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Second Annual Report

October 1973

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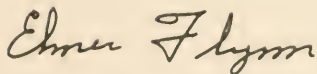
LETTER OF TRANSMITTAL

Honorable Thomas L. Judge
Governor
State of Montana

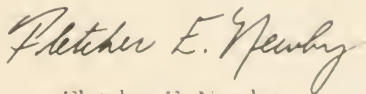
Members of the Legislative Assembly

The People of Montana

The Environmental Quality Council herewith submits its
Second Annual Report for the fiscal year ending June 30, 1973
in accordance with Section 69-6514 of the Montana Environmen-
tal Policy Act.



Senator Elmer Flynn
Chairman



Fletcher E. Newby
Executive Director

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Preface

In its First Annual Report, the Environmental Quality Council (EQC) recommended various legislative actions and policy studies. It is rewarding that several of those legislative recommendations were enacted by the 1973 legislature. These include the Montana Strip Mining and Reclamation Act, the Utility Siting Act, and the acts regulating subdivisions. In addition, legislative resolution directed the EQC to conduct energy policy and land use policy studies, which further implemented council recommendations.

The 1973 legislature considered about 200 environment-related bills, reflecting the extensive public concern about environmental quality documented in the First Annual Report. Many of those bills pertained to energy and land use, major trends of which were identified and discussed in the first report.

Montana's Environmental Quality Council includes members of the legislative and executive branches as well as the public. Its composition is unique in the United States. The council's unusual, independent composition facilitates its role in maintaining a policy overview of state programs with environmental consequences. Integration of the environmental impact analysis process into other acts, such as the Utility Siting Act, reflects increasing recognition of the value of the process in accomplishing systematic evaluation of complex problems while providing wider agency and public involvement.

Following the second anniversary of the passage of the Montana Environmental Policy Act, the EQC was reorganized with seven new members. A diversity among council membership was maintained, thus assuring a broad perspective and balanced consideration of the many interests of the people of Montana.

As the newly elected chairman, I wish to express appreciation to outgoing members for their able service and to the public for its support during this formative period. On behalf of the new council, I pledge our continuing efforts to maintain and enhance the overall quality of life in Montana.

Senator Elmer Flynn
Chairman
Environmental Quality Council

Introduction

The Second Annual Environmental Quality Report begins to examine in depth the major trends identified in the First Annual Report, demands upon Montana energy resources, and patterns and problems of land development.

The second report describes progress and plans for the Environmental Quality Council (EQC) energy and land use policy studies begun in response to 1973 legislative mandates. The enactments are in keeping with the EQC's statutory duty "to make and furnish such studies, reports thereon, and recommendations with respect to matters of policy and legislation as the legislative assembly requests." Additional monetary support for the studies has been provided by a \$150,000 grant from the Ford Foundation.

Basic to any consideration of state energy policy is an understanding of national policy regarding underground natural resources. This report traces the formation of national policy and the legal problems of surface and subsurface rights. Last year's report included an overview of coal development potential in eastern Montana that was widely quoted in national publications. This overview is updated and expanded with specific consideration of the role of water in coal development. Because the pressures on Montana natural resources arise from steadily increasing energy demands as well as air quality standards in consumer regions, initial studies of ways to conserve energy and dampen demand are reported.

The second report continues the land use emphasis of the first report on problems of urban sprawl and speculative second-home and recreational land development. The effect of saline seep, recognized in last year's report, is discussed in greater detail, and new development in another use of land, wastewater disposal, are reported.

Other chapters in this report resemble last year's. The 1971 legislature was noted for its concern about environment, but the 1973 session introduced more environment-related bills — about 200. The most significant of those enacted are reviewed.

Montanans continue to be actively involved in environmental legislation and government decision-making. Citizen environmental protection efforts are surveyed in this report, as well as one innovative process of the metallurgy industry that may allow industry expansion without proportionate increases in pollution.

Other major, ongoing EQC functions include administration of the environmental impact statement process and review and appraisal of state agency programs and activities.

Significant environmental legislative proposals held over from the 1973 legislature are analyzed, and recommendations are made. New proposals to be considered in the 1974 session are presented.

The Second Annual Environmental Quality Report is in part a prelude to the immense task of fulfilling legislative directives for state energy and land use policy studies. Succeeding reports will present findings from these studies in much greater volume and detail.

Fletcher E. Newby
Executive Director
Environmental Quality Council

Reality



PART I

The Overriding Issues

Introduction

In the last few years Montanans have had to face compelling issues that promise rapid and probably irreversible changes in attributes that give Montana uniqueness – its historical, physical, biological, and social atmospheres. Foremost among these issues are the spiralling demands for energy resources stemming from national noupolicy for cheap, abundant energy and the speculative exploitation of land arising from an ethic that regards land strictly as a commodity to produce short-term profits.

By geological and political accident Montana's boundaries include vast quantities of America's most abundant fossil fuel, coal, as well as several other significant energy resources. By similar accident, Montana's attributes combine to provide areas of singular environmental amenity, which, until rural serenity is destroyed by swarms of urban refugees, seem like extraordinary places to live.

Coal stands indicted environmentally at both the extraction and conversion levels, especially because of current strip mining and combustion technology. Nevertheless, western low-sulfur coal is the short-term energy future for consumer regions around Montana.

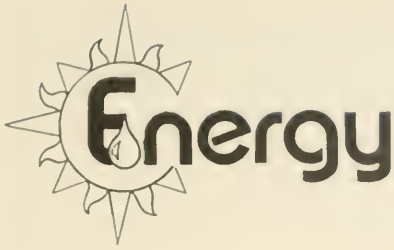
At the same time, as population and affluence grow, demand for pleasant living space not only fulfills a human need but creates a land boom that preempts productive agricultural land, destroys wildlife habitat, and strains local government services.

Energy and land use are intertwined; thus it is appropriate that their policy studies progress jointly. Fundamental questions the studies must ask about basic issues and values must consider:

- what the land is;*
- what the land can be;*
- what the land ought to be; and*
- what options can be saved for future generations.*

Both energy and land use generate economic growth, but too much growth leads only to a higher standard of consumption, while diminishing Montana's unique quality of life.

A question underlying the policy studies has to be: while changing, how can Montana retain its uniqueness? Not through change for the sake of change, not through blind progress to a bland sameness with every other place, but somehow through progress to the productive and enjoyable harmony between man and his environment advocated by the Montana Environmental Policy Act. The energy and land use policy studies must identify and recommend realistic ways to attain this goal.



Montana's Energy Policy Study

by
Walter F. Enderlin
Environmental Engineer

In the past, the United States has enjoyed an abundance of low-priced domestic energy, which has contributed to this country's economic growth and quality of life. However, it has become apparent that energy is not unlimited, as has been evidenced by electrical brownouts and the current fuel shortage.

This situation has become commonly known, rightly or wrongly, as the "energy crisis." Sufficiency of short- and long-term supplies, reliability of geographic supply sources, safeguarding of national security interests, compliance with environmental standards, stability of balance-of-payments, and many other factors interact to cause the problem and no single factor can be identified as the responsible element. Zealous environmentalism, misguided federal regulators, corporate irresponsibility, and failings of "the system" have all been given credit for the dilemma. The fact remains, however, that the energy supply in this country is not keeping up with the current rate of growth in energy consumption.

There are essentially three options for balancing the energy supply and demand situation: increased emphasis on development of domestic supplies, much greater reliance on imports from foreign sources, and restraints on demand growth.

The federal government has concluded that the first option is the best choice for long-term supplies. For short-term supplies, the plan is to also increase imports from foreign sources.

Because of its abundance, coal has been selected as this country's primary fuel source for the immediate future. In a recent statement, President Nixon announced that he would take every necessary step to achieve national self-sufficiency of energy needs and that he would recommend increased research and development funding for

the next fiscal year to advance technology in coal gasification and liquefaction and to explore new approaches to energy conservation. J. John Love, the president's energy advisor, in his address to the American Mining Congress Convention on Environment (September 1973), said that his job is to deal with the immediate problem — to get this country from a position of energy dependence to one of self-sufficiency. He further maintained that part of the solution to this problem is to increase coal production in the western states (Montana, North Dakota, South Dakota, Wyoming, Utah, Colorado, and New Mexico) from the current rate of 50 million tons a year to one billion tons a year by 1985.

United States coal reserves are the world's second largest (3,280 billion tons), constituting over 40 percent of the world's supply. Of these reserves, 40 percent are in North Dakota, South Dakota, Montana, and Wyoming. At the current rate of consumption, it is estimated the United States has enough coal to last for about 400 years (4).

Current sulfur emissions standards that restrict the use of this resource for power generation to coals having a sulfur content of one percent or less have forced increased use of low-sulfur fuels. The technology for removing sulfur from stack emissions is expensive and does not lend itself to existing facilities, hence it is not a widely accepted alternative at this time.

Much western coal is low in sulfur content and is largely uncommitted. However, it is also low in heat content — about 9,000 British thermal units (Btu) per pound — compared to eastern coal (about 14,000 Btu/lb). Thus the transportation costs per equivalent number of heat units is high. Increasing use of large unit trains (100 cars) is tending to lower this cost. Moreover, because the lower heat content requires using more coal, sulfur emissions

per kilowatt-hour generated will be higher than the sulfur content suggests.

Although there is a vast amount of coal in Montana (222 billion tons), not all of this coal is strippable and thus is not economical for power generation. All of the strippable coal is in the Fort Union formation, which extends into Montana, North and South Dakota, Wyoming, and Canada. Montana's share of the coal in this formation is 215 billion tons, of which 128 billion tons is sub-bituminous and 87 billion tons is lignite (3). (Sub-bituminous rather than lignite coal is most compatible with current technology.) Based on recent information in a report to be released by the Montana State Bureau of Mines and Geology in early 1974, the strippable coal is now estimated to be about 42 billion tons. This figure is based only on exploration data obtained south of the Yellowstone River and does not include coal on Indian lands. However, as exploration continues, this figure should grow.

Low-sulfur coal in the eastern part of the country is limited. Because this coal cokes well it commands a high price in metallurgical markets, both domestic and export. These reserves are held by steel companies for future use and are not for sale to utility companies (6).

All United States coal conversion plants now in use or under construction burn coal directly and are confined to steam-turbine-powered generators. The maximum efficiency of conversion by this method is about 40 percent, whereas maximum efficiency of conversion by coal gasification in use in other countries is about 55 percent. Coal gasification is cleaner from an emissions standpoint, though it uses considerably more water.

For economical power conversion using coal, utility companies must have vast quantities of inexpensive, low-sulfur coal and large quantities of water. There are considerable reserves of low-sulfur coal in the west that can be strip mined, which to date is the most economical and safe mining method. However, in some of these areas water is limited. Strip mining in the western coal fields is even more economical than in the East because the beds are flatter, the seams are much thicker, the overburden is less, and the terrain is relatively flat. Thus it is possible to mine much more coal per acre disturbed. Because of the lower heat content of the coal and the correspondingly higher shipping costs per heat unit, more emphasis has been placed recently on generating electricity at the mine and transmitting the power long distances in lieu of shipping the coal to the generating plant.

By 1948, the United States became a net fuels importer and became interested in transferring the German technology on coal gasification to improve its self-sufficiency. Between 1944 and 1955, the U. S. Bureau of Mines researched coal gasification. However, the program was halted in 1955 because of the discovery of Middleast oil (4).

Now, because of the energy crisis, interest in this technology is picking up again as energy self-sufficiency is sought. In 1971, the American Gas Association made

a secret study that identified 141 sites west of the Mississippi River that should be considered for mine-mouth gasification complexes (2). Several pilot plant studies are now in progress to develop more efficient gasification techniques. It is estimated that by 1975, 15 percent of the coal mined will be used by gasification plants to produce gas for power generation and for pipeline use. By 1990, it is predicted that there will be six plants using German technology in operation and about 34 plants that will use the more efficient process now under development. It is very likely that some of these plants will be in Montana.

Obviously, federal and state energy policies are urgently needed. Rapid development of coal is underway in Montana without an energy policy, and consequently the federal government and utility companies are giving little consideration to developing other potential energy sources within the state, such as geothermal, solar, solid waste, or wind. Moreover, as long as vast amounts of inexpensive coal are available, it is unlikely that these sources of energy will compete with coal research and development funds unless some orderly plan or energy policy is formulated. To date, research and development of advanced energy concepts have received only token funding in comparison with coal projects (5).

Montana now has four major operating coal mines: the Western Energy and Peabody mines, both at Colstrip, the Decker mine at Decker, and the Knife River mine at Savage. A fifth mine is slated by Westmoreland Resources to begin production in 1974 in the Sarpy Basin.

Mineral leasing and water right acquisition has increased rapidly. Construction of two 350-megawatt (mw) steam generating units by the Montana Power Company and other utilities is progressing. A permit for units three and four, each with a capacity of 700mw, is being sought at the same site by a consortium of Northwest utilities.

This increased activity and the release of the North Central Power Study that delineated 21 suitable generation sites in the state aroused intense public concern. Citizens were fearful of impacts that would accompany massive coal development in eastern Montana. Among these would be surface destruction by strip mining, water diversions and potential shortages, air pollution, and social disruption resulting from booming population growth. Ultimately, people are afraid that uncontrolled economic growth will irreversibly alter the unique quality of life in eastern Montana.

In response to this concern, the legislature last year enacted a package of important coal-related legislation. It also directed the Environmental Quality Council through Senate Joint Resolution 24 to conduct an energy policy study for Montana. The purpose of the study, as stated in the resolution is "to obtain a comprehensive energy policy, together with recommendations for necessary implementing legislation, to insure a reliable and adequate supply in a manner consonant with the preservation of environmental values and the prudent use of the

state's air, land, water, and energy resources." The EQC study is considering the full range of possible energy sources and their optimal efficiency, conservation of energy, and administration and regulation of the energy industry. SJR-24 acknowledges the need for a state energy policy that responds to and contributes to a federal energy policy.

The resolution also requests the governor to direct the Coal Task Force, now the Montana Energy Advisory Council, to work with and advise the EQC in the study, which was initiated in June. The study is funded by a portion of a grant from the Ford Foundation, which also is sponsoring an ongoing national energy policy study. The work plan for the EQC study outlines five major areas: energy inventory, assessment of energy requirements, current energy policy, energy conservation, and recommendations, including proposed legislation.

The energy inventory will determine the amount of energy resources available in the state, such as coal, petroleum crude, natural gas, water, timber, solar energy, geothermal energy, uranium and thorium, and solid wastes, and the reserves for each. The inventory also will include the methods of extraction, conversion, and transmission, with an analysis of alternatives, efficiency, and associated environmental impacts.

The assessment of energy requirements will include an account of current and projected energy demands in Montana, a breakdown of customers according to activity, and accounts of forms of energy utilized by various consumers, supply facilities for these energy demands, and the flow of energy resources in the state. Foreign demands and domestic demands from adjacent consumer regions also will be examined.

Identifying existent components of current state and national energy policies will include assessing regulatory

activities, taxation policies, and agency programs — such as siting, land leasing, water development, and reclamation.

Energy conservation will be examined in relation to changes in technology, legislation, and life style.

Development of recommendations will complete the study. Options for energy development or non-development will be presented. Critical energy decisions to be made in Montana will be identified, and mechanisms for this decision-making will be proposed.

The EQC is combining staff investigations with research by graduate students, interns, and consultants from the Montana university system. The staff also will organize and supervise the research and integrate it in the final report. The Montana Energy Advisory Council will participate in the study by furnishing information and reviewing findings.

Segments of the study in progress include the feasibility of using solar energy in Montana, geothermal potential in Montana, possibilities for energy conservation in building construction, maintenance, and operation, current coal development activity, water and its relationship to eastern Montana coal development, federal policy and legal problems regarding underground natural resources, the potential for energy conservation in Montana, and energy flow in the state.

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2. *Montana Energy Council Minutes*, 1974, ... and ... 1974, ...
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5. *Solar Cook*, 1973, ...

Energy Study Available

An in-depth report, "Energy Conservation," discusses ways of conserving energy at all levels — international, national, regional, state, and local — in light of the current energy crisis and the nation's eyeing of Montana coal fields. The report is available upon request from the Environmental Quality Council. The author, Dana Martin, is an EQC-WICHE intern.

Montana Coal — Development in Process, 1973

by
Thomas J. Gill
Research Assistant

Introduction

In the past two years, coal development has become the forefront issue in Montana. It has provoked intense and voluminous legislative debate and generated countless workshops, forums, conferences, radio and television documentaries, newspaper features, and magazine articles. More than 40 billion tons of strippable Fort Union coal in Montana, together with soaring demands for fossil fuels, new emission standards in many metropolitan centers, recent federal mine safety laws, and delays in projected nuclear power development, have focused national attention on this state's low-sulfur reserves. The national "energy crisis" has produced a very real Montana crisis: not only a cherished way of life, but the support systems for any sort of life — Montana's air, land and water — are threatened with massive alteration, degradation, or depletion.

New information about some aspect of the Montana coal situation appears almost daily. This report supplements and updates the investigation of eastern Montana coal development contained in the First Annual Report of the Environmental Quality Council, published in October 1972, and the Montana Coal Task Force report of January 1973. Not discussed here are coal-related legislation enacted in Montana's 1973 session, eminent domain and the severance of surface and subsurface ownership, citizen activities in response to coal development, and supply and distribution of water in relation to coal development. These matters are reviewed in other sections of the Second Annual Report.

Current Happenings

Fort Union's vast energy resource has attracted some of the nation's largest coal, electric, mineral, and diversified energy companies. Many have had no previous association with coal production or utilization but figure prominently in recent coal leasing, prospecting permits, and water options in Montana. Although this activity may be partly speculative, the leases and options are long-term contracts that have locked up critical resources until the 1980s (8). To meet the administration goal of one billion tons a year from the western states by 1985 many of these companies would have to be mining Montana coal by then. This projection validates concern about the degradation of Montana's air, land, and water.

Major firms* interested in Montana coal are
Amax Coal, Indianapolis, Indiana
Ark Minerals, Hanna, Wyoming
Chevron Oil, San Francisco, California
Colorado Interstate Gas, Colorado Springs, Colorado
Concho Petroleum, Dallas, Texas
Consolidation Coal (Continental Oil), Pittsburg,
 Pennsylvania
Decker Coal (Pacific Power and Light, Peter Kiewit
 and Sons), Portland, Oregon
Getty Oil, Los Angeles, California
Gulf Mineral Resources, Denver, Colorado
Knife River Coal (Montana-Dakota Utilities),
 Bismarck, North Dakota

* If a firm is a subsidiary, the parent company is in parentheses following the name.

Mobil Oil, Denver, Colorado
 Norsworthy and Reger, Billings, Montana
 Northern Natural Gas, Omaha, Nebraska
 Peabody Coal (Kennecott Copper), St. Louis, Missouri
 Shell Oil, Denver, Colorado
 Teneeco Coal, Houston, Texas
 United States Steel, New York, New York
 Western Energy (Montana Power), Butte, Montana
 Westmoreland Resources (Kewanee Oil, Morrison-Knudsen, Penn-Virginia, Westmoreland Coal), Philadelphia, Pennsylvania

Coal demand predictions by the Northern Great Plains Resource Program (NGPRP) for Montana for 1975 are 1.2 million tons for electrical generation in the state and 17.53 million tons for export. 1980 demand predictions show 9.8 million tons for electrical generation in the state that year and 31.32 million tons for export (11).

Applications for permits to mine filed in accordance with the 1973 Montana Strip Mining and Reclamation Act are summarized below.

a year to each of two 350-megawatt generating plants now under construction at Colstrip. The plants are owned by Montana Power and Puget Sound Power and Light Company (13). Western Energy also has contracts with Northern States Power (Minnesota) for 300,000 tons a year for a three-year period that began May 1, 1972, with Commonwealth Edison (Illinois) for 3.5 million tons through January 31, 1974, and with Wisconsin Power and Light for up to 2.3 million tons annually for 20 years beginning in 1975 (17).

In June 1972, Westmoreland Resources converted to lease 34,000 acres of prospecting permits in the Sarpy Creek area (27). The company recently negotiated contracts with four midwestern utilities providing for the sale of 76.5 million tons of coal over a 20-year period beginning March 1, 1974 (27). The four initial contracts are with Northern States Power, Interstate Power (Iowa), Dairyland Power (Wisconsin), and Wisconsin Power and Light. Westmoreland agreements also contain an option to Colorado Inter-

Permit Applications, 1973

Company	County Location	Total Acres to be Disturbed in Life of Operation	Completion
Western Energy	Rosebud	12,607 ±	Unknown
Westmoreland Resources	Big Horn	1,280	1993
Decker Coal	Big Horn	2,725	1992
Peabody Coal	Rosebud	1,124 ±	1982
Kettle River Coal Mining	Richland	1,320 (15 acres a year, 1958 on)	?

The total acres include plant sites, rail loops, haul roads, etc. (23).

The Department of State Lands estimates that about 200-250 acres of land will be disturbed by mining about 11 million tons of coal this year (22). In comparison, if 1980 demand predictions hold true, about 900 acres could be disturbed that year.

In June 1959, the Northern Pacific Railway granted the Montana Power Company, through its subsidiary, Western Energy, 3,300 acres of coal-bearing land near Colstrip. The company added to the initial leases and now has more than 23,000 acres and about 850 million tons of coal reserves (17). Western Energy's Colstrip operation mined more than five million tons in 1972. It will supply 500,000 tons a year to Montana Power's Corlette Plant in Billings (17), and beginning in 1975, will supply 1.5 million tons

state Gas for the possible use of up to 300 million tons for gasification (2), but Colorado Interstate has not yet disclosed plans to construct such a plant.

Decker Coal, operating in southeastern Big Horn County, is currently mining at a rate of about four million tons a year (20). The customer is Commonwealth Edison in Chicago, with whom Decker has a six-year contract (9). In testimony on coal taxation before a Montana Senate committee, a Decker spokesman stated that the company had unsuccessfully on four contracts totalling more than 524 million tons (6). The statement implied that the contracts were lost because Montana's tax structure reduces Decker's competitive advantage over firms operating in Wyoming.

In August it was announced that Decker sold coal worth \$750 million to Detroit Edison. Decker has agreed to deliver 180 million tons of coal to the firm over a 26-year period, starting in 1976 (11).

No new developments have been announced by Peabody and Knife River since the Coal Task Force report was issued. Peabody maintains its Big Sky Mine seven miles south of Colstrip and continues to supply Minnesota Power and Light with two million tons annually. Knife River continues to operate near Savage and produces about 320,000 tons a year.

Northern Natural Gas of Omaha and Cities Services Gas of Oklahoma City recently announced that they are jointly considering one or more 250-million-cubic-feet-per-day Lurgi gasification plants on or near the Northern Cheyenne Indian Reservation. They are currently discussing with Peabody Coal a possible contract for at least 500 million tons from Peabody's 16,000-acre lease on the reservation. The gas companies have disclosed that they expect to spend \$11 million from 1973 to 1975 for studies and startup evaluations. They also expect to construct four 250-million-cubic-feet-per-day plants in the Powder River Basin, with an anticipated completion date of 1979 for the first unit (14).

The gasification development on Northern Cheyenne land, along with any other coal-related projects in the reservation, is uncertain. In late March 1973 the tribal council voted unanimously to abrogate all surface mining agreements obtained in the tribe's name by the Bureau of Indian Affairs (BIA) (21). The council's decision is presently being considered by the Department of Interior. The cancellation would affect, in addition to Peabody's 16,000-acre lease, more than 250,000 acres of exploration permits held by Consolidation Coal, Amax, and Chevron Oil (7). Under the disputed BIA permit-lease procedure, the permit holder in the past has been able to automatically convert permits to leases after two years.

A coal-fired steam generating plant in Rosebud County is planned by Basin Electric Power Cooperative of Bismarck, North Dakota. On June 29 of this year, Basin Electric appropriated 36,200 acre-feet per year of water from the Yellowstone River. The water is to be diverted for the plant to be built about 22 miles southeast of Colstrip near the northeast corner of the Cheyenne reservation. Basin Electric plans a three-unit, 1,200-megawatt plant to be completed in three stages in 1979, 1980, and 1983. The plant, according to Basin, would be part of a transregional joint power supply system planned by the cooperative to interconnect the Pacific Northwest, the Colorado River Basin, the Great Plains-Missouri River Basin, and neighboring states (19). Basin Electric has not yet filed an application at the Department of Natural Resources and Conservation for the coal-fired steam generating plant.

