing the methods used for environmental protection is left to field personnel and may vary between districts. The measures devised for protecting and enhancing the environment in the Decker-Birney Planning Unit are discussed in Section V.

THE DECKER-BIRNEY MANAGEMENT FRAMEWORK PLAN

Summary Description

The Decker-Birney MFP generally follows the steps outlined in sections 1601 through 1608 of the BLM manual, dated March 6, 1975. These steps consist of the following:

- URA, Step 1 - Preparation of a base map of the planning area with narrative and overlays that indicate the distribution of resources
- URA, Step 2 - Preparation of a physical profile of the basic physical characteristics of the area, including: climate, topography, hydrology, vegetation, soils, and geology
- URA, Step 3 - (1) The analysis and recording of the present situation for each of the following resource categories as part of the Environmental Analyses Records: lands, minerals, forestry, livestock forage, watershed, wildlife, recreation, and environmental enhancement; and, (2) the preparation of the Environmental Profile
- URA, Step 4 - Descriptions are prepared of management opportunities for each resource category described in URA, Step 3

Completion of URA, Step 4, the Environmental Profile, and all other informational documents leads to the preparation of the Management Framework Plan, which includes the following steps:

- MFP, Step 1 - Program activity recommendations have been prepared that provide the basis for an optimum plan for the protection and enhancement of each resource. A summary report of this step, dated December 1973, has been published
- MFP, Step 2 - Multiple-use recommendations have been prepared for resolving (or minimizing) conflicts among the activity programs generated in Step 1 of the MFP — for coordinating activity overlaps and for identifying the support recommendations

necessary to carry out the multiple-use recommendations. A summary report of this step, dated April 1974, has been published. In addition, Environmental Analyses Records Nos. 1 and 2* describe the potential impacts of the proposed actions and of the alternative actions.

Specific Objectives Related to the Decker-Birney MFP. Specific objectives related to the Decker-Birney area include:

- to respond to the increasing and renewed interest in coal as part of our nation's attempt to achieve energy independence
- to develop coal and other resources in a manner that produces the minimum adverse impacts on the environment
- to provide advance resolution of conflicts among and within mineral leasing programs
- to provide a planning framework for other land-use activities in a manner consistent with BLM's objectives and responsibilities
- to provide a framework for evaluating mineral lease and other development applications in a comprehensive manner within the context of the entire Decker-Birney planning area.

MFP Recommendations

The multiple-use recommendations developed during Step 2 of the Decker-Birney MFP have been analyzed in terms of the resource type, the related activity, the wording of the MFP recommendation itself, and the category of the recommendation (e.g., standard, nonspecific enforceable guidelines, policy, and study). This information has been organized into a table, which, due to its length, comprises Appendix C, "Management Framework Plan Recommendations for the Decker-Birney Planning Unit." This table identifies the specific nature of each recommendation, and displays the relevant factors in relation to each resource activity.

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*Department of the Interior: Bureau of Land Management, Decker-Birney Environmental Analysis Records, Nos. 1 and 2, 1972.

Analysis of MFP Recommendations

The Bureau of Land Management divides the nation's resources into seven land-use categories (land, minerals, timber, livestock, watershed, wildlife, and recreation) in order to assess resource development possibilities and to produce a multiple-use Management Framework Plan for a given study area. Such an evaluation was conducted of the Decker-Birney study area; the analysis is summarized in the following paragraphs.

Land Uses Considered. The three, principal land-use classes in the Decker-Birney unit are urban and suburban, agricultural, and public uses.

Urban and Suburban. The Decker-Birney unit has three small communities that provide their citizens with somewhat limited public services. The community of Ashland (population 200*) offers residential, recreational, commerical, and educational facilities; Birney (population 13) has residential, commerical, and educational facilities; and Decker (population 30) consists only of a post office, a general store, a bar, and a slowly developing trailer park. The BLM-administered land within the unit consists primarily of isolated tracts with poor access. In the event of local industrial development, the fairly rough topography limits residential growth to existing communities. Presently, the private lands in the unit are better suited to commercial, residential, industrial, educational, and institutional development associated with industrial expansion than are the BLM-administered lands. The advantage of the privately owned lands is their location adjacent to water supplies (Tongue River, Hanging Woman, Otter, and Rosebud creeks) and to other major transportation routes.

Agricultural. Approximately 3.5 percent of the total acreage of the Decker-Birney unit (898,709 acres) has been developed for agricultural benefit. Of these 31,000 acres, 12,000 are irrigated and 19,000 are

*Population figures are from the Bureau of Land Management's Preliminary Population Study of 1972.

dry-land farms. The Tongue River Reservoir, which belongs to the state, is the only irrigation project in the unit.

The reservoir was developed for irrigation down river, and the users belong to an irrigation cooperative. The principal irrigated crop is alfalfa hay, which is grown along the Tongue River and Hanging Woman and Otter creeks. Irrigation in these areas is accomplished by border dikes and spreader dike systems. The foremost dry-land crops are hay and grain, which are used primarily as livestock forage. They are not sold as cash crops.

Potential agricultural areas in the unit are generally small in size and limited to isolated ridgetop plateaus or the broader valley or coulee bottoms. The public lands in the Decker-Birney unit are too rough and broken for any practical agricultural development.

Public Uses. This category is a catch-all for remaining land uses and includes landfill disposal sites, transportation routes, and rights-of-way.

- Landfill disposal sites. There is a tract of land located adjacent to Ashland designated as a landfill disposal site
- Transportation. The unit's major transportation routes are adjacent to the three primary drainages in the unit. They will have to be expanded in the event of any industrial and associated municipal growth
- Rights-of-way. The public-domain lands in the subject are relatively small and consist of widely scattered tracts surrounded by privately owned land. Coordination of rights-of-way activities with state and local agencies will be essential to maximize development potential and minimize adverse effects of other land uses and land values

Minerals. Presently, there are no operating oil or gas wells in the planning unit, but the large strippable coal deposits in the Decker-Birney unit have been evaluated and proposed for extraction. Presently, one coal company is operating in the unit; Decker Coal Mine at Decker is

actively shipping coal to eastern markets. Transportation systems, including railway extensions and a network of vehicle roads, are needed in the study area if the coal fields are to be developed. Because the Decker-Birney unit has little or no sand and gravel on public lands, the potential for industrial development will depend on the area's extraction of the extensive coal deposits.

Timber. The only logging activity in the Decker-Birney unit has been individual tree selection on a very limited scale. Presently, the Ashland Pine Company is operating in Custer National Forest. Because its demand for timber exceeds the annual allowable cut for the entire Ashland Division of the U.S. Forest Service, privately owned timber has satisfied the balance of its demand.

The timber found on the BLM land in the study area has had no commercial value for saw timber, and little use has been made of the timber resource except for posts and poles. The public-domain timber lands cannot be managed as productive commercial forest lands.

The commercial forest (part of Custer National Forest) consists of ponderosa pine ranging from pole size to mature and overmature timber, with ages varying from 35 to 80+ years. The Custer National Forest timber lands are intensely managed and protected areas.

Livestock. The public lands in the study area are licensed or leased according to the forage production of the land, measured in AUMs (animal unit months). BLM lands are licensed directly to the users. Some users are issued annual licenses and others are granted 10-year permits. Users of national forest lands are licensed on a 10-year permit basis, and special-use permits are issued for national forest lands used in conjunction with private livestock wintering. Past grazing practices have led to heavy use of some ranges and little use of others. The total forage resource has been poorly utilized, although the area has outstanding potential for increased forage production by natural means.

Because livestock grazing has the greatest single impact on the unit's forage, livestock management practices must recognize the physiological needs of forage production.

Watershed. BLM's watershed program is directed toward two goals:

- the conservation of watersheds to protect them from further deterioration
- the development or improvement of watersheds to meet identified needs, such as water quality and quantity requirements and the reduction of damage from flooding and sedimentation, both on and off public lands*

Roughly 104,960 acres on the project site (11.7 percent of the total acreage) are in the critical-to-severe erosion class. Livestock grazing, off-road vehicle use, and man-made surface disturbance have contributed significantly to the soil deterioration and loss.

Watershed conservation suggests maintaining the present watershed conditions in an attempt to restore areas where man's activities have caused deterioration. Hence, increased livestock grazing, coal development, and road building are contrary to any conservation objective in the Decker-Birney unit. However, watershed potential can be developed in this area by the following activities:

- construction of small stock reservoirs, since there is a high drainage density in the unit
- retention of snow water by construction of snow fences in channels with large numbers of drains, gullies, and canyons
- cloud seeding to increase the annual precipitation
- drilling of horizontal wells into the sides of some scoria** buttes to obtain stock and domestic water

Wildlife. The most popular big game species in the Decker-Birney unit is the mule deer. Antelopes are also present, but are found in the more

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*U.S. Department of the Interior: Bureau of Land Management, Planning System Manual, Section 1603, February 12, 1973.

**The term "scoria," as used in this report, refers to a precipitous sandstone outcropping.

rolling grassy areas where few trees or rugged drainages impede their movement. Sharp-tailed and sage grouse are hunted, as are pheasants, near agricultural lands. The Tongue Reservoir and River are the primary sport-fishing areas. The reservoir offers a wide variety of warm-water species, such as the walleye and northern pike, crappies, and bass. Warm-water species, such as bullheads, smallmouth and rock bass, and crappies, are caught below the dam. These areas are managed by the Montana State Department of Fish and Game and the Ashland Division of the U.S. Forest Service. Wildlife management plans for the public-domain lands are made in cooperation with the Montana State Department of Fish and Game.

Recreation. The Decker-Birney study area has been classified into four broad categories in order to evaluate the possibilities of developing the public lands for recreational purposes. They are:

1. Category A (exceptional). Outstanding scenic areas (Category A) become important recreation destinations within the unit. The present scenic qualities and aesthetics of these areas must be retained for use by future generations. Although the Category-A areas have spectacular scenic and aesthetic qualities, they are relatively small in size.
2. Category B (excellent). Category-B lands provide much of the scenic beauty in the area. There are several existing peripheral roads and internal roads from which the scenery can be observed. Although recreational use is minimal at the present time, scenic areas of the quality should be preserved for use by future generations of recreationists.

3. & 4. Category C (moderate) and Category D (slight). The moderate- and slight-scenic-category lands are vital to the visual aesthetics of the area. These lands constitute a majority of the visual surface resources in this particular planning unit. Since several different people-influence zones pass through these two areas, large-scale surface disturbances will be highly visible.

Presently, the only recreational sites in the unit are located adjacent to the Tongue River Reservoir and limited areas in Custer

National Forest. Further evaluation of the unit's scenery, wildlife management plan, historical points of interest, and the demand for winter-sport facilities will be required by the BLM to determine recreational development possibilities.

Implementation Techniques

The BLM has techniques available with which to implement the multiple-use recommendations of the Management Framework Plan. These techniques range from the establishment of policies that make the multiple-use recommendations operative to the granting of permits and leases for specific uses of lands under BLM jurisdiction. The following paragraphs describe several implementation techniques and how they are applied.

BLM Policies. General policies for the use and management of federal lands are contained in the Federal Land Policy Management Act of 1976 (PL 94-579). This act includes policies on:

- land ownership and/or disposal
- periodic and systematic inventories of the present and future use of federal lands
- reviews of public lands not previously designated for any specific use
- the withdrawal or dedication of federal lands for specific purposes
- the establishment of comprehensive rules and regulations
- judicial review
- the establishment of goals and objectives as guidelines for public land-use planning and management
- environmental protection and preservation
- fair market value for the use of federal lands and their resources
- uniform procedures for the disposal, acquisition, and exchange of federal lands
- protection of public-land areas of critical environmental concern

- management of public lands, recognizing the need for domestic sources of minerals, food, timber, and fiber
- payments to compensate states and local governments for the immunity of federal lands from state and local taxation

In addition to these general policies, BLM district managers have a certain amount of discretion in establishing specific policies in response to recommendations contained in the MFP. In effect, the selection of the MFP recommendations to be implemented and the degree of implementation are local BLM policy decisions. The establishment of these policies and their applications are major implementation techniques at the management level.

Lease Stipulations. Lease stipulations are BLM land-use restrictions or reclamation requirements for specific tracts of land being offered for lease. These stipulations may also include requirements for the reduction or elimination of environmental hazards or damage (as well as for rehabilitation) derived from the environmental analysis or impact statement.

Designation of Leasable Tracts. By designating the tracts to be leased and establishing leasing schedules, the BLM can control the location, timing, and rate of the leasing program under its jurisdiction.

Direct Control. The BLM has direct controls available for implementing the MFP recommendations. These include:

- Designation of special- or restrictive-use areas within the context of the MFP
- Withdrawal of entry and occupancy rights from specific surface and subsurface public lands
- Designation of areas and sites for specific uses (e.g., areas with special historical values, geologic features, snow and ice features, special habitat areas, coal resource areas, special livestock forage areas, special timber management areas, off-road vehicle areas, etc.). Special controls are designated for each of these areas in order to maintain or improve the special qualities of the area

- Withdrawl of locatable minerals from the public domain: The BLM can withdraw the public's right to explore and develop areas of locatable minerals
- Land-use planning: The BLM is responsible for developing land-use plans for public lands. The planning process designates allowable uses for specific areas of these public lands and can exclude certain uses
- Sales: The BLM has the authority to sell certain public lands that meet specified disposal criteria. Such sale or disposal removes the land from the BLM's control
- Withdrawals: In addition to the withdrawal of entry and occupancy rights to public lands, the BLM can withdraw an area of federal land from sale. The purpose of withdrawing these lands from sale, lease, or other use is to limit activities in order to maintain other public values in the area or to reserve the area for a particular public purpose or program
- Acquisitions: The BLM is authorized to acquire, by purchase, exchange, donation, or eminent domain, lands or interests consistent with BLM philosophy and with applicable land-use plans

Permits. BLM issues permits for the use of public lands and thereby exercises a form of control on their use. These permits include:

- Grazing permits: Issuance of grazing permits is part of the BLM's range management program and is an important implementation tool. These permits are given within the BLM's Allotment Management Plans (AMP), which provide specific plans for the management of livestock to meet certain range, watershed, wildlife, and aesthetic objectives
- Timber sales: The BLM's timber sales program is an implementation technique for the management of timber for sustained production and for improvement of the vigor and age distribution of the timber stands
- Right-of-way permits: The BLM is authorized to grant or renew right-of-way permits over, upon, under, or through public lands for specific purposes. The control of rights-of-way is an effective management and implementation tool for minimizing adverse environmental impacts on BLM lands
- Special-use permits: The BLM issues special-use permits for the temporary use of public lands
- Archaeological survey and excavation permits: The BLM issues permits for making archaeological surveys and excavations

- Crossing permits: The BLM issues permits to allow livestock to cross federal lands
- Prospecting permits: The BLM issues prospecting permits in areas where coal resource information is inadequate

Leases. One of the BLM's major implementation techniques is through its leasing program. This program includes the exploration for and extraction of coal, oil, and gas from lands under its jurisdiction. In addition, the BLM issues leases for geothermal activities and for the exploration for and extraction of sulfur, potash, sand, and gravel. By imposing conditions on the use of BLM lands to be leased, the BLM can exercise significant controls on these uses and can ensure that reclamation and other mitigating measures will reduce adverse environmental impacts. The bureau's position in imposing these safeguards has recently been strengthened by federal legislation designed to control strip mining in the United States. In addition, cooperative agreements have recently been signed between the Department of the Interior and the State of Montana. Under the terms of these agreements, the state will be principally responsible for the administration and enforcement of surface-coal-mine reclamation operations on federal coal leases within the state. This will improve the enforcement of these safeguards.

Interagency Review. The BLM's review of other agencies' plans and programs and the agencies' reviews of the BLM's proposed activities provide opportunities for coordination and joint implementation of programs handled by several agencies. This review process ensures that programs of different agencies are compatible. The A-95 review process* requires interagency review and comment to ensure that proposed plans and activities of federal, state, regional, and local agencies conform with adopted plans. A further requirement is compliance with the regulations of the Montana Environmental Policy Act (MEPA) and the National

*U.S. Office of Management and Budget (OMB) Circular A-95 requires interagency review of and comment on federal actions that could significantly affect the quality of the environment.

Environmental Policy Act (NEPA). Both acts require environmental impact reports before initiating a proposed action. (For example, the final environmental impact statement on the proposed operation of the East Decker and North Extension surface coal mines in southeastern Montana by the Decker Coal Company has recently been prepared by the U.S. Geological Survey and the Montana Department of State Lands.)

In addition to interagency review and comment, certain interagency coordinating agreements can be used as tools to meet mutual objectives of separate agencies. For example, Bureau of Reclamation water improvement projects can be coordinated so that the BLM can use the same projects to improve forage and grazing on national resource lands.

Provisions for Interagency Cooperation

Within the language of the MFP recommendations, there are a small number of explicit provisions for interagency coordination of land-use management; these are discussed below. Within the larger context of federal law and state-federal relations, several important coordination-cooperation arrangements appear to be influential in implementing the Decker-Birney MFP recommendations. Foremost among them are:

- The NEPA and OMB Circular A-95 both require interagency review and comment on major federal actions that could significantly affect the quality of the environment
- 1976 federal legislation adopting Montana surface-mining and reclamation regulations on federal coal leases in that state
- 1977 agreement between the federal government and the State of Montana, whereby the state agreed to enforce surface-mining and reclamation regulations on federal coal leases
- federal-state agreements transferring authority for regulatory functions to approved state agencies (such as the potential transfer of responsibility from the EPA to the Montana Department of Health and Environmental Sciences for administration of the National Pollution Discharge Elimination System permit program)

The Decker-Birney MFP recommendations contain eight provisions for interagency cooperation, most of which are nonspecific about location, timing, or means of implementation. The provisions are:

1. The BLM should encourage and work with local planning and zoning authorities to control and guide suburban growth and expansion.
2. The BLM should restrict conveyance of national resource lands to private ownership until such time as adequate planning and zoning ordinances have been enacted.
3. The BLM should use its land disposal and exchange functions to meet state and local government needs for land and to consolidate public lands for more effective management.
4. If appropriate, the BLM will dispose of certain national resource lands to the State of Montana in order to satisfy land entitlements granted to the state by the Statehood Act.
5. The management of deer range on BLM lands will be subject to the direction of the Montana Department of Fish and Game; the BLM commits itself to cooperate in this connection with its livestock grazing programs and agrees to allow the state to regulate the deer harvest in BLM lands.
6. The BLM agrees that all predator-control programs and activities are to be approved by the Montana Department of Fish and Game and the Bureau of Sports Fisheries and Wildlife.
7. Stocking of reservoirs with fish is to be coordinated with the Montana Department of Fish and Game and the Bureau of Sports Fisheries and Wildlife.
8. The BLM should encourage the appropriate state and federal agencies to monitor and control emissions from land uses that may be associated with air quality degradation.

Public Participation

In order to obtain the views of interested parties, all federal agencies are required by Executive Order 11514* to develop procedures to ensure the timely provision of the fullest practicable public information on federal plans and programs that could have an environmental impact.

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*Executive Order 11514, March 5, 1970, Section 2(b).

In order to meet this requirement, the BLM prepared a summary report of the resource study of December 1972 and mailed it to approximately 440 interested parties, with a request for their comments. Approximately 70 written responses were received. The respondents included the following groups: ranchers and the general public, mineral interests (private industries), federal agencies, professional groups, state agencies, universities, and county governments. In addition, five informal public meetings were held to discuss the material contained in the summaries. Forty-one persons attended these meetings and offered comments on the summary. Five additional written responses were received during this second review.

The Decker-Birney inventory and proposed recommendations were amended to reflect the comments received from interested parties, and a second summary was prepared and distributed in December 1973.

In August 1976, additional information was mailed to the persons and organizations on the Decker-Birney, Coalwood, and South Rosebud mailing lists. This material stated that although the initial planning efforts for these areas had been completed, several of the resource-use recommendations included in the initial summaries had been revised, and several of the planning recommendations that were presented in the Management Framework Plan had been adjusted. Further, ideas that had been generated from the public were now incorporated into the planning recommendations. This mailing indicated that complete planning documents were on file at the Miles City District office, where they were available for public review.

In addition to the process described above, interviews of residents of the area were conducted as part of socioeconomic studies done by the state and universities. Results of these interviews were available to the BLM staff.

Although BLM involved the general public from the outset of the project, the BLM public-participation procedures were generally based on a responsive mode; that is, the public was asked to respond to the proposed

resource recommendations rather than to participate in the formulation of these recommendations. In addition, the public was not given the opportunity to review the tradeoffs involved in the resolution of conflicts between the individual resource plans of MFP, Step 1, in order to develop the multiple-use recommendations of MFP, Step 2. The consequences of differing tradeoff combinations for energy production and for environmental protection are not discussed in the material that was furnished to the public.

In a broader sense, while the BLM manuals require public participation, they do not specifically identify when this participation should occur, and they neither prescribe nor suggest public participation techniques.* Public input should be secured during the data-gathering stage of URA, Step 4, and in the individual activity recommendations of MFP, Step 1. Alternative tradeoffs should be brought to the attention of the public, together with the potential consequences of each alternative. Public comments on the various alternatives should be used to shape and modify the final multiple-use recommendations of the MFP and should also be used for final decision making by the BLM district manager.

Environmental Protection Provided by the Decker-Birney MFP

The strip mining of coal in the Decker-Birney Planning Unit may cause extensive environmental changes. The Bureau of Land Management has the difficult task of analyzing both the national need for energy and the types and magnitudes of environmental impacts. The mining of all strippable coal reserves in the area would maximize the area's contribution to this nation's energy supply, but would cause major disruptions to the environmental quality of the Decker-Birney Planning Unit and the surrounding region. Conversely, a recommendation not to mine any of the strippable reserves would maintain the environmental quality of the region, but would contribute nothing to the improvement of the energy shortage.

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*1975 revisions to the BLM manual do address these issues.

The BLM has recognized this conflict and has initiated an extensive analysis of the Decker-Birney Planning Unit to determine what level of mining activity (and other resource development activities) can be implemented without causing unacceptable environmental disruptions. Although several of the area's resources may be utilized, mining the strippable coal resource is the major proposed action. The associated impacts of developing this resource overshadow the impacts associated with the possible development of the other resources.

The MFP presents two major recommendations that address the conflict between the development of the coal resource and the protection of the environment. The first recommendation states that 166,000 acres of primarily federal coal deposits should not be mined because of the magnitude of the resulting impacts. The second recommendation states that any future mining of federal coal should be confined to 119,000 acres of the strippable coal reserves. These two recommendations represent the BLM's compromise between mining all strippable coal reserves and minimizing environmental impacts. The BLM's rationale for these recommendations is that the 119,000 acres provide enough coal reserve to provide for the predicted requirements from the area and they will also have the least impact on other resources if developed. The BLM evaluated the significance of each resource in various areas of the planning unit and held a tradeoff session to determine which areas had significant environmental conflicts. This tradeoff session determined that mining in various areas, totaling 166,000 acres, would cause unacceptable environmental conflicts. The significant attributes of these 166,000 acres include:

- 55 wells
- 163 springs
- 233 reservoirs
- 7000 acres of cultivated land
- 151,000 acres of rangeland
- 47,000 animal-unit-months

- 60 ranch operations
- 102,000 acres of antelope habitat
- 24,000 acres of sage grouse habitat
- 22,000 acres of turkey habitat
- 165,000 acres of deer and sharptail grouse habitat
- 50 miles of county roads
- 3 historic battlefields
- 6820 acres of fossil areas
- 1000 campground visitor-days

The actual degree of environmental protection that will be provided by implementation of the MFP is difficult to assess since the MFP recommendations are not the final step in the planning process. These recommendations form the basis for the Activity Plans, which will describe in some detail the procedure for implementing the recommendations. If the MFP is to be a successful step in the BLM process of providing environmental protection, the MFP recommendations should:

- consider all of the major environmental resources
- provide for long-term maintenance of the resources
- be sufficiently detailed to guide the Activity Plans

The MFP for the Decker-Birney Planning Unit is more successful in satisfying the first two requirements than in satisfying the third requirement. The first requirement, concerning the consideration of all the major environmental resources, is accomplished in the basic format of the MFP. The MFP discusses seven major categories (land, minerals, timber, recreation, livestock forage, wildlife habitat, watershed) and has an eighth category, environmental enhancement and protection, that specifically addresses the issue of environmental quality and discusses some resources not included in the other seven categories. Among other subjects, these eight categories take into account archaeology, paleontology (fossils), historic values (battlefields), geological features (sandstone caves), air quality, cultural values, and aesthetic values.

The MFP also provides for long-term maintenance for most of the resources considered. Specific recommendations dealing with erosion control, water and air quality standards, and wildlife habitat were formulated to ensure that these values are not destroyed over the long-term, even when some short-term losses occur as a result of mineral extraction or other resource exploitation. Recommendations pertaining to socioeconomic values are minimal and do not clearly define long-term goals.

The recommendations must be presented in sufficient detail to guide the development of the Activity Plans. If the recommendations are vague or too general, the Activity Plans may not meet the objectives intended. The wildlife recommendations are particularly well presented. For example, the recommendation to maintain at least a 20-percent canopy cover for sage grouse (in those areas where this minimum exists), especially on ridges and swells where sage is between 10 and 14 inches in height, clearly states the objective and where it is to apply. From this information the appropriate Activity Plan can be developed. Other adequate recommendations call for "restriction," "control," or "maintenance" of various environmental qualities.