Colstrip

On April 26 of this year, the Montana Department of Health and Environmental Sciences issued the controversial construction permit for the aforementioned Colstrip

generating plants 1 and 2. Although the Montana Environmental Policy Act requires the department to assess all foreseeable impacts of the project, the department interpreted the permit as relating solely to the actual air pollution device and issued the permit solely on the applicant's ability to demonstrate that no illegal air pollution would result. Even that limited base was not solid: the final environmental impact statement (EIS) on the project could only assure that "... emission and ambient air levels **probably** will comply with all state and federal standards. Effects of pollutants, including fluorides, on flora and fauna, weather, and aesthetics **appear minimal, although subtle long-term effects may be indeterminable** (13)." (Emphasis ours.)

Other adverse environmental impacts of the project were clearly determined in the EIS. They include the use of about 90 million tons of coal over a 30-year period, annual consumption of 4.2 billion gallons of water, land use changes caused by the imposition of plant sites, mining, transmission lines, aqueducts, and human habitations, and changes in life styles and social values associated with rapid population expansion in an agricultural society.

The capacity of the Colstrip generating complex could more than triple by the end of the decade. On June 6 of this year five northwest utilities applied to the Montana Department of Natural Resources and Conservation, as required by the 1973 Utility Siting Act, for a permit to construct two additional generating plants, 700 megawatts each, near Colstrip. Sponsors of the proposed \$500 million venture include Montana Power (30 percent), Puget Sound Power and Light (25 percent), Portland General Electric (20 percent), Washington Water Power (15 percent), and Pacific Power and Light (10 percent). According to the application, the utilities want to begin construction by May 1, 1974, with completion of unit 3 by July 1978 and unit 4 by July 1979 (16).

To meet the proposed deadlines, the companies have petitioned the state to reduce the 600-day study period required by the Utility Siting Act. The governor and the Department of Natural Resources and Conservation have agreed to give the study top priority but have refused any commitment to a time schedule for completion. Collecting and evaluating the information required by the act will be financed by the applicants through the \$1.2 million filing fee.

The application also calls for construction of one 500-kilovolt transmission line between Colstrip and Hot Springs and another between Hot Springs and Billings, and for other facilities to accommodate the increased generating capacity. These include a 36-inch pipeline from the Yellowstone River near Nichols to the generating complex, a distance of about 30 miles. Water consumption for units 3 and 4 would average about 16,000 acre-feet a year with a maximum of up to 26,000 acre-feet. Settling ponds covering 60 surface acres would be necessary. The two plants would consume about six million tons of coal a year (16).

Leasing and Coal Ownership

More than 45 companies, land brokers, and speculator hold leases on Montana coal. The largest lessees include Sentry Royalty (subsidiary of Peabody) — 96,781 acres, Western Energy — 84,737 acres, HFC Oil (Casper Wyoming) — 67,632 acres, Consolidation Coal — 58,651 acres, Westmoreland Resources — 53,399 acres, Shell Oil — 30,247 acres, Peabody Coal — 28,144 acres (18). Total acreage under lease as well as a breakdown of the amount leased from each lessor is as follows (18):

Federal	36,232.27
State	57,594.23
Indian	77,158.98
Private	430,397.57
TOTAL	601,323.05

In addition, 388,324 acres of federal and Indian land are currently under prospecting permits (18).

The private lease figure represents the recorded leases in most of the coal-bearing counties of eastern Montana as of March 1, 1973. Many private leases have never been recorded in the county courthouses, therefore it is impossible to determine the true extent of the lease situation. For example, although Burlington Northern has leased or issued prospecting permits on about 300,000 acres in Montana (10), these agreements were not required to be recorded with the counties (18).

For further discussion of legal complexities and other problems associated with subsurface and surface ownership and eminent domain, see "Underground Natural Resources" by A. W. Stone.

Reclamation

Recent conclusions from a National Academy of Sciences study about rehabilitation prospects for western lands that have been strip mined for coal are pessimistic and sobering (1). The academy's report sent to Congress this year warned:

Reclamation in the West is much more difficult than in other areas of the world where coal has been extensively stripped.

Some western land, especially areas with less than 10 inches of precipitation a year, have such a low possibility of reclamation that strip mining in many places must be considered as eliminating productive use of the land — perhaps for centuries.

Restoration of western land (in the sense of returning it to the way it was before mining) is virtually impossible for all western coal areas.

Since many coal seams in the West are aquifers, strip mining for coal will inevitably disrupt groundwater patterns in those areas. Mining may also disrupt natural drainage networks and thereby disrupt downstream water rights.

There is insufficient ground and surface water in major coal-rich areas to meet requirements of large-scale conventional electric generation or coal gasification and liquefaction facilities.

The study urges prohibiting western coal stripping until adequate programming is done, establishing federal statutes with minimum regulations to be met by states and localities, rehabilitating stripped federal lands to show what using the best technology available was accomplish, recognizing certain (irreplaceable) land values that should prevent strip mining on such lands, and planning alternate locations for energy conversion facilities in light of western water scarcity.

The 1973 legislature gave Montana more of the most stringent performance standards in the country with the passage of the Montana Strip Mining and Reclamation Act. Its provisions include (12):

1. An annual permit system;
2. Selective denial of permit to mine areas of land that have been demonstrated to have special, exceptional, critical, or unique characteristics or whose mining would affect neighboring land possessing such characteristics;
3. A complete ban on contour strip mining;
4. Mandatory restoration of the area of land affected to the approximate original contour of the land;
5. Control over the method of operation;
6. Establishment of a permanent, diverse vegetative cover;
7. Adequate bonding levels, with a minimum per acre bond of \$200, a maximum per acre bond of \$2,500, and a minimum total bond of \$2,000, not to be released until a permanent, diverse vegetative cover has been established and under no condition prior to five years from the first planting;
8. Citizens' rights, including the right to seek a writ of mandamus against the public agency or person responsible for but failing to enforce a particular provision;
9. Termination of all existing reclamation contracts entered into under the 1967 law;
10. Authorization to immediately halt any operation in serious violation of the law; and
11. Penalties for violations of the law, including fines of up to \$1,000 per day, forfeiture of bond, and revocation of permit.

The law's ultimate success will depend on how stringently it is enforced. Experience in other states has been discouraging: strong enforcement laws have been enacted but not enforced.

Since the law went into effect (10) mining by the five coal companies presently mining in Montana have been found in violation of the law. Peabody Coal and Consolidation Coal were both found for prospecting without permits.

A third company—Western Energy—is presently being investigated for similar violations.

Water

Water and coal development are inextricably entwined. Eastern Montana coal will be mined and much water will be consumed to convert coal to various forms of energy. For a discussion of coal-water development potential and problems, see "Water and Eastern Montana Coal Development" by Bob Anderson.

Population and Employment

Population and employment are poorly understood and researched aspects of coal development. Valid estimations of growth levels of population and employment are impossible because they depend on so many variables. Some studies have been made on projected population and employment growth in Montana in coal development areas. Their predictions range from slight to uncontrolled population and employment growth accompanying rapid development of eastern Montana coal resources. Combined, they all show that further study is necessary.

For example, a University of Montana seminar on coal development estimated that full development of gasification and thermal generation plants will result in an increase of 516,000 people (25). A study from the Great Falls office of the Bureau of Reclamation (24) states that if all available water in eastern Montana is used in the most labor-intensive form of development (coal liquefaction), the 43 resulting plants could produce an increase of 645,000 to 860,000 people, using the same amount of water for coal gasification could increase the population by 558,000 to 735,000. The bureau's aqueduct study gauges that full development of the potential outlined in the North Central Power Study would provide employment for 100,000 people and might cause a total population increase of more than half a million people. Montana Coal Task Force report (15) population projections, based on employment plans for the Colstrip plant now under construction, estimate that coal mining and generation of 53,000 megawatts, as outlined in the North Central Power Study, would provide only about 9,000 primary jobs. If the same amount of coal were used in gasification plants the direct employment would rise by about 18,800.

In an April 1973 letter, an energy company spokesman estimated that a possible development in eastern Montana to absorb a share of the predicted 1985 energy deficit could involve a new city of 150,000 to 200,000 or a complex of 10 smaller cities. He added, though, "It appears to me from cursory studies that to deliver the needed products at the cheapest price to the consumer at any given moment in time would come from the larger complexes (5)."

Adverse impacts of excessively rapid and uncontrolled population expansion result in myriad problems, including crime, poor housing conditions, strain on local government services, and sanitation and disposal overburden

It is essential that the pending development receive strong legislative guidance to prevent the boomtown syndrome.

National Considerations

The government has given coal a high priority as a temporary solution to the nation's energy situation. Federal administration attempts to simplistically solve the immediate problems could cancel Montana's efforts to control the rate and extent to which the state's Fort Union reserves are developed. A recent letter by an energy company representative supports this possibility (5). Because most of the known and unknown mineral deposits of the West are publicly owned, he states, the disposition of these minerals will be determined by the desires of some 150 million megalopolitans living outside of the northern Great Plains — "... providing we still have a representative form of government, then the West's minimal population with their opinions, hopes, desires, and dreams about certain tracts of real estate will be of little or more probably of no consequence to the voting majority."

Northern Great Plains Resource Program

The NGPRP, originally a federal program designed to evaluate the potential social, economic, and environmental impacts of coal-based industrial development in Montana, Wyoming, Nebraska, and the Dakotas, appears to have become an implementation plan to develop the coal resources of the Northern Great Plains.

In an April 24, 1973 memo to John Whitaker, Undersecretary of the Interior, Earl Butz, counsellor to the president and Secretary of Agriculture, called for the NGPRP to plan to develop the region's coal resources (3). Butz wrote:

I understand that the Northern Great Plains Resource Program has been under way for almost one year. . . . The President's Energy Message places great emphasis on the utilization of coal to meet our energy requirements for the balance of this century. If we are to be responsive to the President's Energy Message, we should move this Program along with all possible dispatch. . . . I am convinced that the scope of the Program is so broad that it will fail to yield useful information and a plan for action within the next year. I would like to receive recommendations by May 4 of how the Program can be restructured to provide, no later than June 30, 1974, critical information and a plan to develop the coal resources in the Northern Great Plains area. By copies of this memorandum to the Administrator of EPA and Assistant Secretary Robert Long of the Department of Agriculture, I am asking them to have appropriate persons on their staffs cooperate with your assistant secretary to provide the results we must achieve if we are to be able to make prompt use of the vast coal resources in the Great Plains area.

Administration Energy Goals

President Nixon's September 1973 State of the Union Message (26) reiterated the administration's energy program announced in the President's April energy message. Procurement of additional petroleum and natural gas was still Nixon's primary concern, though he indicated that coal will play an increasingly important role in this country's energy future. The President urged in April that "highest national priority be given to expanded development and utilization of our coal resources."

To facilitate the accelerated use of coal, Nixon recommended in April that the deadline for meeting the secondary air quality standards under the Clean Air Act of 1970 be extended beyond 1975. It was suggested that the time limit extension would allow the substitution of coal in many instances and thus permit the use of "virtually all of that coal which would otherwise go unused." The President said in September that he had asked his top energy advisor, John Love, to meet with state officials "to seek temporary modifications of air quality standards. Such modifications would help to minimize fuel shortages this winter." He has since repeated this request.

In April, the President advocated the rapid passage of a federal mined land reclamation act. Apparently the administration feels the primary purpose of such an act would be to define the rules under which industry will be forced to operate. Until this occurs, the President indicated, "our vast reserves of low-sulfur coal will not be developed as rapidly as they should be."

In his September speech, President Nixon admitted that "surface mining is both the most economical and the most environmentally destructive method of extracting coal" but added, "the damage caused by surface mining, however, can be repaired and the land restored."

Summary and Conclusion

The Montana coal development situation and the problems associated with it were well summarized by Governor Tom Judge in his statement this April creating the Montana Energy Advisory Council:

Our state, from all indications, is on the threshold of massive energy development to ease the much publicized and controversial "energy crisis," but inherent in a simplistic solution to one crisis are seeds for another; that of the degradation and destruction of human and natural environmental values and the massive consumption and depletion of local resources.

I believe it unreasonable, inequitable, and contrary to national policy and interest, to temporarily feed a nationwide energy appetite by creating social, environmental, and natural resource problems in one region.

A conclusion about Montana coal development reached in the First Annual Report is still relevant. Unless comprehensive controls are applied, Montana's future will be decided in the hearts of consumers and politicians elsewhere.

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Water and Eastern Montana Coal Development

by
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Engineer

Abstract

Water may be the limiting resource in eastern Montana coal development. Since the public has a major ownership in the water, coal, and associated land resources, and the public will absorb most of the benefits and costs of development, the public should have the major role in determining how that development takes place. Analysis shows that there is adequate water in the Yellowstone Basin for maximum projected diversions of up to 2.7 million acre-feet per year, but only if the main stem of the free-flowing Yellowstone is regulated (by Allenspur Dam) because of critical seasonal low flows. Incremental "nondecisions" could lead to the trading of the free-flowing Yellowstone for coal development.

However, if a water-conservative philosophy is adopted, the Yellowstone may remain free-flowing and the mode of coal development may be determined by other constraints. Several water-conservative alternatives are presented.

Introduction

The potential magnitude of coal-water development in the Fort Union region has been glorified by some and damned by others. Whether the full potential will be realized is questionable. The fact remains that eastern Montana coal will be mined and water will be consumed in the conversion of coal to other forms of energy. The questions are: how much development, at what rate, and in what manner.

It might appear that those with the most at stake in eastern Montana are the energy companies that may reap large profits, but at the risk of large capital investment, and the ranchers who, depending on their land patents or points of view, may either profit from the sale or lease of land and coal or be forced out of a cherished way of life. But others in eastern Montana have an important stake. In a 26-county area the federal government owns almost 25 percent of the land surface, the state owns 6 percent, and Indians own 7 percent (3). Of the mineral estate in the same area, federal ownership accounts for 55 percent and state ownership is about 6 percent (5).

Ownership of Montana water is a fundamental question that can be a controlling factor in coal-energy development. But the legal question of water ownership in Montana is unclear. In its 1972 constitution, the state asserts its rights to all waters

within Montana, whereas federal claims to ownership are based on long-established authority to reserve waters. In addition, Indians claim all waters that flow across or adjacent to reservations, as supported by recent court decisions. Private individuals cannot own water but can merely obtain the rights to the use of water. Therefore, the water belongs essentially to the public.

Unless Montana can assert clear authority to regulate all non-Indian uses of water, it will be almost impossible for the people of the state to control or even influence use of the state's coal resources for energy conversion.

The public has the most to gain and the most to lose from eastern Montana coal-water development: the public will consume most of the energy and the public will suffer most of the social and environmental impacts. Because it owns most of the resources involved, the public has the right, the responsibility, and the opportunity to be the dominant voice in determining how development should proceed.

This report is aimed at providing a systematic analysis of water development - the potential and the constraints. An overview of the water resource picture in eastern Montana is followed by an elementary hydrologic analysis. Based on the analysis, questions are posed, conclusions drawn, and recommendations made.

Appended are a directory of involved federal and state government agencies and an explanation of the development of the low-flow probability hydrography for the Yellowstone River. Also available upon request is a bibliography of pertinent water resource literature.

Water Availability

Some factor will limit the development of coal in eastern Montana. It may be extraction technology or the ability of the land to be reclaimed from surface mining. It may be the ability of the atmosphere to assimilate air pollutants or the willingness of society to accept drastic cultural changes. Or it may be the availability of water — water to cool coal-fired steam generating plants, water to transport coal, water to process coal into gases and liquids, water to assimilate wastes, water to supply expanding populations, and water to assist mined land reclamation. Because eastern Montana is a semiarid region that produces little runoff, it has been termed a "water-short" area. Yet large quantities of water originate in adjacent mountain ranges and flow through or past the region, mostly as spring runoff from snowmelt. During the summer, large withdrawals are made by irrigators. During the winter, flows would often be insufficient to sustain large industrial withdrawals.

The average annual discharges of rivers in the region are shown in Table 1 (12). (See next page.)

Some eastern Montana water originates in Wyoming and is allocated to Wyoming under the Yellowstone River

Compact of 1951. Terms of the compact are shown in Table 2, as are average annual discharges at the pertinent locations (2) (12). (See next page.)

Flows in the Missouri River are heavily regulated by Fort Peck and other upstream dams. The Bighorn River is impounded by Yellowstone Dam (Bighorn Lake), the Wind River (the upper portion of the Bighorn in Wyoming) by Boysen Reservoir, and the Tongue River by Tongue River Reservoir.

The Yellowstone River, however, is virtually free-flowing in its main stem. Because it is one of the few free-flowing rivers in a land of dams, reservoirs, and canals, the Yellowstone is both fortunate and threatened. As a natural aquatic phenomenon it offers unique values. But its free-flowing state also makes it attractive for development. The proposed Allenspur site on the Yellowstone near Livingston is the best remaining damsite in Montana and could firm up 1.7 mafy (2,350 cfs) for downstream industrial or agricultural use (2). Construction of Allenspur Dam would be one of the most massive impacts that could result from coal development, with perhaps the greatest spectrum of environmental costs. Accordingly, public opposition to the project is vehement and widespread.

TABLE 1
Annual Average Discharge of Eastern Montana Rivers

	Discharge	
	Million acre-feet per year (maf)*	Cubic Feet per second (cfs)*
Missouri River near Culbertson	7.1	10,260
Yellowstone River near Sidney	9.4	12,980
Powder River near Locate	0.1	609
Yellowstone River at Miles City	8.1	11,250
Tongue River at Miles City	0.3	417
Bighorn River at Bighorn	2.8	3,805
Yellowstone River at Billings	4.9	6,820

Note that about 16.8 million acre-feet of water leave the state via the Missouri-Yellowstone system in an average year.

*Throughout the text, million acre-feet per year is abbreviated "maf" and cubic feet per second is abbreviated "cfs."

TABLE 2
Conditions of the Yellowstone River Compact

Tributary	Average Annual Discharge			
	Percent Allocation		per second (cfs) per year (maf)	Cubic feet per second (cfs)
	Montana	Wyoming		
Bighorn River at Bighorn	20	80	2.8	3,805
Clarks Fork at Edgar*	40	60	0.7	941
Tongue River at Miles City	60	40	0.3	417
Powder River at Locate	58	42	0.4	609

*Flow records near Edgar have been kept only since October 1969. The discharge reported here is at Bellevue, some 25 miles upstream from Edgar.

Water Consumption and Demand

Current industrial water use in eastern Montana is slight, probably less than 10,000 acre-feet per year (11). The primary use of water is for agriculture; in the Yellowstone Basin about 1.25 million acres are irrigated (12). Unfortunately, precise information about the quantities diverted is sparse and information about the amount of diverted water that returns to the streams is nonexistent.

The Montana Water Use Act (1973) provides for centralized filing of water rights so that a single agency — the Water Resources Division of the Department of Natural Resources and Conservation — will now administer all water rights. The act also reaffirms existing water rights and provides for basinwide adjudication of these rights. Such adjudication will improve the quality of information about diversions.

The question of the magnitude of impending coal-water development in the Fort Union region is perplexing. Plans

and decisions are being made by private individuals, corporations, and the federal government with little public review. Because of competition in the private sector, these plans and decisions are often secretive.

An indication of the scope of the potential development may be seen from the options and applications for water as shown in Table 3 (4).

Most of the water sought for industrial use in the Fort Union region is in Montana. The total of 2.7 maf optioned or applied for tends to support earlier estimates of maximum water use. The Bureau of Reclamation's Appraisal Report on Montana-Wyoming Aqueducts suggested that up to 2.6 maf would be diverted (2). Perse and Willard of the U. S. Bureau of Mines estimated maximum use of up to 2.2 maf (11). To what extent the options will be exercised is not known. These maximum use estimates are based on combinations of wet-cooled steam generation plants and gasification-liquefaction plants.

TABLE 3
Industrial Options and Applications for Fort Union Water

Water Source	Acre-feet per year	
	Option in effect or pending	Additional Applications
Boxsen Reservoir, Wyoming	87,000	70,000
Righorn Lake, Montana, Wyoming	625,000	630,000
Fongue River Reservoir, Montana	13,775	—
Moorhead Reservoir, Montana, Wyoming (Proposed)	—	220,000
Fort Peck Reservoir, Montana	—	110,000
Lake Sakakawea, North Dakota	—	124,000
Lake Tschida, North Dakota	—	18,000
Yellowstone River, Montana	—	670,000
	<u>712,775</u>	<u>1,994,000</u>

Total options and applications: 2,701,775 acre-feet per year (3.734 cfs).

Of interest is the probable cost of water delivered to coal fields. In the aqueduct report the cost of delivered water for the various proposed pipelines was estimated to be \$30 to \$100 per acre-foot (2). These calculations assumed a discount rate of 3.502 per cent and a project life of 50 years. On August 3, 1973 President Nixon approved the Water Resources Council Principles and Standards, which require a discount rate of 6.875 per cent (13). This rate change will substantially increase the estimated costs of delivered water. It may also make private water development competitive with public development and reduce the government's role in coordinating the projects.

Estimates for water consumption by energy conversion plants vary widely. The figures in Table 4 are typical (2) (11). (See next page.)

Table 4 shows that the amount of water required by energy conversion processes varies widely, the largest differences are between wet- and dry-cooling systems. Right now there is little incentive to install dry-cooling towers. Water is essentially free at the point of diversion and the delivery cost is small. Montana law encourages the diversion, appropriation, and beneficial use of water, but not its conservation. In hot weather, the efficiency of dry-cooled plants is reduced so that additional peaking power generation may be needed. And dry cooling may be more expensive. But dry cooling has the singular advantage of conserving water, and, as discussed later, this may be the overriding decision factor in its implementation.

In 1969, the Montana legislature recognized the need to maintain minimum flows in certain reaches of high-quality trout streams and authorized the Montana Fish and Game Commission to appropriate water for that purpose (8).

Accordingly, the commission appropriated Yellowstone water in varying amounts depending on the location and the season. The furthest downstream appropriation has been in the mouth of the Stillwater River and the Carbon, Stillwater county line (510, 1,775, 1,214), and cleared 1,500 (48 (1) Units) from November 1 to April 15 and 1,600 cfs (1.9 units) from April 16 to October 31.

This water right was defined as a seasonal long right that could be abrogated by a different court in favor of another beneficial use appropriate. However, some of the appropriations was over-allocated. The new Montana constitution and the Montana Water Use Act confirmed existing rights, so it is likely that these appropriations are now valid, given appropriate cost-sharing.

The Montana Water Use Act allows a state and federal contractor to apply to receive water by diverting or intercepting water to maintain a minimum flow level (in quality of water) from the proposed transfer of the water and divert the Montana Fish and Game Commission to receiving applications for minimum flows on the Yellowstone River (downstream) from the above-mentioned appropriations.

Conflicts

From the inception of the project had some Montana but at least two unusual situations: the two flowing Yellowstone River and the vast supplies (depot in East River) and. Discretion could be made now that would make use of the water. For example, Allotype Dam could be built to provide contracted water, and development could be prohibited and the Yellowstone included in the National Wild and Scenic River System.

TABLE 4
Estimated Water Consumption by Energy Conversion Plants

<u>Process</u>	<u>Water consumption, acre-feet per year</u>
1,000-megawatt (mw) coal-fired steam generation, wet-cooling tower	9,500 - 17,000
1,000-mw coal-fired steam generation, dry-cooling tower	1,500
Gasification, 250 million cubic feet daily	20,000 - 30,000
Liquelaction, 100,000 barrels synthetic crude oil daily	20,000 - 65,000
Combined products; 50,000 barrels crude daily, 250 million cubic feet gas daily, 1,000-mw	50,000 - 75,000
1,000-mw steam-ammonia, wet-cooling tower	13,500
1,000-mw steam-ammonia, dry-cooling tower	1,300
1,000-mw magnetohydrodynamic (MHD), hot gas to atmosphere	---
1,000-mw MHD, steam auxiliary, wet-cooling tower	7,800
1,000-mw MHD, steam auxiliary, dry-cooling tower	800
1,000-mw MHD, steam-ammonia auxiliary, wet-cooling tower	7,000
1,000-mw MHD, steam-ammonia auxiliary, dry-cooling tower	600
1,000-mw fuel cells	No cooling

Note that many of the processes in the above table are not yet technologically feasible, such as 1,000-mw fuel cells.