Recommendations to "consider" or "encourage" do not indicate the objectives for the resource in question specifically enough for acceptable Activity Plans to be prepared. An example of a poorly stated recommendation is the recommendation to "encourage investigations of feasibility of limited control structures on the lower reaches of some drainages." It is unclear whether the desired goal of this watershed recommendation is some number of control structures, just a determination of feasibility, an investigation, or merely some encouragement. Many of the recommendations that are unclear or too general pertain to the lands, watershed, and recreation categories. Much of the ambiguity can understandably be attributed to the lack of data needed to make specific recommendations. If these values are to be protected, however,

and if the MFP is a critical step in the BLM planning process, some decisions are needed concerning the actual recommendations to be made.

COMPATIBILITY WITH FEDERAL AND STATE ENVIRONMENTAL POLICIES

Summary of Policies

Federal. The National Environmental Policy Act of 1969 (NEPA) was enacted "to encourage productive and enjoyable harmony between man and his environment." The federal government recognized that such a national commitment would require all federal agencies to cooperate and coordinate their plans, functions, programs, and resources so that the nation could:

- fulfill the responsibilities of each generation as trustee of the environment for succeeding generations
- ensure for all Americans safe, healthful, productive, and aesthetically and culturally pleasing surroundings
- attain the widest range of beneficial uses of the environment without degradation, risk to health or safety, or other undesirable and unintended consequences
- preserve important historic, cultural, and natural aspects of our national heritage, and maintain, wherever possible, an environment that supports diversity and variety of individual choice
- achieve a balance between population and resource use that will permit high standards of living and a wide sharing of life's amenities
- enhance the quality of renewable resources and approach the maximum attainable recycling of depletable resources

To achieve these objectives, congress authorized and directed all federal agencies to:

- utilize a systematic, interdisciplinary approach that will ensure the integrated use of the natural and social sciences and the environmental-design arts in the planning and decision making that may have an impact on man's environment

- in consultation with the CEQ,* identify and develop methods and procedures that will ensure that presently unquantified environmental amenities and values may be given appropriate consideration in decision making, along with economic and technical considerations
- prepare environmental impact statements
- study, develop, and describe appropriate alternatives to recommended courses of action in any proposal that involves unresolved conflicts concerning alternative uses of available resources
- recognize the worldwide and long-range character of environmental problems
- make available to states, counties, municipalities, institutions, and individuals advice and information useful in restoring, maintaining, and enhancing the quality of the environment
- initiate and utilize ecological information in the planning and development of resource-oriented projects

In summary, this congressional act directs all federal agencies to include environmental considerations together with economic and technifactors in evaluating all major federal actions that might significantly affect the quality of the environment. These considerations should be presented in an environmental impact report that includes appropriate comments from federal, state, and local agencies, and from the public.

State. The State of Montana established similar legislation to provide environmental protection at the state level as described in the Montana Environmental Policy Act of 1971 (MEPA). This act was modeled after the federal act, and the wording of some sections, such as agency purpose, policy, and direction, is almost identical in the two acts.

Compatibility of the BLM Process with the NEPA and the MEPA

The BLM Planning System is a process that incorporates the objectives and federal directives of the NEPA into BLM planning procedures.

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*U.S. Council on Environmental Quality.

This system meets NEPA requirements by systematically considering seven types of resources as well as environmental components of the region. Socioeconomic, aesthetic, archaeological, paleontological, and historical factors are also included.

The Planning System incorporates all of these factors into a somewhat cumbersome series of procedures consisting of a Resource Inventory, Unit Resource Analysis, Planning Area Analysis, Management Framework Plan, Proposed Activity Plans, Environmental Analysis, and the final Activity Plans. The URA and MFP are further divided into four and three steps, respectively.

This Planning System meets NEPA requirements by virtue of the systematic, interdisciplinary approach; the attempt to balance national energy requirements against environmental impacts; the examination of alternative levels of resource exploitation and associated impacts; the utilization of quantified information, when possible, concerning socioeconomic, cultural, and ecological considerations; and the preparation of an environmental impact statement. The interaction of the BLM with other federal agencies, as well as with state and local agencies and other concerned groups or individuals, increases the compatibility of the BLM Planning System with the NEPA.

The Planning System is also compatible with the MEPA because its wording is nearly identical with that of the NEPA. Benefits to the people and environment of Montana are addressed frequently during various phases of the system because the people and the environment of Montana will be most directly affected by the impacts, especially in the vicinity of the Decker-Birney Planning Unit.

V

REGULATORY/INSTITUTIONAL FRAMEWORK

OVERVIEW OF LAND-USE MANAGEMENT IN THE DECKER-BIRNEY UNIT

Participants

This section identifies those governmental entities that participate in land-use management within and around the Decker-Birney Planning Unit. The discussion first focuses on those entities that can exercise direct controls over specific, identifiable jurisdictions within the planning unit. Second, it proceeds to those entities that indirectly affect land-use allocation within the planning unit through the regulation of specific activities or resources. The section concludes with a discussion of entities that exercise direct or indirect controls over land uses in the areas outside of but adjacent to the planning unit.

Direct Controls

Seven governmental entities are directly involved in land-use management in the Decker-Birney area, generally in a traditional landowner or police-power role.

Bureau of Land Management. The BLM exercises direct controls over national resource lands and the federal mineral estate in the area. It manages these resources under a multiple-use concept, which in effect strives to achieve a maximum level of economic benefit from land uses that are compatible with long-term stability of the resource base and with environmental protection goals. The BLM directly plans for and

controls land uses on the surface of natural resource lands; its control mechanisms on these lands include physical development, access regulation, leases, permits, and rights-of-way. Permitting specific uses on these lands is not done in accordance with a rigid, physical land-use plan, but rather under the guidance of a set of recommendations for prudent resource management (the MFP). In some cases, these recommendations have a spatial dimension and define types of development or limits to development in certain land areas; more often, however, the recommendations are free from locational reference and prescribe management practices in relation to individual resources.

The BLM also directly controls development of federal subsurface resources; of primary interest in the Decker-Birney area are strippable coal deposits. The management of these resources is subject to a more elaborate planning process (Energy Minerals Activity Recommendation System — EMARS), whose products are well-defined in terms of location, timing, and performance standards. Because most of the coal resource is located beneath private land, and because widespread surface mining is associated with land-use conversions on a very large scale (rapid urbanization, industrial and transportation development), the BLM is manifestly responsible for land-use allocation on nonfederal land surfaces. The extrajurisdictional land-use effects of surface mining are recognized by the BLM and embraced by the MFP recommendations. The MFP provides the local policy context within which EMARS decisions (the availability and end use of specific leasable tracts) are reached. The BLM directly controls subsurface resources by selecting tracts to be offered for lease; it indirectly controls the surface land uses associated with subsurface development by controlling the location of mining and directly by lease stipulations.

U.S. Forest Service. The U.S. Forest Service exercises land-use management of the surface of national forest lands. Strippable coal deposits

beneath Forest Service lands are the responsibility of the BLM, although their management is coordinated with the surface-use policies of the Forest Service. The Forest Service is engaged in multiple-land-use planning; the products of the planning process are definitive with respect to location and specific resources. Individual land-use plans in the planning area are vertically integrated with those of the Forest division, the individual National forest, and the federal region. Land uses are allocated with specific-use permits issued in accordance with small-area land-use plans.

State of Montana. The State of Montana is ultimately responsible for land-use allocations on private and state-owned land. Through the Montana Economic Land Development Act, the state seeks to classify these lands for specific uses or combinations of uses. Eventually, implementation of MELDA will result in a statewide land-use plan, which will promote state land-use objectives, but which will be enforceable at the local level. MELDA does not specify a planning approach, but Montana's land-use objectives are clearly stated and reflected in the state's enforcement mechanisms. Land classification is the privilege of individual counties and may be accomplished through planning methodologies of variable refinement. Lands that are not classified by the county will be classified by the state, presumably in relation to their present use and in accordance with MELDA policy directives. State and county land-use plans are enforceable at the state level through taxation. Proponents whose land-use plans conform to adopted classifications and advance state land-use policy (e.g., increasing density and land-use intensity in an urban area or long-term agricultural dedications in rural areas) are rewarded with preferential assessments and tax exemptions. Conversely, land uses that contravene state policy and are at variance with classifications are tax-penalized.

In addition to its comprehensive land-management-through-tax-classification powers, the state also directly regulates certain land

uses, such as power plants that are built on nonfederal lands. No planning is specifically associated with this responsibility, but regulated uses presumably will be evaluated with respect to state and local plans and land classifications. The enforcement mechanism here is a certificate of compatibility and necessity.

The state also controls the waters and shoreline of the Tongue River Reservoir. This facility is intended to enhance agricultural productivity in the area, so it is managed for reliability of supply and maintenance of environmental and water quality. Controls over this resource include regulation of access and regulation of water use.

Big Horn, Rosebud, and Powder River Counties. These three counties are empowered to develop and enforce land-use plans on private lands in the Decker-Birney Planning Unit. The land-use plans that they adopt may be accepted as land classifications for the taxation purposes described above. Their land-use plans may also be enforced through zoning ordinances, which serve as the local counterpart to the state's tax-based, land-use-policy enforcement mechanism. Zoning variances or special-use permits may be granted by the counties, but unless the land uses in question support state land-use policy, county action will not result in a change in tax status. County zoning is enforceable through police power.

Indirect Controls

Several governmental entities exercise control over certain functions or resources without regard to specific location. While these agencies do not have explicit land-management responsibilities, their actions are influential in allocating land for different uses.

Army Corps of Engineers. The COE regulates impoundments, diversions, and channel modifications in navigable waterways. Thus, for example,

on- or off-channel impoundments of Tongue River water for agricultural or industrial purposes require a permit from the Corps.

U.S. Environmental Protection Agency. The EPA indirectly affects land-use decisions through the designation of air-quality regions, the issuance of permits for airborne and liquid wastes, and the administration of federal funds for environmental improvement projects (mainly wastewater treatment).

State of Montana. The state issues environmental permits for most industrial facilities, in addition to regulating certain land uses, described above. In addition, by agreement with the federal government, the state regulates the conduct of surface mining and reclamation operations on federal lands. While advance planning is neither required nor implied by their authority, the power to approve or deny permits and to modify industrial development plans can significantly affect the pattern of land uses in the Decker-Birney area.

Yellowstone-Tongue Areawide Planning Organization. The YTAPO is directly responsible for regional water-quality management planning. The agency conducts resource inventories and analyses related to water quality, prepares wastewater management and pollution-control plans for adoption by constituent local governments, and prepares recommendations for environmental-quality protection and enhancement for consideration by local, state, and federal government agencies. The YTAPO does not issue permits, but its findings have significant, if not controlling, influence on the permitting and funding decisions of other government bodies.

Federal and State Courts. The judicial systems of both the federal and state governments have a pervasive but unheralded influence on land

uses, particularly in a multijurisdictional, energy-impact area like the Decker-Birney unit. Judicial interpretations on such issues as surface-subsurface conflicts, governmental preemption, or aboriginal water rights can change the ground rules upon which development plans are based. While it is not traditional for courts to intervene in the legitimate planning function of other branches or units of government, they can issue interpretations that affect the ability to implement established plans and policies.

External Controls

The management of land uses adjacent to the Decker-Birney unit can materially affect the suitability and implementability of land-use plans within the planning area. Notable exogenous influences are the land-management activities of the Crow and Northern Cheyenne Indians and the State of Wyoming. Each of these entities has comprehensive land-use-control authority over its jurisdiction. Using enforceable plans, ordinances, permits, and regulatory powers, they can allocate land uses that satisfy policies and objectives developed independently from the planning processes of the Decker-Birney area. Thus, for example, an Indian decision to permit surface mining and associated industrialization and water use on land adjacent to the Decker-Birney unit can seriously affect the implementability of state or BLM plans for wildlife or watershed management within the Decker-Birney unit.

Classification of Management Systems

As discussed in the previous sections, a number of governmental entities are engaged in planning, regulating, or otherwise managing land uses, and the approach to land-use management varies from agency to agency. No single central agency takes responsibility for all land-use decisions made in the area, and no agency takes sole responsibility for coordinating the functions and decisions of other agencies. The allocation of land for various uses in the Decker-Birney area will depend on a

relatively complex and highly interrelated system of independent decision-making bodies. This section describes how the components of this multijurisdictional setting might interact in the future and how certain aspects of their interaction could influence the likelihood of implementing the BLM's MFP recommendations.

The absence of widespread and intensive mineral development in the region makes it difficult to imagine whether the variety of planning and management approaches by many separate agencies prefigures an orderly pattern of equitable and environmentally sound development or chaos. The complexity of this multijurisdictional setting may be approached by classifying the approaches of separate agencies into groups of similar management systems. Such a grouping is useful for identifying similar, duplicative, or conflicting roles and for pointing out apparent regulatory or administrative voids. Then, in relation to this grouping, the activities of individual agencies can be characterized as isolated, parallel, redundant, or opposing. Three types of land management systems are discussed:

- comprehensive planning and management of defined, continuous jurisdictions
- regulation of specific lands and resources
- regulation of specific land uses

Comprehensive Management Systems. The comprehensive land-management concept is used here in reference to a system of planning, control, and enforcement of all land uses within a defined and relatively continuous jurisdictions. Typically, the management function has its basis in a jurisdiction-wide, land-use-planning process. Individual land-use decisions are either implicitly regulated by advance allocation of areas for specific uses (such as zoning) or are explicitly regulated by specific-use permits, variances, or plan amendments. The comprehensive management systems in and around the Decker-Birney area are:

- the State of Montana single-tax land classifications
- countywide zoning (Rosebud, Powder River, and Big Horn counties)
- U.S. Forest Service land-use planning in the Ashland Division of Custer National Forest
- ordinance making and land-use regulation powers of the Crow and Northern Cheyenne Indian reservations

Only the state land classifications and Forest Service planning system are currently in operation. The other agencies are empowered to control all land uses in their jurisdictions, and all have made some moves in that direction. The jurisdictions of the State of Montana and of the three counties do not include federal lands, but are relatively continuous and surround the federal out-parcels. The state jurisdiction is mainly conterminous with that of the three counties, but specifically includes state-owned land that is not subject to county control. The state's land classifications are supposed to derive from the county level, and any adopted county land-use plans are supposed to be incorporated into the statewide classification program. In the absence of county activity, the state classifies all lands. State land classifications are enforceable at the state level through a program of tax sanctions; reclassification (analogous to a zoning variance) incurs a tax penalty unless it is associated with a county plan amendment and complies with state classification objectives. State classifications derived from county plans are enforceable at the local level through zoning or specific-use permits. State classifications in inactive counties may be adopted at the local level and enforced as described above. One method of county land-use management that has received some attention in Powder River County is classification of the entire county as agricultural land, adoption of that state classification as a single-district zoning map, and regulation of all uses through specific-use permits. (Surface-mining permits require a performance contract with the county government — an unusual and highly focused application of contract zoning).

The state and county land-use-regulation powers do not usually extend to subsurface resources, unless they are owned by state or private interests. In the Decker-Birney area, most of the mineral estate is federally owned. Where land under state and county jurisdiction is underlain by federal minerals, land surface development in connection with mineral development is subject to control through state and local enforcement mechanisms. It is intended that the interagency coordinative aspects of the BLM-planning process and of EMARS will make it possible to resolve in advance the opposing land-use decisions of federal and other agencies; it is unclear how unresolved, opposing land-use decisions will be treated.

Aside from boundary disputes (as in contiguous cities with conflicting land-use plans), there is little opportunity for direct conflict among comprehensive land management systems, where their jurisdictions are discrete. Thus, for example, it is unlikely that a county zoning plan would seriously conflict with the implementation of land-use plans in Custer National Forest. Conflict is more likely where the jurisdictions overlap. The most notable jurisdictional overlaps are between the state and its counties, and between surface and subsurface jurisdictions (state and county versus federal). The state and county management systems are intended to be complementary, with the counties participating in the formulation of statewide classifications. However, once the land classifications are adopted, any county-initiated modifications are subject to state review and approval. The state has developed explicit objectives and criteria that must be met by any proposed reclassification. If local, land-use-management objectives (which are mutable) are not closely aligned with the state's objectives (which are cast in statutory language), there is a potential for state-county conflict over subsequent, proposed land reclassifications. The state has a clear, constitutional advantage over the counties in matters of legal dispute, and presumably the state would prevail in a land-classification conflict.

The land management system of the Forest Service is based on a land-use-planning process and is enforced through special-use permits. While coal development on Forest Service lands is administered by another agency (BLM), the Forest Service has significant influence in deciding which coal deposits will be produced and has absolute control over surface land uses that are ancillary to coal development.

The two Indian reservations abutting the Decker-Birney area are semiautonomous jurisdictions. The Indian nations have ordinance-making power and in this regard are similar in their land-management capabilities to an incorporated city or a county government. The Crow nation has tentatively adopted a land-use zoning ordinance enforceable with tribal police power. Full utilization of this ordinance implies a tribal land-use-planning function and an administrative structure for permits, compliances, and appeals.

Regulation of Specific Lands and Resources. This type of management system is distinguished from the comprehensive approach by its limited scope and the geographic discontinuity of its jurisdiction. In the Decker-Birney area, the one agency in this classification is the BLM. Strictly speaking, the BLM jurisdiction is limited to the national resource lands (9 percent of the Decker-Birney surface area) and the federal mineral estate (88 percent of the subsurface). The national resource lands are dispersed and consist mainly of small, relatively isolated parcels. Although the BLM regulates land uses in all of these parcels through a permit system, the geographic discontinuity of the land surface makes this management approach responsive rather than prescriptive, and limits the effectiveness of NRL management in meeting broader BLM land-use objectives. The federal mineral estate, on the other hand, is more or less continuous throughout most of the Decker-Birney area, and the BLM can control the location, timing, and means of its development. The coal resource has been the subject of intensive planning and farsighted study; nevertheless, the BLM is not in a position

to manage all of the land area that will be associated with coal development. It can control the use and restoration of the land surface at the site of a surface mine, and the decision about where the mines will be goes a long way towards determining future land-use patterns in the area. It should be remembered, though, that the BLM's control of nonfederal surface land through leasing can be partially or completely abrogated by the decisions of other governmental bodies. This is to say that while there is no question that the BLM can make the decision about where coal development will take place, the issue of whether its decision is the most effective one depends to a great extent on the decisions of other governmental units.

More important, perhaps, is the subject of the BLM's influence on nonmining land uses. The greatest land-use changes in the area are not likely to be strip mines themselves, but rather the new urban areas, transportation systems, industrial facilities, and related support systems that attend mineral development. All these changes will take place on the land surface, which is largely controlled or controllable by governmental entities other than the BLM. In deciding which portions of the federal coal resource would be included in the MFP's mineral recommendations, the BLM went to great lengths to determine the resource base and land-use capabilities of lands mostly outside of their jurisdiction. The recommended mineral areas were selected on the basis of the BLM's judgment that other (nonrecommended) coal resource areas should be managed for other uses, and in the course of making these judgments, the BLM identified what the other uses should be. This was not presumption, but rather a case of making the best of their jurisdictional deficiencies by simulating a comprehensive land-management system.

The fact remains, however, that the BLM's management capability is not comprehensive, and that decisions regarding most major, new land-use allocations will be made by others. At the time the MFP was prepared, only one of the agencies endowed with comprehensive land-management

authority (the Forest Service) was engaged in that activity. This situation has changed appreciably in the meantime, and as development of the coal resource looms closer, it can be expected that the latent regulatory capabilities of state, local, and Indian agencies will be more fully developed. When large-scale coal development begins in earnest, these other agencies may have adopted plans or other regulatory devices that will seriously affect the applicability and implementation of the MFP recommendations.

Regulation of Specific Land Uses. The most common land-management approach in the Decker-Birney area is the regulation of individual land uses, generally through a permit procedure. Governments and agencies with regulatory power are: the State of Montana (in its industrial siting function), county governments (in their specific regulation of surface mining), and an impressive number of federal agencies, such as the Environmental Protection Agency, the Federal Power Commission, the Bureau of Reclamation, and the Army Corps of Engineers. The specific-use-regulation approach to land management does not usually include planning, although compliance or compatability with local plans is often a prerequisite to permit issuance. This management approach generally has its basis in a set of standards or criteria, which are rarely developed with local or regional objectives in mind. A single facility, such as a power plant, may require multiple permits and must usually respond to different and even conflicting standards and criteria. In jurisdictions that do not have comprehensive land-management systems in operation, i.e., where there is a regulatory vacuum, this building-permit approach to land management can have devastating effects on a jurisdiction's pattern of development, since each major land use is considered in isolation and without the benefit of an area-wide policy context. In jurisdictions that have strong, comprehensive land-management systems, the regulation of specific uses is often redundant in terms of land-use planning, but useful in terms of environmental protection. If

the state, local, and Indian comprehensive land management systems were not seen to be emergent in the Decker-Birney area, there would be reason for concern over the specific-use permit approach to land management. In the context of strengthened state and local planning and management, the specific-use approach provides a valuable additional opportunity for environmental protection and for increased public-policy input to land-use decisions.

IMPLEMENTATION OF THE BLM's MFP GUIDELINES IN THE DECKER-BIRNEY AREA

Implementation Mechanisms

The management systems described above serve as mechanisms that are available to implement the MFP recommendations and to enhance environmental quality in the Decker-Birney area. The following is a review of these mechanisms and the types of controls that they include.

Montana Economic Land Development Act (MELDA). This act has the following goals:

1. *To protect prime agricultural land as it is the backbone of today's Montana economy and the heart of tomorrow's need for a well-fed and healthy economy, keeping Montana's position, in the future, as the breadbasket of the nation;*
2. *To encourage urban growth in an inward pattern, rather than a sprawl development, yet through the use of open space provide a greater percentage of open land and a higher density on the developed lands than the urban area;*
3. *To guide industrial and commercial development in Montana;*
4. *To develop a program which is controlled and directed on a local level, with the actual land use direction and classification left wherever possible with the local land owner; and*
5. *In general, to provide for Montana a land use directional policy which will not regulate our future but rather motivate it into a pattern of desirable economic growth based on the development of private enterprise.**

*The Montana Economic Land Development Act, EN.84-7501, Section 1, Chapter 549, L.1975.

This act develops a land classification system for all of the land within the state, using the following categories: agricultural, recreational, residential, commercial, industrial, and open space. Once the land has been classified, it is managed by the governing body to encourage its continued use in that classification.

This management system utilizes tax incentives for those who comply and tax penalties for those who do not comply with the land uses specified in the classification system. Incentives are in the form of tax reductions for the period of time during which the land is dedicated to the specified use. This management system also includes tax incentives and penalties for the location of specified uses and their densities. This system is, in effect, a highly effective, statewide, land-use management system.

Countywide Zoning. Countywide zoning within the Decker-Birney area has not proven to be an effective tool for implementing the MFP recommendations and enhancing environmental quality. For example, under this system, surface mining would be considered a special use and would require a special-use permit. The discretion of policy makers in granting these special-use permits for surface mining provides the potential for a form of "spot" zoning by contract.

Comprehensive Management of Exempted Jurisdictions. Lands belonging to the Indian nations and national forest lands are exempted from the land use management systems of other public agencies.

Indian Lands. The Indian lands are regulated by their autonomous governments, which regulate property within tribal jurisdictions. The Indians' right of self-government has been consistently protected by the courts and has gone through several periods of organization by treaty and legislation. In relation to the implementation of the MFP recommendations and the enhancement of environmental quality, the Indian nations prepare their own land-use plans and implementation ordinances.

In addition, in leasing their lands to the mining companies, the Indians can put certain restrictions into the leases, thereby controlling land use activities within their lands.

U.S. Forest Service. The U.S. Forest Service is responsible for:

- management, protection, and development of the national forests and national grasslands
- cooperation with state and private forest owners, wood processors, and public agencies to improve and extend the nation's forest resources
- research needed for the above and for forest and rangelands in general

The Forest Service's planning system involves a series of steps beginning with the identification of national needs and objectives and ending with plans for managing specific units of land for specific purposes. This planning system includes national environmental programs and budgets, area and regional guides, land-use plans for national forests, and plans for units of lands smaller in size than a national forest. Under this planning system specific land-use plans are developed in order to manage National forest lands in a manner consistent with its objectives and guidelines. This planning and management system is an effective mechanism for the development of land-use plans and controls on national forest lands.

BLM Regulations of Specific Lands and Resources. The BLM's jurisdiction over the surface of national resource lands and over the federal mineral estate provides the BLM with effective and strong mechanisms for implementing the MFP recommendations in a manner that will enhance the environmental quality of these lands.

Regulation of Specific Uses

Various public agencies, such as the State of Montana, local counties, and federal agencies (including the Environmental Protection Agency, the

Federal Power Commission), have the authority to regulate specific uses within the Decker-Birney area. This authority can be used effectively to implement the MFP recommendations for the Decker-Birney area. The agencies and the uses that they are authorized to regulate are:

State of Montana. The state regulates surface mining and the location of energy facilities. In addition, the state generally regulates these activities, some also being controlled by local agencies:

- building codes and restrictions
- zoning
- fire inspection
- water pollution and sewage
- water use and supply
- geophysical exploration
- agriculture
- transportation
- commercial and industrial uses
- food processing and service
- hunting and wildlife
- lodging and camping
- natural resource development
- road use and fuels
- solid and hazardous wastes
- subdivisions
- utilities
- weather modifications

In addition to the above, the state has special land use and activity restrictions for activities to be located in these special areas:

- airport zones
- antiquity sites
- conservation districts
- floodways or floodplains

- forest areas
- highway rights-of-way
- lake shores
- open space and natural areas
- stream beds, stream banks, and wetlands

Counties. Within the context of the Decker-Birney MFP, the counties could regulate surface-mining activities.