It is more likely, however, that a series of "nondecisions" will be made. Energy conversion plants will be constructed. Each will take "just a little bit" of water and each will pay little attention to water conservation or to its role in the overall scheme. Each little bit of water diverted steadily, year round, wet years and dry, may create a critical withdrawal situation that in an exceedingly dry year or two will seriously deplete the river. At that point public support may, for lack of a viable alternative, sway toward regulation of the Yellowstone in order to prevent irrigation

disruption and widespread unemployment in the energy industry and to maintain a minimum flow in the river. And Allenspur will be built.

But it may not be necessary to sacrifice the free-flowing Yellowstone for industrial development. The Missouri-Yellowstone system may have enough water to provide for both, if the appropriate decisions are soon made. To analyze conditions and capabilities of the Yellowstone, it is necessary first to look at the flow:

Fig.1 LOW-FLOW PROBABILITY HYDROGRAPH, YELLOWSTONE RIVER AT BILLINGS

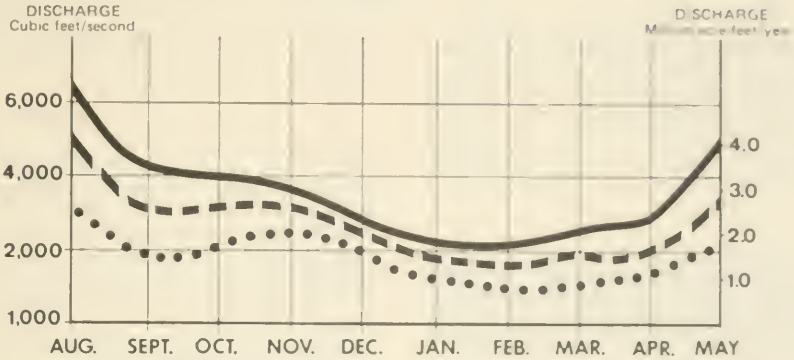
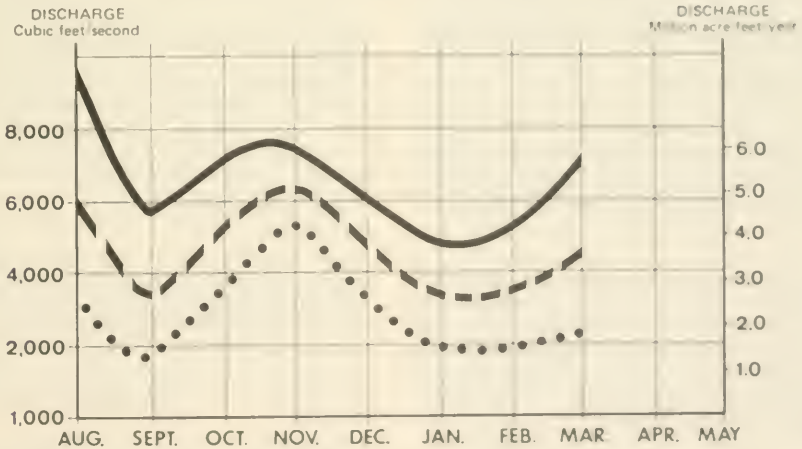


Fig.2 LOW-FLOW PROBABILITY HYDROGRAPH, YELLOWSTONE RIVER AT SIDNEY



LEGEND: MEAN ————; 25% - - - - -; 10% ●●●●●●●●●●

Note: Low flow data for abnormally high flow periods is not depicted in Figures 1 and 2 because the inclusion of a normal distribution of data is poor for these periods.

Flow Analysis

Figures 1 and 2 show probability hydrographs developed from daily flow records at Billings and Sidney. (See Appendix A for an explanation of the methodology used to prepare the graphs.)

Figure 1 shows when the critical low-flow periods occur at Billings. From about September 1 to April 15 the average daily flow is less than 4,000 cfs (2.9 mafy), dropping to 2,400 cfs (1.7 mafy) during January. About 25 percent of the time, January flows at this station will probably be less than 2,000 cfs (1.4 mafy). Ten percent of the time, January flows will be about 1,400 cfs (1.0 mafy) or less.

At Sidney, the furthest downstream gauging station on the river, the flow characteristics are quite different from those at Billings. There is an autumn peak, probably caused by recovery from extensive late-summer diversions.

The autumn low flow at Sidney averages about 5,700 cfs (4.1 mafy). Twenty-five per cent of the time it runs below 3,600 cfs (2.6 mafy), there is 10-percent probability of it being 1,600 cfs (1.2 mafy) or less.

Another critical period at Sidney is in winter. During January, the average daily flow is about 5,000 cfs (3.6 mafy). Twenty-five percent of the time the flow is 3,600 cfs (2.6 mafy) or less, 10 percent of the time it is less than about 2,000 cfs (1.4 mafy).

The two low-flow periods at Sidney are quite different. In autumn, the low flow lasts only a short time. The average daily flow is not unusually low, but the variation in flow is large so that extremely low flows often occur.

In winter at Sidney the low flows last much longer. Flows about equal to the average daily flow are likely to last for about a month, flows about equal to the 10-percent flow are likely to last for about two months. Even though the average daily flow in winter is lower than the average daily flow in autumn, the winter flows vary less and the most extreme lows occur in autumn.

Diversion, Regulation, and Conservation

What effect will massive diversions have on these flow regimes? If all of the options and applications for water are realized, about 2.7 mafy (3,730 cfs) will be diverted,

presumably most or all of this water would be consumed. A glance at Figures 1 and 2 clearly shows that the Yellowstone often does not even have that much water. Therefore, if diversions are to be made on the order of the maximum proposed, the Yellowstone River would have to be heavily regulated. In fact, the extreme low flows at Sidney and Billings may already be approaching critical levels. The 10-percent low flow at Sidney in autumn is considerably less than the 2,600 cfs that the Montana Fish and Game Commission has reserved upstream at the Carbon-Stillwater county line.

What is the potential of the Yellowstone River to be regulated? The most promising site (in terms of capacity) and the most ominous (in terms of environmental values) is Allenspur, near Livingston. Allenspur would flood Paradise Valley with four million acre-feet of water and assure 1.7 mafy (2,350 cfs) for downstream industrial use (2). Other proposed sites on the Yellowstone main stem, in downstream order, and their total (not active) storage capacities include: Yankee Jim (280,000 acre-feet), Wanigan (1,320,000), Lower Canyon (1,384,000), Absaroka (892,000), and Lisa (1,600,000) (9).

Of all the above, Allenspur was the only one listed as a potential site in the Bureau of Reclamation's aqueduct report (2). According to the report, Allenspur and Bighorn Lake could provide the necessary water for maximum diversion.

What is the outlook for offstream regulation? The aqueduct report lists three possible sites near the Yellowstone: Buffalo Creek, Cedar Ridge, and Sunday Creek. Total storage capacity of these offstream reservoirs would be about 630,000 acre-feet (2). Water resource inventories for the Crow and Northern Cheyenne Indian Reservations (6)(7) list potential reservoirs with total active capacities of 171,700 and 345,750 acre-feet respectively. Many of these sites are not included in the 1969 inventory by the Montana Water Resources Board (9).

Without main stem or offstream Yellowstone regulation, about 1.5 mafy of firm industrial water would become available, according to the aqueduct study (2). Offstream storage could probably increase the firm yield to about 2.0 mafy — enough for large-scale coal development but not enough for the maximum diversion mentioned previously (up to 2.7 mafy if options and applications are realized).

How much regulation would be needed if intense water conservation were practiced? This depends on the type and extent of development (see Table 4).

The U. S. Bureau of Mines, an agency with an interest in chemical conversion, projects the following onstream plant capability in the Powder River Basin (11):

TABLE 5
Estimated Number of Coal Conversion Plants
in the Powder River Basin

Plant	1990			2020		
	Low	Medium	High	Low	Medium	High
1,000-mw electric generation	3	3	4	3	4	5
Synthetic gas 500 minimum cubic feet per day	~	7	11	5	19	31
Synthetic crude oil 100,000 barrels per day	~	10	4	~	16	4

The above projection is obviously slanted toward gasification and liquefaction, which provide less opportunity for water conservation than coal-fired steam generation.

The North Central Power Study, a report slanted toward coal-fired steam generation, identified 21 sites in Montana with a total generating potential of 69,000 mw (10). Such a scheme would allow greater water conservation through dry cooling than would the above.

The spectrum of water-conservative alternatives for development include:

1. Transportation of coal to the point of use.
2. Transportation of coal to the already regulated Missouri River for conversion.
3. Transportation of water from the Missouri to coal field conversion plants.
4. Transportation of water from the Missouri to the Yellowstone for flow augmentation.
5. Use of offstream and onsite water storage.
6. Installation of dry-cooling technology.
7. Limiting development by the constraints of a free-flowing Yellowstone with minimum flows assured.
8. Altering energy demand through conservation.
9. Prohibiting coal and water development.

Unanswered Questions

Study of the eastern Montana coal-water situation and the existing hydrologic literature reveals a number of serious information gaps:

The first concerns the hydrology of the Yellowstone Basin, a thorough understanding of which is a prerequisite to intelligent decision-making. This hydrology is complicated by unknown diversions and returns, by regulations large and small, by ephemeral streams, by unknown interactions between surface and groundwater, by ice

jamming in the winter, and by evaporation from storage. In the future it may be further complicated by greater withdrawals, additional regulation, and weather modification. Understanding could be advanced by simulating the hydrologic regime under a variety of hypothetical watershed manipulations. Application of the State Water Planning Model would make this possible (1).

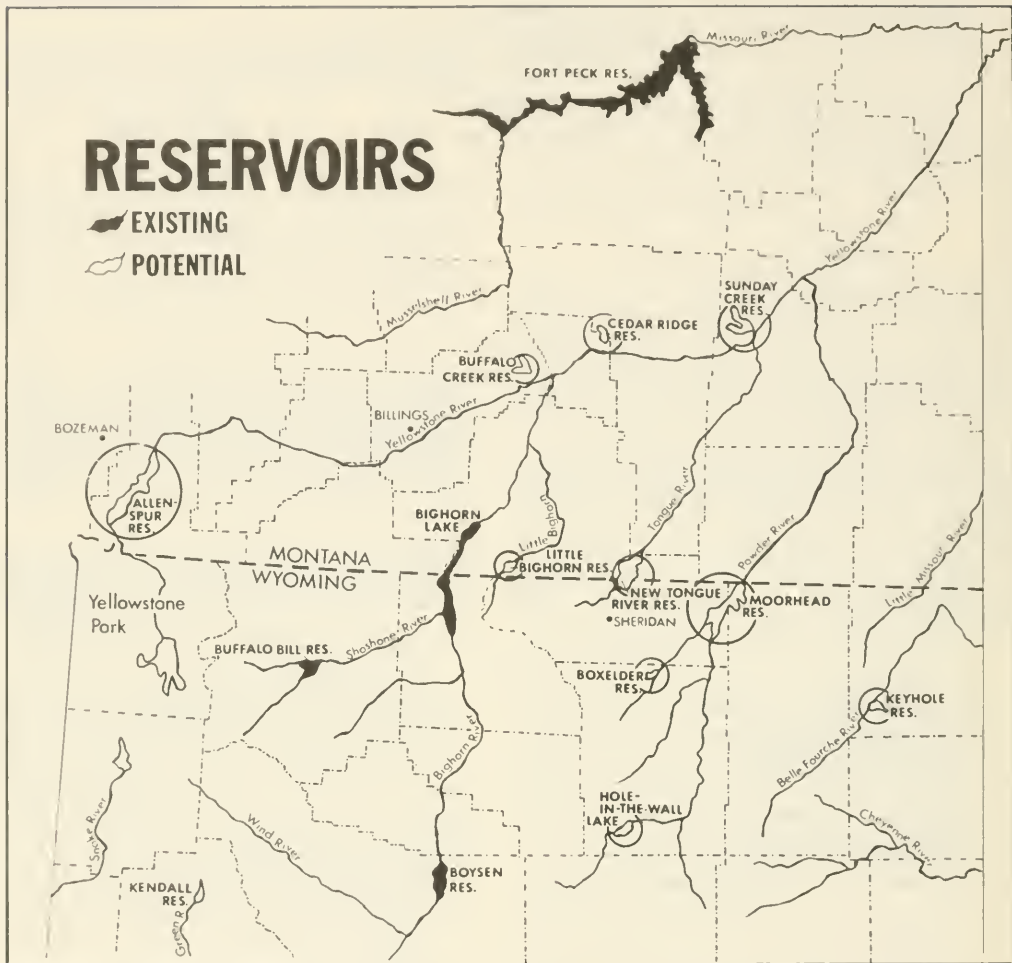
The groundwater resource in eastern Montana is poorly understood. Most existing information concerns alluvial aquifers at specific aquifers. Information is needed on:

1. Interactions between surface and groundwater (recharge and discharge).
2. Potential of aquifers, especially the Madison carbonates, for development, and
3. Effect of surface mining on groundwater movement and quality.

Surface water questions are equally important. What are the minimum acceptable flows in the Yellowstone? How much, if any, attrition of the free-flowing river can be justified? Also needed is information on:

1. The effect of changing flow regimes on water quality.
2. Effect of changing flow regimes on aquatic biology.
3. Effect on water quality of effluents from mines, energy conversion plants, and new human habitation.
4. Quantities of irrigation and other diversions and returns.
5. Changes in ice jamming due to flow changes.
6. Hydrology and water quality of ephemeral streams.
7. Effect of lowered surface water levels on existing diversion structures, and
8. Adverse impacts of new storage reservoirs.

Many of these questions may be answered by traditional research, and some are being investigated. Research is at the University of Montana, Montana State University, and the Montana College of Mineral Science and



Technology are cooperating in a multidisciplinary proposal which, if funded, will address many of the important social, economic, and environmental issues related to coal-water development. The Water Resources Research Centers of Montana, Wyoming, and North Dakota have jointly acquired funds from the Office of Water Resources Research to study research needs and capabilities in the Fort Union region. The Montana Energy Advisory Council is also seeking funds for a coal-water study.

Economics research is essential in order to determine the optimal cost and benefit allocation from coal-water development. Included must be an analysis of the opportunity costs of water withdrawn and consumed. These costs involve natural amenities, wildlife habitat, recreation, and downstream power production

Means of conserving developed water must be investigated, including the technology of process modification (dry cooling) as well as the institutional means of encouraging conservation (regulations and consumption taxes).

Conclusions and Recommendations

1. The sector of society with the largest stake in eastern Montana coal-water development is the public.

The public should play the key role in determining the course of events. Involved government agencies should inform the public and seek opinions on the issues. An agency such as the Montana Energy Advisory Council should accept the lead role in that task.

2. Only if the main stem is regulated would the Yellowstone River have sufficient water to allow maximum diversion. However, regulation of the main stem is not necessary for large-scale coal development, but further tributary regulations would be required.

The Yellowstone River should remain in its free-flowing condition. Other merits and issues may then determine the mode of coal development.

3. Unless proper steps are taken, incremental "non-decisions" will result in development that will create critically low flows in the Yellowstone, thus increasing the need for main stem regulation (Allenspur Dam).

To avoid the pitfall of incremental "nondecisions" a state agency such as the Department of Natural Resources and Conservation should have centralized decision and planning authority. The Montana Legislative Assembly should enact the necessary legislation empowering such an agency and insuring free public access to the workings of the agency.

4. Montana law encourages the diversion, appropriation, and beneficial use of water, but not its conservation. The constraint of water availability on development could be eased by requiring conservative use of water.

A conservative water philosophy should be adopted to maximize the social benefits from development and to maintain options in the public interest. Each development proposal should consider the net social and environmental benefits and costs of the full set of water-conservative alternatives. The legislature should encourage water conservation by statute.

5. Rational decision-making on Montana coal-water development is hampered by a serious lack of knowledge, including information about Yellowstone Basin hydrology, impacts of development on the Yellowstone, and the socio-economic costs of water withdrawn and consumed.

Coal-water development should proceed only when the crucial questions on Montana water resources have been answered sufficiently to enable Congress and the legislature to act in the best interest of the people. Proceeding without the answers to these questions is a continuation of the dangerous nondecision approach that, one-by-one, forecloses intelligent options.

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Appendix A

Development of the Low-Flow Probability Hydrographs

Figures 1 and 2 are low flow probability hydrographs for the Yellowstone River at Billings and Sallis. The graphs were developed from data collected and published by the U. S. Geology and Survey.

The top line in each graph shows the flow rate that can be expected to be exceeded on any given day over a long-term average year. The middle line shows the rate of flow that equals the flow that can be expected 25 percent of the time on any given day. The bottom line shows the rate of flow that equals the flow that can be expected 10 percent of the time on any given day.

Fifty-eight evenly spaced days of the year (the 1st, 9th, 17th, and 25th of each month) were chosen for the analysis. On each of these days, the daily flow was tabulated for all the years of record (28 years at Billings, 28 years at Sallis). On each of the days, the mean average daily flow was calculated. The resulting flows are plotted in Figures 1 and 2 and smooth lines were drawn through the points. These are the top flow in each graph. These lines show the flow rate at the gauging station, on the average, on any given day of the year.

Low flow probability hydrographs of 25 percent and 10 percent were calculated for each selected day, assuming a normal distribution of events. The assumption of a normal distribution is poor for peak flows but is acceptable for low flows.

The 75 percent (7) statistic was used to calculate the 25 percent low flow rate of the selected days. On a given selected day, about 25 percent of the time the daily flow will be equal to or less than the amount calculated. These flows were plotted and smooth lines drawn through the points. Six stations on the lower flows are given also (1) the year, the date, the flow that can be expected 25 percent of the time. The 10 percent flow were developed in the same way.

For example, at Billings on September 1, the average daily flow is about 4,000 cfs. About 25 percent of the time, the daily flow at Billings on September 1 has been 2,800 cfs or more. About 10 percent of the time on any day the flow at Billings on September 1 has been 1,800 cfs or less.

The hydrographs for Sallis on low water flow are given by Figure 2. Only 18 years of records are available for that time. The flow rate is generally lower than at Billings. However, the average flow is very high on 1000 cfs and above about 1400 cfs. Because the years 1966 and 1967 are included, the 1967 flow is about 25 cfs (1,400 cfs) in the Billings River. About 10 percent of the time at Sallis is more probable.

If it were to be assumed that the flow rate will be 1000 cfs per day, Figures 1 and 2 show the low flows and the corresponding probability of flow being exceeded.

Appendix B

Directory of State and Federal Agencies Involved in Water Resources Related to Eastern Montana Coal Development Federal

Bureau of Indian Affairs

Billings Area Office
Federal Building
316 N. 26th St.
Billings, Mt. 59101

The BIA is assisting some Montana tribes, including the Crow and Northern Cheyenne, by financing water resources inventories. A private consulting firm, Hurlbut, Kersich, and McCullough of Billings, has completed Phase I - Water Resource Base for both reservations. Three other phases will follow, leading to detailed recommendations for water resource development.

Bureau of Land Management

Federal Building
316 N. 26th St.
Billings, Mt. 59101

The BLM, with the U. S. Forest Service, is conducting an intensive resource study in the Decker-Birney area. The study has progressed to the point of offering arrays of alternative recommendations for public review and comment.

In addition, BLM is cooperating with the U. S. Geological Survey in the establishment of two water quality monitoring stations on the Tongue River and is a participant in the Northern Great Plains Resource Program (NGPRP). (See below).

Bureau of Reclamation

Upper Missouri Region
P. O. Box 2553
Billings, Mt. 59103

The bureau, along with the U. S. Army Corps of Engineers, has been a lead agency in the development of the water resources in the Missouri Basin. At present, the bureau's major activities involve participation in NGPRP. A list of potential reservoir sites is being compiled and a series of operation studies will be developed to predict the effects of various storage and withdrawal schemes on the flow regimes of the rivers in the Fort Union region.

The bureau is responsible for acting on applications for water allocations from Bighorn Lake and Fort Peck Reservoir.

Bureau of Sport Fisheries and Wildlife

P. O. Box 1296
Billings, Mt. 59103

As a participant in NGPRP, the BSW is identifying critical stream reaches that might be impacted by coal development. A combination of analytical techniques and field observations will result in an estimation of flow requirements to satisfy instream water needs.

Based on different levels of coal development, the impacts of water withdrawals will be predicted.

Corps of Engineers

Omaha District
6014 U. S. Post Office and Court House
Omaha, Nb. 68102

The Corps, a major water resources development agency, is responsible with the Bureau of Reclamation, for allocating the waters in Fort Peck Reservoir a Corps project.

Environmental Protection Agency

1860 Lincoln Street
Denver, Co. 80203

The EPA is responsible for administering a permit system for the discharge of industrial and municipal water-borne wastes and is a participant of NGPRP.

Missouri River Basin Commission

10050 Regency Circle, Suite 403
Omaha, Nb. 68114

The commission, which succeeded the Missouri Basin Inter-Agency Committee, participates in NGPRP but has no current active involvement in eastern Montana water development.

Northern Great Plains Resource Program (NGPRP)

NGPRP, a one-year program, is the official federal effort to guide coal, water, and other resource development in the Fort Union region. Participants include all federal agencies involved with the region as well as interested state agencies.

The program is divided into seven work groups: regional geology, mineral resources, water, atmospheric aspects, surface resources, socio-economic and cultural aspects, and national energy considerations.

Soil Conservation Service

P. O. Box 970
Bozeman, Mt. 59715

The SCS, as a participant in NGPRP, provides information gathered over the years, but currently has no specific hydrologic studies under way in eastern Montana.

U. S. Forest Service

Custer National Forest
Box 2556
Billings, Mt. 59103

(See the paragraph on BLM for mention of the joint BLM-USFS study in the Decker-Birney area.)

SEAM (Surface, Environment, and Mining), 145 Grand, Billings, Mt. 59101, is a USDA program that is researching strip mining reclamation problems in eastern Montana.

The USFS is a participant in NGPRP.

U. S. Geological Survey

Federal Building
310 N. Park Ave.
Helena, Mt. 59601

The USGS is the major source of hydrologic information in the United States and operates, often in cooperation with other federal, state, and local agencies, a network of gauging stations in eastern Montana. Gauging stations may provide flow and water quality data.

The USGS also performs an inventory of wells and springs to determine water levels and quality.

In cooperation with the Montana Bureau of Mines and Geology, it is studying the Madison formation and shallow aquifers.

A technique for estimating mean annual flows in ungauged streams based on channel geometry is being applied.

BALI (Resources and Land Information) is a USGS program which, although it has no active involvement in Montana, is performing a relevant study near Gillette, Wyoming.

State

Department of Natural Resources and Conservation

Mitchell Building
Helena, Mt. 59601

DNRC includes the Water Resources Division, mentioned later. In addition, the Energy Planning Division is responsible for the detailed analysis of impacts, including hydrologic ones, of proposed energy generation and conversion plants and associated facilities.

Department of State Lands

Capitol
Helena, Mt. 59601

The Department of State Lands is responsible for the review of applications for strip mining. That review includes an assessment of hydrologic and water quality impacts.

The department is also charged with the management of state school lands. This management may include water development.

Environmental Quality Council

Box 215, Capitol Station
Helena, Mt. 59601

As an advisory arm of the state legislature, the EQC is charged with overseeing the physical, biological, and human environments in Montana, all of which have water as a major component.

The 1973 legislature directed the EQC by resolution to undertake detailed studies of land use policy and energy policy. Important aspects of both areas are water resources.

Fish and Game Department

Mitchell Building
Helena, Mt. 59601

The F&G is responsible for the management and protection of wildlife, including aquatic forms, in the state. Because coal development could have significant impacts on aquatic ecosystems, the F&G is attempting to better understand the Yellowstone Basin so that impacts may be predicted and prevented where necessary.

Under the Montana Water Use Act (1973) state agencies may apply to reserve surface waters for existing or future beneficial uses or to maintain minimum flow, level, or water quality. The F&G will make such applications in an attempt to perpetuate the high quality of Montana's aquatic resources.

Montana Bureau of Mines and Geology

College of Mineral Sciences and Technology
Butte, Mt. 59701

The Montana Bureau of Mines and Geology has taken an active role in hydrologic studies in eastern Montana strip mine areas

including the Ducker Sarge Creek, Archa Creek, and Youngs Creek and areas. The investigations emphasize surface water and consequences and other impacts, analyzing the amount of strip mining on water quality and hydrology.

Montana Energy Advisory Council

Department Governor's Office
Capitol
Helena, Mt. 59601

MEAC, which succeeded the Montana Coal Task Force in April 1973, is chaired by the Department Governor and consists of the heads of the Departments of Natural Resources and Conservation, State Lands, Intergovernmental Relations, Fish and Game, Health and Environmental Services, Labor, Social and Behavioral Services, Agriculture, and the Environmental Quality Council.

MEAC is charged with coordinating energy-related activities, formulating and analyzing information, and recommending policy. Since water is critical to the burning factor in coal development, MEAC is intimately involved with that resource.

Water Quality Bureau

Environmental Sciences Division
Department of Health and Environmental Sciences
Board of Health Building
Helena, Mt. 59601

The Water Quality Bureau is responsible for administering the state's water pollution laws and regulations. The bureau has established an extensive water quality sampling program to monitor Montana.

Water Resources Division

Department of Natural Resources and Conservation
Mitchell Building
Helena, Mt. 59601

The Water Resources Division has broad responsibility under Montana law. Activities include collection of streamflow information and interpretation, Title Ground Water Code, Floodplain Management Act, the State Water Plan, and enforcement of laws of water rights as required by the Montana Water Use Act.

A potentially powerful tool in the division is the State Water Planning Model, a detailed mathematical model of the state's hydrology that has not yet been extensively applied.

The division is currently reviewing just potential irrigated land.

Bibliography

This annotated bibliography on pertinent studies is included in the resource literature is available from the Environmental Quality Council upon request.

Underground Natural Resources

by
Albert W. Stone*
Legal Consultant

Introduction

Exploitation of underground natural resources has been consistently encouraged by the federal government. The results of its policies can be seen in legal problems of coal strip mining in Montana rising from divided ownership of the land surface and of the mineral rights.

The following report traces the development of national policy concerning underground natural resources (surface and subsurface ownership rights), especially in relation to coal strip mining in the West. Montana policies pertaining to divided ownership of surface and subsurface rights are discussed, as well as Pennsylvania case law. Pennsylvania's court cases illustrate the decision-making process in relation to underground natural resources and indicate considerations that may guide Montana courts in deciding whether to permit strip mining.

The Development of National Policy

Law concerning underground space and its resources has always been intimately related to law affecting the surface — real property law. To discuss the development of policies for underground space, land law must be considered.

American common law has its roots in old England, where from feudal times private real property law governed both the surface and subsurface, and typically the surface owner also owned the subsurface and could do with it as he pleased, it belonged to him. There were a few exceptions — the Crown had the exclusive right to mine gold and silver, and in Derbyshire the miners had the right to prospect and locate mines on private property.

In the United States, the original thirteen states succeeded to the Crown's interest in lands, but never asserted the Crown's right to subsurface gold and silver. After the Revolutionary War, but before the formation of the United States or its constitution, the Continental Congress, by a 1785 ordinance, adopted a policy that still endures: the reservation to the sovereign of the subsurface minerals with every grant of public lands under the public land laws.

That 1785 ordinance established another enduring policy: the reservation from private sale of Section 16 of each township for the maintenance of public schools. In 1848 Section 36 was added to that reserve if it was not classified as mineral land (1). (If it was so classified, another section was granted in lieu of the mineral land.) In 1927 legislation, Congress granted to the states all minerals under school lands, but with the stipulation that upon any subsequent state grant, the state must reserve to itself the mineral rights (2).

Following the Revolutionary War, the United States attempted to raise money to pay debts and finance government by selling its vast landholdings. The land was treated as a capital asset to be exploited by merchandising it. That policy neither settled the land nor raised revenue, so emphasis turned to land settlement rather than revenue raising. Thus the General Preemption Act of 1841 permitted anyone to settle 160 acres at \$1.25 an acre (3), and the more liberal Homestead Act of 1862 authorized the outright transfer of land to settlers who complied with conditions of residence, cultivation, and use (4). But these laws applied only to lands not classified as mineral lands. Mineral lands were reserved to the United States.

Between 1850 and 1871, the railroad land grants were established — up to 10 alternate sections a mile on each side of the right-of-way. Except for coal and iron, mineral lands again were excluded, so where minerals were known the United States retained the mineral lands and the railroad received other lands (5).

Thus, except for a few particular grants such as those for copper and iron in the states formed from the Northwest

*Albert W. Stone is a professor of law at the University of Montana. The principal sources for this portion of his paper are 1 American Law of Mining, Title 1 by Robert W. Swenson; Title III by Joseph Gerard; and 4 American Law of Mining, Title XXIV by George Vaneish.

Territory, the federal government followed a consistent, long-term policy of not granting mineral lands.

For a long time, the United States did nothing with its mineral land holdings. No federal law regulated or otherwise affected mining on the public domain (6), and for the first half-century of the country's history little activity would have required such legal developments.

That situation changed with the Treaty of Guadalupe Hidalgo of February 2, 1848. By that treaty, the United States acquired the southwestern United States and California, where one week earlier (January 24, 1848) John Marshall had discovered gold in the millrace of Sutter's lumber mill at Coloma, California. When the news leaked, the great gold rush was on. In a few years California's population expanded a hundredfold, from around 2,500 to around 250,000, according to one estimate.

Miners flocked to the federal public domain in California's Mother Lode country in the foothills of the Sierras. Since there was no articulated law or developed law enforcement, the miners organized their own "mining districts," "laws," and rules. These governed how to establish a claim and take title to the minerals and real property. The State of California soon recognized and confirmed these miners' customs in the Possessory Acts of 1850 and 1852 (7).

The miners had no right to settle and take gold on federal land, and California had no authority to confirm their titles. In the 1858 federal district court case of *U. S. v. Parrott* (8) and the 1862 U. S. Supreme Court decision in *U. S. v. Castillero* (9), the burden was placed on the occupant to prove his private title; the Attorney General was authorized to enjoin mining on the public domain, and legally the miners were trespassers and converters of federal property — the minerals. In 1863 President Lincoln ordered the U. S. Marshal for the Northern District of California to enter a particular mining property, "remove therefrom any and every person or persons who shall be found in the same," and take possession for the United States (10). (The California gold rush was the original and grandest "sit-in" on federal property of all times, prompted not by a cause, but by economic advantage.) But the United States did not oust the miners, in practical effect it acquiesced to the illegal occupancy and seizure.

Federal Policy Encourages Exploitation

Conflict between law and fact in California's Mother Lode country, conflict between miners and settlers under the 1862 Homestead Act, and discovery of the Comstock Lode at Virginia City, Nevada in 1859 made it evident that some articulated federal policy concerning minerals in the public lands was necessary. The result was the Lode Mining Act of 1866 (11). Characterized as the "miners' Magna Charta" (12), it said:

... the mineral lands of the public domain both surveyed and unsurveyed, are hereby declared to be free and open to exploration and occupation by all citizens of the United States ...

This was not a mining law, but it established several enforcing policies:

1. The rules and regulations developed by the miners themselves were recognized and confirmed.
2. Lode locators were enabled to obtain title to mineralized public lands of the United States for a fee of only \$5 an acre. The United States made no charge for the minerals taken, not even a royalty on the minerals extracted, and reserved no interest in them.
3. The nation's mineral resources were opened to unrestricted exploration and exploitation.

This 1866 act was superseded by the Placer Act of 1870 (13) that permitted placer claimants to obtain grant title to up to 160 acres, a person must possess it for 2.50 an acre and fulfillment of minimum conditions of possession and work.

Both laws were consolidated and extended to the general mining law — the Mineral Location Law of 1872 (14) — that is our basic mining law today. It:

1. Added some specifics concerning dimensions of surface claims and the annual work required to hold a claim prior to patent.
2. Limited placer claims to 20 acres, except that associations of individuals could obtain up to 160 acres.
3. Reaffirmed the policy of reserving all mineral lands from sale under the general land statutes.
4. Continued the newly established policy of declaring mineral lands open to exploration and sale under the mining statutes, and
5. Continued the policy of reserving no interest in and making no charge for the minerals removed.

In 1873 coal land was specifically made locatable and patentable (15). Legislation in 1862, 1867, and 1903 included building stone, oil and gas, and salt deposits among the minerals subject to entry and patent under placer claims (16). The creation of oil and gas lands in 1897 was particularly important.

This open-handed giveaway of the nation's mineral resources was modified by the 1900 Placer Act (17), which authorized the President to stop mineral leasing for non-metallic uses wherever on the public domain. It was aimed at protecting the nation's oil and gas reserves, but it resulted in the withdrawal of non-metallic minerals from nearly all of the public domain since the enactment of the Mineral Leasing Act of 1920 (18). The 1866 act opened non-metallic mineral resources to mineral claims and land patents. (Metallic resources were left where they were today — open under the Mining Location Law of 1872.)

This change in mining law affected non-metallic minerals and was a part of the beginning of the conservation movement, which commenced at the end of the 19th century, continued into the early years of the 20th century, and after a respite, resumed, became active on a government basis in the 1940s. Gilbert Pritchard and Theodore

Roosevelt promoted a change in land policy to limit the indiscriminate encouragement of settling on public lands and to withdraw lands from entry. Forest lands were withdrawn and the Forest Service was established in 1905. Under Franklin Roosevelt, the Taylor Grazing Act of 1934 withdrew for classification vast areas of potential crop and grazing land. These surface land acts generally had little effect on mining because they were principally concerned with surface land use rather than the long-established policies opening mineral lands to exploitation and sale.

One change in land policy during this period altered a long-standing minerals policy. It was the Act of March 3, 1909 (19). Instead of reserving mineral lands from agricultural settlement, it opened those lands to settlement and patent, but reserved the coal under those lands to the United States. Subsequent acts have extended the 1909 pattern, reserving other minerals to the United States while permitting entry and patent of the surface for farms and ranches (20). That change in policy was a great boon to homesteaders, for it offered them much more land. But some of that policy's effects are only arising today. (They will be discussed later.) This new policy created a divided land ownership — ownership of the surface by homesteaders, and ownership of subsurface rights by the federal government or its mineral patentees or lessees.

More recent federal activity affecting underground natural resources can be summarized (21): In 1935 and 1937 bituminous coal legislation gave continued federal support to the production, mining, and pricing of coal. The mineral stockpiling program commenced in 1938, partly to stockpile minerals and to assure a healthy national mineral industry.

Under the Defense Production Act of 1950, the Department of Interior is responsible for adequate supplies and private facilities for production of strategic metals, minerals, solid fuels, and oil and gas. The department serves this function by financial assistance and direct aid, enabling the mineral industry to obtain favorable tax amortization, loans, guarantees, and government procurement contracts. The U. S. Bureau of Mines and the U. S. Geological Survey support industry through research and services.

The Exploration Assistance Act of 1958 authorized the Secretary of Interior to enter into contracts with private parties to aid in the discovery of minerals, by paying up to 75 percent of the cost of exploration, with a ceiling of \$250,000 per contract. These contracts carry no obligation to produce or to repay the government if production transpires. If there is production, the United States receives a royalty of five percent of the "gross proceeds" or "value," generally for 10 years or until the government is repaid with interest, whatever occurs first. Small operators of lead and zinc mines have received further assistance through price support since 1961.

Federal policy has consistently encouraged private exploitation of underground natural resources, regardless of whether public minerals or lands are involved. Federal assistance programs are strongly paternalistic in this respect.

Coal Mining Problems in the West

In northeastern Wyoming, eastern Montana, and the western Dakotas, vast areas of land were patented by settlers under stockraising homestead and other land laws, subject to mineral reservation by the United States (22)

This land is underlain by the Fort Union coal formation — one of the world's largest coal resources. Moreover, the coal is low in sulfur content and therefore has a lower pollution potential than most of the midwestern, eastern, and southern coal. With the nation facing an environmental crisis and an energy crisis, the large coal and energy companies have turned vigorously to the northern plains.

The federal government owns most of the coal in eastern Montana. Most of the surface land overlying the federal coal is now privately owned. It has been homesteaded in accordance with the aforementioned federal policies reserving the coal to the United States, beginning in 1909. The federal government, or a coal company acting as a licensee of the United States, can mine the coal. Eastern Montanans are perplexed about what coal mining methods are permitted and whether shafts and tunnels must be dug to preserve the use of most of the surface for overlying ranches, or whether eastern Montana can be strip mined, turning it into a neo-Appalachia.

Strip Mining of Coal: Unsettled Legal Problems in Montana

The Montana law of eminent domain as it applies to strip mining is a problem area. Eminent domain is the power of the state to take property for what it considers to be a public use, subject to compensation to the person whose property is taken. The state, through legislation, may delegate this power to private corporations and may, by similar legislation, designate what activities are to be considered public uses.

In Montana, the principal legislation defining the public uses for which eminent domain is authorized was first enacted in 1877 and has since been periodically amended and expanded (23). In 1961, mining was added to that statute as a 15th subsection, describing the additional public use in these words:

To mine and extract ores, metals or minerals owned by the plaintiff located beneath or upon the surface of property where the title to said surface vests in others (24).

In other words, the owner of the minerals can condemn the surface property owner in order to mine them.

When the power of eminent domain is exercised to take another's property, no more property may be taken than is needed to accomplish the public purpose (25). Applying this to the eastern Montana coal underlying many large ranches, the foregoing statute would authorize taking

through eminent domain only so much of a ranch as is needed to gain access to the coal and mine it. Thus the statute does not authorize the use of eminent domain to condemn entire ranches, and in many instances only a temporary easement would be justified. This is an important qualification, though for any ranch the vital fact will be the location of the coal — whether it underlies a meadow or hay land or less productive land.

If a coal company can take only so much land as is needed to mine and extract the coal, can it exercise the power of eminent domain to enable it to strip mine, or should that power be limited to taking only so much land as is needed to deep mine by shafts and tunnels? This is the most important legal question the courts have not answered about coal strip mining.

Meanwhile, the Montana legislature has provided an answer. In 1973 it added the following language to the above quoted subsection 15 of the state's eminent domain law.

... provided, however, the use of the surface for strip mining or open pit mining of coal (i.e., any mining method or process in which the strata or overburden is removed or displaced in order to extract the coal) is not a public use and eminent domain may not be exercised for this purpose (26).

This enactment may be challenged on federal constitutional grounds. Coal is only one of several minerals that may be taken by strip or open pit mining. Thus the challenge could be based on the law's selection and isolation of coal owners, prohibiting them from strip mining while allowing other mineral owners to continue under the right of eminent domain. In short, the coal owners may claim unfair discrimination and denial of equal protection of the law.

The threat of such a challenge was recognized by the legislature, which sought to justify this special restriction against coal through extensive findings (27). Excerpts from some of these are:

1. Because of the large reserves of ... coal in eastern Montana, coal development is potentially more destructive to land and watercourses and underground aquifers and potentially more extensive geographically than the foreseeable development of other ... minerals, and affecting large areas of land and large numbers of people,
2. ... to permit the mineral owner to condemn the surface owner is to deprive the surface owner of the right to use his property in a productive manner ...;
3. The magnitude of the potential coal development in eastern Montana will subject landowners to undue harassment by excessive use of eminent domain;
4. ... it is the public policy of the State to encourage and foster diversity in land ownership ...

With these legislative findings, challenging the restrictive legislation will be a formidable task.

Surface and Subsurface Ownership Rights

Ownership of the land, surface and of the underlying coal has been divided by two principal methods: the system of both the surface and subsurface one self only has mineral rights in one and the land while reserving the mineral rights. The latter pattern was used by the Northern Pacific Railway Company. Northern Pacific acquired a vast amount of land in eastern Montana, reserving the underlying coal from the federal government in the railroad land grants to Subsequently the railroad sold large amounts of land to private ranchers, but reserved to itself the coal, which now belongs to the Burlington Northern. A 1908 Northern Pacific deed contains this reservation:

Excepting and reserving unto the party of the first part, its successors and assigns, forever, all coal and iron upon or in all of said lands hereinbefore described and also the use of such surface grounds as may be necessary for exploring for and mining or otherwise extracting and carrying away the same ...

It is unclear whether this reservation entitled the railroad to use only as much surface as it needed for deep mining or whether it includes use of the surface needed for strip mining. Although this question, exemplified by the Northern Pacific case, has not yet been answered in Montana, it has been the basis for extensive litigation in the coal mining states of the East. Eastern court decisions will be considered by and will influence the Montana Supreme Court. For that reason, Pennsylvania case law since 1950 has been selected to illustrate the decision-making process and reveal considerations that may guide Montana courts in deciding whether strip mining is permissible.

In chronological sequence, the first case is *Commonwealth v. Fisher*, 1950 (28), in which an 1896 deed conveyed the land reserving to the seller:

... the full entire complete and exclusive ownership ... as though the present conveyance had not been made, to all metals ores minerals coal mine-banks and deposits of ores minerals metals or coal ... and the right to excavate ... any part of said premises.

Some time later the Commonwealth purchased the land surface for residential purposes, and still later the owner of the coal sought to strip mine the land. The commonwealth asked for an injunction against strip mining and was successful in the trial court. But the decision was reversed on appeal — strip mining was permitted. The appeals court noted that the 1896 deed reserved common law rights to surface support² and that the deed contained no restrictions on mining methods. The appeals court also concluded the fact that the land was common maintenance and had been leased over. One judge dissented, arguing that the deed, which reserved permanent ownership of the coal should not be used to confer broad and exclusive income of mining the coal. So the language in the 1896 deed ... "as though the interest

²The court also pointed out that the deed reserved the right to mine the coal. The court also noted that the deed reserved common law rights to surface support and that the deed contained no restrictions on mining methods.

conveyance had not been made — refers to the quality of ownership reserved and not to mining methods. That judge also found that strip mining was inconsistent with the surface owner's use of his land and contrary to the conveyance of that land.

The next case also permitted strip mining. In *Mount Carmel Railway Co. v. Hanna Co.*, 1952 (29), the railway tried to restrain Hanna from strip mining coal under the railroad right-of-way because (as the court found) such mining would make railroad operation impossible until the land had been back-filled after mining was completed. The document in question was an 1891 grant to the railroad of an easement for its right-of-way. The grant reserved for Hanna the minerals "under the surface" and the right to take them "by any method of mining." It "also reserved the rights to use" drifts, tunnels, gangways, airways, breasts, slopes and other ways through and under the said tracts." The railroad assumed the risk of "the said surface of the ground hereby granted breaking or falling in" as the result of any method of mining. In upholding strip mining, the court emphasized the language "by any method of mining" and found that the other language, appropriate only to deep mining, followed the word "also" and hence described additional rights rather than a limitation on the generality and breadth of the earlier language.

In *Rochez Bros. v. Duricka*, 1953 (30), Rochez had been prevented access for strip mining and sought to prohibit such interference. The document in question was a 1919 deed that reserved the coal:

Together with the right to mine . . . rights . . . to such mining and removal, draining and ventilating the same, and without being required to provide for support of the overlying strata, and without liability for injury to the said surface . . . (and the) right to enter in, upon and under the lands.

In prohibiting strip mining, the court noted that the land was agricultural rather than logged-over, remote, mountain land and emphasized that the clauses in the 1919 deed were appropriate to deep mining and not to strip mining. The relinquishment of surface support and the rights to damages for injury to the surface were found inapplicable to strip mining — a method of mining that will necessarily destroy the surface. The "right to enter in, upon and under the lands" was also found to be language of deep mining. Finally, the court found that the right to destroy the surface must be specifically reserved because it is so inconsistent with the use of the surface and contrary to the grant of surface ownership. As a general rule for construing such a deed, the court said that if the grantor used language that led to ambiguities or uncertainties about his reservations of the coal and mining rights, the doubt should be resolved against him and in favor of the grantee of the land.

In *Commonwealth v. Fitzmartin*, 1954 (31), the deeds were executed from 1921 to 1923 and reserved "... all the coal . . . and other minerals in and under the surface without any liability whatsoever for damages to said lands . . ." In allowing strip mining, the court emphasized the breadth and generality of the quoted language and

ignored other language that was in the context of deep mining, such as references to "shafts" or "ventilation." It declined to follow the 1953 *Rochez Bros.* case because that case involved rich, useful agricultural land, whereas here, as in the 1950 case of *Commonwealth v. Fisher*, the state land was logged-over, mountainous and unimproved. Three judges dissented on the basis that the contents of the deeds lent themselves only to deep mining, that the present utility of the land was irrelevant, and that (following the rule stated in the *Rochez Bros.* case) any ambiguities or uncertainties should be resolved against the grantor.

In *Wilkes-Barre Township School District v. Corgan*, 1961 (32), school land had been strip mined and the school district was suing for damages, alleging that the land had been stripped without right. The document in question was an 1893 deed of the surface, reserving the coal and the right to drive tunnels and passageways under the land without liability or responsibility for injury to the surface, as by subsidence or collapse. In interpreting this deed, the appeals court stated (as in the 1953 *Rochez Bros.* case) that uncertainties and ambiguities should be resolved against the grantor of the land, who reserved to himself only the minerals. The court found that nothing specific permitted the grantor such a broad, destructive power as strip mining, that strip mining would not have been contemplated in 1893 when the deed was executed, and that the land was valuable for its surface uses. And so it found that the school district had a good case for suing for damages. Two judges filed a brief dissent saying that the 1954 case of *Commonwealth v. Fitzmartin* (above) should be controlling.

In *Heidt v. Aughenbaugh Coal Co.*, 1962 (33), the court found that a 1915 mineral lease permitted strip mining because it provided:

The right to mine to include all practical methods now in use, or which may hereafter be used . . . and the right to strip the surface or excavate, dig, bore, shaft, quarry and otherwise explore for and mine said minerals.

In *Merrill v. Manufacturers Light and Heat Co.*, 1962 (34), Merrill wanted to strip mine and brought an action to prevent interference. The document in question was a 1930 deed that granted the power company an easement for its gas transmission line, but relieved Merrill from responsibility for damages caused "... by the removal of surface support thereunder in the mining of coal." The court found that the quoted language referred to weakening of the surface strata by removal of lower supporting strata and had no reference to strip mining: "Patently, surface support is not synonymous with surface destruction . . ." (Court's emphasis.) The court said that since strip mining was known in 1930, the parties would have expressly provided for it, had it been intended. Other circumstances were considered, such as that in 1930 Merrill (1) did not own all of the mineral and surface rights that he owned by the time of the trial and (2) did not have the right to strip mine all of the land when he granted the easement to the power company. Once again, the fact that it was agricultural land affected the court's judgment. It said that the burden is on "him who seeks to assert

the right to destroy" and that the conveyance should be interpreted "... in the light of the apparent object or purpose of the parties and of the conditions existing when the words were employed." The strip mining was prohibited.

In *New Charter Coal Co. v. McKee*, 1963 (35) the coal in question was granted to New Charter under a 1903 deed, with McKee reserving to himself a seam of coal that lay between the grantee's coal and the surface. New Charter wanted to strip mine its deeper seam, but the court denied it that right, principally because McKee's seam would be torn up by New Charter's stripping.

The most recent case was *Stewart v. Chernucky*, 1970 (36), in which Chernucky had strip mined and Stewart sought damages, alleging that his land had been stripped without right. The document in question was a 1902 deed that granted to Chernucky the coal and the right of

... mining ... also the right to drain and ventilate said mines by shaft or otherwise ... with a full release of and without liability for damages for injury to the surface ...

The court found that the deed was not specifically for or against strip mining, but placed the burden of proof upon whoever seeks authority to destroy the surface. It acknowledged the general rule enunciated in the 1953 *Roches Bros.* case and the 1961 *Wilkes-Barre School* district case that ambiguities and uncertainties should be resolved against the grantor, but it did not find that the deed gave rise to significant ambiguities and uncertainties. Rather, since strip mining was not common in 1902 when the deed was executed and since it incorporated such language as "ventilate said mines," it found that strip mining was neither intended nor included in the grant of the mineral rights.

The above cases are almost evenly divided for and against strip mining. Several key considerations caused the Pennsylvania court to decide one way or the other.