U.S. Environmental Protection Agency. The EPA regulates air and water quality and establishes standards for these functional areas.

Federal Power Commission. The FPC regulates the location of power plants and transmission lines.

U.S. Bureau of Reclamation. BuRec regulates water improvements for irrigation and power, except where this is done by state agencies.

Army Corps of Engineers. The Corps is responsible for navigable waterways, and it regulates water improvements, channel modifications, and flood control operations for reservoirs on navigable streams.

KEY ISSUES AFFECTING IMPLEMENTATION OF THE MFP RECOMMENDATIONS

A number of major issues will affect the implementation of the MFP recommendations. These include:

- governmental preemption and the problem of dealing with conflicting or inconsistent regulations at the local, state, and federal levels
- property rights — surface and subsurface ownership conflicts
- Indian water rights — local needs versus mining needs
- Indian land-use powers — local powers versus national energy needs

- litigation — the role of the courts in relation to the MFP recommendations

Each of these issues is discussed below.

Governmental Preemption

A major problem affecting the implementation of the MFP recommendations is dealing with conflicting or inconsistent regulations at the local, state, and federal levels. For example, the federal government may institute a program to regulate mining procedures, and state or local authorities may supplement this program by enacting their own, more rigorous programs. The state or local programs may go far beyond the scope of the regulations envisioned by the federal government. The implied or direct powers of the local authorities to regulate an activity may have a substantive rather than a procedural effect. The mining industry may challenge these more rigorous local restrictions as being prejudicial to their industry by minimizing effective production, interfering with interstate commerce, or causing an unconstitutional preemption of state-to-local, federal-to-state, or federal-to-local statutory authority.

Montana provides a good example of the problems of articulating conflicting interests under the federal system. Because of the similarities among and the urgency of federal, state, and local interests in fostering multilevel land and resource control and because of the difficulty in ascertaining when some of these controls have progressed from supplemental to conflicting interests, the chances are great that the courts will soon act on several landmark cases to decide the proper limits of federal, state, and local interests.

Environmental protection is one area in which many conflicts are expected. The federal government has already established certain criteria in this area.* It has also specifically allowed the state to

*Nationwide strip-mining reclamation regulations were promulgated by Secretary of the Interior Thomas Kleppe in June 1976. The BLM's MFP for the Decker-Birney unit also includes a number of standards for environmental protection.

regulate the use of its environment and the mining industry. Such state regulations may go beyond the control the federal government had envisioned giving to the state; the legislative history of these federal acts must be studied to determine if this is the case. The national importance of the coal industry in the United States will be considered in the court's decision and in future legislation in the Congress. The urgent demand for energy in the U.S. may be considered as conflicting with the effective environmental protection of energy-resource areas and may suggest that less prohibitory standards be adopted for the mining industry. In other words, some policy standards developed or recognized by the judiciary or Congress might be used to weigh the variations between national welfare and local welfare in determining priorities.

The question of which level of government has the power to regulate a specific activity arises with increasing frequency in federal-state-local conflicts; the difficulty in determining the autonomy of one level of government from the others is the core of a problem that will face mining operators. No clear-cut establishment of judicial rulings on preemptory governmental authority in such matters can be found. The courts will probably look to the stated and implied objectives of higher statutory authority, the objectives of the conflicting authority, and the effects that these conflicts could have. The key question for this project is whether the Montana laws will be viewed by the courts as supplemental to federal law and consistent with the scope of any federal enabling act, or whether they will be viewed as preempting the power of the federal government and thus interfering with interstate commerce.

Local control of land use is different from the outright control of the environment by state law. Local control involves the exercise of local governmental authority through the enactment of zoning ordinances, which may exert a direct control over the mining industry. In order to invalidate a zoning ordinance, a property owner must do more than place the validity of the ordinance in doubt; he must show that the ordinance

has no relation to the public health, safety, morals, or general welfare of his community or that it imposes a specific and unreasonable hardship on him or her. Since there is no set formula to determine where regulations end and where property rights begin, any antizoning argument must emphasize the unreasonableness or confiscatory nature of a zoning restriction — not simply its vague impact on people's living arrangements or on town growth patterns. The courts will weigh the benefit to the community against the detriment to the individual or industry that the ordinance affects.

Points that the courts have considered in weighing zoning provisions that regulate mining are the temporary nature of the mining use, the economic value of the property to the plaintiff (the homeowner or rancher), the previous condition of the land, the distance from the mine to developed areas ("not within 1500 feet of a dwelling" has been used as a criterion for mining activities), and the proximity of the land to preexisting operating mines. These criteria have been used against zoning ordinances in Illinois and Kentucky to uphold strip-mining activities in areas that are more heavily populated than Montana. If the courts base their decisions solely on the local zoning issue, the surface-mine operators could well overturn a local zoning ordinance in the sparsely populated, relatively unurbanized areas of proposed operation.

A local government may not have the power to regulate mining operations that take place within municipal boundaries if the industry is considered by the courts to be a state rather than a municipal concern. In addition, the language of a state statute that regulates strip-mining activities may give exclusive jurisdiction over all coal mining operations to the state or to a state administrative body.

In deciding local zoning disputes, the courts may consider the economic effects on the property owner and the community, as well as the physical effects of strip mining on the specific parcel of land in question. The courts may also consider the aesthetic effects of strip

mining. Courts generally have held that aesthetic considerations alone are not a sufficient basis for upholding a zoning ordinance. This view, however, is being undermined by decisions that consider aesthetics such an important factor that it alone justifies the zoning. This is probably due to the courts' increasing awareness of the impact of mining on the environment.

Surface and Subsurface Property Rights

In Montana and other western states, a large portion of the strippable coal has been severed from the surface, either by reservation or grant, in a manner that has left most agricultural surface owners with no ownership of the coal under their lands. The vast majority of mineral rights affected by this severance are retained by the federal government, although mineral rights are also retained by the State of Montana, Indian tribes, and some individuals.

The issue of the owner of a severed subsurface estate using the surface for the purpose of strip mining and conducting associated activities to the detriment of the surface owner has been questioned. First, the doctrine of the mineral estate does not take precedence over the surface estate and, second, the emergence of state and federal legislation that requires environmental and operational planning and protection makes it extremely important for lessees to have complete access to the surface areas.

To ensure protection for the owners of surface land and other interested parties in a mining area, the Montana Strip Mining and Reclamation Act of 1975* requires that a plan be submitted to state authorities showing the location of the proposed mine, access to the area, and the names and addresses of the owners of record of (1) the affected

*Section 10-1039(2).

surface area, (2) the area within one-half mile of the affected area, and (3) all subsurface minerals in the lands in question. Furthermore, written permission must be given by the surface owner before any surface disturbance (e.g., road building) is made.*

The complex property-ownership pattern of southeastern Montana is characterized by multiple surface ownership by federal, state, and Indian-nation owners, as well as by some individual owners. An equally varied subsurface-ownership pattern exists with mineral rights, which are mostly controlled by the federal government and Indian nations.

Starting with the Homestead Act of 1862, and through succeeding acts, the federal government granted parcels of land to anyone willing to work them. The original grants gave to settlers the surface and mineral rights to the land, but the federal government eventually began to reserve the coal and other minerals. The result is that there is a scattered surface-ownership pattern in the homesteaded areas, with the federal government controlling the right to mine the coal and other minerals on land for which it has no surface rights. The federal government has recognized the rights of the Indians to the minerals on their reservations by express treaties and has granted ownership of mineral rights in certain areas of Montana to the state and to the railroads. This scattered ownership pattern complicates coal operations in various ways. A reasonably large contiguous area is required to make mining economically feasible. This would require combining rights to enough land with adequate coal reserves to support a mining unit and obtaining the necessary rights-of-way. The problem of costly litigation and injunctions against proceeding with the mining operations can be avoided by leasing or purchasing the surface parcels within the area of operations.

Leasing requirements with the Indian nations have been considerably simplified by a recent Supreme Court decision. Under the Northern Cheyenne Allotment Act of June 3, 1926, members of the Cheyenne tribe were allotted lands for individual ownership and given vested rights to

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*Sections 15-1302, 15-1303.

the minerals, the ownership of which was to vest in June 1976. In the Northern Cheyenne Tribe vs. William Hollowbreast, et al., No. 75-145, May 19, 1976, the Supreme Court ruled that the act of July 24, 1968, 82 Stat. 424, which terminated the grant to allottees and reserved the mineral rights in perpetuity for the benefit of the tribe, was constitutional and did not constitute a taking of property without due process of the law. This gives the tribe the sole bargaining and leasing power of the area; this is easier to deal with than several hundred separate owners.

Two methods for obtaining the surface rights needed for coal mining are purchase and surface leases. A surface lease is a contractual arrangement between the owner of the coal, or someone with an interest in the coal, and a lessee who wants to mine the lessor's coal. The lease should give the lessee the right to explore the lands for coal and the right to extract coal from the premises. If coal is to be extracted by strip mining, it is absolutely essential that the lessee obtain as a part of the lease broad rights to use the surface of the leased lands, roads, and water sources. A lease may authorize disruption of the lessor's groundwater supplies and thereby protect the lessee from a claim for such disruption occurring beyond the actual mine site.* A lessor may require the lessee, in a lease of this magnitude, to be responsible for any disruption occurring beyond the actual mine site.

Many firms have attempted to acquire surface rights by the outright purchase of lands overlying coal deposits. The contract should specify that the lands are purchased for the purpose of strip mining of coal and conducting other activities pertaining to strip mining; both activities should be explained. If the parties decide to lease the land back to the seller to farm until it is needed for mining operations, Montana imposes a 10-year limitation on agricultural leases.

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*Such a claim would be pursuant to Montana Rev. Code Ann. 50-1055 (Supp. 1974).

The coal-bed owner who has surface rights has the right to remove as much of the overlying stratum of the leased surface as is necessary to work the coal and the right to use space to transport the coal, but the mining operations are still subject to the state or federal regulations concerning environmental protection and reclamation. If specified protection conditions cannot be met, the BLM district manager or the state agency official may restrict or prohibit operations on any part of the area covered by the permit or lease. An exploration plan and a mining plan providing for the protection of the area must be filed by the operator and must be approved by the BLM district manager before beginning mining or surface-disturbing exploration activities. Under certain circumstances, such as when the surface is owned by the state and is subject to state law but the subsurface area is federally owned, or when scattered and mixed ownership patterns cause overlap in the jurisdictions in control, both federal and state rules could apply.

Indian Water Rights

The problem of Indian water rights is one component of the conflict of rights in the area. In southeastern Montana, water is necessary for surface mining operations, power generation, irrigation, watering of livestock, and recreation. The effects of the operation of surface mines in this area will depend on the mines' proximity to water and the amount of water used on the Indian lands.

When the federal government creates a national forest or an Indian reservation, it reserves sufficient water to serve the needs of the area of the grant. Under treaties between the U.S. and the Indians, the right to the use of water was reserved for the Indians, at least to the extent necessary to irrigate and use these lands. These rights continue to exist against the U.S. and its grantees as well as against the state and its grantees. This theory of reserved rights, known as the Winters Doctrine,* holds in essence that when Indian or other federal reservations

*After Winters vs. the U.S., 207 U.S. 564 (1908).

are established from the public domain, water rights sufficient to fulfill the needs or purposes of the reservation are reserved from sources that traverse, underlie, or border upon the reservation to the extent necessary to support the proposed activities on the reservation. The priority of this right extends from the date of the reservation or, in the case of the Indian reservations, since time immemorial. Unlike appropriative rights, reserved rights may exist although no water is beneficially used. For example, if a stream provides only water enough to meet the needs of the Indians, the Indians are entitled to the entire amount. Also, surface flows of many streams depend on full or near-full underground aquifers that connect with the surface flows; any use of these reserves, whether on or off the reservation, that prevents the Indians' use of water to meet their needs will not be allowed.

The Indians in the area control large (but hard to quantify) amounts of water. This could cause difficulties for mining operations in planning potential resource development and in calculating the related costs. Estimates will have to be made of the quantity of water to be used at the surface mining sites, of the approximate water needs of the Indians, and of how the former will affect the latter. The rate of increase in Indian water use could be assumed over the length of the lease to ensure a margin of safety for continued mining operations.

The rights of the landowners who share a common groundwater source with an Indian reservation are also affected by whether the land on which the mining operations are to take place is land leased from the Indians. If so, the land is still subject to control by the tribe. While lessees of land situated within an Indian reservation are allowed to divert as much of the water flowing through a reservation as their predecessors in interest, the lessees are not permitted to use more than that prescribed amount. After meeting the reservation's needs, and after allowing enough water for irrigation, the tribe is responsible for allocating or leasing remaining rights. This could create problems if

all the other land uses (industry, mining, or recreation) could not operate with the remaining water; however, the mine operators now appear to be the sole lessees of the leased lands. Additionally, the leases with the Indians could specify that the needs of the mining operations must be met before those of any other consumer and that no thermal discharge or pollution of any stream would result in any compensation to any other lessee.

If the mining lands are adjacent to the Indian reservation, the streams may be used and the groundwater tapped only to the extent of the basin's safe yield and pursuant to state law. As time passes and the Indians or the federal government put these waters to use, claims made under state law that have low priorities will be reduced to the difference between the safe yield and the amount pumped by the Indians or the federal government. State law, in this case, will determine the priorities between the non-Indians or nonfederal water users and allocate any remaining amounts of water among them. If the state does not deal with this type of problem in a manner that is fair to the Indians, or if conflicts develop, the Secretary of the Interior may intervene to ensure the just and equal distribution of irrigation water to the Indians.

It is apparent that the use of water for mining operations will have some effect on the Indians' use of their land. If the mining operations are upstream from the Indian reservation or if drawing water from a basin affects the streams flowing into the reservation, the effects will be pronounced. How the thermal discharges will affect the area — how they will interfere with the Indians' use of the area and with irrigation of their lands — is one of the principal uncertainties that the mine operators will have to deal with. If there appears to be a conflict between the Indians and the mining operators over the water, the courts can quantify the amount of water that the Indians would otherwise have used and investigate the possibilities of tapping other on-reservation water sources to compensate for the loss from the polluted areas.

In summary, an analysis must be made concerning the lands the operator will use. If the lands are leased from the Indians, additional payments will probably have to be made on waters used beyond what would be used for irrigation purposes. (This issue has never been before the courts, but the tone of recent Supreme Court decisions has been definitely pro-Indian.) Also, regardless of the classification of the land, care must be taken to meet the needs of the Indians for the duration of the lease. This would require, among other things, careful analysis of water use at the proposed mining sites and the effect of the thermal discharges on the Indians' water use. It will also have to be determined if there are any alternative on-reservation sources that the Indians could use to satisfy their needs.

Indian Land-Use Powers

The General Leasing Act of August 9, 1955, provides, among other things that:

> *Any restricted Indian lands, whether tribally or individually owned, may be leased by the Indian owners, with the approval of the Secretary of the Interior, for public, religious, educational, recreational, residential, or business purposes, including the development or utilization of natural resources in connection with operations under such leases, for grazing purposes, and for those farming purposes which require the making of a substantial investment in the improvement of the land for the production of specialized crops as determined by said Secretary. All leases so granted shall be for a term of not to exceed twenty-five years, excepting leases for grazing purposes, which shall be for a term of not to exceed ten years.*

The act exemplifies the Indians' right of self-government, which has been consistently protected by the courts and which has gone through several periods of organization by treaty and legislation. Congress has been occupied with more pressing national affairs, and the states have been precluded from exercising powers of government in connection with Indian affairs. The result has been that government control is exerted by the Indians themselves or by the officials of the Department of the Interior.

The course of judicial decisions on the nature of Indian tribal powers has been marked by adherence to three fundamental principles:

- an Indian tribe possessed all the powers of a sovereign state
- conquest rendered the tribe subject to the legislative power of the U.S., and in substance terminated the external powers of sovereignty of the tribe
- the internal powers were subject to qualification by treaties and by express legislation of Congress, while leaving many powers of internal sovereignty to the Indian tribes and their duly constituted organized government

Tribal powers of self-government are now considered to be municipal in character. In the earliest days of the republic, the Indian tribes were recognized as distinct political communities and were permitted to exercise powers of self-government — not necessarily by virtue of any delegation of powers from the federal government, but rather by reason of their original tribal sovereignty. Treaties and federal statutes have sometimes been viewed by the courts as limitations upon those original tribal powers; the rule has been accepted that Indian law is binding, except when modified by positive federal enactments.

While the federal government has limited the powers of the Indian tribes, the Indians, for the most part, can regulate property within the jurisdiction of the tribe. This power was not granted by Congress, but was an inherent power of a limited sovereignty that was nullified by federal action. An Indian tribe is, however, subject to the United States Constitution in the same sense that the City of San Francisco is. The power the Indians have over their leased lands overlaps with the power of the federal government; this is exemplified by the federal controls and regulations pertaining to the environment on these leased lands. In a situation with as much impact as the administration of energy resources, the Indians would most likely be prevented from controlling land uses beyond the scope of the lease, by congressional legislation or by the courts' considering such moves as confiscatory and interfering with interstate commerce.

The Indians, on the other hand, may have put certain restrictions into their leases — restrictions which were approved by the BIA. One restriction could be that the use of water by the mining companies depends on the Indians' needs and the amount the Indians allocate to the mining company. This allocation would be based to some extent on the mining companies' needs, but if these needs were to change or if thermal discharges had a more deleterious effect than anticipated, the Indians could control the land use by obtaining an injunction. In a case of this sort, the courts would probably favor the Indians. The needs of the mining companies and the Indians would be considered, as would any alternative approach to the problem that would allow mining operations to continue. Royalties to the Indians could be increased or the Indians could find an alternative solution to the problem by using resources from other parts of the reservation. The added impact caused by the federal environmental control regulations should be considered by the courts; there is no clear-cut precedent as to how the courts will rule.

Litigation

In the past few years, several proposals have been made to amend the U.S. Constitution to provide, in various forms, a constitutional right to a healthy environment. A number of federal cases have considered claims that such a constitutional right already existed by virtue of the fifth, ninth, and fourteenth amendments, but no federal court has yet accepted the proposition that such constitutional rights exist. Recently, this sort of argument has been made less frequently in environmental litigation.

The citizen can bring action if pollution or degradation is a public nuisance (as that term is defined in case law), and if the citizen has suffered special damages, or if the state permits an action without proof of special damage.

Regarding pollution or degradation that can be considered a nuisance, a state has the power under common law to bring criminal or civil action to abate the nuisance, even if it arose outside the state's borders. If the state refuses to sue, the following alternatives may apply:

- there may be a statute allowing the citizen to sue in his own name or on behalf of the state
- there may be a common-law theory that the right that the state sues to vindicate is really the right of the citizen to a clean environment, and he or she can sue in his or her own name
- the state, by refusing to sue, may be violating the citizen's civil right by the inaction, so that he or she can sue both the state and the polluter

The strongest case illustrating a common-law right to sue in the absence of a statute is the case of Alameda Conservation Association vs. California.* In this case, four individuals who owned property from one to six miles away from San Francisco Bay were found to have the right to enjoin a salt company from filling the bay. Their basis for the action was that the threatened bay fill would injure fish and wildlife and would affect the climate around them. The case rests on a general right to a clean environment, and the right of a property owner to claim injury to his or her property by environmental degradation anywhere that makes his or her property less valuable because of climatological changes. However, it should be noted that the relative damages to the salt company were small and the possibility of finding another fill was financially feasible.

The courts act as a check on administrative agencies in ascertaining whether the proper procedural and substantive safeguards and rules have been adhered to before an operation of large magnitude, such as a mining operation, is allowed. The Administrative Procedure Act** provides that a "reviewing court shall . . . hold unlawful and set aside

*437 F2d 1087 (9th Cir. 1971).

**5 USC 706 (1964 ed., Supp. V).

agency action, findings, and conclusions" found not to meet six separate standards. In all cases, agency action must be set aside if the action was arbitrary, capricious, an abuse of discretion, or otherwise not in accordance with the law, or if the action failed to meet statutory, procedural, or constitutional requirements. In certain narrow, specifically limited situations, the agency action can be set aside if the action was not supported by substantial evidence or was unwarranted by the facts. This does not mean that a court can ignore an agency's rulings and come up with its own decision, but that the court should decide whether the agency correctly discharged its duties by considering all relevant factors and has based its considerations on substantial evidence. The court should not consider the desirability of the result, or attempt to substitute its judgment for that of the commission. Unless gross incompetence on the part of the agency is shown, the court may be expected at most to issue a temporary injunction until the unresolved issues have been reconsidered by the agency involved. If the agency does not have the power to do what it proposes to do, the court will protect the plaintiff until Congress grants specific authority to the agency to continue operating in the same manner.

Before a preliminary injuction will be granted by a court, the plaintiff must show that the failure to grant the preliminary injunction will result in irreparable harm for which there is no adequate legal remedy. This appears to be the situation in any action that would arise concerning the strip-mining activities in Montana. However, when granting preliminary injunctions in environmental suits against federal agencies, many courts have indicated that before such relief will be granted there must be some indication that the plaintiff will be successful when the case is tried on its merits. Unless it is reasonably suspected that the plaintiff will succeed, no temporary injunction will be given. In these cases, courts cannot revoke licenses or permits, but

they can force the agency to review its procedural policies in light of strong public and governmental feeling, or they can issue an injunction until certain prerequisites have been met.

Several defenses exist that might be used in the face of litigation and judicial review by the courts. One important defense is the question of ripeness. Ripeness relates to whether the administrative activity has progressed to a point where it is ready for review by the court. Agencies are protected from judicial interference until an administrative decision has been formalized and its effects felt in a concrete way by the challenging parties.

Another defense that can be used by the defendent in a suit is that the plaintiff who is bringing the action has waited an unreasonably long time before starting the action. This delay results in prejudice against that defendant in the form of large economic losses, which could have been avoided if the suit had been brought at an earlier time.

VI

MONITORING SYSTEM FOR THE DECKER-BIRNEY PLANNING UNIT

JUSTIFICATION FOR MONITORING SYSTEM

Implementation of the multiple land uses proposed or envisioned for the Decker-Birney Planning Unit would cause several changes in the physical, biological, and socioeconomic environment of the region. The greatest impact would result from coal mining and related increases in population. Other land uses under consideration include increasing agricultural productivity, oil and gas exploration, timber and forage production, and recreation development. These land uses are being carefully and systematically evaluated to ensure that their environmental and socioeconomic impacts do not exceed their anticipated benefits. Certain impacts can be predicted with reasonable accuracy before they occur, and in some instances appropriate mitigating measures can be implemented to reduce the impact substantially. Because of the many variables (such as those involving housing, employment, meterology, geology, hydrology, and biology) and the complexity of the relationships among these variables, the magnitude of the actual or anticipated impacts cannot be adequately determined during the environmental-evaluation phase of the proposed land-use project. Therefore, a program for monitoring selected key environmental and socioeconomic parameters is an important component of large-scale development, such as the proposed coal mining projects in the Decker-Birney Planning Unit.

While coal mines, power plants, and the like may be individually monitored for certain parameters pursuant to a specific-permit program,

it is uncommon for radical changes in population, housing, public service demands, industrial productivity, or urban land-use intensity to be followed so closely. Yet these socioeconomic effects can, taken together, be of greater consequence to the individuals and communities involved than incremental degradations of air or water quality. In the same vein, the synergistic or cumulative impacts from multiple projects may approach natural or biological thresholds that are not perceptible at the individual project level. These notions suggest that a regional impact-monitoring system should be very broad in scope, broader perhaps than the purview of any existing institution. The monitoring system described in this section relies on the participation of several government agencies and members of the public to attain the perspective and integration appropriate to the complexity of the problem.

OBJECTIVE

The objective of the monitoring program is to detect adverse changes or impacts, and to initiate mitigating steps to reduce or eliminate the adverse impact.

APPROACH

A desirable monitoring program should include carefully planned procedures for data collection and analysis and a comprehensive management system to evaluate the results efficiently and to make appropriate recommendations. Many procedures for data collection and analysis have been suggested for the environmental resources that may be affected by large-scale projects. Some of these procedures have been suggested in relation to monitoring nuclear power plants,* but are often applicable

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*Northwest Laboratories and Columbus Laboratories, "Environmental Impact Monitoring of Nuclear Power Plants," Source Book of Monitoring Methods, Vols. 1 and 2, February 1975.

to other projects involving various degrees of environmental disturbances. The Environmental Protection Agency has made a considerable effort to monitor air and water quality; hence, methods for measuring various aspects of these two environmental components are quite well documented. The monitoring of aquatic and terrestrial ecology and of socioeconomic components has received considerably less emphasis; as a result, methods are less precise or are not statistically valid. The monitoring of impacts on socioeconomic conditions that result from a major project has been particularly lacking. This absence of appropriate socioeconomic monitoring methods is related to the complexity of this subject and to the fairly recent consideration of impacts on socioeconomic conditions.

While programs have been proposed or are currently in progress in various areas of the United States to monitor specific aspects of the environment (the changes in the turbidity of a stream or the concentration of NO_x in the atmosphere, for example), the establishment and operation of monitoring management systems have received much less attention. Such a system should coordinate the many specific environmental monitoring tasks conducted or supervised by various federal and state agencies, carefully evaluate the conclusions from each task, review the adequacy of the methods, and formulate decisions or recommendations concerning any significant increases in an adverse environmental impact. This section of this report describes a proposed environmental monitoring system for the land-use projects envisioned for the Decker-Birney Planning Unit and places particular emphasis on the management aspect of such a monitoring system.

The purpose of this proposed monitoring system is regularly to measure appropriate environmental parameters in the Decker-Birney area in order to detect the occurrence or accumulation of any unacceptable impacts resulting from exploitation of the various resources. Such unacceptable impacts may necessitate some type of action, such as mitigation, compensation, or project modification. The following attributes were considered in developing a monitoring system:

- All significantly impacted resources should be monitored
- The data management aspect should be an integral part of the monitoring system — it should not be developed after collection of the data
- Review procedures should be incorporated into the system
- The knowledge and experience of experts should be incorporated into the system
- An organizational framework should provide for a smooth working relationship among the affected government agencies
- An annual report should be published detailing the findings and recommendations
- A method for periodic public review and input should be incorporated into the system
- A staff function should be created to lend continuity and sustained technical supervision to the system

RECOMMENDED MONITORING SYSTEM

The recommended system consists of a series of logical, step-by-step procedures (Figure 2) that begin with identifying the proposed land uses and end with publishing an annual monitoring report. The system is cyclical and is not actually completed when the annual report is published. The system is designed so that data acquisition and evaluation continue until it is clear whether or not significant environmental changes are accumulating or anticipated.

The main element of the system is a monitoring committee. The membership would be drawn from agencies, organizations, and individuals who have an interest in, responsibility for, or information about land uses or natural resources in the region. The Bureau of Land Management should be the lead agency for the management of the monitoring system and should initiate formation of the committee. The recommendation is based on the amount of BLM-administered land that is involved and on the agency's orientation toward multiple-use resource planning. In addition, the district director of the BLM is in the best position to initiate the

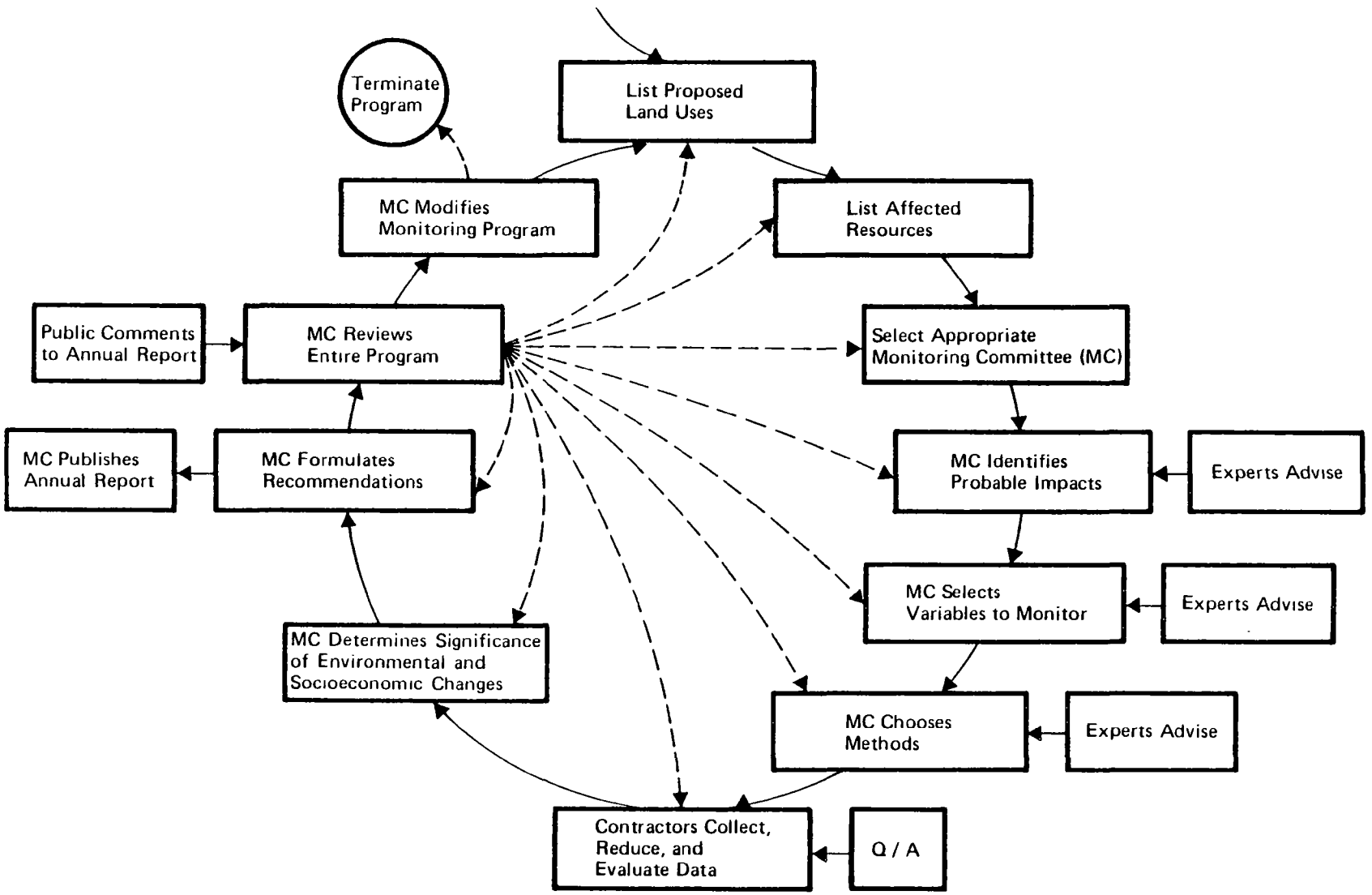


Figure 2. MAJOR STEPS OF RECOMMENDED MONITORING SYSTEM

monitoring cycle, due to his knowledge of and participation in major land-use decisions in the area.

It is further recommended that the staff of the Yellowstone-Tongue Areawide Planning Organization serve as the technical staff for the committee. This suggestion is made on the basis of YTAPO's specific interest and experience in environmental monitoring in the Decker-Birney area. The duties of the staff would include doing research, providing technical information to the committee, supervising subcontractors hired by the committee, compiling and analyzing monitoring-network data, and preparing reports as directed by the committee.

A qualified BLM employee should be designated as the director (or other suitable title) of the monitoring program; a YTAPO counterpart should be designated as staff leader. The director should initiate the program by identifying proposed land uses and the resources that such uses might affect, so that a monitoring committee can be appropriately selected. The monitoring committee would then act as the decision-making body, with responsibility for the orientation and operation of the monitoring program. The identification of proposed land uses and affected resources, the formation of the monitoring committee, and a discussion of remaining key steps of the monitoring program are presented below.

Identifying Proposed Land Uses

A logical step with which to begin formulating a monitoring system is to identify the anticipated land uses in the Decker-Birney Planning Unit. These possible land uses were preliminarily identified in the MFP and, if implemented, could cause significant changes in the physical, biological, and socioeconomic resources of the region. Coal mining and related development, including community expansion, will have the largest impact on the available resources. Increases in the production of agricultural crops, timber, and forage; the exploration for and development

Table 5. SELECTED EXAMPLES THAT ILLUSTRATE THE RELATIONSHIP BETWEEN PROPOSED LAND USES, POTENTIAL IMPACTS, KEY PARAMETERS, AND METHODS

Proposed Land Use	Potential Impact	Key Parameters	Methods
MINING	Loss of vegetative productivity	Number of acres	Aerial photography; ground measurements
		Percent ground cover	Aerial photography; line interceptions; plant diameters
		Pounds of vegetation/acre	Stem lengths; harvesting; capacitance meter
	Disruption of surface water	Flow rates	Surface floats; dyes; cross-sectional measurements and current
		Dissolved oxygen Content	Winkler method; D.O. meter
		Turbidity	Turbidity meter; Secchi disc
	Housing shortage	Building permits issued	County records
		Vacancy rates	Post office, local realty associations
		Chamber of Commerce	
		Mobile home permits issued	County records
	School overcrowding	Available capacity vs. enrollment	School district records
		Age structure of new residents	Community census, employee records, school district records
		Student-teacher ratio	School district records

of oil and gas; and the development of recreation facilities are also envisioned as land uses in the planning unit. See Table 5.

It is important for the committee to be aware of the interconnectedness of land uses, and to account for the causal chain of events resulting from a single land-use decision. For example, consideration of an export coal mine would initially imply land-use allocations and associated impacts related to the coal mine itself, to rail transportation facilities, and to housing needs for a few hundred people. But these land uses can precipitate requirements for additional resource commitments, such as aggregate and fill for railroad construction, or sewage-treatment facilities for a new population. As the scale of proposed activities grows, so also will the chain of land uses grow longer and more interrelated. Therefore, the range of influence will reach beyond the Decker-Birney Unit. For example, socioeconomic impacts may be experienced in Sheridan, Wyoming, and in Hardin and Broadus, Montana, and elsewhere.

Listing Affected Resources

A variety of the significant resources will be affected by implementation of the several land uses proposed for the Decker-Birney Planning Unit. Some of the proposed land uses (coal mining, for example) would affect many of the major resources, while other proposed land uses (development of recreational facilities, for example) would affect relatively few of the major resources. See Table 6. Some of the effects to resources can be determined by reviewing proposed project plans and identifying the types of disturbances that may occur, such as clearing land for building sites or other uses, constructing roads, and disposing of wastes into the air or water, among others. Once the scope of a project is reviewed, identification of the significant resources that will be directly affected is basically straightforward. For example, plowing rangeland to produce new croplands would disrupt the land features but not the geology of the area, since only surface soils would be disturbed.

Table 6. EXAMPLES OF RESOURCES THAT MAY BE AFFECTED BY PROPOSED LAND USES

Proposed Land Uses	Affected Resources						
	Geology and Soils	Hydrology and Water Quality	Air Quality	Vegetation	Wildlife	Socioeconomic	Cultural Resources
Mining	•	•	•	•	•	•	•
Agriculture	•	•		•	•	•	•
Timber	•	•		•	•	•	•
Livestock Forage		•		•	•	•	
Recreation Facilities				•	•	•	•

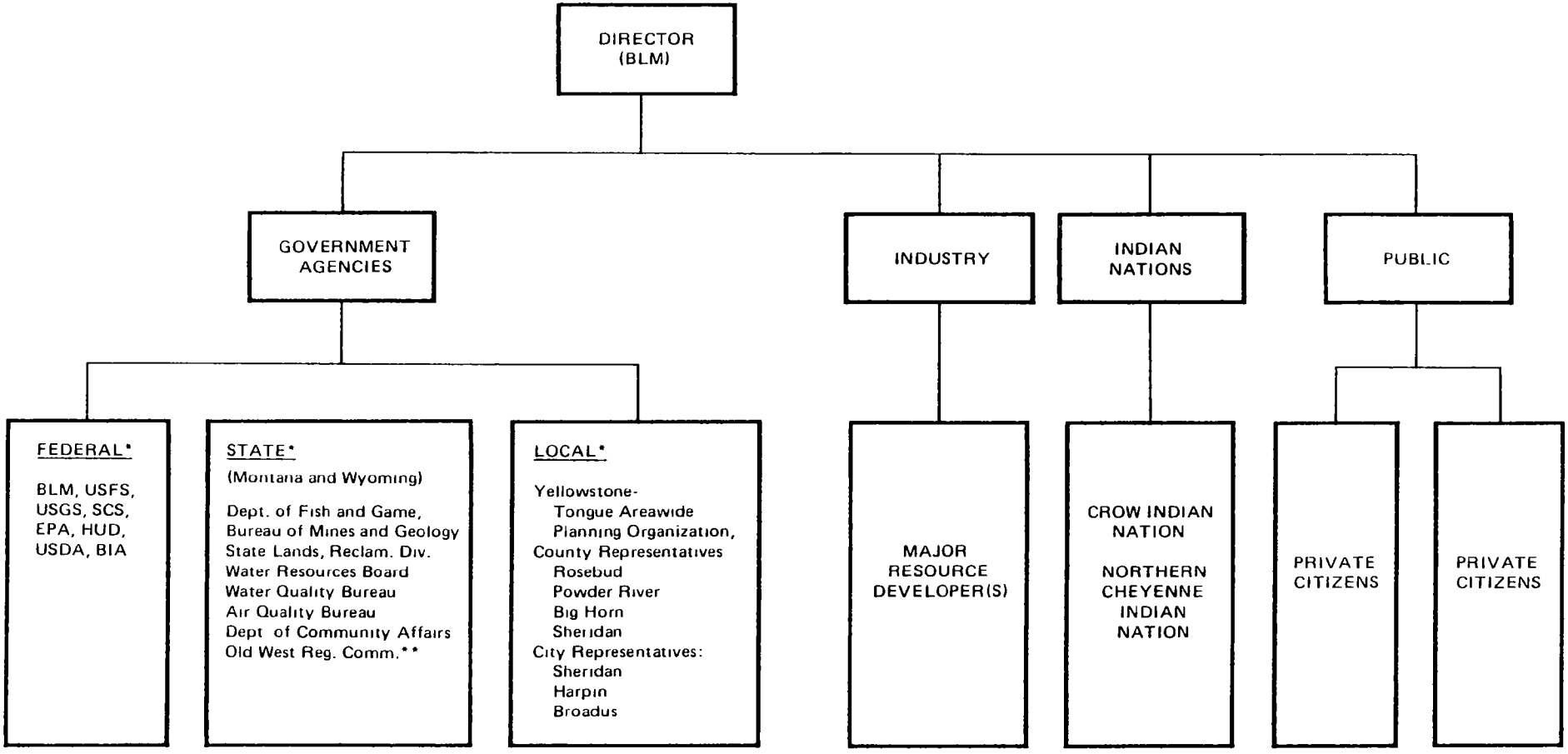
It is not as easy to identify resources that may be indirectly affected by a project or combination of projects, but effects may be identified if the chain of land uses is carefully constructed. The process of identifying resources affected by primary and lower-order actions is well documented in the literature of cost-benefit analysis. The process of detailing possible effects of land use on resources in the Decker-Birney area should be thorough, because the findings will greatly determine the composition of the monitoring committee.

Selecting the Monitoring Committee

The monitoring committee is one of the most important aspects of the monitoring system. The objectives of the monitoring committee are:

- to monitor the environment for any significant changes related to land use
- to coordinate the efforts of the specific monitoring agencies in order to maximize benefits and minimize duplication of effort or expenditures
- to make recommendations as necessary to ensure protection of the environment and to provide continuity and direction to the efforts of diverse agencies

The monitoring committee would consist of approximately 10 to 15 people and would be composed of the director (a BLM employee), representatives of selected agencies, industry representatives, representatives of the Indian nations involved, and the general public. See Figure 3. One member each would be selected from those federal, state, and local agencies considered to have major responsibilities for those resources that will be affected by the proposed land uses. See Table 7. More than one agency may represent the same resource, if appropriate. Conversely, one agency may be selected to represent more than one resource (e.g., the EPA is responsible for monitoring both air quality and water quality). The composition of the committee is intended to change from time to time in response to evolving patterns of development and resource



* Members to be selected from the agencies listed or others

** Joint federal-state agency

Figure 3. ORGANIZATION OF MONITORING COMMITTEE

Table 7. EXAMPLES OF FEDERAL AND STATE AGENCIES THAT HAVE RESPONSIBILITIES FOR AFFECTED RESOURCES

Affected Resource	Agency
Geology and soils	USGS; SCS; BLM; USDA; Montana Bureau of Mines and Geology
Hydrology and water quality	EPA; USGS; SCS; BuRec; Montana State Lands, Reclamation Division; Montana Water Resources Board, Montana Water Quality Bureau
Air quality	EPA; Montana Air Quality Bureau
Vegetation	BLM; SCS; USFS; USDA
Wildlife	BLM; USFS; BuRec; SCS; Montana Department of Fish and Game
Socioeconomic	Old West Regional Commission; HUD; Montana Department of Community Affairs, BIA
Cultural resources	BLM; USFS; Montana Fish and Game Commission, Parks and Recreation Division

use. Continuity of purpose is provided through the guidance of the director and the presence of a staff.

The participation of the mining industry in the monitoring program is important, but problematic, because of the number of companies that might be involved. One method of achieving equitable participation is to offer two committee positions to the Montana Mining Association, to be filled by representatives of companies that are active in the area. This representation from the industrial sector is intended to add another dimension of balance and input to the monitoring committee. The participation of this group is anticipated to be especially helpful during the phase of the monitoring program that deals with recommending realistic mitigating measures or project alterations.

Two members of the monitoring committee would be selected from the public to provide a nonagency perspective. These members should be generally knowledgeable of the development of energy-related resources in Montana and should have somewhat diverse or unrelated backgrounds.

The monitoring committee would meet on a regular basis (bimonthly or quarterly, for example) to ensure that monitoring objectives are being accomplished in a timely fashion. The director of the monitoring committee could also meet with the members at other times, as the situation demands.

The duties of the monitoring committee should include, but not be restricted to, the following tasks:

- identify the anticipated impacts
- select the proper environmental and socioeconomic parameters to monitor
- select the appropriate methods for monitoring the key environmental parameters
- evaluate the data capabilities of member agencies and identify the need for contractor assistance
- provide quality assurance to the data collection task

- analyze results of monitoring tasks and identify any environmental changes (including cumulative and synergistic effects) that have occurred as a result of ongoing land-use projects
- develop a systematic technique for the quantitative assessment of impacts
- determine significance of identified environmental changes
- formulate recommendations
- prepare an annual report that describes the year's activities, findings, and recommendations
- review and make necessary adjustments to each step in the monitoring program
- provide documentary, data-base, and expert-testimony capabilities as needed in regulatory and adjudicative proceedings

Identifying Potential Impacts

The potential impacts should be identified by the monitoring committee as a means of focusing on the specific components of the environment that may actually be impacted. A proposed project may not have an effect on every aspect of water quality or disrupt every species of wildlife or cause hardships on every member of the local communities. The monitoring committee can determine the specific components that may be impacted by reviewing appropriate environmental reports (EAs, EARs, EIRs, EISs, among others), having personal knowledge of the members, and collecting information from other experts. Examples of anticipated impacts include the following:

- hydrology and water quality — alteration to or loss of an aquifer; change in the surface water turbidity, salinity, pH, temperature, or oxygen content
- air quality — change in humidity, air currents, or particulates (NO_x, SO_2, etc.)
- biology — disruption of plant and animal population dynamics (carrying capacity, reproductive potential, survival of offspring), loss of wildlife habitat for some species, loss of vegetative productivity
- socioeconomic conditions — overloading of municipal service systems; impaired fiscal viability; rapid, unplanned urban development

Selecting the Key Parameters To Monitor

Once the monitoring committee has identified the potential impacts, the committee must select specific parameters to be measured that will indicate significant changes to components of the affected resources. Every parameter in the environment cannot be monitored because of the overwhelming number of parameters, their complexity, the difficulty in adequately measuring each parameter, and the associated costs. The selection of parameters to measure (Table 5) is one of the more critical duties of the monitoring committee and will require the professional judgment of many experts, including committee members. This is somewhat of a "shotgun" approach and is one of the reasons that the review procedure discussed below is an important aspect of the monitoring program. The monitoring committee should periodically review its choice of parameters to determine if some parameters need to be added to or deleted from the list.

It is not necessarily appropriate to monitor all possible parameters related to a particular land use or a specific resource. To be useful for monitoring, a parameter must differentiate between project-related environmental changes and the many, continuously occurring, natural, environmental changes. For instance, if a project is anticipated to have an impact on the insect population, one possible parameter would be the number of insects per unit-area through time. Theoretically, the normal baseline number could be determined, and any changes occurring during the project operation could be detected as changes from this normal number. In reality, the number of insects in a population fluctuates dramatically from area to area and from one week to another under normal conditions, without any exogenous influences. Thus, it is entirely likely that any changes in an insect population measured during the operation of the project could not be clearly attributed either to the operation of that project or to the normally occurring changes in that insect population. A population parameter with more constant values (perhaps

the concentration of a potentially harmful chemical in the tissue of the insects) would be a more acceptable parameter.

In the area of socioeconomic impacts, parameters to be monitored would include impacts on overall population demographic characteristics, housing, employment, income, public finance, taxes, local economic characteristics (retail sales, etc.), and community services (public facilities, social services, etc.).

Selecting Assessment Methods

A number of assessment methods may be available to quantify each key parameter (Table 5). The selection of an appropriate method can be extremely important in establishing a successful monitoring program. Methods vary with respect to:

- the equipment or technique required to collect the data
- the number and qualifications of people needed to collect the data
- the clarity and statistical reliability of the results
- the time required to collect the data
- the cost associated with each method

The monitoring committee will select the method that it feels will provide the desired information, with the above considerations in mind. The significance of cost is a factor that cannot be ignored. One of the benefits of having a centralized monitoring committee is its ability to balance the portion of the budget appropriated to each data-collection task with the importance of each specific aspect of a resource. It would not be in the best overall interest of the monitoring program or of the resources themselves to expend 75 percent of the monitoring budget on monitoring an uncommon threatened species if the potential impact to several other resources (big game species, fish populations, or socioeconomic conditions, for example) is anticipated to be more significant or of a much greater magnitude.

Selecting an assessment method requires a knowledge of the state-of-the-art technology in the specific fields of concern. While some of the members of the monitoring committee are certain to be familiar with some of these techniques, it may be necessary for the monitoring committee occasionally to seek the knowledge and advice of outside experts. It would be valuable if the monitoring committee could evaluate more than one assessment method per parameter and be aware of the pros and cons, costs, and limitations of each method. While an expert may recommend the best technical method, the monitoring committee may wish to select one of the alternative methods that represents a more suitable combination of man-hour, educational, and cost requirements, as well as technical considerations.

The monitoring committee should be especially cognizant of the type and format of data output that is possible with each method. Some methods may result in only qualitative results and not be acceptable for statistical analysis. Other methods may be quantitative, but be of limited value because of inherently large standard errors or confidence limits (± values about a mean). The latter problem would make it difficult to distinguish those changes resulting from a project's operation from those changes that are simply related to the normal fluctuations of the existing environmental systems. To the extent that data on certain parameters or data that refer to certain projects may bear upon regulatory or adjudicative proceedings, the methods used to quantify and analyze these data should be rigorous, formal, and defensible.

Collecting, Reducing, and Evaluating the Data

The monitoring committee will be responsible for selecting and managing the agencies and outside contractors who will collect the data, for coordinating the various data collection tasks, and for providing quality assurance of the data as necessary. These functions can be facilitated by using data structure analysis. This technique requires

a preview of the entire monitoring program in terms of data flow. From the data flows necessary to achieve the desired results of each potential monitoring task, a composite "data structure diagram" can be prepared, showing data sources, monitoring techniques and locations, analytical processes, and all of the intermediate and final "destinations" of data used in the monitoring program. Typically, these diagrams reveal opportunities for consolidating data collection and analyzing and permitting effective coordination in terms of time, budget, methods, and data format. For example, this analysis may show that data collection for a water-quality parameter can be collected by the same individual and at the same time as data collected for a fish-population parameter. Soil samples may similarly be taken in conjunction with vegetation sampling.

The data management program should prescribe the periodicity of measurement and specify the handling of the data after they have been collected. The selected agencies and outside contractors should perform the required field work and reduce the data, using the procedures and statistical tests specified by the monitoring committee. Data evaluation should include a determination of whether observed environmental changes are normal, project-related, or ambiguous.

Determining Significance of Any Environmental Changes

It is the responsibility of the monitoring committee to determine the significance of changes in the monitored parameters. Because the committee has the advantage of a perspective that embraces the whole monitoring program, this determination should be assigned to the committee as a whole rather than to individual agencies or contractors.

The efficacy of the monitoring effort depends on a rational approach to this task. It is insufficient to assume that the significance of change in an environmental parameter varies in proportion to the magnitude of change. For instance, it is intuitively clear that the destruction of an entire, unique, plant community is more than twice as bad as

the destruction of 50 percent of that community; the relation between magnitude and significance of impact is not linear. It is also important to consider the range over which change in each parameter might occur; without this information it is difficult to make a valid comparison (tradeoff) between change in one parameter and change in any or all others. These requirements imply the use of analytical methods, such as utility theory or value functions, that can explicitly account for the ranges, magnitudes, and significance of environmental change. In the simplest application of these methods it is possible to develop concepts of acceptable limits of change in a parameter, beyond which any additional change is significant. These notions of threshold values for environmental parameters are based on generalized criteria, which can be preferentially established by the committee. As examples of the use to which such generalized criteria could be put, the committee could determine that change in any parameter is significant if the change:

- endangers the health of any human
- threatens the existence of adjacent wildlife or plant species, especially endangered or threatened species
- results in any unanticipated property damage or value reduction
- causes an unacceptable degradation of the environment
- is an abnormal increase in a known or suspected harmful agent
- is potentially harmful in the future if the change continues at the similar rates

As the monitoring program becomes more complex with the introduction of new and different land uses to the region, the need for a more formal technique to assess the significance of change in each parameter will become more acute.