The principal emphasis in each case was upon the language of the grant or reservation of the coal. Broad language, authorizing mining "by any method" or releasing the mineral owner from liability for any damage, tended to permit strip mining. Language that is particularly applicable to deep mining, such as "ventilating," "tunnels," "shafts," "passageways," and that concerns liability for support of "overlying strata" tended to exclude strip mining. Factual circumstances also helped the court to interpret the language, such as whether the land supported a valuable activity (agriculture), or was timbered mountains or hills, and whether strip mining was common in the areas when the language was employed. The release of liability for surface support or damage to the surface was used by the court to arrive at opposite conclusions; the more reasonable decision would seem to be that reached in the *Merrill* case, such language applies only to deep mining because "surface support is not synonymous with surface destruction." Several of the Pennsylvania cases suggest that strip mining can only be authorized

by specific language to that effect, because such a result is inconsistent with an inherent right of the surface ownership.

These background cases make it possible to predict how the courts might deal with the language of the 1907 Northern Pacific deed. That language is repeated here for convenience.

Excepting and reserving unto the party of the first part, its successors and assigns, forever, all coal and iron upon or in all of said lands heretofore described and also the use of such surface grounds as may be necessary for exploring for and raising or otherwise extracting and carrying away the same. ...

The reservation of all coal "upon or in" the lands reserved seems neutral in regard to strip mining, since it supports ownership rather than mining methods. Then the document speaks of the "use" of such surface as needed for exploration, mining, etc. In the context of a 1907 deed, it seems unlikely that only a common, general word as "use" would be construed as permitting the sort of destruction involved in strip mining. The word "raising" is unambiguous as the word "use" neither aids in carrying the burden of proving a right to strip mine. The words "otherwise extracting" summate a drawing out, as in deep mining.

The Pennsylvania cases show that surrounding circumstances should be examined to help determine the intent of the parties. A very important circumstance is that strip mining was nonexistent in eastern Montana in 1907, but ranching and other agricultural pursuits were widespread and were expected to be common uses of the mineral grant lands.

The Pennsylvania cases also show that uncertainties and ambiguities should be resolved against the grantor who reserved the coal and that the burden of proof is upon whoever seeks to destroy the surface. The Northern Pacific deed is devoid of such clear language as "removing," "excavating," "mining," or "strip mining."

Montana Land Patents and State-owned Minerals

Like the Northern Pacific railway, the State of Montana divided Federal swamp-land between surface and subsurface. The state originally held both the surface and subsurface, but conveyed the former to private buyers, reserving mineral interests, including coal. When public land is conveyed, the conveyance is often called a deed, but a "patent." Montana property contains this reservation:

... and also excepting and reserving to the State of Montana all title in and to all coal, oil, oil shale, gas, phosphate, sodium and other mineral deposits in the above described land which have not already been reserved by the United States, except sand,

gravel, building stone and brick clay, whether now known or hereafter found to exist therein, together with the right for itself and its lessees to enter upon the said lands, to prospect for, develop, mine and remove such mineral deposits so reserved and to occupy and use so much of the surface of the said lands as may be required for all purposes reasonably extending to the exploring for, mining and removal of such mineral deposits therefrom, but the lessee shall make just payment to the purchaser for all damage done to the premises by reason of such entry upon the land and the use and occupancy of the surface thereof.

The operative words here begin with "develop, mine and remove." If "remove" can be taken as part of the mining operation itself, it could encompass strip mining, but the word probably was not used in that way. Rather the whole phrase suggests a process: develop the operation, mine the mineral, and remove it from the premises. The word "mine," then, seems equivalent to "mining" in the Northern Pacific deed. Then the state reserves the right to "occupy and use" the necessary surface. Again, the neutral wording is similar to the Northern Pacific deed. The clause "required for all purposes reasonably extending to the exploring for, mining and removal" does not offer much help either, because again nothing indicates that any particular method of mining was contemplated. The clause requiring "payment to the purchaser for all damage done to the premises by reason of such entry upon the land and the use and occupancy of the surface thereof" is not an enabling or authorizing clause, but rather one that protects the landowner and restricts the state or the lessee to whom the state has granted rights to mine the coal. Of course, that clause does imply that damage may result from entry, use, and occupancy, but that would be the case whether the land was deep mined or strip mined. So again, no words truly describe strip mining or imply any intention of using such a destructive method.

One basis for differentiating this state patent from the Northern Pacific deed stems from a doctrine that was developed to protect the public whenever there is a conveyance of public property. That doctrine is that "nothing passes by implication and a public grant will be interpreted in favor of the grantor" (37). In effect, this would strictly limit the rights of the patentee to those specifically granted by the state land patent. The burden of proof is shifted from the grantor (the state), where it rests in the Northern Pacific deed, to the purchaser. And this doctrine could be used to resolve uncertainties against the purchaser and in favor of the grantor, once again the reverse of the Northern Pacific deed. But it does not authorize rewriting of a public grant or avoid the necessity of searching the language of the grant in light of the circumstances of the parties at the time of the grant, to ascertain what was intended.

Certainly it was intended that the state should have the right to remove "coal, oil, oil shale, gas phosphate, sodium and other mineral deposits." The lack of any differentiation between coal and oil, etc., suggests an absence of any contemplation of strip mining. And certainly it was contemplated that the purchaser would conduct farming

and ranching operations on his homestead. Nothing suggests that either the state or the purchaser conceived that the surface might be destroyed by strip mining one of the state's reserved minerals.

Strip Mining on Homesteaded Land

As noted earlier, the federal government owns much of the coal beneath the ranches in eastern Montana. The division of ownership of the surface and the minerals parallels the Montana land patents. The land has been homesteaded under the following federal statutes:

Upon satisfactory proof of full compliance with the (several homestead, desert land entry, and stock-raising homestead laws) the entryman shall be entitled to a patent . . . which patent shall contain a reservation to the United States of all the coal in the lands so patented, together with the right to prospect for, mine, and remove the same . . . (The language continues, reading nearly identically to the 1916 statute quoted below, authorizing licensees of the United States to enter, to prospect, and to mine, and to occupy so much of the surface as may be required, subject to payment of damages or the giving of a bond to secure damages ascertained by a court.) 1910 (38).

All entries made and patents issued under (stock-raising homestead) shall be subject to and contain a reservation to the United States of all the coal and other minerals in the lands so entered and patented, together with the right to prospect for, mine, and remove the same . . . Any person qualified to locate and enter the coal or other mineral deposits, or having the right to mine and remove the same under the laws of the United States, shall have the right at all times to enter upon the lands . . . for the purpose of prospecting. . . and shall compensate the entryman or patentee for all damages to the crops on such lands by reason of such prospecting. Any person who has acquired from the United States the coal or other mineral deposits in any such land, or the right to mine and remove the same, may re-enter and occupy so much of the surface thereof as may be required for all purposes reasonably incident to the mining or removal of the coal or other minerals, first upon securing the written consent or waiver of the homestead entryman or patentee; second upon payment of the damages to crops or other tangible improvements to the owner thereof, where agreement may be had as to the amount thereof; or, third, in lieu of either of the foregoing provisions, upon the execution of a good and sufficient bond or undertaking to the United States for the use and benefit of the entryman or owner of the land, to secure payment of such damages to the crops or tangible improvements of the entryman or owner, as may be determined and fixed in an action brought upon the bond or undertaking in a court of competent jurisdiction . . . 1916 (39).

In 1949 Congress foresaw the probability of strip mining on homesteaded land and provided that a person seeking the minerals by such a method must, in addition to paying for damages to a crop and improvements

... be liable for any damage that may be caused to the value of the land for grazing by such prospecting for, mining, or removal of minerals 1949, (40).

This law simply determines what the damages will be if federal coal is strip mined under homesteaded land. As written, the law does not and could not give the United States or its licensees the right to strip mine such land because the rights of the United States and the homesteaders were established at the time the land was homesteaded and the patents were issued. Since this statute enacted in 1949 and therefore subsequent to nearly all of the homestead patents in eastern Montana, does not purport to be an exercise of the power of eminent domain the property rights created by the homestead patents are not affected.

The problem still remains of determining whether the United States, under the quoted laws enacted from 1910 to 1916, reserved not only the coal and the right to mine it, but also the right to strip mine it. The process of making this determination is essentially the same as the process used in connection with the Northern Pacific deeds and the Montana land patents. And once again no language authorizes or even refers to strip mining.

However, some considerations and circumstances lead toward the conclusion that strip mining is permissible under these laws.

1. It was certainly a known technology by 1910 and was practiced in states east of the Mississippi.
2. The land patented under the homestead laws was sold to settlers for a nominal price. Thus the doctrine that public grants will be interpreted in favor of the grantor may acquire the additional force of the appearance of fairness.
3. The laws contain no indication that the United States or its licensees should be precluded from using developing technology in exercising their right of access to the coal.
4. The homesteaders took the surface land with clear notice that the United States had reserved the coal and the right to mine it.

On the other hand, strip mining was not being practiced in the West during the period in question and, as in state patents, it scarcely could have been contemplated by the settlers. It is doubtful that Congress, when it encouraged homesteaders to move west to settle the public domain, intended that the homesteads — the grazing and farming lands — would be ravaged to recover the coal.

Strip mining of coal is of course permissible in lands where the mineralized surface and minerals have been divided. Future court decisions may determine that strip mining is also permissible on some or all of these lands. And if the courts deny the mineral owner the right to strip mine in accordance with his reservation of mineral rights, he still has the alternative of trying a contractual solution. He can offer to buy easements for strip mining from the landowners or he can offer to buy the surface.

Legislation may be enacted which provides solutions to protect surface owners who prefer to maintain their grazing and farming lands and continue their established way of life.

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Montana's Land Use Policy Study

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Characteristics that have discouraged urbanization — remoteness, topography, climate, and sparse population — now place Montana lands in great demand. The state's physical, biological, and cultural resources are beginning to experience pressures generated by an anti-urban mood prevalent throughout the country. Affluent, mobile Americans are fleeing the stresses of metropolitan areas, and land speculators encourage and profit from their flight. In eastern Montana, impending development of vast minable coal deposits is placing additional demands on the land.

The state's natural characteristics and relatively slow-growing economy have contributed to produce a variety of life styles that are highly dependent on the continuation of similar conditions. Montanans enjoying those life styles do not want them changed, yet many of them have come to expect a greater variety of services and choices than those associated with their life styles in the past. Likewise, people moving to Montana and hoping to adopt a more desired life style do not want Montana to change, yet their expectations are often incompatible with their hopes. In a typical irony of human behavior both groups seem to be inadvertently cooperating to destroy what they both desire.

The future life styles of Montanans, present and new, will be largely determined by decisions about the use of land. Such decisions are made today much the same as they were made during the last 100 years, although conditions surrounding those decisions have changed drastically. A great many more land use decisions will come in the immediate future. The 1973 Montana legislature recognized this and in response passed House Joint Resolution 9 (HJR 9), which in part directs the Environmental Quality Council to "... undertake a thorough study

of land use practices and policies in Montana and elsewhere in the United States, prepare a report and make recommendations with respect to such practices and policies, and prepare suggested legislation for the consideration of the governor and the 1975 legislature"

As presently outlined, the land use policy study is divided into two phases. The first involves defining the state and national context in which land use decisions are made and will be made. The second delineates and discusses policy options and means of implementing them, including consideration of administrative structure, tax policy, and the mechanics of land use analysis.

Numerous states — for example Hawaii, Vermont, Colorado, Florida, Maine, and New York (1)(2) — and the federal government have been struggling with the complexities of land use legislation. Other states' legislation will provide ideas for Montana, while federal legislation will influence Montana's options because of legal and financial support that will accompany the federal act. As of this writing, legislation before Congress is primarily concerned with process, leaving most policy questions to the states. Hopefully, the federal position will be clarified in time to allow consideration of its effects in the EQC's land use policy study.

Concurrent with researching state and federal land use efforts the EQC is investigating the larger legal context encompassing land use regulation. Obligations and areas of possible preemption with respect to federal laws and guidelines (such as those relating land use to air and water quality) are being identified. Existing Montana codes are being searched for all laws that affect land use decisions. Included will be interstate compacts, the power of eminent domain, interim and standard zoning laws, self-government charters, the separation of development

rights, and the jurisdictions of state agencies with respect to land use. Government agency cooperation is necessary to carry out this and many other aspects of the study.

A picture of current land use and prevailing trends is emerging from the study, as well as information on land ownership and conversion. Work on the latter topic begins with research by three summer interns who studied examples of land conversion in Stillwater, Carbon, and Gallatin Counties and in the Bitterroot Valley. Consideration of land ownership will distinguish between land use decisions the state may directly influence and those it may not. The latter group primarily involves federal land and Indian reservations, the former involves state and private lands. Part of the intent of this element of the study is to locate areas with high rates of land conversion and identify the uses from which land is taken, the uses to which it is put, and the manner by which the conversion takes place. The mutual presumption is that land is taken out of agricultural and natural system support (such as winter game range) uses and converted to grazing or suburban uses.

Assessing the pressures on Montana's land resource will conclude the first phase of the study. Projections of transient and resident population growth prepared by state and federal agencies will be compared and analyzed, as will any available private marketing surveys. Federal, state, and private plans that may effect population growth (such as construction of major dams, major highways, and mining and/or power generation centers) will be considered. Demands on water supply, solid waste and sewage disposal, social services, and other secondary effects of population growth also will be considered in devising methods for converting projected population into demand as acres of land.

The first phase of the land use policy study is akin to a reconnaissance; its purpose is to provide the necessary background against which Montanans may make choices about what happens to their land. Once the reconnaissance is complete and analyzed, alternative land use policies and their expected results may be developed.

State policies could range from no control of growth to the opposite extreme of "no growth," discouraging future development and population influx. The latter alternative seems unlikely to be chosen, given the dearth of public support for including environmental considerations in decision-making, as demonstrated by the "93 legislation. "No growth," on the other hand, could prove to be unrealistic. Excessive efforts toward this alternative have inevitably been rejected by the courts, and many Montanans could find this choice unacceptable for economic and/or ethical reasons. Furthermore, a reasonable policy would be an inadequate response to pressures that state and national needs may place on resources.

Between the two extremes may lie public options that recognize the diversity of life styles and aspirations of Montanans, the obligation of the state to provide for the health, safety, and general welfare of its residents, and the responsibility of the state to the rest of the nation.

Selected state interests attempt to balance the costs and benefits of land use. Land use is not viewed as a zero-sum game. In land use, it is assumed, values from various perspectives are necessary to make a balancing or compromise difficult. There is no generally accepted method of weighing and trade economic, environmental, and aesthetic values; the task of a policy statement is to define such a method.

Any land use policy must attempt to summarize the benefits, benefits of environmental quality, the quality of life, and land use. Land use decisions are more subtle and complex issues; it is possible to establish a goal of pure air or clean water, but there is no comparable clarity of land. The good of land has characteristics that directly affect air and water quality, resource values, and economically territorial and aquatic ecosystems.

A land use policy must also acknowledge and address the fact that land is a nonrenewable source. Not just any land, but land that satisfies user preferences needs. At one time this was not a concern. Prevailing opinion was that technology would solve any problem with enough money. A little research and development, and the Sahara would be made to bloom. Slowly, however, we are beginning to realize that there are costs other than those measured in dollars, that technology and solutions can be a long time in coming, and that there are user problems—wastes. Montana's winter recreation and following profits, Montana's industry and its private agricultural land and grazing land, only its winter game range and lake and stream frontage. All are threatened by land conversion.

Acknowledgment of the scarcity of land and the interactions of land use with ecological, social, and cultural systems changes the way land is perceived. No longer can land be seen only as a resource-making commodity; it must also be seen as a resource. And as a resource it must be managed, because like other resources the land and its natural systems may be lost by exploitation.

A land use policy should protect the community support, however. The social and economic unity of American society is too interwoven with the possession of land as a commodity to allow this support to be easily altered. A land use policy should recognize the long-term of Montanans' expectations to be with the land and that they should regard the societal costs of the resulting transitions.

The question here becomes, how much is society willing to pay to perpetuate land use conditions established before some of the United States has disappeared by being run and used by the population that is a massive land using the system in place? The complexity question is how much is society willing to pay to change those conditions? It is establishing the priority of an appropriate assessment that the costs are not only additional dollars to provide services to displaced, displaced, or displaced, some, some, perhaps, be less, to determine the regulatory program, to be part of land that has to be displaced or because land has been that some to be displaced. The responsibility is the reasonable success of economic and environmental values and the process of free and support for public institutions that allow when government policy, unlikely or not so. The policy systems, w.

be generated by the land use policy study will offer the legislature a number of balancing points among these diverse concerns.

A final point essential to a state land use policy is an emphasis on solutions that lie with sound resource management and not with attempts to establish plans for all time. The policy orientation must be toward creating a process that will remain flexible yet provide firm guidance as the context of land use decisions shifts with changing social attitudes and technology.

In American political history, policies have not been well defined except in terms of implementing programs or processes. On the other hand, policies that have neglected implementation processes have often come to nothing. In considering these processes, the land use policy study must first examine the future roles of local, regional, federal (where subject to state influence), and state government. The role of local government is particularly significant. In an era when alienation of the governed is a common problem, the closeness of local government to its constituents and its ability to assess local needs and respond quickly to local problems should not be disregarded offhand. Though local governments are generally inadequate in dealing with situations that have ramifications beyond their borders and may be particularly susceptible to certain types of influence, other levels of government have not proved to be free of similar faults.

An important task of state land use policy is to distinguish between ordinary development, which ideally can be dealt with by local government, and extraordinary development, which has ramifications beyond the competence of local government to control. The policy also must offer local governments guidelines for assessing the magnitude of land use decisions that fall within their jurisdiction. Answers will be sought to questions concerning the amount and kind of assistance the state should offer, how much state assistance local government should accept, and what role regional government should play. Existing areawide planning organizations and proposed district councils will be investigated to evaluate present efforts in regional government.

Before developing implementation options and suggesting legislation, the EQC will research local government and landowners' responses to present land use regulations. Local government stances about such regulations will help define realistic alternatives and partially answer

questions about the amount and type of state assistance needed.

Regardless of the option chosen, state government will need to coordinate the efforts of other levels of government and of single-purpose state agencies. The latter part of this task will be eased as the environmental impact statement, required by the Montana Environmental Policy Act, becomes more effectively used in state agency decision-making.

The land use policy study will provide policy options and suggestions for administrative structure that could further define the role of state government. If the legislature chooses an option requiring an active role by a state agency, some state-level analysis will be needed. Therefore the study is also investigating mechanics of land use analysis. Experience with analysis procedures in other states and regions will be researched to provide information on costs and usefulness.

Since a land use policy will affect the lives of Montanans, the EQC is exploring ways to insure public participation. Every effort will be made to open channels of information to the public and to be available to receive comment.

A project of the size outlined above could not realistically be undertaken by the EQC staff without substantial assistance. In addition to the cooperation of state agencies, the staff will be assisted by the Inter-Agency Land Use Advisory Council recommended by the 1973 Legislature (HJR 9) and recently filled by appointments of Governor Judge. A Ford Foundation grant to the EQC has allowed hiring of consultants and assistants from the state university system. This option has been employed to hire summer interns and five graduate students working on their master's degrees in environmental science. Four of the five are investigating the relationship between specific types of development and natural systems. For example, one is studying subdivision effects on wildlife in the Bitterroot Valley. The fifth student is researching land conversion in the upper Flathead drainage.

In accordance with the mandate given the EQC by HJR 9, the results of the land use policy study and suggested legislation will be presented for the consideration of the governor and the 1975 legislature.

Literature Cited

1. Bosselman, Fred and David Callies. 1977. *The Quiet Revolution in Land Use Controls*. Prepared for the Commission on Environmental Quality. Government Printing Office, Washington, D. C.
2. Reilly, William K., ed. 1977. *The Use of Land: A Citizens' Policy Guide to Urban Growth*. New York: Crowell Co.

Land Use Studies Available

Two reports of investigations of subdivision activity in Montana are available from the Environmental Quality Council.

The first, "A Perspective on Subdivision Activity in Montana's Bitterroot Valley," gives an historical perspective of how the area developed; examines the land conversion process from the viewpoints of the farmer and county officials; and discusses the current land boom in light of results of a recent subdivision inventory done on the county and in relation

to defining the motivation of the potential land buyer. Tina Torgrimson, an EQC-WICHE intern, is the author.

The second is a case study of Ponderosa Pines Ranch, a land development in Gallatin County that includes about 13,000 acres divided into 908 lots of 10 and 20 acres. Sales are being made in Hawaii, Southeast Asia, and Japan; none of the land is being offered in Montana. The report discusses the developer's sales tactics, as well as the problems of interstate land sales. The author, Ken Porter, is also an EQC intern.

Saline Seep in Montana

by
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Introduction

*Saline seeps are recently developed saline soils in nonirrigated areas that are wet some or all of the time, often with white salt crusts, and where crop or grass production is reduced or eliminated.** They are manifestations of 20th century dryland agriculture and the crop-fallow rotation system necessary for moisture conservation and small grain production on the scale practiced in Montana. The widespread occurrence and rapid growth of saline seeps have been recognized as one of the most serious conservation problems in the northern Great Plains (1).*

A 1971 Soil Conservation Service (SCS) survey revealed that more than 80,000 acres of nonirrigated Montana cropland had been lost to saline seeps (6). Serious outbreaks of seep have now appeared in northcentral and northeastern Montana and are increasing at a rate of over 10 percent a year. Other estimates show that 150,000 to 250,000 acres of cropland have been lost and if the acreage of saline farm, recreation, and stock ponds as well as badly eroded coulees and "swept" drainage canals were included, the affected area would be much greater. Saline seep is known to be highly destructive to Montana's soil, water, and wildlife resources, but the true extent of its adverse environmental effects is only guesswork.

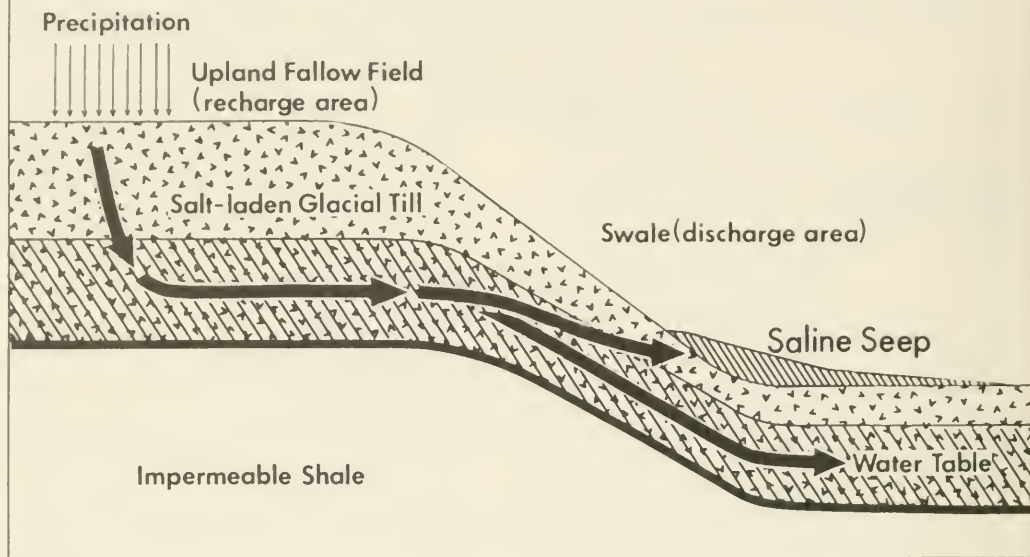
Although aggravated by the crop-fallow system now in use, the saline seep problem stems from the geology of the northern Great Plains region. The surface material is glacial till up to 70 feet thick. The till is underlain by a thick marine shale formation that is impermeable to water. Both the till and the shale contain an abundant supply of natural soluble salts. Excess water, evidently produced by dryland moisture conservation, moves through the till, picks up salts, and builds up on top of the shale, forming a "perched" water table. This excess water gradually moves downslope, accumulates in the lower valleys, and eventually reaches the surface and evaporates, leaving the dissolved salts behind (Figure 3).

This paper outlines the history of the development of saline seeps in Montana and efforts to control it; it describes in detail the hydrogeological setting of the area affected and notes the potential for ameliorating throughout much of the northern Great Plains. The latter portions of the paper deals with environmental aspects and possibilities of saline seep, including environmental impact and feasible control technologies.