Formulating Recommendations

One of the principal duties of the monitoring committee will be to formulate recommendations to regulatory agencies and other interested

parties pertaining to the operational projects. These recommendations will be based on the extent of the significant environmental changes related to the projects. In general, the monitoring committee can make four kinds of recommendations (or combinations of the four). They can recommend:

- no changes to the projects in operation
- mitigating measures or some type of action to compensate for the impacted resource
- alterations to the projects
- reevaluation of continuation of the project

A recommendation to continue the project without any changes may be considered appropriate, even if some environmental changes were judged significant. The changes may have been a one-time occurrence or may have already been corrected. It is also possible that more observations of the changes would be needed before a specific action would be considered necessary.

One of the objectives of the monitoring program is to detect adverse changes or impacts and to initiate mitigating steps to reduce or eliminate the adverse impact. Preferably, the monitoring committee should make every effort to recommend several alternative mitigating measures that are realistically possible. The monitoring committee can draw on its members' experience (especially that of the project representative) or the experience of others who may have encountered similar problems.

A recommendation to alter a project may also be necessary, especially if observed environmental changes are considered severe or harmful. Project alteration, as discussed here, refers to an action that will reduce the production or output of an operating land-use project. For example, this could mean reducing the annual timber harvest or coal production.

If extremely severe impacts are documented by the monitoring program, the monitoring committee could conceivably recommend that the

project be reevaluated to determine if continuation is still feasible. This kind of recommendation would be considered appropriate only if all possible mitigating measures were tried without success or if an immediate health emergency or other catastrophe were likely to occur if the project continued to operate.

In reality, a recommendation to alter or stop the operation of a project is unlikely; it is anticipated that for most problems created by a project an acceptable mitigating measure or compensation can be designed and implemented.

Publishing an Annual Report

The monitoring committee should prepare an annual report that contains the following information:

- an overview of the monitoring program and the composition of the monitoring committee
- a summary of the activities of the monitoring committee during the last year
- a discussion of the selection of key parameters not previously discussed
- a discussion of new methods or modifications used to collect data
- a discussion of the results and analysis provided by each contractor
- a discussion of the monitoring committee's decisions about the environmental changes, if any, that were considered significant
- a discussion of the monitoring committee's recommendations regarding solutions to any significant environmental impact problems
- a list of newly proposed or expanded land uses or projects, including the resources that may be affected and that will be addressed by the monitoring committee during the next year
- a request for comments from persons (including the public) that review the annual report
- a discussion of how the comments will be used during the monitoring committee's review of the monitoring program
- a brief summary of the report

The report should be written in easily understood language, since it will be read by many people with varying backgrounds. The availability of the report should be announced through accepted methods (Federal Register, press releases, etc.), and the number of copies printed should be sufficient to meet the demand.

Reviewing the Monitoring Program

The monitoring committee should carefully and completely review the entire monitoring program annually. Each task in the program should be carefully examined to determine whether all of the task objectives are being met and whether other objectives should be added. Problems pointed out and suggestions provided by the contractors in their reports and public comments about the annual report should be addressed by the monitoring committee.

An annual review of the key parameters selected for study is extremely important. The monitoring committee should carefully determine whether each parameter is still appropriate, whether a different method should be used to measure the parameters, or whether other parameters should be used instead. Since every parameter of every affected resource cannot be monitored, the monitoring committee has a major responsibility to remain continually aware of any impacted components of the environment that may require monitoring and that have not previously been considered.

Modifying the Monitoring Program

The above review process would culminate in a series of modifications to improve the monitoring program, to be implemented the following year. Each contractor affected by the modifications would be notified of forthcoming changes. The notification would include the justification for these any changes and a detailed description of the modifications to the data-sampling methods or other changes in the scope of work.

A monitoring program is expected to last several years, depending on the life of the project and the expected level of impact, but is not expected to be a permanent program. Therefore, at various intervals, it is necessary to assess the appropriateness of continuing or terminating the monitoring program. The program may be considered complete if (1) the project in question is no longer in operation and all significant environmental parameters have returned to normal or have stabilized, or (2) no significant environmental impacts are detected during a reasonable period of examination and none are anticipated in the future.

RELATIONSHIP BETWEEN MONITORING PROGRAM AND ENVIRONMENTAL BASELINE STUDIES

Distinguishing between a monitoring program and the environmental baseline studies preceding the operation of a proposed project can often be confusing. The distinction is important and can result in considerable savings of time, effort, and money to both programs. A monitoring program is not an extension or continuation of an environmental baseline program. The confusion arises because the same environmental parameters discussed in the baseline program can sometimes be used in a monitoring program. The purpose of each program must be kept in mind. An environmental baseline program attempts to *describe* the existing environmental conditions in order to *predict* how the proposed project may impact that existing environment and to provide a comparative base for some parameters. The descriptive portion tells about the climate, soils, plants, animals, archaeological and historical sites, and socioeconomic conditions in the affected area. A monitoring program attempts to *differentiate* normal environmental changes from project-related environmental changes. The methods used to *describe* and *predict* in the baseline program are not necessarily appropriate in order to *differentiate* the changes described in the monitoring program, although some may be. For example, describing the habitat requirements of waterfowl in an area may be appropriate for the baseline program but may not be sufficient (or may not be the correct

parameter) to detect an adverse impact on these birds caused by a land-use project.

The baseline and monitoring programs are naturally related, however, and coordination of their planning would be beneficial to both programs. The data-collection task of the monitoring program should begin before operation of the proposed project begins in order to have some preoperational data for comparison. The monitoring and data-collection task could begin at the same time as the baseline studies or between the baseline program and operation of the project. The latter is more likely, since the monitoring program would probably be initiated only after the project is approved and, therefore, after the environmental evaluation processes that include the baseline studies are complete.* However, the baseline program can be designed to include examination and measurement (using methods approved for monitoring) of some of the more important parameters that experience or research has shown may be impacted. For example, if chemical X were known to be extremely harmful above a certain concentration in the bones of certain waterfowl, and if the proposed project were expected to emit chemical X, the baseline program could be modified to include an analysis of the birds' bone tissue for chemical X.

Too often, baseline studies are performed in order to provide useful monitoring data, but fall short of this objective. The main reason for this failure appears to be the different emphasis of the two programs, the selection of parameters, and the methods of measurement. The methods used are often statistically unacceptable because they can't provide results with a sufficiently small standard of error (± value) to differentiate project impacts during the monitoring program.

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*In the case of activities already underway in the planning unit, a minitoring program, as described in this section, should be initiated as soon as possible.

CONCLUSIONS

It is recommended that a system be instituted to monitor environmental and socioeconomic changes that may occur in the Decker-Birney Planning Unit as a result of the expected future land uses discussed in the BLM Management Framework Plan. The system should incorporate a management group — the monitoring committee — to coordinate and supervise the operation of the monitoring program. The monitoring committee should consist of representatives from the affected agencies, companies conducting major land-use projects, Indian nations, and the public. The monitoring committee should determine the environmental and socioeconomic parameters to be measured, the methods to be used, and the contractors to be employed to collect and analyze the data. The committee should then determine which project-related environmental and socioeconomic changes are significant and formulate recommendations for reducing or eliminating the adverse impacts or for modifying the projects. The system should provide for direct public input through membership on the committee and through comments on an annual report published by the committee. The system presented attempts to protect environmental quality by using a monitoring program that begins before implementating the proposed land-use activities and by maximizing organizational and planning procedures.

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APPENDIX A

PLANT CHECKLIST, DECKER-BIRNEY AREA

Appendix A. PLANT CHECKLIST, DECKER-BIRNEY AREA

Scientific Name	Common Name
Grasses and Grasslike Plants	
Agropyron dasystachyum	Thickspike wheatgrass
Agropyron spicatum	Bluebunch wheatgrass
Agropyron smithii	Western wheatgrass
Agropyron subsecundum	Bearded wheatgrass
Andropogon gerardi	Big bluestem
Andropogon scoparius	Little bluestem
Andropogon hallii	Sand bluestem
Aristida longiseta	Red threeawn
Bouteloua curtipendula	Sideoats grama
Bouteloua gracilis	Blue grama
Bromus anomalus	Nodding brome
Bromus carinatus	California brome
Bromus japonicus	Japanese chess
Bromus tectorum	Downey chess
Buchloe dactyloides	Buffalo grass
Calamagrostis montanensis	Plains reedgrass
Calamagrostis rubescens	Pinegrass
Calamovilfa longifolia	Prairie sandreed
Carex eleocharis	Needleleaf sedge
Carex filifolia	Threadleaf sedge
Carex nebraskensis	Nebraska sedge
Danthonia unispicata	One-spike oatgrass
Distichlis stricta	Desert saltgrass
Elymus cinereus	Giant wildrye
Festuca idahoensis or F. ovina	Idaho fesque
Festuca octoflora	Six-weeks fescue
Hordeum jubatum	Foxtail barley
Koeleria cristata	Junegrass
Muhlenbergia cuspidata	Plains muhly
Muhlenbergia squarrosa	Mat muhly
Orzyopsis hymenoides	Indian ricegrass
Phlaris arundinacea	Reed canarygrass
Poa canbyi	Canby bluegrass
Poa nervosa	Wheeler bluegrass
Poa pratensis	Kentucky bluegrass
Poa secunda	Sandberg bluegrass
Sitanion hystrix	Squirreltail
Spartina gracilis	Alkali cordgrass
Spenopholis obtusata	Prairie wedgegrass
Sporobolus cryptandrus	Sand dropseed
Stipa columbiana	Columbiana needlegrass
Stipa comata	Needle-and-thread
Stipa spartea var. custiseta	Porcupine grass
Stipa viridula	Green needlegrass

Forbs

Achillea millefolium	Western yarrow
Agoseris glauca	Pale agoseris
Allium spp.	Onion
Amaranthus retroflexus	Redroot pigweed
Ambrosia artemisifolia	Low ragweed
Ambrosia psilostachya	Western ragweed
Antennaria dimorpha	Low pussytoes
Antennaria parvifolia	Small-leaf pussytoes
Arnica fulgens	Leafy arnica
Arnica sororia	Arnica
Arnica cordifolia	Heartleaf arnica
Artemisia dracunculus	False tarragon sagewort
Artemisia ludoviciana	Cudweed sagewort
Asclepias pumila	Plains milkweed
Asclepias viridiflora	Green milkweed
Astragalus spp.	Milkvetch
Astragalus drummondi	Drummond milkvetch
Bahia oppositifolia	Opposite leaf bahia
Balsamorhiza sagittata	Arrowleaf balsamroot
Besseya cineria	Kittentail
Calochortus nuttalii	Segolily mariposa
Camelina sativa	False flax
Campanula rotundifolia	Roundleaf harebell
Cerastium arvense	Field chickweed
Chrysopsis villosa	Hairy golden aster
Cirsium arvense	Canada thistle
Cirsium canovirens	Thistle
Cirsium undulatum	Wavy leaf thistle
Collinsia parviflora	Blue-eyed Mary
Collomia linearis	Narrow leaved collomia
Comandra pallida	Bastard toadflax
Crepis acuminata	Tapertip hawksbeard
Cryptanthe bradburyana	Miners candle
Delphinium bicolor	Low larkspur
Dyssodia papposa	Prairie dogweed
Echinacea pallida	Purple coneflower
Epilobium angustifolium	Fireweed
Erigeron spp.	Daisy fleabane
Eriogonum spp.	Eriogonum
Eriogonum flavum	Yellow eriogonum
Erysimum asperum	Plains wallflower
Fragaria vesca	Woodland strawberry
Gaillardia aristata	Gaillardia
Galium boreale	Northern bedstraw
Gaura coccinea	Scarlet gaura
Geranium viscosissimum	Sticky geranium

Geum triflorum	Prairie smoke
Glycyrrhiza lepidota	Wild licorice
Grindelia squarrosa	Curlycup gumweed
Hedeoma drummondi	Drummon false pennyroyal
Helianthus annuus	Common sunflower
Helianthus petiolaris	Prairie sunflower
Heuchera cylindrica	Round leaved allumroot
Humulus lupulus	Common hop
Hymenoxys spp.	Hymenoxys
Hymenoxys acaulus	Hymenoxys
Hyoscyamus niger	Henbane
Iva axillaris	Poverty weed
Kochia scoparia	Summer cypress
Lactuca pulchella	Blue lettuce
Lappula redowskii	Western sticktight
Lesquerella alpina	Alkaline bladderpod
Lesquerella argestea	Bladderpod
Leucocrinum montanum	Star lily
Liatris puctata	Dotted blazingstar
Linum lewisii	Blue flax
Linum rigidum	Stiffstem flax
Lithospermum spp.	Gromwell
Lomatium spp.	Biscuit root
Lupinus caudatus	Spurred lupine
Mamillaria spp.	Pincushion cactus
Medicago lupulina	Black medic
Mentzelia laevicaulis	Five petal blazingstar
Opuntia fragilis	Brittle prickly pear
Opuntia polycantha	Plains prickly pear
Oxtropsis lambertii	Purple point loco
Penstemon albidus	White penstemon
Penstemon eriantherus	Fuzzytongue penstemon
Penstemon glaber	Saw sepal penstemon
Petalostamon canadidus	White prairie clover
Petalostamon pupureum	Purple prairie clover
Phacelia hastata	Silverleaf phacelia
Phacelia linearis	Linear-leaf phacelia
Phlox canescens	Canada phlox
Phlox hoodii	Hoods phlox
Plantago purshii	Wooly plantain
Plantago spinulosa	Spindle plantain
Polansia trachysperma	Clammy weed
Polygala alba	White milkwort
Polygonum convolvulus	Buckwheat bindweed
Polygonum douglasii	Douglas knotweed
Potentialla glandulosa	Gland cinquefoil

Psoralea argophylla	Silverleaf scurfpea
Psoralea esculenta	Breadroot scurfpea
Psoralea tenuiflora	Slimflower scurfpea
Pteridium aquilinum	Western bracken
Ratibida columnifera	Prairie coneflower
Rumex spp.	Dock sorrel
Salsola kali	Russian thistle
Senecio canus	Wooly groundsel
Solidago missouriensis	Slender goldenrod
Solidago rigida	Stiff goldenrod
Sphaeralcea coccinea	Scarlet globemallow
Taraxacum officinale	Common dandelion
Thermopsis montana	Mountain thermopsis
Thalictrum venulosum	Veiny meadowrue
Thlaspi arvense	Fanweed
Townsendia spp.	Townsendia
Tragopogon dubius	Common salsify
Urtica dioica	Stinging nettle
Verbena bracteata	Bracted verbena
Vicia americana	American vetch
Viola spp.	Violet
Xanthium strumarium	Cocklebur
Yucca glauca	Soapweed yucca
Zigadenus venenosus	Death camas

Shrubs and Trees

Acer glabrum	Rocky Mountain maple
Acer negundo	Box elder
Alnus tenuifolia	Thinleaf alder
Amelanchier alnifolia	Western serviceberry
Apocynum androsaemifolium	Spreading dogbone
Arctostaphylos uva-ursi	Kinikinnick
Artemisia cana	Silver sagebrush
Artemisia frigida	Fringed sagebrush
Artemisia tridentata	Big sagebrush
Atriplex nuttallii	Nuttall saltbush
Atriplex confertifolia	Shadscale saltbush
Betula occidentalis	Water birch
Chrysothamnus nauseosus	Rubber rabbitbrush
Chrysothamnus viscidiflorus	Green rabbitbrush
Clematis ligusticifolia	Western white clematis
Cornus stolonifera	Red dogwood
Crataegus columbiana	Black hawthorn
Eleagnus commutata	Silverberry

Eurotia lanata	Winterfat
Fraxinus pennsylvanica	Green ash
Haplopoppus spinulosus	Spiny goldenweed
Gutierrezia sarathrae	Broom snakeweed
Juniperus horizontalis	Creeping juniper
Juniperus scopulorum	Rocky Mountain juniper
Berberis repens	Oregon grape
Populus angustifolia	Lance-leaf cottonwood
Populus deltoides	Plains cottonwood
Populus tremuloides	Quaking aspen
Potentilla frutcosa	Shrubby cinquefoil
Potentilla glandulosa	Gland cinquefoil
Prunus americana	Wild plum
Prunus virginiana	Chokecherry
Rhus trilobata	Skunkbush sumac
Rhus radicans	Poison ivy
Ribes aureum	Golden currant
Ribes cereum	Squaw currant
Ribes hunsonianum	Hudson currant
Ribes setosum	Redshoot gooseberry
Rosa arkansana	Prairie rose
Rubus parviflorus	Thimbleberry
Salix spp.	Willow
Sarcobatus vermiculatus	Greasewood
Shepherdia argentea	Buffaloberry
Spiraea betulifolia	White spiraea
Symphoricarpos albus	Common snowberry
Symphoricarpos occidentalis	Western snowberry

APPENDIX B

MAMMALS FOUND WITHIN THE BLM MILES CITY DISTRICT

Appendix B. MAMMALS FOUND WITHIN THE BLM MILES CITY DISTRICT*

Scientific Name	Common Name	Occurrence	Abundance
Sorex cinereus	Masked shrew	Dry woods	Common
Sorex merriami	Merriam shrew	Sagebrush and grasslands	Quite rare
Myotis lucifugus	Little brown bat	Throughout area	Common
Myotis yumanensis	Yuma bat	Throughout area	Less common
Myotis evotis	Little long-eared bat	Throughout area	Fairly common
Eptesicus puscus	Big brown bat	Throughout area	Common
Mustela prenata	Long-tailed weasel (P)	Throughout area	Common
Mustela nivalis	Least weasel (P)	Throughout area	Rare
Mustela vison	Mink (F)	Marsh areas and stream banks	Common
Mustela nigripes	Black-footed ferret (F)	Prairie dog colonies	Extremely rare
Mephitis mephitis	Striped skunk (P)	Throughout area	Common
Taxidea taxus	Badger	Throughout area	Common
Procyon lotor	Raccoon	Creek and river valleys	Common
Vulpes vulpes	Red Fox	Throughout area	Fairly common
Vulpes velox	Swift fox	Originally throughout area	Probably extinct
Canis latrans	Coyote (P)	Throughout area	Common
Lynx rufus	Bobcat (P)	Throughout area	Common
Spermophillus richardsonii	Richardson ground squirrel	Throughout area	Common
Spermophillus tridecemlineatus	Thirteen-lined ground squirrel	Grasslands	Common
Cynomys ludovicianus	Black-tailed prairie dog	Grasslands	Less common
Eutamias minimus	Least chipmunk	Sagebrush area	Common
Sciurus niger	Fox squirrel	Yellowstone River bottoms	Fairly common
Thomomys talpoides	Northern pocket gopher	Throughout area	Common
Perognathus fasciatus	Wyoming pocket mouse	Dry areas	Less common
Castor canadensis	Beaver (F)	Along streams and lakes	Common
Dipodomys ordii	Ord kangaroo rat	Sandy soil and sagebrush	Common
Onychomys leucogaster	Northern grasshopper mouse	Grasslands	Common
Reithrodontomys megalotis	Western harvest mouse	Grasslands	Common
Peromyscus maniculatus	Western deer mouse	Throughout area	Common

Peromyscus leucopus	White-footed mouse	Grasslands	Common
Microtus ochrogaster	Prairie vole	Dry grasslands	Common
Lagurus curtatus	Sagebrush mouse	Sagebrush areas	Rare
Ondatra zibethicus	Muskrat (F)	Ponds and streams	Common
Zapus hudsonius	Meadow jumping mouse	Meadows	Less common
Mus musculus	House mouse	Around human habitations	Common
Erethizon dorsatum	Porcupine	Throughout area	Common
Lepus townsendii	White-tailed jackrabbit	Open areas throughout	Common
Syluilagus audubonnii	Desert cottontail	Throughout area	Common
Odocoileus virginianus	White-tailed deer (G)	Brushy river bottoms	Common
Odocoileus hemionus	Mule deer (G)	Throughout area	Common
Antilocapra americana	Pronghorn antelope (G)	Sagebrush areas	Common
Felis concolor	Cougar (P)	Rough, mountainous terrain	Rare
Marmota flaviventris	Yellowbellied Marmot	Rocky, mountainous areas	Common

*(G) = game animal; (P) = predatory animal; (F) = furbearer. Source: Montana Mammals, Montana Fish and Game Department, January 1972.

APPENDIX C

MANAGEMENT FRAMEWORK PLAN RECOMMENDATIONS FOR THE DECKER-BIRNEY PLANNING UNIT

Appendix C. MANAGEMENT FRAMEWORK PLAN RECOMMENDATIONS FOR THE DECKER-BIRNEY PLANNING UNIT

			Description of Recommendations			
Resource	Activity	Recommendation	Standard	Nonspecific Enforceable Guideline	Policy	Study
LANDS	Urban and sub-urban expansion	Encourage, where possible, residential and commercial expansion within the unit's already established town-sites	--	Where possible, limit urban growth to exist-ing townsites	--	--
		Encourage and work with local planning and zoning authorities to control and guide urban and suburban growth and expansion.	--		Encourage local planning and zoning to guide and control urban development	--
	Intensive devel-opment outside urban and suburban expansion areas	Plan for any residential and commercial expansion needed in association with the unit's industrial (min-ing) or other resource de-velopment, if any	--	Plan for secondary growth resulting from coal-mining operations	--	--
		Complement minerals or other resource recommenda-tions to facilitate industrial growth and de-velopment	--	Plan for the orderly and timely development of industry	--	--
		Encourage local planning and zoning to guide and control development and use of outlying areas	--	--	Encourage local planning and zoning to guide and control industrial or urban development in rural areas	--

Appendix C. (Continued)

Resource	Activity	Recommendation	Description of Recommendations: Standard	Nonspecific Enforceable Guideline	Policy	Study
LANDS	Intensive development outside urban and suburban expansion areas	Restrict transfer of national resource lands to private ownership for residential, commercial, and industrial development until adequate planning and zoning ordinances have been enacted	--	National resource lands cannot be transferred to private ownership in areas that do not have adequate local planning and zoning ordinances	--	--
		Promote further development of private agricural lands	--	--	Promote private agricultural development	--
		Provide, where appropriate, public lands to satisfy bonafide federal, state, and local public-purpose needs	--	Provide public lands for bonafide federal, state, and local public needs	--	--
		Whenever possible, work toward land tenure adjustments through state and private exchanges	--	Consolidate public land holdings	--	--
		Plan for adequate signing to identify public lands	--	Identify public lands with signs	--	--
		Provide for a continuing access acquisition program for national resource lands	Obtain or maintain public access to to all national resource lands	--	--	--
		If appropriate, provide for the disposal of certain lands to the State of Montana	--	Assist the State of Montana in making land selections from national resource lands	--	--

Appendix C. (Continued)

Resource	Activity	Recommendation	Description of Recommendations: Standard	Nonspecific Enforceable Guideline	Policy	Study
LANDS	Intensive development outside urban and suburban expansion areas	Proposed development on the areas within the unit underlain by strippable coal deposits should be carefully evaluated by the appropriate management and/or administrative agencies of the area	--	--	--	BLM management and/or other administrative agencies should evaluate the proposed coal development recommendations for the Decker-Birney Planning Unit
		Any expansion of minerals or other resource activities will undoubtedly result in an increased demand for public utilities rights-of-way and special-use areas. This demand should be satisfied with a minimum of conflicts to other resources	--	Special-use areas and utility corridors required for the development of a particular resource are to be located in a manner that will cause the least conflict with the use of other resources	--	--
		Develop additional guidelines for the selection of right-of-way corridors	--	--	--	Develop comprehensive guidelines for the selection of right-of-way corridors
MINERALS	Coal exploration and extraction	Consider issuing leases on all federal strippable reserves within the outlined strippable coal resource areas	Lease coal within designated areas in the Otter Creek, Ashland, Moorhead, Hanging Woman, Decker, Birney, and Kirby coal fields	--	--	--

Appendix C. (Continued)

Resource	Activity	Recommendation	Description of Recommendations: Standard	Nonspecific Enforceable Guideline	Policy	Study
MINERALS	Coal exploration and extraction	Continue contract drilling programs with appropriate state and federal agencies on federal coal within the outlined coal resource areas. Obtain coal quality and quantity data (tonnage, thickness, Btu, ash, sulfur moisture) as well as subsurface soil and water data	--	--	--	Identify potential economic lease blocks where reclamation is feasible and environmental damage can be minimized
		Identify specific lease sites for strip mining	The size of potential coal lease blocks is to be based on a projected national need for coal from this region	--	--	--
		No leasing of federal coal in flood plains	Federal coal located in flood plains will not be leased	--	--	--
		Offer coal for domestic use to individuals living in the area as demand develops. Establish a community pit if sufficient interest arises	--	--	Offer coal for local domestic use	--
	Unit-wide development of sand, gravel, and clinker	Designate material sites that can feasibly be developed and establish community pits where sufficient demand exists	--	--	Establish barrow pits where sufficient demand exists	Identify economic deposits of sand, gravel, and clinker

Appendix C. (Continued)

Resource	Activity	Recommendation	Description of Recommendations: Standard	Nonspecific Enforceable Guideline	Policy	Study
MINERALS	Unit-wide oil and gas exploration and development	Encourage unit-wide oil and gas exploration and issue leases to allow development	--	--	Encourage oil and gas exploration and development	--
TIMBER	Intensive management	Manage for sustained production of timber and related resources and improvement of the vigor and age distribution of the stands through carefully planned harvests by: a. Removing mature overstory b. Thinning younger overstory c. Thinning pole stands	Remove the mature ponderosa pine overstory on 12,025 acres of U.S.F.S. lands and thin immature ponderosa pine pole stands on 900 acres of U.S.F.S. lands	--	--	--
	Protection	No cutting on the protection areas of the national forests within the study area	No timber harvest is allowed on 38,523 acres of designated U.S.F.S. lands	--	--	--
		The timber on these areas should generally be left undisturbed. Incidental sales of small quantities of timber may be made on demand, provided that it will not cause permanent damage to the stands. Such sales should be located with an eye toward improving stand condition where possible	If a market develops, 730 acres within the timber protection area of the national forest should be harvested	--	When a resource can be utilized without permanent damage to that resource or to other related resources, it should be made available to those who need it	--

Appendix C. (Continued)

Resource	Activity	Recommendation	Description of Recommendations: Standard	Nonspecific Enforceable Guideline	Policy	Study
RANGE	Livestock forage production	In general, artificial treatment for increased production on undisturbed range lands (for example, brush control, reseeding, waterspreading, and fertilization should not be undertaken until intensive grazing management to increase the natural potential has been tried	--	Intensive livestock management is to be attempted before resorting to mechanical and/or chemical treatment of range lands	--	--
		Implement grazing systems on all allotments, including those areas mined for coal, in order to obtain the highest livestock use compatible with all resource values	--	Intensive grazing management is to be used on all grazing allotments	--	--
		As the potential range forage production becomes available for use, hay and feed crop production should also be increased to balance each livestock operation	--	Agricultural use of suitable deeded land should be continued, acreage increased where possible, and agricultural practices intensified in order to obtain maximum production	--	--
WATERSHED	Unit-wide water development of control structures	Encourage investigation of the possibility of expanding or modifying existing water developments to achieve applicable watershed and other resource goals	--	--	Encourage the expansion or modification of existing water developments	--

Appendix C. (Continued)

Resource	Activity	Recommendation	Description of Recommendations: Standard	Nonspecific Enforceable Guideline	Policy	Study
WATERSHED	Watershed management in Restricted Use Area K-4	Modify or eliminate surface uses as necessary to maintain or improve watershed conditions and promote erosion control	--	Modify or eliminate surface uses in order to maintain or improve watershed conditions and promote erosion control	--	--
		Encourage investigation of feasibility of limited control structures on the lower reaches of some drainages	--	--	--	Investigate the feasibility of limited control structures on the lower reaches of some drainages
	Watershed management in restricted use areas	Investigate restricted-use areas of the unit to further determine type of remedial action necessary	--	--	--	Determine remedial actions necessary to maintain or improve watershed conditions and promote erosion control in restricted use areas of the planning unit
	Watershed management in Restricted Use Area K-5 (Zone A-3)	Maintain or improve the generally stable and intensively utilized alluvial bottoms and flood plains. Proper management is the only treatment indicated except for the following subrecommendations:	Maintain or improve the stable alluvial bottoms and flood plains	--	--	--

Appendix C. (Continued)

Resource	Activity	Recommendation	Description of Recommendations: Standard	Nonspecific Enforceable Guideline	Policy	Study
WATERSHED	Watershed management in Restricted Use Area K-5 (Zone A-3), continued	a. Limited installation of water control structures, taking into account other resource values	Install water control structures on actively eroding stream channels	--	--	--
		b. Limited initiation, in selected areas, of a vegetation manipulation program	--	Initiate vegetation manipulation program in erosion-prone flood plains	--	--
	Watershed management in Restricted Use Area K-5 (Zone A-4)	Proper management is the only treatment indicated to maintain a suitable vegetative cover and soil stability	--	Institute proper watershed management procedures	--	--
	Watershed management in coal resource areas	Apply watershed tillage practices on all strip-mined areas	Till strip-mined areas to assist in water retention and infiltration	--	--	--
		All water development should be in sequence with mining operations	--	Time watershed management practices to fit in with mining and reclamation plans	--	--

Appendix C. (Continued)

Resource	Activity	Recommendation	Description of Recommendations: Standard	Nonspecific Enforceable Guideline	Policy	Study
WATERSHED	Watershed management in coal resource areas	Coal mining within the critical-severe erosion areas may be permitted if carefully planned and implemented	--	Coal mining is allowed in critical-severe erosion areas as long as mining and reclamation plans provide suitable means for preventing erosion and increased stream sedimentation	--	--
		Investigate coal resource areas to determine the best type of remedial action necessary to restore the watershed to its former stability or better	--	--	--	Determine best methods for restoring watersheds to their former stability or better on stripmined areas
		Coal mining within the following ecosystems may be permitted if carefully planned and implemented: grassland, pine-woodland, broadleaf, ponderosa pine, sage shrub, and agricultural land. No mining should be permitted when the above ecosystems occur in major stream channels (second and third order) or alluvial bottoms	--	Carefully planned and implemented coal mining is allowed in grassland, pine-woodland, broadleaf, ponderosa pine, sage shrub, and agricultural ecosystems outside of major stream channels or alluvial bottoms	--	--

Appendix C. (Continued)

Resource	Activity	Recommendation	Description of Recommendations: Standard	Nonspecific Enforceable Guideline	Policy	Study
WATERSHED	Unit-wide watershed management	Investigate cloud seeding, snow fences, or vegetative windbreaks to determine the feasibility of increasing the amount, seasonal distribution, or quality of water produced in the planning unit	--	--	--	Investigate methods for increasing the amount, seasonal distribution, or quality of water produced in the planning unit
		--	--	--	--	Items requiring analysis before initiating such a broad-scale program include: a. The effect of possible heavy downpours on the critical-to-severe erosion class lands b. Problems of liability in case of flooding or excess rainfall c. Total effects on the area's ecosystems d. A cost-benefit or cost-effectiveness analysis e. Aesthetic and recreational considerations
WILDLIFE HABITAT	Unit-wide management practices, except for areas leased for coal mining	Manage and control all surface uses to maintain a variety of native vegetation (grasses, forbs, shrubs, and trees) in all ecosystems, except for cultivated lands	--	Except for cultivated lands, manage and control all surface uses to maintain a variety of native vegetation	--	--

Appendix C. (Continued)

Resource	Activity	Recommendation	Description of Recommendations: Standard	Nonspecific Enforceable Guideline	Policy	Study
WILDLIFE HABITAT	Unit-wide management practices, except for areas leased for coal mining	Maintain present densities of mule and white-tailed deer. Increase plant vigor of key browse-plant species and riparian vegetation on year-long deer range by manipulating livestock grazing and regulating deer harvest, as directed by the Montana Department of Fish and Game	--	Regulate livestock grazing and deer harvest to maintain present densities and increase plant vigor of key browse-plant species and riparian vegetation on yearlong deer range	--	--
		Manage for vigorous stands of shrubs, particularly snowberry, buffaloberry, and wild rose, for sharptail grouse in coulees and heads of drainages, and for native perennial grasses and forbs on adjacent uplands	--	Maintain vigorous stands of shrubs, particularly snowberry, buffaloberry, and wild rose, in coulees and heads of drainages, and native perennial grasses and forbs on adjacent uplands	--	--
		Manage for an adequate perennial grass cover for sharptail grouse during the nesting season, usually within a 2-mile radius of the courtship site. Curtail land disturbance activities near these courtship areas during May and June	Curtail land disturbance activities within a 2-mile radius of a sharptail grouse courtship site during May and June	Maintain dense stand of perennial grass cover within a 2-mile radius of a sharptail grouse courtship site during May and June	--	--
		Manage and/or develop for waterfowl, aquatic, and shoreline vegetation in suitable reservoirs with fairly stable water levels. Waterfowl habitat could be enhanced through reclamation plans in developing reservoirs	--	Develop and/or manage suitable reservoirs for waterfowl	--	--

Appendix C. (Continued)

Resource	Activity	Recommendation	Description of Recommendations: Standard	Nonspecific Enforceable Guideline	Policy	Study
WILDLIFE HABITAT	Unit-wide management of prairie dog towns	Maintain present black-tailed prairie dog towns until a population survey has been completed to determine the presence of black-footed ferrets	--	Protect black-footed ferret habitat	--	--
		Control measures may be taken if excessive damage is detrimental to other resources, such as livestock forage production and watershed	--	Control black-tailed prairie dogs if they become detrimental to other resources	--	--
	Unit-wide management of birds of prey and predators	Protect raptor nesting areas from destruction and avoid disturbance during the nesting season, especially from April through July	Protect raptor nesting areas and potential nest sites from destruction	--	--	--
		Protect potential nest sites. Eagles and hawks generally like large, dead trees and sandstone cliffs	Avoid disturbing these areas during the nesting season, especially from April through July	--	--	--
		Require design of power transmission facilities to prevent electrocution of large raptorial birds, particularly eagles	Design power transmission towers to prevent electrocution of large raptorial birds. R.E.A. Bulletin 61-10 describes transmission designs and their effects on raptors	--	--	--

Appendix C. (Continued)

Resource	Activity	Recommendation	Description of Recommendations: Standard	Nonspecific Enforceable Guideline	Policy	Study
WILDLIFE HABITAT	Management activities in the sagebrush vegetation type of Area A	Restrict all vegetal control programs and surface disturbances within a 2-mile radius of the sage grouse breeding complex (strutting grounds and nesting areas)	Vegetation control and surface disturbances are not allowed within a 2-mile radius of sage grouse breeding grounds and nesting areas	--	--	--
		Construct and maintain fences to allow antelope to pass	--	Fences are to be designed and located so that they allow antelope to pass	--	--
	Management of turkey habitat in Area B	Maintain farming adjacent to ponderosa-pine types and deciduous drainages for "optimum" turkey habitat	Continue grain farming adjacent to ponderosa-pine stands and deciduous drainages	--	--	--
		Manage for turkeys a deciduous, brushy understory and adequate grass cover along drainages	--	Maintain deciduous, brushy understory and grass cover along drainages	--	--
	Management activities in the cultivated-broadleaf types of Area C	Continue present farming practices to maintain pheasant and Hungarian partridge habitat. Protect native vegetation interspersed with agricultural lands, field borders, and fence rows	Continue present practices in Area C and protect native vegetation, interspersed with agricultural lands, field borders, and fence rows	--	--	--

Appendix C. (Continued)

Resource	Activity	Recommendation	Description of Recommendations: Standard	Nonspecific Enforceable Guideline	Policy	Study
WILDLIFE HABITAT	Unit-wide management of birds of prey and predators	Manage those resident wildlife species commonly known as predators for the public benefit, to include: sport hunting, fur trapping, sight-seeing, and photography. Organize control of predators only when need can be justified and demonstrated. All control action should be approved by the Montana Fish and Game Department and the Bureau of Sport Fisheries and Wildlife	All predator control actions must be approved by the Montana Fish and Game Department and the Bureau of Sport Fisheries and Wildlife	Predators will be controlled only when a justifiable need is demonstrated	--	--
	Management activities in the sagebrush vegetation type of Zone A	Coordinate intensive livestock grazing systems to maintain present sagebrush densities and plant vigor (primarily big and silver sagebrush) along drainage bottoms and heads of drainages for quality antelope habitat	--	Coordinate intensive livestock grazing systems to maintain big and silver sagebrush densities and plant vigor along the drainage bottoms and heads of drainages	--	--
		Maintain for sage grouse at least a 20% canopy cover of sagebrush in areas where this minimum exists. Especially important on ridges, swells, and slopes where sagebrush is from 10-14" high	Maintain a minimum sagebrush canopy cover of 20% in areas where at least this minimum exists. This practice is most important on ridges, swells, and slopes where sagebrush is from 10-14" high	--	--	--

Appendix C. (Continued)

Resource	Activity	Recommendation	Description of Recommendations: Standard	Nonspecific Enforceable Guideline	Policy	Study
WILDLIFE HABITAT	Management of Area-D aquatic habitat	Identify reservoirs suitable for stocking with fish and coordinate with the Montana Fish and Game Department and the Bureau of Sport Fisheries and Wildlife	--	Stock suitable reservoirs with game fish	--	--
		Identify potential fishing access sites and obtain easement or right-of-way to these sites	--	Obtain fishing access along the Tongue River and Tongue River reservoir	--	Identify potential fishing-access sites
		All waters should be maintained within the limits recommended by the Environmental Protection Agency or Montana Water Quality Standards, to satisfactorily support good water quality and aquatic ecosystems	Dissolved Materials - In no instance should the concentration of dissolved innocuous (not toxic) materials exceed 50 milliosmoles (the equivalent of 1500 mg/l NaCl) Ph - Maintain at level no lower than 6.0 or higher than 9.0. (Most natural productive waters fall between 6.5 and 8.5.) Dissolved Oxygen - Maintain not less than 5 mg/l in all waters	--	--	--

Appendix C. (Continued)

Resource	Activity	Recommendation	Description of Recommendations: Standard	Nonspecific Enforceable Guideline	Policy	Study
WILDLIFE HABITAT	Management of Area-D aquatic habitat		Carbon Dioxide - Free carbon dioxide should not exceed 25 mg/l Turbidity - Should not exceed 50 Jackson units in all streams and the Tongue River Temperature - The following maximum temperatures are recommended as compatible with the well-being of various species of fish and their associated biota: 48°F. - Tongue River Reservoir in spring for spawning and egg development of walleye and northern pike 68°F. - Tongue River in spring for spawning of smallmouth and rock bass 84°F. - Maximum in reservoir for growth of walleye and northern pike; and in river from dam to point 10 miles below Birney for growth of smallmouth bass 90°F. - Maximum in all other waters for growth of largemouth bass and crappie Flows - To be determined based on water needs of salmonid and nonsalmonid fisheries			

Appendix C. (Continued)

Resource	Activity	Recommendation	Description of Recommendations: Standard	Nonspecific Enforceable Guideline	Policy	Study
RECREATION	Unit-wide scenic values, except for strippable coal resource areas	No surface disturbances should be allowed within the designated people-influence zones unless such developments are capable of blending in harmoniously with the surrounding landscape	--	No surface disturbance is allowed in the people-influence zones that parallel the major thoroughfares in the planning unit unless they can be blended harmoniously with the surrounding landscape	--	--
		Management within the various scenic categories is recommended as follows:	--	--	--	--
		Category A (Exceptional) - Management should provide protection of these areas and include appropriate buffer zones if further study indicates a need for additional lands	Surface disturbance is not allowed in Category-A areas	--	--	Further studies should be made to determine whether buffer zones are required around Category-A areas
		Category B (Excellent) - Any development allowed within this area should be capable of blending in harmoniously with the surrounding landscape, to maintain visual integrity and associated aesthetic values. If this is not possible, development should not be allowed	--	Surface disturbance must blend harmoniously with the surrounding landscape in Category-B areas. If this is not possible, development is not allowed	--	--

Appendix C. (Continued)

Resource	Activity	Recommendation	Description of Recommendations: Standard	Nonspecific Enforceable Guideline	Policy	Study
RECREATION	Unit-wide scenic values, except for strippable coal resource areas	Category C (Moderate) and Category D (Slight) - Any action affecting scenic qualities in these two areas should be allowed only where a conscientious effort is made to minimize visual impacts. Major impacts should be located in inconspicuous areas away from people-influence zones	--	Minimize visual impacts in Category-C and -D areas. Locate major impacts away from people-influence zones	--	--
		Land-use practices on national resource lands must be geared to preserve open-space values of the natural landscape	--	Preserve open space when developing other resources	--	--
		Evaluate public utility corridors through scenic categories B, C and D	--	Place utility corridors through the least scenic areas of the planning unit	--	--
		Management decisions should insure that existing airsheds found over the planning unit will meet applicable air-quality standards as set forth either by the state or federal government	Air quality will meet applicable state and federal standards	--	--	--

Appendix C. (Continued)

Resource	Activity	Recommendation	Description of Recommendations: Standard	Nonspecific Enforceable Guideline	Policy	Study
RECREATION	Unit-wide wildlife recreational values, except for strippable coal resource areas	Management decisions should stress the preservation and enhancement of raptorial bird habitats	--	--	Management decisions should stress the preservation and enhancement of raptorial bird habitats	--
		Predators should be controlled only when they threaten the existence of other resource values. An example might be an increase of coyotes to such an extent that they substantially reduce numbers of deer or small game	--	Predators will be controlled only when they threaten the existence of other resource values	--	--
		Implement livestock management programs, where applicable, to maintain and/or improve the vegetative cover, which, in turn, will encourage a healthy population of native plant and animal species	--	Implement livestock management programs to maintain and/or improve the the vegetative cover	--	--
		Studies are needed to determine whether additional roads are required or whether some existing roads need closing	--	--	--	Determine whether new roads are required or whether some existing roads need to be closed
		Prairie dogs should be treated as a recreational resource. If, for some reason, control is necessary, sport shooting is recommended	Use sport shooting to control prairie dogs	--	Prairie dogs are a recreational resource	--

Appendix C. (Continued)

Resource	Activity	Recommendation	Description of Recommendations: Standard	Nonspecific Enforceable Guideline	Policy	Study
RECREATION	Unit-wide overlooks, except for strippable coal resource areas	Evaluate present overlooks and identify potential sites to establish a system of overlooks in the unit	--	--	--	Evaluate present overlooks and identify potential sites to establish a system of overlooks in the unit
	Unit-wide archeology	An archeological survey of the entire planning unit should be made, concentrating on the outlined strippable coal resource areas, prior to leasing	Conduct an archeological survey of the entire planning unit, beginning with strippable coal resource areas	--	--	--
		Important archeological sites have been located through inventories conducted in 1972-73. If these sites fall within leasable areas, salvage operations conducted by a professional archeologist will be initiated prior to mining. Coal companies to whom the lease is issued will be responsible for this implementation process	Coal companies will contract archeological salvage operations on leasable coal areas prior to mining	--	--	--
		Determine how best to protect valuable archeological sites on private land, especially where threatened by land disturbance (i.e., the prehistoric buffalo jump on the Rosebud Battlefield site)	--	--	--	Determine how best to protect archeological sites on private land

Appendix C. (Continued)

Resource	Activity	Recommendation	Description of Recommendations: Standard	Nonspecific Enforceable Guideline	Policy	Study
RECREATION	Unit-wide archeology	Development and interpretation of sites should be done only when public exposure will not endanger the values being preserved	--	--	Development and interpretation of sites should be done only when public exposure will not endanger the values being preserved	--
	Unit-wide paleontology	A professional paleontologist should be consulted to determine whether a unit-wide survey is warranted. If a survey is needed on lands leased for mineral development, the involved coal company should be responsible for implementing this survey	--	--	--	A professional paleontologist should be consulted to determine whether a unit-wide survey is warranted. If a survey is needed on lands leased for mineral development, the involved coal company should be responsible for implementing this survey
	Unit-wide access	ORV use should be restricted or closed on BLM forest service lands where known damage is occurring or where key resource values are in danger	--	Restrict ORV use or close BLM forest service lands where damage is occurring or where key resource values are endangered	--	--
		Access is needed for those areas of national resource lands shown on MFP, Step 2, Overlay for Lands and Recreation	Obtain access to the NRL shown on MFP, Step 2, Overlay for Lands and Recreation	--	--	--
		Any access acquisition or construction should be done only after there is assurance that important resource values (including recreation) will not be destroyed or excessively marred	--	--	Construction of access roads should not take place at the expense of other values	--

Appendix C. (Continued)

Resource	Activity	Recommendation	Description of Recommendations: Standard	Nonspecific Enforceable Guideline	Policy	Study
RECREATION	Unit-wide visitor-use analysis	Visitor-use information on all forms of recreational activity should be obtained as soon as possible	--	--	Visitor-use information on all forms of recreational activity should be obtained as soon as possible	--
	R-1 historical values	No actions should be taken that will jeopardize the integrity of Battle Butte and Rosebud Battlefield; lands adjacent to these sites should be protected until a survey determines whether or not they will be needed to help preserve the actual site. Battle Butte should be submitted to the National Park Service for consideration as a national historic site	Battle Butte will be nominated for inclusion in the National Register of Historic Places	Management activities will not jeopardize the integrity of the Battle Butte and Rosebud Battlefield sites	Lands adjacent to Battle Butte and Rosebud Battlefield should be protected until a survey determines whether or not they will be needed to preserve the actual sites	--
		Urge the National Park Service to buy the Rosebud battle site and any adjacent lands deemed important to the site	--	--	Urge the NPS to buy the Rosebud battle site and any adjacent lands deemed important to the site	--
		Stag Rock and Needle Rock should be evaluated to determine whether they warrant submission to the NPS as national historic sites. An additional study should be made on Hanging Woman Creek	--	--	--	Determine whether Stag Rock, Needle Rock, and Hanging Woman Creek should be nominated for inclusion in the National Register of Historic Places

Appendix C. (Continued)

Resource	Activity	Recommendation	Description of Recommendations: Standard	Nonspecific Enforceable Guideline	Policy	Study
RECREATION	R-1 historical Values	An inventory and evaluation of the old, metal water wheel on the Tongue River, plus assorted old homestead buildings scattered throughout the unit, should be conducted to determine whether they warrant some type of federal or other protection (see Step 3, Overlay No. 4).	--	--	--	Determine whether the metal water wheel on the Tongue River and old homestead buildings throughout the Planing Unit warrant protection
		A commemorative plaque or memorial should be placed along the county road (near where the Tongue River and Hanging Woman Creek roads join) marking the routes taken during the Miles Expedition of 1877 and the Reynolds Expedition of 1876.	Place a commemorative plaque or memorial near the junction of Tongue River and Hanging Woman Creek roads to mark the routes of the 1877 Miles Expedition and the 1876 Reynolds Expedition.	--	--	--
	R-1 geological features	Until the quality and/or importance of erosional features are evaluated, management should assure proper protection of sandstone caves and buttes, petrified wood areas, etc., identified on Step 3, Overlay No. 5	--	Protect the geological formations identified on Step 3, Overlay No. 5 until their quality and/or importance can be evaluated	--	--

Appendix C. (Continued)

Resource	Activity	Recommendation	Description of Recommendations: Standard	Nonspecific Enforceable Guideline	Policy	Study
RECREATION	R-1 geological features	Geological featuers should be evaluated by Forest Service personnel (these features are located primarily within the confines of Custer National Forest). Unique geological features should either be submitted to the NPS for consideration under the natural landmark program or designated as a natural area	--	--	--	Geological features in Custer National Forest should be evaluated by the Forest Service for possible inclusion in the National Registry of Natural Landmarks
	R-1 snow and ice features	The Forest Service should identify a trail system on the Ashland Division of the Custer National Forest for snowmobiles	--	--	--	The Forest Service should identify a trail system on the Ashland Division of the Custer National Forest for snowmobiles
	Management of water bodies	Investigate further to ascertain whether appropriated waters previously acquired for industry or agricultur - can be used for recreation and wildlife after mined areas have been rehabilitated	--	--	--	Determine whether waters appropriated for industrial and agricultural uses can be used for recreation and wildlife after mining

Appendix C. (Continued)

Resource	Activity	Recommendation	Description of Recommendations: Standard	Nonspecific Enforceable Guideline	Policy	Study
RECREATION	R-1, Tongue River Reservoir	State agencies should assist the BLM in developing an activity plan for the Tongue River Reservoir. If coal leases are issued near this reservoir, subsequent mining plans should include appropriate measures that will mitigate impacts to existing recreational values	--	If coal leases are issued near the Tongue River Reservoir, mining plans must include provisions that will mitigate impacts to existing recreational values	--	--
	R-1, Tongue River	Additional public access to national resource lands along the Tongue River should be obtained. These tracts of land should provide boat launching and fishing sites as well as enhance other recreational opportunities. Specific lands are shown on MFP, Step 2, overlay for Recreation	Obtain lands along the Tongue River shown on MFP, Step 2, overlay for Recreation	--	--	--
		Develop a comprehensive study of the Tongue River to ascertain what recreational pursuits are of primary importance. These studies should be coordinated with the appropriate state agencies	--	--	--	Determine recreational uses of the Tongue River

Appendix C. (Continued)

Resource	Activity	Recommendation	Description of Recommendations: Standard	Nonspecific Enforceable Guideline	Policy	Study
RECREATION	R-1, Tongue River	The stretch of river between the Tongue River Dam and the bridge at Prairie Dog Creek should remain free-flowing and be considered as a possible scenic corridor	The Tongue River between the Tongue River Dam and the Prairie Dog Creek bridge is to remain free-flowing	--	--	Determine whether the Tongue River between the Tongue River Dam and Prairie Dog Creek should be classified as a scenic corridor
	R-2 fire protection	All historic sites and natural areas, identified on the MFP, Step 1, Recreation overlay should be protected from wildfires	All historic sites and natural areas identified on MFP, Step 1, Recreation overlay will be protected from wildfires	--	--	--
		The use of heavy equipment to control fires in geological areas (erosional and fossil features identified on MFP, Overlay No. 7 should not be allowed. If necessary, hand lines or other fire-fighting techniques will have to be utilized to control the fire	Heavy equipment such as tank trucks and bulldozers will not be used to fight fires in the erosional and fossil-features areas identified in MFP, Overlay No. 7	--	--	--
ENVIRONMENT	Environmental enhancement and protection of lands	Soil pollution recommendations: Restrict and/or control the following uses or practices:				

Appendix C. (Continued)