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**Definition accepted by Government Commission on Saline Soils, August 19, 1971.

Fig. 3 Saline Seep Formation



History

Patches of alkali dotted the northern plains before the white settlers arrived. Lewis and Clark referred to them in their journals: "The salts which have been mentioned as common on the Missouri are here so abundant that in many places the ground appears perfectly white, and from this circumstance the river may have derived its name (8)." These spots persist today, mostly on rangeland, but are apparently nothing more than static, residual salt accumulations from some natural evaporative process working over geologic time. Unlike present-day seeps, these naturally occurring salt deposits do not spread. For these reasons they are not included in the definition of saline seep given at the beginning of this paper.

The saline seep story began between 1910 and 1920 when most of the native grassland of northern Montana was plowed. Undoubtedly some excess water accumulated beneath the root zone for many years following, but extended periods of drought and inefficient farming practices probably slowed saline seep development. The phenomenon (locally called alkali or north slope alkali) first appeared in Montana in the late 1940s, just a few years after the alternate crop-fallow farming system became well established, after large, high-powered farming equipment became available, and after the beginning of widespread chemical weed control (7).

Some early accounts show sporadic concern about the problem. In 1947 the Montana Cooperative Extension Service (MCES) made a brief field investigation and wrote

an evaluation (26). In 1954 an article titled "North Slope Alkali" appeared in the *Montana Farmer Stockman* (29). And in 1955, primarily through the efforts of R. W. Warden, first district conservationist for the SCS at Fort Benton, a team of SCS specialists investigated seep areas and prepared a short report.

The Highwood Bench south of Fort Benton was one of the first areas in Montana to be affected. Salt accumulation there has become increasingly serious, with 10,000 to 12,000 acres of nonirrigated farmland put out of production during the past eight years. It was not until 1968-69, however, that an organized plan of action was initiated by several farmers on the bench. The Highwood Alkali Control Association (HACA) was formed in 1969 with 75 members. At the association's behest, the Montana Bureau of Mines and Geology (MBMG), Montana State University (MSU), Agricultural Research Service (ARS), and SCS have begun to investigate the problem.

To quantify the rates of growth and areal extent of saline seeps on the bench, aerial photographs of the Nine Mile watershed taken over a 30-year period were used. Accumulated percentages of the total land area in the watershed (19.1 square miles) affected by saline seeps are as follows.

1941	0.1 percent
1951	0.4 percent
1956	2.2 percent
1966	9.1 percent
1971	19.4 percent

Of the 19.4 percent, about 15 percent is cultivated dryland, much of it poorly drained recharge areas that occupy about 5.8 percent of the watershed. If the present alternate crop-fallow farming system is continued at least 30 to 40 percent of the watershed will probably be dominated by saline seep. This compares to less than 0.1 percent of the watershed affected by saline conditions under the native soil system.

Progress since 1969 has been modest at best, but some awareness has been achieved. In February 1971 the IACGA sponsored the Saline Seep-Fallow Workshop, where data was presented showing saline seep to be regional in scope and a much more serious environmental problem than previously thought. While MBMG, MSU, and SCS research continued, additional research was initiated by the ARS at Sidney, Montana and Mott, North Dakota and by the Canadian Department of Agriculture at Lethbridge, Alberta. The IACGA made extensive efforts to secure additional research funds; the 1973 Montana legislature passed a joint resolution (23) asking the governor to marshal all state resources and seek emergency aid from the federal government to halt saline seep; the governor appointed an emergency saline seep committee to develop a plan for correcting the problem, and that committee, with the Environmental Quality Council (EQC), requested technical assistance from the Environmental Protection Agency (EPA) relating to water quality problems arising from saline seep.

Hydrogeological Setting

Much of the definitive hydrogeological work relative to saline seep has been conducted on the Highwood Bench near Fort Benton. The details of geological history and mode of seep formation vary from area to area, but the situation on the bench may serve as a general model for the entire northern Great Plains region.

The geological history of northern Montana and the bench included long periods of sedimentation, emplacement of volcanic and plutonic igneous rocks, regional uplift, erosion, and glaciation. Throughout most of the Paleozoic and the Mesozoic (600 to 70 million years ago), thousands of feet of predominantly marine sediments were deposited in this region. At the end of the Mesozoic (late Cretaceous) and extending into the early Tertiary (70 to 50 million years ago), the entire area was uplifted, faulted, and folded, producing the Rocky Mountains to the west and south, gently tilting the sedimentary rocks to the northeast, and subjecting the area to erosion. The emplacement of volcanic and plutonic rocks that form the Highwood and Bear paw Mountains also occurred during this time. Continued erosion during the Tertiary stripped away the uppermost Cretaceous sediments and exposed the Black Shale of the Colorado Group over what is now the Highwood Bench. This same area was dissected and drained by the ancestral Missouri River, which flowed in a northeasterly direction to Hudson Bay.

During the Pleistocene (one million to 15,000 years ago) glaciers covered the entire region north of the Highwood Mountains two or more times and left a mantle of unconsolidated, poorly sorted deposits (glacial till) that blanketed most of the pre-existing valleys and produced a gently rolling plain. The soil blanketed the drainage of the Missouri River and its tributaries, leaving the streams to change course and eventually silted in. During the last 15,000 years, erosion established the present-day drainage pattern in northern Montana.

The glacial till and underlying black shale of the Highwood Bench are geologically important. Drill hole information and exposure along the Missouri River show till either absent or up to 70 feet thick. Two distinct till representing two ice advances are present — the upper is normally the thicker and is full to two-thirds the lower is generally only a few feet thick (almost to some localities) and is light to dark gray. A possible time-sequence-water layer is often found between the tills. Except for the upper two or three feet — the leach zone of the soil profile — the entire till is loaded with salt crystals.

The till is predominantly associated clay and silt with well rounded pebbles scattered throughout. X-ray analysis of the clay fraction indicates Silurian-type muscovillite (highly plastic, indurated to a granular clay). A fine sand and gravel layer is often found between the tills, but they are normally thin, discontinuous, and small in area. Numerous vertical joints are believed to enhance the vertical movement of water through the till. Estimation studies on poorly drained upland (recharge) areas indicate downward movement at over five inches of water table. These high infiltration rates greatly exceed practices considered.

The black shales in general shade of the Colorado Group that underlies the entire Highwood Bench is 300 to 1,500 feet thick. Owing to erosion and the gentle dip to the northeast, the shale dips to the southwest toward the Little Belt Mountains. A weathered zone, 200 to eight feet thick at the till-shale contact, is commonly recognized and appears to be the only highly permeable shale zone. The unweathered shale (to completion) is:

Close correspondence between local precipitation and water table fluctuations require that moisture is moving through the soil to beneath the root zone, through the remainder of the till, and eventually reconstituted in the bedrock. Most of this movement occurs in spring, particularly April, May, and the first part of June. The water table may rise a few inches to several feet in areas with average or above average precipitation. These water declines during the rest of the year, but usually do not reach the groundwater table, producing a seasonal build-up of excess water. This water seeping into the soil under the saline soil, problem areas.

In many areas the "ground" water table has built-up to a point where conditions that exist beneath the root of the plant are less suitable to their growth. Most of the surface water evaporated before reaching potential streams, leaving the salt behind to be flushed away during spring runoff, but unless the seeps stop growing, some seeps will soon start to grow heavily, adding water to all the region's potential streams.

Saline seeps are a result of local, not regional, flow systems, that is, the excess water that produces the seeps is locally derived. The surface dimension of each wet saline (discharge) area is directly related to the size of the adjacent upland (recharge) area. Freshwater ponds often cover part or all of the recharge area for weeks at a time, adding large quantities of water to the soil profile and seriously aggravating the seep problem downslope. The importance of recharge areas has for the most part been overlooked. Delineation of these areas, improved drainage where possible, and an intensified cropping system would mitigate the seep problem. Frequently, the recharge area is left fallow while attention is focused on the discharge area — the seep itself.

Potential Regional Problem

As noted earlier, Montana has already lost over 80,000 acres of cropland to saline seep and the area affected is increasing by over 10 percent a year. Geological conditions that favor saline seep—a variable thickness of glacial till underlain by thick sequences of black marine shale—are similar over vast areas of Montana (12,500 square miles), North and South Dakota (45,500 square miles), and the three prairie provinces of Canada (70,000 square miles). Saline seeps are spreading in that entire region and also in farming areas underlain by the siltstone, sandstone, shale, and coal of the Fort Union formation (21). Here again, excess water is moving downward and accumulating on thin impermeable underclays, in this case forcing the water to move laterally along coal seams until it breaks out at the surface. The farmed portion of the Fort Union area covers another 100,000 square miles (4,500 in Montana), making a total of 228,000 square miles (17,000 in Montana or about 10.5 million acres) of potential saline seep in the northern Great Plains (Figure 4). These plains are the major grain-growing region for North America. The cropping sequence over the entire region—generally an alternate crop-fallow system—is the same as that on the Highwood Bench.

Over 90 percent of eastern Montana's cultivated dryland is in the Missouri River Basin. Based on discharge records at Fort Benton and limited groundwater data, the water table within the glacial till is rising an average four to ten inches a year and the basin is storing considerably more water than it did prior to farming. More complete discharge data from both the Missouri and Yellowstone Rivers reveal that the Missouri River Basin is storing 4.3 million acre-feet of water a year over that being stored by the Yellowstone River Basin, a basin of much less extensive farming (22). If the annual 4-to-10-inch water table rise is projected over all the cultivated farm area of the Missouri Basin, it accounts for most of the excess storage.

The discharge of the Missouri River, and presumably direct runoff into the river, was significantly greater from 1891 to 1915 than from 1915 to 1940. Since 1940, discharge has been gradually rising as excess water began seeping into tributary drainages. The decline from 1915 to 1940 was undoubtedly accentuated by extended drought. Even so, groundwater buildup associated with the crop-fallow system appears to be the most plausible explanation for the reduced discharge.

Saline seep development is most pronounced where the glacial till is less than 30 feet thick. Excess water appears to be accumulating over large areas where the till is much thicker, but has not yet reached the surface. Along with the extensive loss of valuable farmland, widespread deterioration of surface and shallow groundwater resources seems inevitable as long as factors contributing to this process are maintained.

Ecological Aspects and Implications

Saline seep is essentially an ecological problem. It involves all the major components, both biotic and abiotic, of the ecosystem known broadly as the northern Great Plains. Since 1940 the preponderant biotic influence upon that ecosystem has been man and his agricultural systems, only now to be manifest, over half a century later, in the form of saline seep.

Those who attack the problem need to know how serious the problem is by inventorying land, water, and biotic resources, and monitoring any subsequent deterioration. An understanding of complex ecological relationships responsible for maintaining balance in the remaining undisturbed portions of the ecosystem is needed in land management practices.

Environmental Effects

Although saline seep destroys an estimated 8,000 to 25,000 acres of productive Montana land each year, facts are not available to determine the precise location, extent, and progression of the problem. To gain such information the Governor's Committee on Saline Seep recently adopted a standardized form with which to inventory all agricultural producers in the affected area. Also, state and federal personnel will try to apply the space-age remote sensing of Earth Resources Observation System (EROS) and Earth Resources Technological Satellite (ERTS) to delineate the scope of the problem (11) (19). Even with a more definitive figure of total acreage destroyed, however, the impact on production of agricultural commodities and the loss in terms of market value will still be difficult, if not impossible, to ascertain.

Saline seep is certainly responsible in part for increasing saline pollution of Montana's water (28). The growing unpalatability of community water supplies at Nashua, Wiota, and Frazer has been attributed to saline seep (23), and nitrate poisoning of livestock from salinized farm reservoirs has recently been reported in the Fort Benton and Denton areas (3). Seeps develop in areas having no alternate source of fresh water for household, livestock, or wildlife purposes (15). Siltation from erosion, probably the most important water quality problem in dryland streams, is likely to increase with loss of vegetative cover brought on by the seeps (17).

Representative analyses of water and salt samples from the Highwood Bench and Missouri River, along with recommended standards for domestic water supplies, are shown in Table 6. (See page 40.)

In all surface water, groundwater, and salt samples collected on the Highwood Bench, the predominant dissolved constituents are sodium, magnesium, sulfate, and

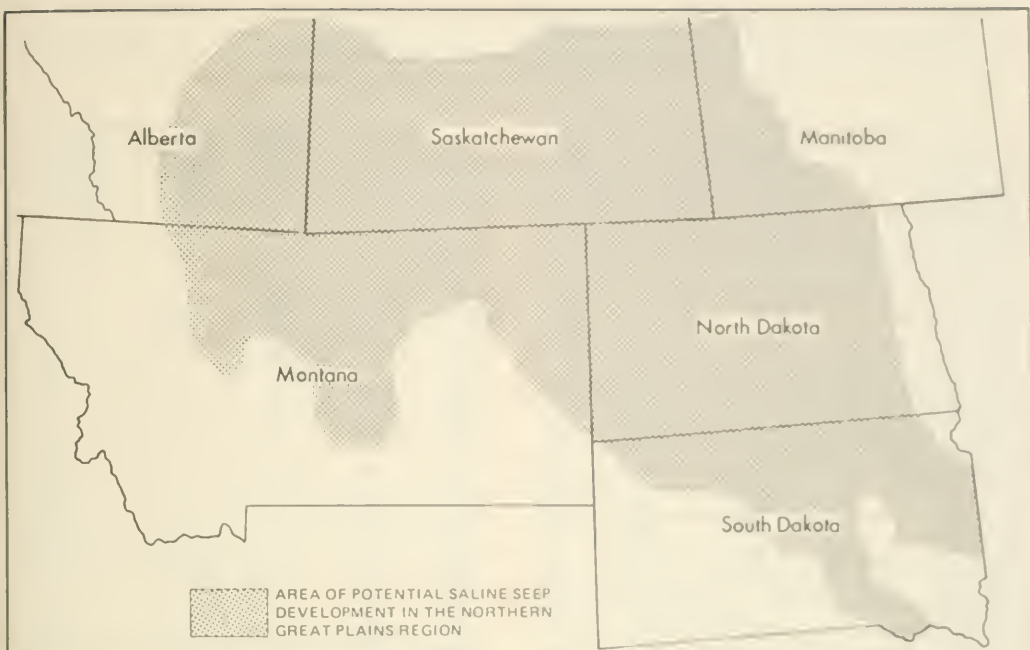


Fig. 4 Northern Great Plains Region, Showing Area of Potential Saline Seep Development.

nitrate. The samples also contain unusually high concentrations of trace elements: aluminum, iron, manganese, strontium, lead, copper, zinc, nickel, chromium, cadmium, lithium, and silver. Most of these elements are rarely detected in water samples from other areas. Groundwater samples commonly contain more than 25,000 milligrams per liter (mg/l) total dissolved solids (TDS), with some exceeding 50,000 mg/l TDS, which is more saline than sea water (30,000 mg/l TDS).

High nutrient levels have created eutrophic conditions in all the small ponds and reservoirs on the Highwood Bench. Almost all the wells, springs, and reservoirs on the bench, which were once fresh, are now highly saline. And many of the reservoirs that once produced trout no longer support a sport fishery. The EPA National Field Investigations Center, Cincinnati, at the request of the Governor's Saline Seep Committee and the FQC, will conduct a limnological reconnaissance of the reservoirs to determine the exact cause or causes of fish disappearances.

The demise of Highwood Bench reservoirs has been linked to the acceleration of saline seeps. Three characteristics of saline seep waters — TDS, heavy metals, and nutrients — alone or in combination, are the suspected causative agents for fish mortalities in these waters.

Levels of heavy metals in at least one reservoir on the Highwood Bench in Table 6 exceeded recommended water quality standards for fish and aquatic life (300 TDS were also above recommended levels for sensitive life, and nitrate was extremely high in the one reservoir sampled). As noted in Table 6, nitrate is one of the major components of the salt deposited by seeps on the bench and may be partly responsible for eutrophication of some reservoirs. Although increased aquatic plant growth may have depleted oxygen levels and thereby led to the single case of mortality, the stressors from elevated oxygen levels may have made fish more vulnerable to the other toxic agents — heavy metals and TDS.

Several times, groundwater from the Highwood Bench has been of quality and quantity sufficient to cause mortality in fish with what consequences to the drainage and what to the potential for ground-water contamination (damaged young fish excluded).

The implications of increased water quality deterioration in Montana as a freshwater recharge area for downstream states in the Missouri River Basin will be demonstrated if water quality here will affect downstream ecosystems. Saline seeps in the Highwood Bench, which provide water for irrigation, recreation, and fish and wildlife, will be seriously degraded and water treatment will become more expensive.

TABLE 6
Analyses of Salt and Water Samples in the Fort Benton Area.
(All values are in milligrams per liter (mg/l) except as indicated.)

Parameter	Salt Sample (milligrams per gram)	Test Hole H.C. (70)	Ground-	Test Hole D21 (72)	Bramlette Reservoir 1969	Surface Water	Miyovour River at Fort Benton	Recommended Drinking Water Standards
			water Test Hole 10-2 (70)			Bramlette Reservoir 1972		
Sulfate (SO ₄)	536,000	26,475	33,000	36,730	3,600	5,690	55	250
Nitrate (NO ₃)	12,800	2,262	881	918	115	14	0	45
Chloride (Cl)	10,200	168	255	280	57	96	5	250
Bicarbonate (HCO ₃)	4,000	878	288	545	334	425	163	
Sodium (Na)	110,000	4,821	7,045	5,600	720	950	42	
Magnesium (Mg)	72,000	4,607	1,546	6,295	498	908	14	
Calcium (Ca)	8,200	341	594	446	215	273	18	
Potassium (K)		41	6	45	16	28		
Strontium (Sr)		22.5	8.1	7.7	2.0	2.4	.22	
Lithium (Li)		2.8	1.1	.99	.28	.36	.04	
Iron (Fe)	3,340	5.1	8.0	1.4	.14	.20	.13	.30
Manganese (Mn)	112	.87	.70	1.1	.24	.39	.01	.05
Aluminum (Al)	1,108	8.2	8.2	2.0	*.10	*.10	1.0	
Copper (Cu)	5.2	.12	.14	.12	.02	.03	.01	1.0
Lead (Pb)	28.0	.78	.78	1.3	.20	.13	*.02	.05
Zinc (Zn)	22.0	1.32	.69	.10	.03	.02	.03	5.0
Nickel (Ni)	9.6	.34	.52	.42	.05	.03	*.02	
Cobalt (Co)		.22	.25	.38	*.05	.10	*.02	
Cadmium (Cd)		.11	.12	.06	.01	.01	*.01	.01
Chromium (Cr)		.12	.12	.22	*.02	.02	*.02	.05
Silver (Ag)	1.48	.08	.08	.13	.02	.01	*.01	.05
pH		8.08	8.35	7.46	8.00	7.63	8.00	6.0-8.5
Specific Conductance (micromhos)		26,700	31,750	31,700	5,860	8,110	405	
Total Dissolved Solids		39,690	46,750	50,880	5,566	8,380	307	500

*means "less than."

The effects of saline seep on wildlife habitat and populations are even more uncertain. At the fringes of most seeps, salt-tolerant weeds, mostly *Kochia* (*Kochia scoparia* or summer cypress), provide some cover (and perhaps food) that would not otherwise be available (13). The seep-affected area is within the range of upland game birds and migrant waterfowl. In some cases seeps are providing habitat for these game birds where none existed before (27).

The major concern of the wildlife biologists is that seeps may eventually destroy or greatly reduce the carrying capacity of the land. One can only speculate on the fate of upland game birds in Montana's grain belt and of nesting and migrant waterfowl in Montana's prairie potholes should saline seeps proliferate. Wildlife population trends in response to the spreading saline problem have not been established. Perhaps what Aldo Leopold observed 25 years ago can be expected. He was reflecting upon a jack-pine sand farm in Wisconsin and depleted soils and fallen civilizations in North Africa and the Middle East.

This . . . display of disorganization in the land seems to be similar to disease in an animal, except that it never culminates in complete disorganization or death. The land recovers, but at some reduced level of complexity, and with a reduced carrying capacity for people, plants, and animals (18).

Natural and Agricultural Ecosystems

Research on saline seep in Montana has been insufficient. Efforts have been restricted to geology and subsurface hydrology, as described in the first part of this paper, and to soil moisture management by crop selection and farming practices. These studies should of course be continued and expanded.

Ultimately, however, the solution to the problem may depend on understanding complex ecological relationships as they operated, apparently with some success in foresting saline seeps, for many thousand years on the native prairie of the Highwood Bench and similar areas

of the northern plains. Thus it is important to compare that native prairie ecosystem with agricultural systems, particularly crop-fallow, and to understand why the one has succeeded where the other has failed.

The undisturbed aboriginal prairie ecosystem (covering the glacial till of northeastern Montana represents an accumulated "wisdom" of about 15 000 years. Since the retreat of the last ice-age glacier the plant community has been evolving, by trial and error selection and replacement of species, to the point of optimum environmental adaptation. The grasses, forbs, and shrubs of the native prairie, together with the fauna, geology, soils, and hydrology, and such extrinsic factors as precipitation, temperature, solar radiation, and their seasonality, function in a finely tuned dynamic equilibrium that is only remotely approached in the most diversified of man's agricultural systems. The ecologic flexibility of the hundreds of native plant species allows them to form communities adapted to a wide array of environmental situations (including extreme natural fluctuations in climate, such as very dry, wet, warm, or cold periods). The destiny of a diverse native plant community is more predictable than that of a homogeneous system such as a field of grain, patchy distribution plus the inherent resistance of some native species to insects and disease make the diverse community much less susceptible than monoculture to widespread devastation.

The most important characteristics of natural systems in preventing seeps appear to be efficient water use and restricted vertical percolation. Efficient water use implies a permanently expanded root system at all depths in the soil profile. Annual grasses and forbs, like small grain crops, obtain their water only from the upper soil levels; their root systems are shallow, expanding and contracting only during the growing season. Perennial grasses and shrubs, absent from most cropping systems, use water that escapes from shallow-rooted plants into the subsoil; their root systems are deeper, permanently expanded, and functional over a longer period.

In nature, big sagebrush (*Artemisia tridentata*) occupies the niche of a deep-rooted perennial shrub. A Department of Fish and Game study in the Winnett area shows that a substantial amount of moisture was released into the soil during the year sagebrush was treated with 2.4 D (24). In this study, even perennial grasses could not grow enough during the season of treatment to consume all the released moisture.

Precipitation that reaches the ground must either run off, evaporate, or soak in. Water penetrating the ground surface is infiltration, whereas water moving through the soil is percolation.

Infiltration studies conducted on fallow and soil native grassland situations on the Highwood Bench show no appreciable difference in infiltration rates but greater horizontal water movement with the soil system. The reason for this greater horizontal movement in soil is the furrow layer at the soil surface. This porous mulch, usually over two inches thick, acts as a sponge, or soil moisture storage

reservoir, and is able to absorb considerable amounts of precipitation (30). Although not frozen or jelled, the water is distributed horizontally, allowing it to be used by plants before it has a chance to percolate below the root zone.

The surface mulch also points to the soil from drying and consequent structural alterations. Without the heavy cover, the soil and subsoil alternate wetting and drying, which causes cracks that allow more rapid and deeper penetration of water (25). As noted earlier, a vertical percolation occurs in the glacial till of the Highwood Bench. In such situations a surface mulch may be essential to prevent rapid and excessive percolation of water below the root zone and consequently to prevent the formation of seeps.

To apply these and other ecological relationships to land management and cropping practices will require some grade level of soil science, encompassing ecology and hydrology, soil geology, hydrology, and plant-soil relationships. If the approach is limited to the traditional engineering attitude, a practical solution may be no closer than it is today.

Prospects for Retardation

Most authorities agree that saline seeps are mostly irreversible, since the productivity of land is destroyed; reclamation is difficult. With time, the soils can possibly be leached below the root zone, provided the flow of saline water is cut off. However, the principal objective is prevention rather than reclamation.

As long as the crop-fallow system is practiced in the northern part of the United States, farming seeps will continue, and the problem cannot be totally prevented. To control seeps, however, seep flows can be controlled and perhaps even discontinued.

Seeping methods to control saline seeps have some obstacles in common: prevent excess water from the discharge area. The discharge area, where seeps are abundant, is less important than the treated subsoil. Preventive methods may be grouped into two categories: draining practices and retarding practices.