Resource	Activity	Recommendation	Description of Recommendations: Standard	Nonspecific Enforceable Guideline	Policy	Study
ENVIRONMENT	Environmental enhancement and protection of lands	a. Sagebrush, weed, or brush control involving chemical herbicides not meeting federal, state, or public health standards	Chemical herbicides that do not meet federal, state, or public health standards cannot be used for sagebrush, weed, or brush control	--	--	--
		b. Chemical treatment and practices used on lands to foster their use for agricultural purposes not meeting federal, state, or public health standards	Agricultural chemicals that do not meet federal, state, or public health standards cannot be used	--	--	--
		c. Private and public sewage systems not meeting state or public health standards	Sewage systems must meet state or public health standards	--	--	--
		d. Concentrated industrial operations adjacent to water courses or that would significantly affect groundwater aquifers where soil and water contamination can occur	--	Industrial operations cannot contaminate surface or subsurface waters	--	--

Appendix C. (Continued)

Resource	Activity	Recommendation	Description of Recommendations: Standard	Nonspecific Enforceable Guideline	Policy	Study
ENVIRONMENT	Environmental enhancement and protection of lands	e. The continued operation of any untended refuse-disposal sites where proper methods of handling dangerous or pollutable substances are nonexistent or limited in nature. The operation of the area's refuse disposal sites on a sanitary landfill basin would greatly alleviate any problems associated with potential soil and water pollution hazards	--	--	The refuse generated in the Planning Unit should be disposed of in a single, sanitary, landfill basin	--
		The possibility of utilizing land impacted by surface mining for sanitary landfill sites should be considered and investigated as a possible alternative	--	--	--	Determine if land impacted by surface mining can be used for sanitary landfill sites
		Compatability of land use: a. All industrial and extraction operations bordering water courses in the unit should be monitored so that their operations will not adversely affect the aquatic life or water quality for recreational or other life-sustaining purposes. Noise and air-quality control should also be monitored and controlled when necessary	--	Compatibility of land use: All industrial and extraction operations bordering water courses in the unit should be monitored so that their operations will not adversely affect the aquatic life or water quality for recreational or other life-sustaining purposes. Noise and air-quality control should also be monitored and controlled when necessary	--	--

Appendix C. (Continued)

Resource	Activity	Recommendation	Description of Recommendations: Standard	Nonspecific Enforceable Guideline	Policy	Study
ENVIRONMENT	Environmental enhancement and protection of lands	b. Sale of timber to processors will not exceed allowable cut limits. (An exception would be disease treatment or sanitation cuts, if undertaken.)	--	Except for salvage or sanitation cuts, timber sales will not exceed allowable cut limits	--	--
		c. Poorly placed and designed fences should be appropriately modified and new fences carefully planned and designed before installation	--	Poorly placed and designed fences should be appropriately modified and new fences carefully planned and designed before installation	--	--
		d. Acquire legal access for the general public to all parcels of federal and state lands that possess significant public value. Valuable activities include hunting, outdoor recreation, geological and environmental studies, and archeological, paleontological, and historical sites	--	Legal access shall be acquired for the general public to all parcels of federal and state lands that have significant public value	--	--
		e. The Decker Coal Company's operations may adversely affect the aesthetic and recreational use of the Tongue River Reservoir. Vegetative or topographic screenings should be considered and evaluated	--	--	--	Evaluate the possibility of screening the Decker coal mine from the Tongue River Reservoir for alterations in vegetation topography

Appendix C. (Continued)

Resource	Activity	Recommendation	Description of Recommendations: Standard	Nonspecific Enforceable Guideline	Policy	Study
ENVIRONMENT	Environmental protection and enhancement of waters	In order to ascertain the present situation properly and to make meaningful recommendations for the capabilities of and opportunities for development, both the surface and groundwater sources of the unit should be analyzed as they pertain to federal and public health standards. From this base information, future plans and developments may be more fully considered and evaluated as they pertain to the present situation	--	--	--	Conduct an analysis of surface and groundwater quality in the planning unit
		Areas meriting special study are those tracts of land designated for the strip mining of coal in the minerals portion of this report. An analysis of the groundwater resources and the local and regional impacts of mining on these resources is needed before implementing any large-scale development alternatives	--	--	--	Conduct a detailed analysis of groundwater resources in the areas designated for coal surface mining. Determine the local and regional impacts of coal mining on groundwater

Appendix C. (Continued)

Resource	Activity	Recommendation	Description of Recommendations			
			Standard	Nonspecific Enforceable Guideline	Policy	Study
ENVIRONMENT	Environmental protection and enhancement of waters	Surface and groundwater supplies should be managed and maintained within the limits set by the State of Montana	a. Drinking, culinary, and food-processing purposes, which must also adhere to Public Health Service standards Due to their length and complexity, the standards are not included here, but are noted in the body of the Decker-Birney report b. Bathing, swimming, and recreation c. Growth and marginal propagation of salmonoid and nonsalmonoid fishes and associated aquatic life, waterfowl, and furbearers d. Agricultural water supply, including irrigation, stock watering, and truck farming e. Industrial water supply	--	--	--

Appendix C. (Continued)

Resource	Activity	Recommendation	Description of Recommendations: Standard	Nonspecific Enforceable Guideline	Policy	Study
ENVIRONMENT	Environmental protection and enhancement of air	In order to ascertain the present situation properly and to make meaningful recommendations for the capabilities of and opportunities for development, Montana air quality should be controlled by continuously sampling air and comparing it to State standards and climatological information. From this base information, future recommendations may be evaluated	--	--	Encourage the establishment of a continuous air-quality sampling program in Montana	--
		Manage and control all land and water uses to maintain the quality of the air as established by applicable state and federal air quality standards	All land and water uses must meet applicable state and federal air quality standards	--	--	--
		Areas meriting special attention are those tracts of land designated as being suitable for the strip mining of coal in the minerals portion of this analysis	--	--	Lands suitable for the strip mining of coal should receive special attention	--
		Particulate matter recommendations:				
		a. Paving or oiling all major public roads	--	Pave or oil all major public roads	--	--

Appendix C. (Continued)

Resource	Activity	Recommendation	Description of Recommendations: Standard	Nonspecific Enforceable Guideline	Policy	Study
ENVIRONMENT	Environmental protection and enhancement of air	b. Elimination and vegetative reclamation of unneeded roads that are subject to wind and water erosion	--	Reclaim unneeded roads that are subject to wind and water erosion	--	--
		c. Encourage the conversion of all open-burning or untended dump sites to sanitary landfills. The coordination of this activity, if undertaken, should be with local units of government	--	--	Encourage local governments to convert open-burning or untended dump sites to sanitary landfills	--
		d. Encourage state and federal monitoring and emission control measures, where necessary, on those land-use activities that may degrade the area's air quality	--	--	Encourage state and federal monitoring of land-use activities that may affect air quality and the development of emission control measures for these activities	--
		e. Increase the fire protection measures serving the region such as manpower and equipment	--	--	Increase the fire protection capabilities in the region	
	Living components for humans	More detailed studies are needed to ascertain the present situation of the people who live and/or work in the region before implementing detailed activity plans that would significantly alter the environment	--	--	--	Prepare a detailed socioeconomic study of the planning unit Some of the data needed for this study are:

Appendix C. (Continued)

Resource	Activity	Recommendation	Description of Recommendations			
			Standard	Nonspecific Enforceable Guideline	Policy	Study
ENVIRONMENT	Living components for humans	--	--	--	--	Population - Amount, age, mix, growth Employment - Unemployment Housing - Abundance, quality, price Affluence and poverty - Distribution of wealth Significant institutions - Education, safety, security Professional services - Medical, legal, scientific Public health - Quantity, quality Energy services - Adequacy, rate, future needs, pollution Transportation services Sewage treatment and disposal Public recreation Public administration - Goals, representation, finances, services, planning Local amenities Well being of local inhabitants- Goals, attitudes, wants Sector economics

Appendix C. (Continued)

Resource	Activity	Recommendation	Description of Recommendations: Standard	Nonspecific Enforceable Guideline	Policy	Study
ENVIRONMENT	Protection and enhancement of ecological processes	Detailed soil surveys are needed in the Rosebud County portion of the planning unit. Such surveys have already been completed in Big Horn and Powder River Counties that outline the chemical, physical, and engineering properties of each major soil type	--	--	--	Conduct detailed surveys to determine the chemical, physical and engineering properties of major soil types in the Rosebud County portion of the planning unit
		Additional wildlife data are needed for both terrestrial and aquatic ecosystems	--	--	--	Conduct studies to determine on-site interrelationships and habitat conditions of in the planning unit
		Manage and control all land uses in order to maintain the vegetative and aquatic habitats and their associated ecosystems in a vigorous and healthy condition and compositional structure. The following ecosystems are found in the Decker-Birney area:	--	Manage and control land uses in order to maintain terrestrial and aquatic ecosystems in a vigorous and healthy condition	--	--

Appendix C. (Continued)

Resource	Activity	Recommendation	Description of Recommendations: Standard	Nonspecific Enforceable Guideline	Policy	Study
ENVIRONMENT	Protection and enhancement of ecological processes	Ecosystem / Acreage / % of Area Aquatic 3,803 .42 Grassland 214,622 23.89 Pine-woodland 217,116 24.15 Ponderosa pine 159,668 17.76 Big sagebrush shrub 262,336 29.20 Broadleaf 10,164 1.13 Agricultural land 31,000 3.45				
		Broadleaf habitat (streamside):				
		a. Maintain and enhance this vegetative component of the environment	--	Maintain and enhance the broadleaf vegetation type	--	--
		b. Proper management of the surrounding areas is important for this vegetative habitat	--	Management activities on lands adjacent to broadleaf habitat will not be detrimental to this habitat	--	--
		c. Road construction should not be permitted or should be highly restricted in this environment	Road construction is not permitted in the broadleaf habitat	--	--	--
		The Water Resources Board should ascertain the practices, if any, that can be initiated to regulate more adequately the Tongue River Reservoir and the downstream water fluctuations and temperatures of the Tongue River, especially during early summer and fall	--	--	--	Determine methods that can be initiated to regulate adequately the Tongue River Reservoir and the downstream water and temperature fluctuations of the Tongue River

Appendix C. (Continued)

Resource	Activity	Recommendation	Description of Recommendations: Standard	Nonspecific Enforceable Guideline	Policy	Study
ENVIRONMENT	Hazards to human and animal health and safety	Landslide and snowslide areas				
		Investigations of the higher elevations may be in order	--	--	Determine necessity of studying landslide and snowslide areas in the planning unit	--
		Earthquake or fault hazards				
		Several major faults are depicted on the mineral resources overlay. The type and magnitude of development should be carefully evaluated and controlled on these sites	--	--	Control development in major fault areas	--
		Unprotected areas, mine shafts or dumps				
		Mining in the area is currently limited to one operation and the elements of hazards and safety have been taken into account. Any new or ongoing commercial or industrial activities, however, should be operated and managed with safety in mind. The open-dump sites situated near Birney, Decker, and Ashland have been discussed under the nonliving components section of this report, which outlines proposed mitigating measures	--	New mining operations will take safety into account	--	--

Appendix C. (Continued)

Resource	Activity	Recommendation	Description of Recommendations: Standard	Nonspecific Enforceable Guideline	Policy	Study
ENVIRONMENT	Hazards to human and animal health and safety	Toxic water				
		Groundwater supplies vary drastically in their quality. Surface or subsurface disturbances should not be permitted that mix the contents of underground aquifers unless the water quality meets state and federal water standards	--	Surface or subsurface disturbances cannot mix the contents of underground aquifers unless the water quality meets state and federal standards	--	--
	Aesthetics	Visual				
		a. Burning at community dump sites should not be permitted. It should be managed on a sanitary landfill basis and fenced to help keep any blowing trash within the area	Burning at community dump sites should not be permitted. Solid waste should be disposed of at fenced sanitary landfills	--	--	--
		b. The scoria and gravel pits in the unit should be located out of view of the traveled roadways	Locate scoria and gravel pits outside of the view of roadways	--	--	--
		c. The Decker Coal Company mine adjacent to the Tongue River Reservoir should be screened by plantings or other approved reclamation practices. An exception, however, is that area between the road and	Screen the Decker Coal Company mine adjacent to the Tongue River Reservoir with trees, except for the area between the road and the railroad	--	--	--

Appendix C. (Continued)

Resource	Activity	Recommendation	Description of Recommendations: Standard	Nonspecific Enforceable Guideline	Policy	Study
ENVIRONMENT	Aesthetics (contined)	railroad tract in the fill area. The Highway Department has stated that no trees should be planted here since they will produce a snow-fence effect and enable snow to drift onto the road and railroad tracks				
		Sound				
		This is not known to be a problem at this time in the unit. Land-use controls may be a partial answer to prevent noise encroachment into people-use areas or vice versa. Areas meriting consideration and study would be around airports, mining operations, timber, and sawmill operations, etc.	--	Prevent the encroachment of noise into or from people-use areas	--	Study methods of controlling noise from airports, mining operations, timber and sawmill operations, etc.
		Odors				
		Outside of the three generally open and burning sites situated in Ashland, Decker, and Birney, no source of undesirable odors is known. The conversion of these sites to sanitary landfills will greatly alleviate the problem	Convert open disposal sites in Ashland, Decker, and Birney to sanitary landfills	--	--	--

Appendix C. (Continued)

Resource	Activity	Recommendation	Description of Recommendations: Standard	Nonspecific Enforceable Guideline	Policy	Study
ENVIRONMENT	Aesthetics	Land-use controls should also be established to prevent offensive land uses from being established within or near population centers or in geographical areas of high recreational use or enjoyment	--	Prevent the establishment of land uses that create offensive odors near population centers and areas of high recreational use	--	--
	Human interest value	Cultural				
		Much inventory, research, and data must be compiled to determine present cultural resources and to evaluate the potential for their protection and/or enhancement	--	--	Conduct a study to determine the potential for protecting or enhancing cultural resources	--

APPENDIX D

DECISION ANALYSIS FOR THE SITING OF NUCLEAR POWER PLANTS – THE RELEVANCE OF MULTIATTRIBUTE UTILITY THEORY

(by Ralph L. Keeney and Keshavan Nair, Proceedings of the IEEE, Vol. 63, No. 3, March 1975)

Decision Analysis for the Siting of Nuclear Power Plants—The Relevance of Multiattribute Utility Theory

RALPH L. KEENEY AND KESHAVAN NAIR

Abstract—The necessity for improved decision making concerning the siting and licensing of major power facilities has been accelerated in the past decade by the increased environmental consciousness of the public and by the energy crisis. These problems are exceedingly complex due to their multiple objective nature, the many interest groups, the long-range time horizons, and the inherent uncertainties of the potential impacts of any decision. Along with the relatively objective economic and engineering concerns, clearly the more subjective factors involving safety, environmental, and social issues are crucial to the problem. Hence, the professional judgments and knowledge of experts in these areas should be utilized in analyses of siting decisions. Likewise, the preferences of the general public, as consumers, the utility companies, as builders and operators of power plant facilities, and environmentalists and the government must be accounted for in analyzing power plant siting and licensing issues. We advocate an approach for formally articulating the experts' judgments and the decision makers' preferences, both of which are clearly subjective, and processing these along with the more objective considerations in a logical manner to acquire the implications for decision making. The appropriateness and application of decision analysis for power plant location decisions is discussed and illustrated in this paper. Emphasis is placed on the assessment of the decision maker's preferences and tradeoffs concerning multiple objectives.

I. Introduction

ALMOST ALL proposed strategies for meeting the projected energy demands of the next two decades include building a substantial number of power plant facilities. Unfortunately, long delays are often experienced between the initial planning by the utility company and the date of operation. President Nixon recognized this in April 1973 when he stated that as part of his program to alleviate the energy shortage, he proposed legislation and procedures to reduce unnecessary delays in the siting and licensing of nuclear power facilities.

The long delays result in part from the conflicting demands of an adequate energy supply and an acceptable level of environmental impact. It has been argued [4] that the shortage of electricity in New York City is due "in large measure to an inability to build plants as needed" and that "to reestablish the reliability of the electricity system we must find the tradeoff point between power plant siting and the environment." This issue is formally addressed in this paper. More generally, we are concerned with describing a systematic approach for rationally balancing achievement on the many conflicting objectives of siting power plants. The procedures and methodology offer a significant contribution to improved decision making.

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A. Problem Statement

In the existing institutional framework, the utility companies make the initial decision on a suitable site for power generation facilities, and then attempt to justify this decision to the regulatory agencies. The regulatory agencies review the utility companies' position and approve, suggest modifications, or reject the utility companies' recommendations. Both the utility company and the regulatory agencies have to consider the views of interested groups from the general public.

The major issues in the selection of a site for a power plant are as follows.

1) Difficulty in Defining the Problem: What alternatives are available to the decision makers? Who are these decision makers? What are the objectives and how are they going to be measured? What is the time scale of the problem? The identification of all significant impacts of potential decisions is often extremely difficult. There are several points of view to be considered (e.g., environmentalists, consumer groups, utility companies, regulatory agencies), each of which needs to be identified and articulated.

2) Multiple Objectives: There are a number of conflicting objectives on the basis of which the decision should be made and evaluated. These objectives which can be considered as components of the "quality of life" include environmental, social, economic, and safety considerations. Some of these have direct measures of effectiveness; e.g., cost (dollars), and others are intangibles; e.g., aesthetics. For the intangible objectives it will be necessary to develop subjective indices of measurement. The decision maker will be faced with the inevitable tradeoffs between achievement on one objective and achievement on others.

3) Impact Over Time: The decisions made today have an impact in the future. In economic studies this has usually been accounted for by discounting to net present worth. However, when considering radioactive waste, for example, it does not appear that discounting would be appropriate because at most moderate (3–7 percent) discount rates, society should effectively neglect all waste generated after 50 years. Such an implication of discounting does not appear to be intuitively justifiable. More appropriate procedures for addressing impact over time must be developed and used.

4) Uncertainty: There is always a degree of uncertainty associated with the possible impacts of an action. For example, the future effects in terms of environmental, safety, and social considerations cannot be predicted with certainty at the time the siting decision has to be made. Lack of knowledge and in-

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complete information contribute to this uncertainty. It is this uncertainty that often forms the basis of many of the objections to the location of nuclear power plants.

5) Several Impacted Groups: There are several identifiable groups who are impacted by a siting decision. The preferences of these groups are different. There is a desire on the part of the decision maker to attempt to achieve a degree of equity among the impacted groups.

6) Several Decision Groups: Often State and Federal agencies interact in making decisions. Not only can there be several groups involved in making the decision but there may also be some ambiguity and overlap concerning their responsibilities. If the problem is examined from the utility company's viewpoint, the utility company executives are the decision makers and the Federal and State agencies can be considered as impacted groups.

An analysis which claims to address the total problem must account for the aforementioned issues.

B. Need for Formal Analysis

The complexity of the problem in terms of conflicting multiple objectives, many interest groups, and the uncertainties associated with the potential impacts of a decision make it impossible to process the information satisfactorily through an informal and intuitive analysis. Recognizing this, the National Environmental Policy Act (NEPA), which forms the basis for judging the adequacy of the decision making process, requires that agencies of the Federal Government "utilize a systematic, interdisciplinary approach which will insure the integrated use of the natural and social sciences and the environmental design arts in planning and in decision making which may have an impact on man's environment." Furthermore, NEPA requires that the decision making process be available for public scrutiny. A formal analysis is necessary to meet the NEPA requirements.

C. Organization of Paper

The advantages of a formal analysis in the selection of a power plant site are discussed in Section II. In Section III, current approaches to this problem are briefly reviewed and appraised. Section IV suggests the applicability of decision analysis for analyzing the siting problem and discusses how the issues raised in Section II are treated in decision analysis. A critical part of the analysis, the structuring and assessment of a multiattribute utility function, is discussed in Section V. Conclusions are presented in Section VI.

II. Advantages of a Formal Analysis

A formal analysis, designed to improve decision making, has several major advantages.

1) It develops a good definition of the problem in terms of explicitly stating the alternatives and future contingencies, and identifying potential impacts.

2) It permits sensitivity analysis on alternative courses of action to study the impact of variations in estimates of uncertainty and of changes in the preferences of the decision makers and those affected by the decision.

3) It focuses discussion on substantive issues and provides a framework for resolving different points of view.

4) It permits an explicit treatment of uncertainty and preferences over both objective and subjective aspects of the problem.

5) It provides documentation for advocacy processes which need to be conducted in power plant siting and licensing decisions.

6) It provides the basis for developing a generic model for the evaluation of the aspects of nuclear siting problems common to many separate cases.

III. Current Approaches to the Siting Problem

The initial decision on selecting a site for locating a power plant is made by the utility company based on studies which it undertakes. This decision with appropriate justification is presented to the regulatory agencies. These agencies review the work of the utility company and hold public hearings prior to reaching a decision whether to approve or disapprove the utility company's position. Other special interest groups; e.g., environmentalists, local communities, etc., can challenge the regulatory agencies' decisions in the public media and in the courts. The regulatory agencies and the special interest groups have to rely heavily on the work conducted by the utility company.

Prior to the enactment of NEPA, the major factors in the selection, in addition to essential functional requirements, were safety and economics. Designs were developed to ensure safe performance under prescribed loadings. Criteria established by the regulatory agencies excluded certain areas as sites because of the potential risk of damage from an accident.

NEPA requires that broader environmental and social issues be addressed and that the alternatives considered be explicitly discussed. Since site selection is a long process, many of the initial studies after the enactment of NEPA consisted of examining a decision already made to demonstrate that environmental and social impacts were acceptable.

However, the trend now is towards regional studies where many candidate sites are selected and a comparative evaluation conducted to select the 'best' site. There is no generally accepted methodology for conducting such studies. However, the following steps contain the essential features of approaches currently in use.

1) Establishing Exclusionary Criteria: Criteria which are utilized to exclude areas as potential sites are established. These are based on regulatory agency requirements and essential functional requirements. Examples of such criteria are population centers in excess of 2500, Federal reserves, earthquake faults, areas where air pollutant concentrations are already in violation of Federal standards, and water availability.

2) Selecting Candidate Sites: On the basis of these exclusionary criteria a number of candidate sites are selected.

3) Establishing Evaluation Criteria: A list of criteria is established for comparative evaluation of the candidate sites. Currently these criteria, in most cases, do not reflect the objectives to be attained in a siting decision. They represent the sensitivity of the site to impact, but do not measure what the impact might be. These criteria cover the broad range of cost, safety, social, and environmental factors. However, specific measures are generally not developed for all these criteria, specifically in the social and environmental areas.

4) Application of Criteria: In most cases the effort is concentrated on those criteria which can be easily quantified; these are primarily cost and safety. Recently attempts have been made at subjectively quantifying environmental factors. However, in most cases the techniques for quantification have been inadequate. Very little attention is paid to social issues.

5) Siting Decisions: In making decisions over multiple criteria, tradeoffs are not currently explicitly considered. Generally those criteria which can be relatively easily quantified (e.g., cost, safety) dominate the decision. Recent attempts at weighting the several criteria are not done in an appropriate manner and can lead to erroneous conclusions. Sensitivity studies excluding various criteria have been conducted to assist the decision maker.

Many factors that were not being considered prior to NEPA are now being considered and the approaches now in use represent significant improvements over past practice. Nevertheless, the shortcomings in the current approaches, which are very significant, include the following.

1) The criteria are not formulated in terms of impacts. Under the existing procedures it is generally advantageous to select a site which has already suffered substantial environmental damage or is in a low-income area.

2) Uncertainties are not considered. This is one of the most important issues in the arguments on siting. What is the likelihood of a particular impact occurring?

3) The tradeoffs between various conflicting objectives are not explicitly treated and the relative preferences of the decision maker are not determined.

4) Impacted and other special interest groups who have different tradeoffs and preferences as compared to the decision maker are not considered directly in the analysis.

5) The 'no build' alternative is not formally analyzed. The intrinsic value of preservation is therefore not considered.

6) Where quantitative work has been done in order to consider multiple objectives, it has not been on a sound theoretical basis.

IV. Modeling the Problem

In this section, we will briefly describe the decision analysis approach and then structure the nuclear power plant siting problem in this context. Specifically, we indicate how the issues raised in Section II are addressed within the decision analysis framework.

A. The Decision Analysis Approach

How can one "make sense out of all the considerations" which are important to selecting the best alternative concerning a siting problem? The difficulty in doing this informally in one's mind is that there are just too many factors and interactions to think through and balance competing effects, along with the many considerations of equity, long-range consequences, etc. It would be very nice if the decision makers could systematically analyze all this relevant information in the manner they would like to, using their own common sense and preferences. Decision analysis, the approach we advocate for analyzing these complex problems, does exactly this.

For discussion purposes, it is convenient to divide decision analysis into four steps. In practice the distinction is not so clear as there is a great deal of interaction among the steps. These steps are as follows.

1) Structuring the decision problem includes identification of the decision maker, impacted groups, generation of alternatives and an appropriate set of objectives and measures of effectiveness to indicate the degree to which these objectives might be achieved by various alternatives.

2) Describing the possible consequences over time of each alternative in terms of the measures of effectiveness. With this step, the uncertainty associated with possible alternatives is identified.

3) Prescribing the relative preferences of the decision maker or makers for the possible consequences. Here the tradeoffs among the conflicting objectives which one is willing to accept are identified.

4) Rationally synthesizing the information from the first three steps and performing sensitivity analyses to decide which of the proposed alternatives is preferred.