Farming Practices

To keep excess water from reaching below the root zone in discharge areas, any vegetation is clearly better than no vegetation at all (26). Stems and leaves intercept moisture and reduce evaporation. Thus, because the receipt of transpiring moisture from the soil up through the stems to the aerial parts, where it can be transpired, is profitable, certain soil or drainage systems are a natural first choice for moisture control practices.

Currently, soil moisture management through crop rotation and farming methods is probably the only practical means of controlling seeps today. Increasing to a practical amount, summer crops, out of the system to most areas, gives only a slight benefit and backwash. The retarding practices listed in the following section do not appear amenable to widespread application.

Because with few exceptions saline seep is a problem only on croplands, an enlightened program of soil moisture management will depend on the individual producer.

MSU researchers are examining several approaches to seep control in studies on the Highwood Bench (4), their preliminary findings are available to farmers in a recent bulletin from the MCEES (5).

An initial alternative is to crop small grains every year instead of every other year, but this method of seep control does not appear to be feasible. Since winter and spring wheat use soil moisture to a depth of only four to seven feet, and root systems may not be established at snowmelt or when rains arrive, water may still move beyond the root zone in wet years. Only a few of the minor seeps have disappeared from the Highwood Bench after two dry years in combination with annual cropping (5). Also, harvest during the second or subsequent years may be too meager to pay farming costs, except in areas receiving adequate annual precipitation.

Deep snow accumulation may be responsible for particular saline seeps, but a certain amount of snow accumulation is needed for successful annual cropping. Standing stubble and intermittent rows of perennial grasses, which can hold snow in place and reduce drifts, are being studied by MSU and ARS as means of controlling the amount of water entering the soil in recharge areas.

Dryland alfalfa and intermediate and tall wheatgrasses are better prospects than small grains for drying out soil and subsoil on recharge areas (5). Sweetclover, sainfoin, vetch, corn, millet, and safflower were also tested by the MSU team, but these plants used less soil moisture than wheatgrass or alfalfa. Although effective, widespread conversion to these crops will raise serious economic, ecologic, and practical questions. For example, can farmers adapt mechanization to changing crops and still be able to operate at a profit? Can a market for forage or seed crops be established and maintained in a region now largely devoted to cereal crops? What will be the long-term environmental consequences of such crop conversions?

According to the MSU studies, Kochia is effective at reducing soil water, it grows primarily in saline soils on discharge areas, and it may produce over five tons of forage an acre (1). Kochia also makes excellent hay: "cattle eat it just like alfalfa (1)." Besides being palatable, it is nutritious (12).

Although deep-rooted and a vigorous water user, Kochia left standing over winter will trap snow, which will contribute to the seep the following spring. No evidence shows, however, that such moisture accumulation in the form of snow will exceed or even approach the amount used by the plant during the growing season. Furthermore, snow accumulation on discharge areas (where Kochia grows) is not as critical in perpetuating seeps as accumulation on recharge areas. Kochia is apparently well adapted to growing in seeps where agricultural plants have failed, and any proposals for control of this plant and replacement by others should be seriously examined.

Fertilizer applications are known to enhance plant growth in some situations and thereby aid in soil water reduction. Only as much fertilizer as the plants can use should be applied, otherwise excess nutrients might contaminate surface and ground waters.

Farmers need to recognize that successful cropping in seep areas must include soil moisture and water table management. A simple soil auger should become standard equipment to help farmers decide whether to plant and what to plant depending on soil moisture content and depth to groundwater. Farmers will need to consider the penetration and character of root systems as well as above-ground plant production, they may need to diversify — to call on any one of a number of crops depending on moisture use and needs. Water tables should not be allowed to rise any further, yet adequate soil moisture in the root zone is a prerequisite to profitable cropping. Some way, a moisture balance must be maintained, neither too little nor too much can be tolerated.

For convenience and economy, farming has traditionally been practiced on geometric land patterns, usually rectangles or squares. Within the last half-century the average size of these units has greatly increased, mainly because of large, mechanized farm implements. However, the diverse characteristics of soil, subsoil, substrata, and surface and subsurface hydrology do not conform to these regular patterns. On larger fields especially, these land features, many of which determine the potential for seep development, are not consistent. Applications for controlling seep may be necessary and effective in one part of a field, yet unnecessary and ineffective or even counter-productive in another. For example, a field might cover both a recharge area and a discharge area with varying soil moisture content and water table levels throughout, a deep-rooted perennial would be effective where the water table is deep and surface moisture deficient, but annual cropping to small grains may be more productive and equally as effective where surface moisture is adequate.

In short, farmers may not be able to continue imposing conventional field geometry and still hope to solve the problem of saline seep. They may need instead to adapt more closely to the varied capabilities and constraints of the land, which in some areas may mean smaller fields, fields of irregular shape, both of these, or possibly no farming at all. They may also be unable to continue present monocultural cropping practices. Farmers, in certain situations, should be willing and able to crop not only cereal grains but also grasses, legumes, or whatever else may be suitable.

Nonfarming Practices

Nonfarming methods control both the flow of fresh water into the recharge area and the flow of saline water from the discharge area. They include underground drainage, ponding, land grading, and phreatophytes (A phreatophyte is a plant capable of drawing its supply of moisture from the groundwater reservoir or from the capillary fringe above it.)

Land grading is probably the most feasible and effective alternative. This involves contouring the land surface in recharge areas to enhance runoff and eliminate short term ponding on fallow fields, thereby reducing the water contributing to seeps. Runoff could be directed along grassed drainageways to reduce erosion potential.

The conventional method of lowering water tables is artificial drainage. But the impermeability and thickness of the till (it averages about 25 feet), and the problem of what to do with the saline water, make artificial drainage of the discharge areas infeasible. Most affected areas would require a very extensive and expensive network of tiles (16).

In any event, the question remains — what is to become of the excess saline water now flowing freely from the ground? Contamination of fresh surface waters is clearly a problem, and any purposeful discharge through drainage and/or diversion of saline waters would certainly conflict with state and federal nondegradation policies.

One method of saline water control is to collect saline discharges in sealed ponds and to allow the water to evaporate, leaving the salts behind. This method would disturb a considerable amount of land and would probably not be economically feasible (16).

Another method of managing seep water in discharge areas is to establish stands of salt-tolerant phreatophytes. One candidate is five-stamen tamarisk (*Tamarix pentandra*), a deciduous tree native to Eurasia whose root system sometimes extends 90 feet or more down to the water table. This species has spread with explosive speed through the drainage systems of the Southwest. Other nonspreading *Tamarix* species may be more desirable.

Nevertheless, native plants should be considered before contemplating introductions. More likely candidates from area flora include saltgrass (*Distichlis stricta*), pickleweed (*Salicornia rubra*), and species of *Suaeda* or seep weed. Kochia and foxtail barley (*Hordeum jubatum*) naturally take over seep areas but occupy only the dry fringes.

These and other steps may be necessary to prevent the progressive depletion of the soil resource base of north-eastern Montana and other glaciated lands of the northern Great Plains. In the words of State Senator George Darrow, saline seep is

... not an isolated local problem, it is a systemic problem . . . The overall dimensions of the saline seep problem involve nothing less than the future of Montana's agricultural economy. We now understand that that future is in jeopardy. Our response will determine that future (9).

Conclusions

1 Although water contributing to saline seeps is locally derived, the problem is regional and systemic, potentially encompassing a major portion of the northern Great Plains in both the United States and Canada.

- 2 Natural grassland systems are more effective than agricultural systems in forestalling saline seep development.
- 3 Saline seeps are clearly caused by the present cropland system of farming, unimproved by the hydrologic and geologic conditions of the northern Great Plains.
- 4 Soil and water pollution are the two most serious environmental impacts of saline seeps. Little is known about its impact on wildlife populations.
- 5 The true extent of losses from saline seeps, in terms of productive land surface and market value of agricultural commodities, is unknown.
- 6 Reclamation proposals are only stopgap solutions; the only real hope lies with regional production and an enlightened program of soil moisture management based on sound ecological principles.

Recommendations

- 1 Initiate an extensive, coordinated research program dealing with all aspects of the saline seep problem. Critical research needs include separate estimations on:
 - a. total acreage affected,
 - b. annual loss of crops and livestock in terms of market value,
 - c. extent of seep-caused water quality problems and cost of restoring affected waters to beneficial use, and
 - d. impacts on fish and wildlife resources and losses to the associate recreation industry.
- 2 Identify major recharge areas and where feasible improve the runoff efficiency on fallow field through ponding.
- 3 Intensity cropping practices over the entire northern plains region, particularly in recharge areas and during years with average or above average turbine precipitation.
- 4 Rotate perennial grassland development regions into the cropping program. Available data show that alfalfa can use till practices to a depth of 25 feet, once it gets established.
- 5 Determine why the native plant system, working together with the hydrologic and soil regions, has been able to prevent saline seeps and apply this knowledge to farming practices.

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Land Treatment 1973: A Cautious Step Forward

by
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Ecologist

Introduction

Widespread enthusiasm for the land treatment and reuse system of wastewater management generated by successful pilot studies reached a crescendo a year ago with passage of the Federal Water Pollution Control Act Amendments of 1972. The amendments set as a national goal the total elimination of pollutant discharges by 1985 and give specific encouragement to systems such as land treatment that will recycle wastewater.

The enthusiasm has not waned, research and development continue and more favorable reports have been issued. But the popular movement has been tempered by critics, mostly sanitary engineers who point out that the concept and practice of land disposal is not new, that it has at times resulted in disastrous failures, and that it cannot be considered as a panacea for waste disposal problems because many soils and wastewaters are unsuited to this method. (2) (9)

This paper outlines significant national and statewide activities in wastewater irrigation since publication of "Prospects for Spray Irrigation and Wastewater," by this author, in the Environmental Quality Council's First Annual Report.

Federal Legislation

The Federal Water Pollution Control Act Amendments of 1972 have given great impetus to the land treatment movement. In addition to that 1985 no-discharge goal and preference to recycling technologies, the law directs all municipalities to achieve at least secondary treatment* by 1977 and the best practicable waste treatment technology by 1983. The three "best practicable" technologies at present are forms of tertiary treatment**—advanced biological, physical-chemical, and land treatment. (Land treatment generally requires some form of secondary treatment as a prerequisite to irrigation.)

The new law calls for a federal outlay of \$18 billion over the next three years to meet a 75 percent federal share in financing construction of new waste treatment facilities.

For the first time the application of land for waste treatment purposes is recognized as a legitimate candidate for federal funding. This should improve the economic position of land treatment as a local alternative and also make available to local governments a new source of federal funds for open space preservation. According to a land use planning expert, "The 'living filter' system can be a very forceful discharge urban, great characteristics of postwar growth by means of positively occupying land from the metropolitan center base. It provides essential opportunities to block undesirable growth patterns." (1)

The Sanitary Engineering Viewpoint

Recent support for the land treatment alternative may come from the Center for the Study of Pollution, Yonkers University (14), and the Program on Great Water, sponsored by the Natural Resources Defense Council and five other environmental organizations (2). However, agricultural, public health, sanitary engineering, as well as hydrogeologists and soil scientists, have been outspoken critics of

*The second step in most waste treatment systems is to oxidize dissolved organic parts of the wastewater to a level suitable for recycling.

**The third step in a waste treatment system is tertiary treatment, which is based on chemical and biological processes. It is designed to remove nitrogen, phosphorus, and other constituents.

the current trend. As professional groups that must eventually help guide the land treatment process to fruition, the advice of these experts must be heeded.

Sanitary engineers point to the great strides made in wastewater treatment technology, the breakthroughs that are imminent, and the tremendous commitment and collaboration of effort responsible for these advances. They also point to the almost completely overlooked potential of aquaculture and of using natural aquatic ecosystems to assimilate many of the constituents of wastewater productively (9). As a rule they are not straightforwardly opposed to land treatment, but only wish to place it in a proper perspective as an alternative and not a cure-all.

Although land treatment is not new, it is evolving from a disposal concept to a concept of treatment and reuse. The "out of sight, out of mind" disposal approach, based on maximum hydraulic loading, is being replaced by a more conservative treatment and/or reuse approach, based on utilization of the plant-soil complex to achieve desired water quality changes (15). Thus past failures under the old, outmoded process cannot be cited as reasons for condemning land treatment as it is currently envisioned.

The Muskegon and Other Projects

Although widely publicized, the giant Muskegon (Michigan) project (3) using wastewater for spray irrigation, is by no means the first of its kind in the United States. There are at least 570 and perhaps as many as 950 municipalities, involving about 6.6 million people, utilizing the infiltration or crop irrigation modes of land treatment (15).

The Muskegon project is in its first full year of operation and it is still too early for an evaluation of performance. Meanwhile, the Army Corps of Engineers and the Environmental Protection Agency have been locked in a bitter power struggle for control of national policy on wastewater management systems. The Muskegon situation was further clouded by initial resistance from Michigan state environmental agencies. Some feel that if the Muskegon project is successful it will be because of design revisions insisted on by the Michigan Department of Public Health (9).

Concern about public health problems arising from the Muskegon project and other spray irrigation facilities has been largely subdued. According to a recent review article authored by a researcher in communicable diseases, " . . . land disposal is far less hazardous than disposal into rivers and streams . . . The actual hazard, or potential hazard, to a community's health would be related to the degree of treatment or the ultimate quality of the reused waste (4)." It should be remembered that a pre-requisite to spray irrigation in most cases is the equivalent of secondary treatment including chlorination for disinfection.

The Project on Clean Water report (5) points out that on a national scale, the Muskegon system's use of treated wastewater to irrigate crops would produce a savings in the energy and resources needed to manufacture chemical

fertilizers. The report states that the synthesis of one ton of nitrogen fertilizer requires the burning of five tons of coal (or its equivalent in other fuels). It also alludes to the enormous environmental costs involved in phosphate fertilizer production.

The Montana Picture

In February 1973, Montana State University, in cooperation with the State Department of Health and Environmental Sciences and the Montana League of Cities and Towns, sponsored the two-day Environmental Engineers Conference on Land Disposal of Municipal and Industrial Wastewaters. The objective of the conference was to acquaint practicing engineers with the latest technology in a rapidly changing field. Several recognized land treatment experts from around the country were invited to speak and the conference was well attended.

Probably the most valuable product of the conference will be its proceedings, scheduled for publication later this year. A collection of papers on all phases of land treatment, it should prove to be a useful guide to practicing engineers in Montana who may wish to consider land treatment for municipal wastewaters. An overview paper by T. Asano and R. L. Sanks should be particularly helpful. The paper concludes that land treatment is one more engineering alternative and that a decision to use this method should be based upon consideration of all alternatives and be contingent upon both economic and "intangible" factors (2).

Land disposal in Montana was evidently practiced some years ago. In 1937, farms at Anaconda, Helena, and White Sulphur Springs were flood irrigating feed crops with domestic sewage. About the same time, the State Board of Health prohibited the commercial marketing of human food crops irrigated with sewage "due to the possible transmission of typhoid fever (12)." These projects were apparently discontinued although a Helena Valley farmer is presently diverting Helena sewage for flood irrigation of hay land (17).

In addition to the handful of land treatment facilities now operating in Montana, three more are being proposed. The National Park Service has announced plans to replace defective and outdated sewage treatment systems with centralized land treatment systems in the Rising Sun-St. Mary and Lake McDonald areas of Glacier National Park (7)(8). A new resort complex on the Rocky Boy Indian Reservation also proposes to spray irrigate lagoon-treated wastewater (13).

To the north of Montana, two communities in Alberta, Taber and Granum, have initiated crop irrigation with municipal wastewater (1)(11). According to an Alberta environmental official, these two systems "have totally eliminated direct surface water pollution" and several more were scheduled for operation this year (10). Reports on the Alberta projects, however, did indicate that an increase in salinization of groundwater under irrigation fields would be likely. It would seem that this problem

could be particularly critical in areas of existing or potential saline seep and that every precaution should be taken to avoid aggravating this already intolerable situation (see "Saline Seep in Montana" by this author and Marvin R. Miller).

The revised regulations relating to approval of water and sewer facilities in subdivisions (see State Agency Programs and Activities, Department of Health and Environmental Sciences, Water Quality Bureau) recognize irrigation as a legitimate method of treating wastewater from municipal or community sources. The new regulations also direct developers to consider community sewer systems for subdivisions of 10 lots or more that are contiguous to or within 1,000 feet of an existing public sewer system. This presumption in favor of community collection of sewage for larger subdivisions will encourage the use of community treatment by such means as lagooning and spray irrigation, over individual sewage disposal systems. The Water Quality Bureau of the Department of Health and Environmental Sciences is also preparing engineering guidelines for land disposal of wastewater in Montana (16).

Summary

Passage of the Federal Water Pollution Control Act Amendments of 1972 has given further momentum to the popular movement behind land treatment of wastewaters. However, criticism from sanitary engineers and others has somewhat tempered proponents' enthusiasm.

Although land treatment is not new, it is evolving from a disposal concept to a philosophy of treatment and reuse. Failures, such as those in the past, are avoidable when adequate engineering and scientific precautions are taken. Public health concerns have been largely reconciled and proponents of the system emphasize the savings in energy and resources that may be realized. The land treatment system may also prove to be a valuable land use planning tool.

Recent activities in Montana indicate that government and academic people are willing to further investigate the concept of land treatment. They stress that land treatment should be encouraged as a creative and that a theoretical basis for this method should be based on demonstration of all factors and interactions.

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Response



PART II

The Search for Solutions

Introduction

The condition of Montana's environment was a wide-ranging issue during the past year. The legislature, the public, and industry were all involved in significant environmental protection efforts, some of which are discussed in this chapter.

The 43rd legislative assembly was responsive to extensive public concern about environmental issues and considered about 200 environment-related bills. Many were enacted, and others were held over for further consideration in the 1974 session. About 30 bills pertained to the emerging issue of coal development and related matters. Several momentous bills were enacted.

Public interest in environmental quality encompassed constituent pressure on elected representatives, as well as creation of new organizations and persistent involvement of pre-existing ones. More citizens have learned to use the environmental impact statement process to induce environmental values in government decision-making.

Environmental protection efforts of the mining and metallurgy industry were not accounted in the First Annual Report. Since then, much publicity has been given to a technological innovation hailed as much more pollution-free than previous pyro-metallurgical processes.

The search for solutions to environmental problems necessarily involves all sectors – government, citizens, and industry – because all make decisions with environmental consequences. However, citizens bear the greatest burden because they are at once insatiable consumers and irate preservationists, the sources of environmental demand and of environmental conscience. Only through continued involvement of informed citizens from all interests will balanced responses be found.

Environmental Efforts In The 1973 Legislature

by
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Introduction

Environmental measures flooded the 1973 legislature. By the end of the 60-day regular and 12-day special sessions, a substantial body of environmental law had been enacted.

Under the new Montana constitution the legislature meets annually as part of a biennial session, with opportunity to hold measures for study in the session interim. The 1973 legislature used this situation advantageously, and a sizeable number of bills are in various stages of consideration pending further action in 1974. A number of other measures, some containing important environmental concepts, were killed. The major enacted and held-over bills are discussed below.

Coal/Energy Development

Coal and related energy development were the salient environmental issues in the 1973 assembly. Nearly 30 bills directly relating to coal development were introduced. They ranged from a measure allowing state agency assistance to Indian tribal councils on coal matters to a bill prohibiting strip mining for coal.

The growing attention focused on Fort Union formation coal is only part of an increasingly understood state, national, and international energy crisis. President Nixon has acknowledged the dilemma and initiated establishment of a national energy policy. Montana coal, water, and air figure prominently in that policy. If Montana is to be a full partner in the formulation and implementation of a national energy policy, some serious policy and ecosystem research needs to be done.

State Energy Policy Study

The legislature acknowledged the need for a state energy policy by adopting SJR24, which directs the Environmental Quality Council (EQC) to conduct a study and propose legislation for establishment of a state energy policy. For a detailed explanation of the study, see "Montana's Energy Policy Study," by Walter J. Enderlin.

Facilities Siting

One of the most important pieces of legislation ever enacted by a Montana legislature is HB 127. In response

to the uncertain threat of massive coal energy development in eastern Montana, the Legislative Council, the EQC, the Coal Task Force, and the governor proposed the country's strongest utility siting measure.

Legislative findings in the act reveal a guarded approach to siting:

The legislature finds that the construction of additional power and energy conversion facilities may be necessary to meet the increased need for electricity and other energy No power or energy conversion facility shall hereafter be constructed or operated within this state without a certificate of environmental compatibility and public need

The act applies to energy generating and conversion plants that could generate 50 megawatts or produce 50,000 barrels of liquid hydrocarbon products a day, to any addition to plants if their estimated cost exceeds \$250,000, to associated facilities such as railroads, diversion dams, and aqueducts, and to uranium enrichment plants. Transmission lines with a design capacity of 34.5 kilovolts or more (with some exceptions) also are regulated. Routine administration of the act is funded by a 0.25 percent surtax on electrical energy producers.

Applications for a permit to construct a facility must be filed with the Montana Department of Natural Resources and Conservation at least two years before anticipated construction. Besides describing the facility's location and

environmental impact, the application must outline the need for the facility. This important necessity presumption may be a focal point for controversy over utility decisions. The application must be accompanied by a fee ranging from 0.1 percent to 3 percent, depending on the facility's cost.

Upon receipt of the application, the department initiates an intensive 600-day study of the environmental and socio-economic effects of the proposed facility. The Department of Health and Environmental Sciences, Highways, Fish and Game, Intergovernmental Relations, and Public Service Regulation all contribute. Factors the departments must consider include energy needs, alternative sources, utility promotional activities, energy conservation, impacts on land, existing socio-economic and cultural patterns, and water resources.

When the study period is over, the Board of Natural Resources may not grant a certificate to the applicant unless the need for the facility has been determined and its probable adverse environmental impact has been minimized. The board also must receive prior certification from the Department of Health and Environmental Sciences that state and federal air quality standards will not be violated.

The siting act also includes general planning requirements. Utilities must submit by April 1 of each year a long-range plan covering projected utility construction for the next decade. These reports must include projections of the demand for service and explanation of the basis for the projections. Any projects listed to be constructed within five years are studied by the Department of Natural Resources and Conservation. Strict civil and criminal penalties accompany non-compliance with any of the act's provisions.

Strip Mining and Reclamation

The Montana Strip Mining and Reclamation Act is reputed to be the strongest legislation of its kind in the nation. At a recent Council of State Governments meeting, much of SB 94 was adopted as model state reclamation legislation. However, the act has been substantially weakened by the attorney general's opinion that a number of preparatory mining-related activities are not covered by the act.

Under the act, an operator must apply for an annually renewable permit from the Department of State Lands. The application must contain a detailed reclamation, revegetation, and rehabilitation plan for the land and water to be affected. The application must be accompanied by a \$50 fee and a bond of not less than \$200 an acre or more than \$2,500 an acre, as determined by the board. Annual prospecting permits also are required and are bonded.

The department cannot approve an application to prospect or mine if information and inspections indicate the act's purpose will not be fulfilled. In addition, an application cannot be approved if the area affected has special, critical, or unique characteristics. These include areas of biological productivity—the loss of which jeopardizes wildlife

or domestic stock areas on which the land could not be returned to its former ecological role, areas that influence the total ecosystem so strongly that even temporary disturbance could have large-scale, system-wide effects, and areas of scenic, historic, archeologic, geologic, scientific, cultural, or recreational significance. In the administration of these provisions, special attention must be given to the preservation of Plains Indians' history and culture. Substantial sedimentation, water pollution, and hazard to public facilities also are grounds for denial of a permit to mine.

Reclamation must be completed as rapidly and completely as the current technology will permit. Land must be restored to approximate original contour, and highwall reduction must be to a slope less than 20 degrees. The board can require additional restoration work. Contour mining is prohibited, and topsoil must be segregated. The establishment of stable and diverse vegetation capable of withstanding grazing pressure, erosion, and regeneration to accommodate ecological extremes is required. Annual planting reports also must be filed.

The act provides citizen complaint and suit procedures, civil actions for surface and groundwater damages, and strict civil and criminal penalties for violations. Moreover, all reclamation contracts under prior reclamation laws are cancelled.