The decision analysis approach attempts to consider systematically all the available relevant information and to utilize explicitly the preferences of the decision maker. It does this by breaking the problem into parts, which are easier to analyze than the whole, and then putting the parts back together in a "logical fashion." The crucial difference between decision analysis and other approaches which claim to help the decision maker, is that the 'logical fashion' for integrating the parts depends on the individual decision maker doing the integrating. It is essential, as well as desirable, to exploit the experience, professional judgment, and knowledge of the individual in making the siting decisions. Decision analysis provides procedures for formalizing the judgments and preferences of such decision makers and integrating this using *their* logic to evaluate alternative courses of action in complex decision problems. To illustrate this, let us consider a siting problem in the decision analysis framework.

B. The Siting Problem in a Decision Analysis Framework

We will state a general hypothetical problem and then follow the four steps outlined in the preceding to illustrate the procedure for analyzing it.

To keep the discussion simple and to the point, consider the decision of whether or not to build a nuclear power facility at any of three alternative sites. Only one site will be chosen if, in fact, any is. There is the possibility that the 'no build' alternative is better than building at any of the three sites. Hence, this must be included in any analysis which purports to assist the decision maker.

Structuring the Problem: For our hypothetical problem the alternatives are already specified. We take the position that the decision maker is the utility company; furthermore, we assume that for purposes of discussion the decision maker is an individual.

An appropriate set of objectives for the utility company and measures of effectiveness for each of these to indicate the degree to which they are achieved need to be developed. The choice of objectives and measures of effectiveness should be made by the decision makers with the assistance of experts in the various disciplines. Clearly in all nuclear siting decisions, the utility company's overall objective is "to select the best site." However, this objective is too broad to be operationally useful in analyzing the alternatives. It must be divided into a number of lower-level more specific objectives. A possible set of objectives, which could be specified is as follows:

a) minimize environmental damage;
b) maximize human health and safety;
c) provide quality service for consumers; and
d) maximize desirable economic impact on the company.

This set of objectives is oversimplified but may be still too general to be of practical use. Subobjectives are developed, and associated with each of these is a measure of effectiveness.

TABLE I
CONCEPTS ON DEVELOPING OBJECTIVES, SUBOBJECTIVES, AND MEASURES OF EFFECTIVENESS

OBJECTIVE	SUB-OBJECTIVE	MEASURE OF EFFECTIVENESS[1] (Attributes)
Minimize Environmental Damage	Aquatic Ecology	Fish population; Change in ambient temperature of water; Subjective indices in terms of other sites
	Terrestrial Ecology	
	Water Quality	Objective measures available
	Air Quality	
	Aesthetic and Scenic Values	Subjective indices
	Impact of Transmission Lines	Length of line
	Historic & Cultural Features	Subjective indices
Maximize Human Health & Safety	Radiation Exposure	Level of radiation per person
Provide Quality Service for Consumers	Service Interruptions	Days
	Cost to Consumer	Annual cost in dollars
	Delays in Initial Operation	Days
Maximize Desirable Economic Impact on Company	Profit to Company	
	Cost (Initial)	
	Operating revenues	
	Operating expenses	Dollars
	Cost of Delays in Licensing	

[1] For each sub-objective there can be more than one measure of effectiveness. When no objective measure is apparent, by appropriate techniques a subjective index can be developed within the experience of the decision maker.

Table I, although not intended to be complete for any specific problem, illustrates this concept. In practice it is always extremely important to attempt to include all the relevant objectives in one's analysis.

For example, under minimizing environmental damage we would have to consider aquatic ecology, terrestrial ecology, and water quality, etc. An important point is that none of the options (including the 'no build' alternative) is likely to have no detrimental environmental impacts. We now face the question of what is a useful measure of aquatic ecology. The possibilities are to develop a subjective index based partially on the professional judgments and experience of aquatic ecologists or to utilize an established objective indicator of aquatic ecology. It is often not obvious what objective measure should be used. For aquatic ecology, possible measures include fish population or other elements in the food chain or causes of change in the aquatic ecology like the number of Btu added to the water by the plant. It may be possible to integrate several such objective measures into one overall measure of aquatic ecology (see [9]). By formally analyzing a problem with alternative measures of effectiveness for a specific objective, it is possible to conduct a sensitivity analysis to determine if the choice of the measure influences the decision.

For purposes of discussion, let us assume that there are n measures of effectiveness, labeled $X_1, \cdots, X_n$. We will also refer to $X_1, \cdots, X_n$ as attributes, and small letters x_i will represent a specific amount of attribute X_i.

The consequence $x \equiv (x_1, x_2, \cdots, x_n)$ of implementing a particular alternative can be described in terms of the levels x_i of the attributes X_i. However, there is always a degree of uncertainty associated with predicting the consequences of any course of action at the time the decision is made. These uncertainties are always treated explicitly in decision analysis. To describe the possible consequences of each alternative, we want a probability distribution function which indicates which consequences $(x_1, \cdots, x_n)$ might occur and their likelihoods of occurrence. Thus, for each alternative, the utility company should quantify its judgment, based on expert opinion, data, experiments it may have conducted, energy demand forecasts, etc., to specify $p_j(x)$, the probability distribution for consequences given alternative j is chosen. Many disciplines besides decision analysis, including operations research, management science, systems analysis, and computer science address such issues as constructing appropriate models to generate probability distributions. These models include both analytic and simulation models. We will not dwell on this important consideration here as our main consideration in this paper concerns the next step.

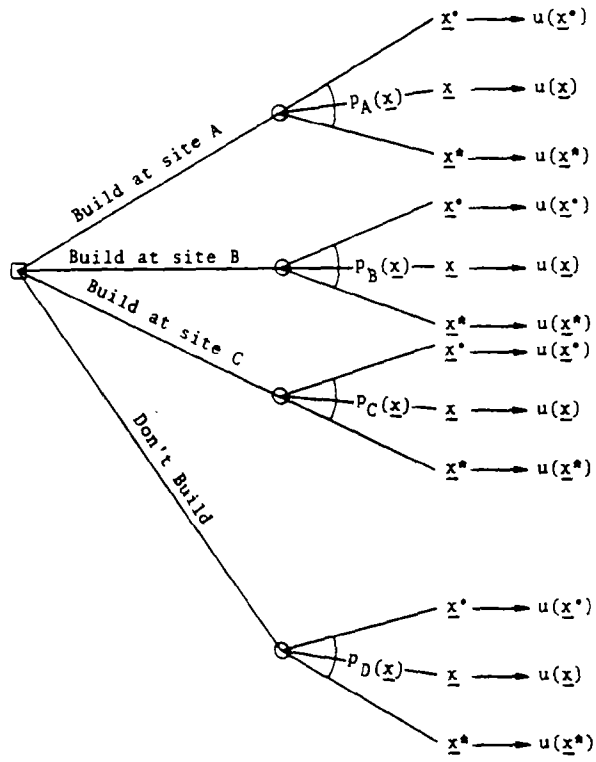

Fig. 1. Simple decision analysis model of a nuclear siting decision.

Prescribing the Relative Preferences: The tradeoff issue is addressed by assessing the decision maker's relative preferences for the consequences. We want to quantify the decision maker's subjective preferences so we can clearly see for instance if $x' = (x_1', \cdots, x_n')$, is preferred to $x'' = (x_1'', \cdots, x_n'')$, if they are indifferent, or if the latter is preferred. Then if $(x_1', x_2', x_3^0, \cdots, x_n^0)$ is indifferent to $(x_1'', x_2'', x_3^0, \cdots, x_n^0)$; one can say that given $x_3 = x_3^0, \cdots, x_n = x_n^0$, the decision maker is willing to change x_1' to x_1'' if x_2' is changed to x_2''.

To quantify preferences, we need to assess the decision maker's preference function which assigns a number u to each of the possible consequences $(x_1, x_2, \cdots, x_n)$. This function[1] has two desirable properties: 1) $u(x_1', \cdots, x_n') \geqslant u(x_1'', \cdots,$

[1] The term utility function is more common for what we refer to as a preference function. The terminology here avoids misunderstandings due to assessing a utility company's utility function.

x_n'') if and only if $(x_1', \cdots, x_n')$ is preferred to $(x_1'', \cdots, x_n'')$; and 2) in situations with uncertainty, the expected value of u is the appropriate guide to make decisions. For each alternative j, the probability distribution p_j and the preference function u are necessary and sufficient to calculate the expected value of u. Then the alternative with the highest expected value is chosen. This last result follows from some fundamental behavioral assumptions specified in von Neumann and Morgenstern [13]. Raiffa [11] has a discussion of their appropriateness in decision making. This brings up the crucial issue which we address in Section V: "How is u assessed?"

Rationally Synthesizing the Information: This step is mainly computational given the information of the previous three steps. It consists of calculating expected values of u for the alternatives and choosing the alternative associated with the highest value. The sensitivity analysis involves varying the basic parameters of the probability distributions and the preference function to see how this affects the best alternative and also changing the structure of the problem slightly by adding measures of effectiveness which were initially left off because they were felt to be not significant enough to influence the best strategy.

A picture of the decision analysis model in simple form is illustrated in Fig. 1. The four alternatives are clear. The notation $p_j(x)$ is the probability distribution if alternative j is taken, where $j = A, B, C, D$, and D indicates do not build. The possible consequences range from a worst, labeled x^0, and a best, labeled x^*, and the utility firm's preference function is u.

V. Structuring and Assessing the Preference Function

The most unique aspect of a decision analysis is the degree to which subjective factors—judgments about possible consequences and preferences—are formally incorporated into the analysis of the alternatives. We believe that it is these subjective factors that cause most of the disputes on siting decisions and that formalizing them provides a basis for constructive discussion and a basis from which to reach agreement. Our position is that these subjective factors are essential in any analysis to prescribe a best alternative for the situation. In this section, the focus is on the preference aspect of the problem. First, the general approach in structuring the preference function is discussed, and then procedures for assessment are illustrated in the context of a hypothetical example.

A. Structuring the Preference Function

We would like to break the preference assessment into a number of smaller tasks. In particular, it would be convenient if a simple function form for u could be found such that

$$u(x_1, x_2, \cdots, x_n) = f[u_1(x_1), u_2(x_2), \cdots, u_n(x_n)] \quad (1)$$

where x_i represents a specific amount of attribute X_i, $i = 1, 2, \cdots, n$, and u_i is a preference function over X_i. For instance, u might be additive so that

$$u(x_1, \cdots, x_n) = \sum_{i=1}^{n} k_i u_i(x_i) \quad (2)$$

or multiplicative so

$$1 + ku(x_1, \cdots, x_n) = \prod_{i=1}^{n} [1 + kk_i u_i(x_i)] \quad (3)$$

where in both cases the k_i's are positive scaling constants.

The basic manner used to structure simple forms of u consistent with (1) is to verify sets of assumptions about the decision maker's preferences which imply certain reasonable forms of u. Two basic assumptions are referred to as preferential independence and utility independence. Let us define these.

Preferential Independence: The pair of attributes $\{X_1, X_2\}$ is preferentially independent of the attributes $\{X_3, \cdots, X_n\}$ if preferences among $\{X_1, X_2\}$ pairs given that $\{X_3, \cdots, X_n\}$ are held fixed do not depend on the level where $\{X_3, \cdots, X_n\}$ are fixed.

Preferential independence implies that the tradeoffs between attributes X_1 and X_2 do not depend on $X_3, \cdots, X_n$.

Utility Independence: The attribute X_1 is utility independent of the other attributes $\{X_2, \cdots, X_n\}$ if preferences among lotteries over X_1, specifying various amounts of x_1 and the probabilities of receiving them, given $X_2, \cdots, X_n$ are fixed, do not depend on the levels where these attributes are fixed.

Rather than present theorems following from various independence assumptions which can be found elsewhere (see, for example, Fishburn [1], [2], Keeney [5], [7], and Raiffa [10]), let us just say that a number of forms consistent with (1), such as (2) and (3) can be derived. We want to concentrate on two other matters: i) indicating how the various complexities of the nuclear siting problem discussed in Section II are formally addressed within our preference structure, and ii) discussing the assessment of u.

B. Addressing Complexities in the Preference Structure

By their very structure the consequences $(x_1, \cdots, x_n)$ do incorporate the multiple objective nature of the nuclear siting problem, and we have already indicated how the tradeoff issue and uncertainties can be explicitly addressed in this framework. One of the complexities we did not yet consider is impacts over time. Suppose our fourth attribute X_4 is cost measured in dollars. Likely the dollar flow due to a particular nuclear plant would exist for many years. Here we include construction and maintenance costs, power generation costs, revenues received from the power generated, etc. Rather than lumping this into one number x_4 initially, it may be better to view it as a sequence of numbers $(x_4^0, x_4^1, \cdots, x_4^t)$, where x_4^t represents the net flow in dollars in year t from now. It may then be appropriate to aggregate these x_4^t's using the net present value, label it $\bar{x}_4$, of the monetary stream, where

$$\bar{x}_4 = \sum_{t=0}^{T} \lambda^t x_4^t \quad (4)$$

and λ is the discount factor. One must be aware of the assumptions implied by (4) before blindly using this discounting. Other more sophisticated means of aggregating time considerations are available (see Meyer [8]).

The intangible and less quantifiable aspects of a problem represent a challenge to all who work on it. For instance, suppose that the environmental damage could not be measured simply by fish killed, but that it was desirable to measure how the overall environmental loss due to the construction of a nuclear facility on what was previously wilderness. There may be no objective manner to count up the impact due to lost solitude for campers, the lost sanctuary for animals, the ecological balance among small species in the area which may be lost forever, etc. In these situations one is forced to structure a subjective index of environmental damage which attempts to

account for all these factors. A scale of environmental impacts can be set up from zero to ten where zero represents no damage—the site is not built here—and ten may be complete devastation of a few square miles area. A five on such a scale may be defined as the solitude and privacy of the area are gone, but larger animals and foliage are not particularly disturbed. Then one must consider relative preferences for the various amounts of environmental damage as represented on the subjective scale.

A utility company is often concerned about the impact of its decisions on various groups such as local groups of individuals living near prospective sites, environmentalists, consumers, State and Federal agencies, etc. In order to explicitly consider this, rather than treat it under one general term like "public acceptance," it might be possible to quantify the preferences of each of the groups of interest with preference functions in the same manner in which the utility company's preferences were structured.[2] Suppose this is completed and we just have preference functions u_L for local groups, u_E for environmentalists, and u_C for consumers. Then issues of tradeoffs between the groups can be formally addressed. The analysis should answer questions such as if we built a big plant at Site A versus a moderate-sized plant at Site B, what will the attitudes of these groups be. Who benefits and who does not and by how much? Also, is this package of benefits and disbenefits justifiable? This is the equity issue raised in Section II. If by increasing a plant's size the utility company can provide better service to consumers and slightly improve their profits, is this justifiable, given that the environmentalists will be slightly displeased and the local groups living near the site very upset? Another question facing the utility company is, will the State and Federal agencies allow such an expansion in light of the impacted groups' feelings. Such an analysis may shed some light on this issue and in the process help suggest better courses of action for the utility company to pursue.

C. Assessing the Preference Function

Now let us concentrate on the implementation of the ideas. We want to answer three questions in this section. 1) Whose preferences should be assessed? 2) What information is needed to specify the preferences? 3) How does one obtain this information?

Whose Preferences Should Be Assessed: The decision maker upon whom we have focused to illustrate the concepts is the utility company. The methodology discussed could be utilized to assess the preferences of any of the impacted groups discussed above. Thus, it is the utility company's preferences that are of interest. These may in practice come directly from the president of the company, persons whom he designates, or a combination of both. For example, the president may designate certain nuclear engineers and safety engineers to assess preferences over attributes concerning radiation hazards of particular designs. Environmental experts in the employment of the utility company may specify preferences for degrees of environmental impact. The tradeoffs between these two factors may be concluded jointly by both groups of people as well as the president and other executives of the utility company. Issues concerning profits and service may be considered only by the executives of the firm. After all the assessments, the president of the board must "ratify" the preference function as representing the professional judgments and overall interests of the utility company.

What Information Is Needed to Specify Preferences and How Is It Assessed: The information needed to specify preferences can be adequately illustrated in terms of a four attribute example with an additive preference function

$$u(x_1, x_2, x_3, x_4) = \sum_{i=1}^{4} k_i u_i(x_i) \tag{5}$$

where u and the u_i are all to be scaled from zero to one and

$$\sum_{i=1}^{4} k_i = 1.$$

The idea is that if the k_i's and u_i's are specified, these can be plugged into (5) to give us the complete u. Procedures for assessing the u_i's are discussed in a number of places (see, for example, Schlaifer [12]). Let us briefly illustrate the basic ideas.

Step 1—Assessing the preference functions over the individual attributes: Assume we wish to assess preferences over the net present value of profits generated by the facility and the possibilities range from zero to 500 million dollars. In notation, $0 \leqslant x_4 \leqslant 500$, where X_4 is measured in millions of dollars and $u_4(x_4)$ is a preference function for profits. First one can arbitrarily set

$$u_4(0) = 0 \quad \text{and} \quad u_4(500) = 1 \tag{6}$$

since the best consequence—i.e., the 500—must have the highest possible u_4 value and the worst consequence must have the lowest. The decision maker must then consider two options: one, a lottery where profits will either be 500 or 0, each of which has a chance of 0.5, and the other where profits will surely be 200 million. The question the decision maker must consider is which is preferred. One could think of the lottery as formalizing a situation where an AEC decision was in question at the time a site is selected by the utility company. There may be a 50–50 chance the AEC would go along with the utility company's recommendation. Suppose that due to investors' interests, etc., the 200 was preferred to the lottery even though the expected payoff of the lottery is 250. The fact is that there was one-half chance with the lottery that the result would be zero. Well, if 200 is preferred, then by nature of assessing u_4, it must be that $u_4(200)$ is greater than the expected value of u_4 for the lottery. This $(0.5)u_4(500) + (0.5)u_4(0) = 0.5$, so it follows that $u_4(200) > 0.5$. Now the lottery is compared with 150 million for sure, and suppose the lottery is preferred. Then it follows that u_4 assigned to 150; that is, $u_4(150)$ must be less than the 0.5 value calculated for the lottery. Finally, suppose the decision maker says 175 for sure is indifferent to the lottery. Then the preference value assigned to 175 must be equal to that of the lottery so $u_4(175) = 0.5$. This gives us a third point on a u_4 preference function as illustrated in Fig. 2.

The process now repeats itself. A lottery yielding a 50–50 chance of 175 or 0 is compared to a sure amount of say 50. If the lottery is preferred, the 50 is incrementally increased until indifference is reached. Suppose this occurs at 75. Then $u_4(75)$ must be assigned to equal the expected value of u_4 for the lottery, $(0.5)u_4(175) + (0.5)u_4(0) = 0.25$. Thus, $u_4(75) = 0.25$ as illustrated in Fig. 2. Finally, assume we have ascertained that 300 for sure is indifferent to the lottery yielding either 175 or 500, each with probability 0.5. Then, of course,

[2] Gros [3] has some initial results on quantifying the preferences of various interest groups.

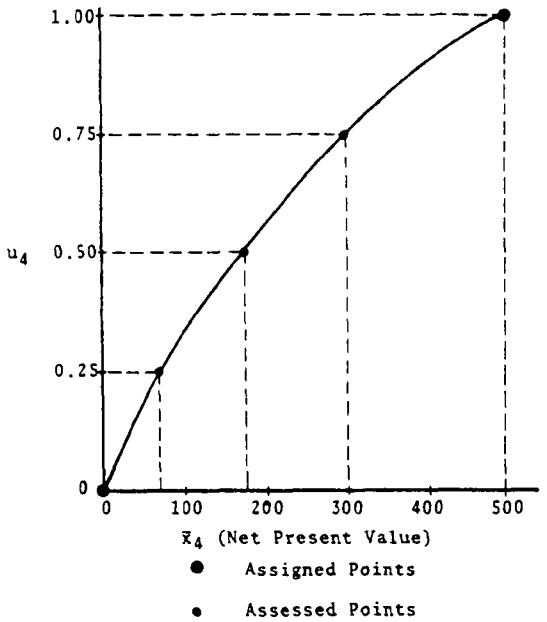

Fig. 2. Preference function for profits.

$u_4(300) = 0.75$ which is also indicated in the figure. The curve smoothed through the points of u_4 in Fig. 2 represents the preference function for net present value of profits.

There are more sophisticated procedures for assessing u_4 than illustrated here which explicitly account for attitudes toward risk in the assessment. These were not discussed here because the fundamental questions concerning the decision maker's preferences for different amounts of a single attribute could be simply illustrated with our example. The other preference functions u_1, u_2, and u_3 could be assessed in the same manner.

Step 2—Assessing the tradeoffs among attributes: The important issue of tradeoffs among the attributes is addressed by assessing the k_i's in (5). For illustrative purposes we will use a four-attribute problem where the following limits are appropriate:

$$\begin{aligned} x_1^0 &\leqslant x_1 \leqslant x_1^* \\ x_2^0 &\leqslant x_2 \leqslant x_2^* \\ x_3^0 &\leqslant x_3 \leqslant x_3^* \\ 0 &\leqslant x_4 \leqslant 500. \end{aligned}$$

Then by our scaling conventions of assigning a preference value of zero to the worst level and one to the best level of each attribute, suppose

$$\begin{aligned} u_1(x_1^0) &= 0 \qquad u_1(x_1^*) = 1 \\ u_2(x_2^0) &= 0 \qquad u_2(x_2^*) = 1 \\ u_3(x_3^0) &= 0 \qquad u_3(x_3^*) = 1 \\ u_4(0) &= 0 \qquad u_4(500) = 1 \end{aligned} \tag{7}$$

where we have assumed for illustration purposes that preferences are increasing in each of the four attributes. Also, clearly

$$u(x_1^0, x_2^0, x_3^0, 0) = 0 \quad \text{and} \quad u(x_1^*, x_2^*, x_3^*, 500) = 1 \tag{8}$$

in order to be consistent with (5).

Now the decision maker is asked to rank in order which attribute he would like to move from the worst to the best level given he started with all of them at the worst level, that is $(x_1^0, x_2^0, x_3^0, 0)$. Suppose he responds that he would prefer to move X_2 from x_2^0 to x_2^*. Next he would prefer to move X_4 from 0 to 500. Then X_3 from x_3^0 to x_3^*, and lastly X_1 from x_1^0 to x_1^*. This implies that the k_i's of (5) are such that

$$k_2 > k_4 > k_3 > k_1. \tag{9}$$

To directly face the tradeoff issue, the decision maker is asked to consider beginning at the worst level of all attributes and changing either X_2 from x_2^0 to some intermediate value x_2' or x_4 from 0 to 500. Suppose the latter is preferred but that if X_2 was changed from x_2^0 to x_2'', he would be indifferent. Then, of course, the preference u of the two indifferent consequences must be equal so

$$u(x_1^0, x_2'', x_3^0, 0) = u(x_1^0, x_2^0, x_3^0, 500). \tag{10}$$

Evaluating both sides of (10) with (5) and (7), we find

$$k_2 u_2(x_2'') = k_4. \tag{11}$$

Tradeoffs between X_3 and X_2 and between X_1 and X_2 are now considered in the same manner. Suppose the decision maker agrees that starting at the worst consequence, changing X_2 to x_2''' is equally desirable from the utility company's point of view as changing X_3 to x_3^*. Then, it follows that

$$k_2 u_2(x_2''') = k_3. \tag{12}$$

Similarly, suppose,

$$k_2 u_2(x_2'''') = k_1. \tag{13}$$

Evaluating (5) at the best point and employing (7) and (8), we find

$$1 = k_1 + k_2 + k_3 + k_4. \tag{14}$$

Because u_2 is already independently assessed, (11)–(14) represent four equations with four unknowns which can be solved for the k_i. With this and the u_i's, the utility company's preference function u is completely specified.

As in the assessment of the u_i's, there are alternative methods for arriving at the k_i's (see Raiffa [10]). Which procedure is best depends on many factors and must be adapted during the assessment process. It is not expected that on a first try one could be completely comfortable with his articulation of preferences. The questions requiring answers are difficult. However, the initial assessment should serve as a basis for discussion and reconsideration, modification, and improvement. After a few iterations, the preference function should closely represent the utility company's preferences.

VI. Conclusions

It is our view that decision analysis is a sound approach for assisting the making of power plant siting decisions. A formal analysis, which has its limitations, is to be preferred over an informal, intuitive analysis which also has limitations. Such a formal analysis will focus discussion on substantive issues and provide the basis for developing a compromise between conflicting points of view.

All the critical issues in a siting problem can be addressed within the decision analysis framework. Of special significance is the explicit inclusion of the preferences of the decision maker and the treatment of the uncertainty associated with the consequences of a decision.

A preference (utility) function, over multiple attributes, including both tangible and intangible factors, can be structured and assessed for the decision maker. The tradeoffs between

competing objectives are addressed in developing a preference function.

An example of constructing a multiattribute utility function utilizing the preferences of the decision maker is provided in Keeney [6]. Work by Gros [3] and the experience of the authors indicate that utility company executives and knowledgeable professionals in the environmental and social sciences are willing to address the question of tradeoffs between competing objectives and can provide the necessary information to quantify preferences over multiple objectives.

Because decision analysis incorporates the preferences of the decision maker, it is essential that those conducting the analysis and the decision maker work closely together in contributing to improved decision making.

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