Eminent Domain

Severance of surface and mineral ownership received legislative attention in HB 238. Pre-existing eminent domain law permitted a mineral estate owner to condemn the surface to permit recovery of minerals. This 1961 law was primarily a response to the Anaconda Company contention that its open pit mine expansion should prevail over adjacent landowners' occupancy. However, the law was also being used by coal companies in eastern Montana to convince ranchers to sell their lands to the companies or be condemned. HB 238 prohibits the use of eminent domain for a strip or open pit coal mine. All other mining operations are still permitted to condemn under Montana law.

The legislature was concerned that removing condemnation power from one type of mining for one mineral might be deemed unconstitutional, so it included policy findings to illustrate its rationale. The findings include the intensity and scope of the impending development, the encouragement of existing productive uses of the range land, the potential for landowner harassment, and the state's policy of fostering land ownership diversity.

For further discussion of legal complexities and other problems associated with subsurface and surface ownership and eminent domain, see "Underground Natural Resources," by A. W. Stone.

Coal Taxation

Coal taxation was a subject of heated debate in the 1973 session. HB 97 was enacted, creating a resource indemnity trust fund. The measure is intended to provide financial security against environmental damage from the

extraction of essentially non-renewable resources. A tax is imposed on the gross market value of all precious stones, gold, silver, copper, coal, lead, petroleum, natural gas, oil, uranium, and other nonrenewable resources. The tax is \$25 plus 0.5 percent of the gross value if gross value exceeds \$5,000. Money collected can be invested by the Board of Investments. All net earnings, interest, and dividends from the investment are kept until the account reaches \$10 million. Thereafter, net earnings may be appropriated and spent "to improve the total environment and rectify damage thereto" until the account reaches \$100 million. From that point, receipts and net earnings can be expended providing the account balance exceeds \$100 million.

Trust Funds

A bill was introduced to make this trust "irrevocable" that is, to elevate it to constitutional status so that trust funds cannot be randomly expended by succeeding legislatures. The bill, HB 576, is currently held over.

Strip Mine License Tax

Changes in the coal strip mine license tax are contained in HB 509. Actually, the tax is a production tax, not a license tax. Coal is taxed according to its weight and British thermal unit (Btu) rating: 12 cents a ton for 7,000 Btu or lower, 22 cents for 7,001 to 8,000 Btu, 34 cents for 8,001 to 9,000 Btu, and 40 cents for more than 9,000 Btu. The first 5,000 tons are exempt. A pre-existing tax credit for reclamation work was repealed.

Coal Resource Conservation

The Strip Mined Coal Conservation Act (SB 101) was enacted to prevent waste of the coal resource defined as the nonutilization of strippable and marketable coal. The definitions of strippable and marketable coal obscure the law's effectiveness. Strippable coal is coal that can be removed by methods adaptable to the location. Marketable coal is coal that is economically feasible to mine and fit for sale in usual trade. It would seem that if the coal is economically feasible to mine and is fit for sale in the usual course of trade, no operator would want to leave it in the ground. However, a provision in the bill granting the Board of Land Commissioners discretionary authority to prevent waste of coal and implement the act may permit the board to expand the application of the act.

Tribal Council Assistance

Another coal-related measure permits state agencies to assist Indian tribal councils in coal matters. The bill, SB 426, allows agencies to charge for services rendered on request.

Materials and Minerals

Important materials and minerals measures enacted by the legislature include:

Open Cut Mining

New legislation was enacted to regulate the mining of sand, gravel, or bentonite. The Open Cut Mining Act

SB 113, [enacted] early states regulating strip mining for coal in that the state signs contracts, not permits, for mining. The act covers all operators removing 10,000 or more cubic yards of material and overburden. All operations are bonded between \$200 and \$1,000 an acre. The law provides for the submission of reclamation plans that cannot be approved by the Board of Land Commissioners unless the land will be reclaimed for one or more uses such as forest, pasture, or hard, top land, residential, and habitat. Steps also must be taken to prevent potential acid drainage or sedimentation.

Other requirements includes slopes must be reduced to 5:1 or less, metal or other wastes must be removed, roads must be constructed and maintained to control and minimize churning and erosion, historic and archaeological values must be protected, and annual progress reports must be submitted by the operator. The commission or its representative is empowered to enter mine lands at all times to inspect and determine whether the act's provisions are being followed. Labor and other mechanisms also are stipulated.

The history behind the Open Cut Mining Act reveals that the act should be scrutinized to determine whether it effectively regulates bentonite operations. Late in the legislative session, bentonite was removed from SB 94 (The Montana Strip Mining and Reclamation Act) and placed in SB 445 which was drafted primarily to regulate sand and gravel operations. The difference between those operations and bentonite mining should be reviewed with the idea of possibly amending SB 113 to more effectively regulate bentonite mining.

Mining Claims Assessment

The legislature corrected a potentially damaging situation concerning annual assessment work on mining claims by enacting HB 249. Before its enactment, a hole or claim owner had to complete certain annual assessment work (improvements or maintenance) to avoid forfeiture of a claim. By 1974 enactment, this work applied only to 10 or fewer contiguous claims. This was intended to deter the large miner from monopolizing large tracts of land without proceeding with mining. For example, a miner with 53 contiguous claims would have to show assessment work on six of the claims. As discussed in the EPC's First Annual Report, this requirement would lead to unnecessary environmental disruption merely to avoid claim forfeiture. It would not help the small miner, since owners of large contiguous blocks of claims would not file at the claims. HB 249 altered the assessment requirement by allowing assessment work done on one claim to apply to all contiguous claims.

Nuclear Energy

Montana was permitted by SB 207 to join the Western Interstate Nuclear Compact (WINC) advisory, research, and development group for peaceful nuclear technologies. Recent energy studies, notably the California Road Corporation study, have cautioned a "cash flow" approach to nuclear energy. The serious and unanswered environmental

problems of nuclear energy, particularly the safe disposal of residuals, indicate that WNC activities should be monitored carefully.

Oil, Gas Severance Tax

A severance tax on oil and gas produced in Montana was established by HB 518. The tax is 13 percent of the value of the oil and gas, which is determined by deducting from the market value the value of the oil and gas used in connection with extraction operations, the amount of the capital expenditures, and the costs of the operation and the production.

The tax is paid to the county treasurer. Ten percent is to be used by the state and 90 percent by the county. With its broad deductions, this tax is somewhat similar to net proceeds taxation. The severance tax poses the same problems as net proceeds taxation because of difficulties in evaluating deductions and computing taxation.

Land Use Planning

Land use planning, often directly intertwined with coal and energy development, is receiving considerably more attention.

Land Use Policy Study

The EQC is directed by HJR 9 to conduct a land use policy study and propose legislation for establishment of the policy. The study is discussed in detail in "Montana's Land Use Policy Study," by Charles E. Brandes.

Subdivision Regulation

Two measures were enacted regulating subdivisions, condominiums, trailer courts, and mobile homes. The Montana Subdivision and Platting Act (SB 208) creates a comprehensive system of local government review of subdivisions. Amendments regulating solid wastes, water, and sewer facilities in subdivisions (HB 465) generally strengthen existing Department of Health and Environmental Sciences authority over water supply and sewer systems. They also require the sanitary disposal of solid wastes and provide for the protection of surface waters for recreation, wildlife, and other uses.

Primarily, SB 208 is aimed at prevention of excessive density and promotion of public and environmental values in subdivisions and certain other land development activities. The act's definition of subdivision ("...the division of land, or land so divided, into two (2) or more parcels, whether contiguous or not, any of which is ten (10) acres or less, exclusive of public roadways, in size . . .") is unclear and will have to be interpreted by the legislature or the courts. The method of description (metes and bounds, for example) and the method of disposition (contract for deed, for example) do not exempt the transaction from the coverage of the act. Subdivision is defined to include all condominiums, spaces for camping trailers, or mobile homes, irrespective of the size of the tract on

which they are situated. (This is another part of the law that is unclear and will have to be interpreted.) Specific exemptions from the act's requirements are divisions created by court order or by lien, mortgage, or trust indenture, creating an interest in oil, gas, minerals, or water, creating cemetery lots, constituting a gift to the member of the landowner's immediate family, and creating a lease or rental for farming and agricultural purposes. These exemptions apply only if they are not used to evade the act.

In accordance with the act, the Department of Intergovernmental Relations has prepared and circulated model subdivision rules, minimum requirements, and subject areas to be contained in local governing body regulations. The minimum requirements include the stipulation that the subdivider submit an environmental assessment to the local governing body. The assessment must contain a description of the surface and groundwater affected by the subdivision, a description of the topography, vegetation, and wildlife use within the subdivision, a description of soil types and their suitability for development, a community impact statement describing anticipated needs of the subdivision for local services, and other information required by the department.

By July 1, 1974 local governing bodies must adopt subdivision regulations that reasonably provide for orderly development of their jurisdictional areas and that meet at least minimal department requirements. Should a governing body fail to comply, the department will establish regulations for the area by January 1, 1975. In short, the act provides state back-up to insure that standards are minimally consistent statewide.

Park dedication requirements adopted by the 1971 legislature also are changed by SB 208. Under the act, a plat containing any lot five acres or less must forever dedicate one ninth to the public for parks and playgrounds. Where all lots in a subdivision are greater than five acres and less than 10, one twelfth of the area must be dedicated. No dedication is required for plats on which all lots are greater than 10 acres. Cash donations in lieu of dedication may be accepted by the governing body for good cause shown. However, the fair market value of the unsubdivided, unimproved land is used to determine the amount of the donation. This discourages the dedication of lands. Obviously, a developer can sell a lot for much more than the cash donation on the land valued as unsubdivided and unimproved. In addition, if all parcels are five acres or more and the subdivider will establish a covenant that parcels will never be less than five acres, and that all parcels will be used for single family dwellings, the local governing body may waive dedication and cash donation requirements for good cause shown.

The governing body is required to hold a public hearing and take action on a preliminary plat within 60 days. Other provisions in the act are efforts to insure uniform surveying and monumentation.

HB 465 contains important amendments to existing Department of Health and Environmental Sciences

authority to require subdivision plans. General policy is revised to permit explicit review of sewage and solid waste disposal to protect the quality of water for public domestic, agricultural, industry, recreation, and wildlife uses. The definition of "subdivision" is amended from the 1947 definition of "less than five acres" to "10 acres or less" and is amended to the definition in SB 208. Minor and formal transfer of interests no longer will be exempt from regulation. "Sanitary restriction" — the department's key instrument of regulation — is defined as a prohibition against the erection of any building until the department approves plans for water supply, sewage, and solid waste disposal facilities.

The critical change made by HB 465 is that no new building will be filed and building may be erected or occupied and no lot may be sold until the local health officer has approved water availability and quality and sanitary facilities, and the state department has indicated the subdivision is not subject to sanitary restriction. Another stipulation that has not been adequately publicized is that as long as a subdivision is conditional, no new lot may be filed, no building may be erected or occupied, and no lot may be sold.

Health detail was added to the department's rule-making duties. Rules must provide the description of the land and evidence of its available water supply, dependability, and variation in quality and quantity. Additional forms specify a hearing procedure for agricultural subdivisions and enforcement of the act, as well as penalties for violations.

The implementation of the new laws might create confusion about possible overlaps in jurisdiction. It was argued locally during the legislation that the missions do not conflict. Health department authority over subdivisions is not diminished. The department will still review plans under its statutory guidelines under supply and quality, sewage, and solid wastes) and will file environmental impact statements for public review. Consequently, the Department of Environmental Relations will develop future requirements for comprehensive assessment of subdivisions at the local level.

Agricultural Assessment

Montana is experiencing a rapid conversion of agricultural lands. Highway subdivisions and other special developments increasingly divide up prime agricultural lands in the Gallatin and Yellowstone Valleys and elsewhere. The legislature took some initial regulatory steps in the enactment of SB 72. This measure provides permanent assessment for some high agricultural lands if the landowner applies to the Department of Business. Agricultural lands can be assessed and assessed without regard to a municipality's potential for subdivision. Eligible lands include lands actively devoted to agriculture and lands at least five contiguous acres with gross value of \$1,000 or which agriculturally produce 15 percent of the owner's annual gross income. Should the owner decide later to convert the land from agricultural use, the land becomes subject to a "roll-back" tax. If so, however, the land will be assessed at its full agricultural value in its next year, less credit for taxes actually paid as agricultural land, returning the owner to their taxes.

City-county Planning

The legislature added an alternative procedure for city zoning and subdivision legislation beyond the rules provided by local health and planning. HB 422. Existing law required that a city could not extraordinary zoning if the city planning board included two representatives of the unincorporated area — only until a master plan is drafted and adopted. HB 422 provides that once a zoning plan, a city-county planning board could be formed. This could be advantageous since city-county planning boards are permitted by existing law to cross city limits, and in some cases 12 miles from the boundaries of an incorporated city or town.

Housing Types

Development of new housing types for local production is restricted by SB 296. Under its provisions, master planning councils and housing type areas the planning board (or other bodies that such housing is important to public health, safety, and welfare. The act also requires master plans to include a housing study, transportation, income and types of housing conditions, needs, and family income as a means of establishing housing standards and priorities available financing and construction methods. Perhaps mandatory studies by master plans should also include site conditions, local production, energy and growth densities, energy and disposal facilities, construction of water and agricultural and mineral resources, and public utilities. Although the act probably was drafted to stop the inclusion of mobile homes, it also could be used to balance the case of one who planned to erect a house of one innovative design.

Water

Appropriation and Use

One of the most important pieces of state water legislation is the new Water Use Act. SB 444 established a mechanism for appropriation and use of all waters, including very importantly, groundwater.

The act encourages water use of all waters by making them available for appropriation for beneficial use. Beneficial uses are defined to include fish, wildlife and recreation as well as traditional uses — agricultural, domestic, industrial, municipal, and power. An appropriation does not necessarily require diversion, abandonment, or production of human purposes if the act establishes concrete public-use exception for which state agencies can reserve water for in-stream uses.

The approving state agency — unlike other water laws — may not allocate benefits, irrigations, and events involved in considering an application for a reservation. In addition, the applicant must establish the public interest and need of the reservation and the amount of water needed for its purpose. The public must and interest in the reservation cannot affect any existing water rights. Beyond that, the Board of Natural Resources must approve all reservations of water users. The process issues that determine of the reservations are being made.

The act also establishes a state-level filing and adjudication system for all water appropriations, pursuant to the new state constitution. This is crucial since Montana's water rights situation has long been unclear. With impending food development and its potentially exorbitant water demands, it is important that Montana's water regulations be in order. It is vital to know the needs of aquatic life, wildlife, and the stream ecosystem, agriculturalists, recreationalists, and other users in order to establish whether room exists for other water demands.

Water Quality

State water quality law was amended to comply with the Federal Water Pollution Control Act of 1972. Definitions of performance and effluent standards were added to reflect federal intent to require best available technology with a zero discharge goal, as well as to regulate quantity and rate of effluent and ambient water quality. State Board of Health powers are amended to require the establishment and publication of pretreatment standards for wastewater discharged into municipal disposal systems, effluent standards, and performance standards. Additional sections provide for monitoring, inspections, enforcement, penalties, and emergency powers.

Floodway Management

The 1972 Floodway Management Act is potentially a momentous piece of critical areas legislation. It was amended in the 1973 session, pursuant to EQC recommendation, from a 50-year flood standard to a 100-year standard. The 50-year standard precluded the Department of Natural Resources and Conservation from using existing Corps of Engineers floodway delineation studies, which are drawn for 100-year floods.

The law had been scarcely implemented because of the added expense of duplicating ground covered by the corps. The new amendment should rectify that. In response to criticism, the department has strengthened new regulations to place more emphasis on the non-structural alternatives to flood control and the environmental needs of watercourses for flooding.

Wildlife

Wildlife received further attention from the legislature. As mentioned above, wildlife is to be considered in Department of Health and Environmental Sciences decisions on subdivisions (HB 465), and might be protected by reservations of the Water Use Act (SB 444).

Wildlife Conservation

The Nongame and Endangered Species Conservation Act establishes state policy to insure the perpetuation of nongame as well as game animals. HB 205 requires the Department of Fish and Game to thoroughly investigate the status of game and nongame species and to submit biennial reports listing species and subspecies endangered within the state. Animals placed on this list or on the U. S. lists of foreign and native endangered species are protected from taking, possession, or sale unless authorized by the department for scientific, educational, or propagation purposes.

The criteria for determining the status of species reflect a broad ecological outlook: destruction, drastic modification or curtailment of habitat, overfertilization for scientific, commercial, or sporting purposes, disease, pollution or predatory effects, and other natural or man-made factors affecting the survival prospects of the species. The act also authorizes land and aquatic habitat acquisition as necessary for protection of endangered species.

The act is enforceable by any peace officer. Violations are a misdemeanor.

Vehicle Restrictions

Hunters are prohibited by HB 126 from driving motorized vehicles off established roads or trails, except to retrieve downed big game. Also prohibited are harassing, molesting, or flushing of game birds or animals with a motor-driven vehicle. Retired cropland, brush, sloughs, timber, or open prairie can be traversed only on established roads or trails unless the hunter secures the landowner's written permission. Although it may be difficult to determine what constitutes an established road or trail, HB 126 is a good first step toward preventing abuses in off-road motor vehicle operation.

Goat Licenses

A seven-year waiting period is provided in HB 245 for anyone securing a mountain goat license. The mountain goat joined the grizzly bear, moose, mountain sheep, and oddly, the bison in this category.

Others

Additional environment-related measures enacted by the legislature include:

Special Land Site Preservation

An important step toward the preservation of historic, archeologic, and cultural values was the enactment of SB 300. The State Antiquities Act provides for identification, acquisition, restoration, and preservation of such sites. The Board of Land Commissioners designates areas on state lands for registration. Upon registration, the sites are protected from destruction. Removals, excavation, or restoration activities are prohibited without a permit from the Department of Fish and Game. Specimens and data collected under a permit are state property since the permits are issued to disseminate knowledge about cultural properties. The fish and game department is empowered to enter into cooperative agreements with private landowners, including agreements to register sites. Other provisions in the bill stipulate enforcement procedures and sanctions and the discretionary authority to appoint an advisory council to assist state agencies involved.

Weather Modification

By enacting HB 335, the legislature permitted more extensive research and experimentation in weather modification. The Board of Natural Resources and Conservation

is the reviewing agency for all weather modification permits. The Department of Natural Resources and Conservation has the discretionary authority to determine if a public hearing on a permit application is necessary.

The department also is directed to promote continued research and development of weather modification while identifying and evaluating environmental and socioeconomic effects. Because of substantial effects, HB 335 merits environmental scrutiny and monitoring.

Noxious Weed Control

The mandatory noxious weed control program was extended in HB 71 to include eradication of weed and seed along public streets, alleys, and municipally owned land. These locally operated control programs need careful environmental assessment to insure against unacceptable effects.

Junked Motor Vehicles

HB 112 regulates junked motor vehicles. The act establishes an annual motor vehicle disposal fee of \$2 to cover costs of administration. All passenger cars and trucks up to 8,000 lbs. gross vehicle weight (GVW) are required to pay this fee at registration. The Department of Health and Environmental Sciences licenses all motor vehicle wrecking facilities dealing with four or more vehicles a year.

Counties are required to acquire and maintain property for free disposal of junked vehicles. When 200 vehicles have accumulated, the county must notify the department for disposal. The department also can contract with a private facility for the removal of 200 or more vehicles.

Funds collected by the department from the resale of junked vehicles are earmarked for further regulatory activities. The department also is given broad authority to adopt regulations controlling junked vehicles in locations other than wrecking facilities.

Development Funds Transfers

Needed flexibility in the administration of state lands was clarified by HB 113. Some income derived from state lands is used to develop other lands in the same trust with the intention of realizing a higher income potential. However, it was uncertain if monies beyond those available from the same trust amount could be used. HB 113 permits the Board of Land Commissioners to transfer development funds from one trust to another as needed.

Hold-over Bills

Some very significant concepts are contained in measures held over during the 1973-74 legislative interim. Among these are SB 349, dealing with critical areas of concern for statewide land use regulation; HB 88, giving citizens, corporations, agencies, cities, counties, and others the standing to sue any administrative agency for decisions in which damage to the environment is or might be at issue; HB 550, authorizing counties to adopt shoreland protection regulations with state back-up; HB 133, establishing scenic waterways — the controversial bill is being redrafted by a special legislative subcommittee; SB 305, authorizing the Department of Natural Resources and Conservation to regulate forestry practices on private lands; HB 568, dealing with public access to state lands; SB 188, requiring corporate disclosure of the content of emissions and effluent; HB 474, broadening the application of the stream preservation act to cover private modification of streams; and HB 628, establishing a state natural areas system. Besides these measures, some state agency recodification bills are in hold-over status. These bills, necessitated by the Executive Reorganization of 1971, contain the enabling authority for state departments and deserve careful attention. Concerned environmental groups and citizens have the opportunity to review these and other hold-over bills and prepare for the deliberations of the next session.

Citizens and Environmental Quality

by

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Introduction

During the past year, citizen environmental groups continued to play an important role in environmental decision-making. A number of agencies still complain that citizen involvement appears sparse or at least sporadic. Citizens counter that their input often is not sought until agencies have committed themselves to courses of action and that, if sought, their views can be easily ignored. The Montana Environmental Policy Act is directed at solving this problem and is helping to ensure timely and effective public involvement. However, some agencies still do not have updated lists of concerned citizens and groups for environmental impact statement circulation; as these are developed, more fruitful assessment of the quality of citizen participation will be possible. In the meantime, activities of some of Montana's citizen environmental groups can be discussed. The following listing is incomplete and is intended only to indicate the range of citizen environmental activity. Omission of certain groups does not indicate lack of activity or interest.

Recent Montana Citizen Advocacy

The Montana Wilderness Association (MWA) continued as one of the state's largest, most active environmental groups. In the face of rapidly proliferating federal review of national forest lands for wilderness candidacy and multiple use planning, the association appointed local chairmen for Montana's national forests and for specific major issues such as the Absaroka-Beartooth wilderness proposal and the Spanish Peaks Primitive Area. The association also showed its concern for issues not so directly related to wilderness preservation. For example, MWA became plaintiff in litigation against a rural subdivision in Gallatin County.

Another successful group in the state is the Northern Plains Resource Council. Northern Plains began as a group of ranchers deeply concerned about the strip mining of eastern Montana lands and has become a leading force in coal energy issues. The group was an active lobby during the last legislative session and has pressed agency personnel to implement enacted legislation. The council's newsletter, the Plains Truth, is an excellent source of information on coal-related activities. The council currently is investigating strengthening its ties with other Montana environmental groups.

Trout Unlimited (TU) has been especially active in efforts to amend the state's Stream Preservation Act. A lobbyist for TU spent considerable time during the last legislative session working on scenic waterways legislation. The group is now initiating a program to increase its effectiveness on a broad range of environmental issues and may employ an executive secretary to assist its state council.

During the last legislative session, a coalition of environmental groups — headed by the Montana Wildlife Federation — organized the Environmental Lobby. It actively lobbied on nearly all environmental issues before the legislature and established a phone network to facilitate communication between environmentalists during the busy session.

This lobbying effort will be pursued in the coming legislative session and will be further aided by the newly organized Helena Environmental Information Center. The center is designed as a clearinghouse for environmental groups on a year-round basis. It will perform critical functions including maintaining an office and library in Helena, compiling evidence files on legislation and environmental issues, scrutinizing state agency files and activities, monitoring the legislature, advising citizen groups on lobbying, testifying, and conducting state

agency reviews, and establishing more effective and immediate communications between environmentalists.

Another new group, recently formed in response to rampant land development in the Flathead Valley, is Flathead Tomorrow. Primary concerns of the organization include the monitoring and control of subdivision and recreational second-home development, the protection of Flathead drainage water quality, the mobilization of an alert and involved citizenry, and continuous review of public officials vested with environmental decision-making authority.

The controversy over current United States Forest Service (USFS) multiple use planning led to the formation of the Cedar-Basnet Action Group (C-BAG) in the Paradise Valley south of Livingston. The immediate point of contention is the USFS proposal to road and log a corner of the North Absaroka roadless area. C-BAG has joined the Montana Department of Fish and Game in criticizing the USFS for not adequately considering the wildlife effects of the proposal, more specifically, the requirements of the resident elk herd and the migratory patterns of the Yellowstone herd. C-BAG also contends that the Cedar-Basnet area was erroneously excluded from the USFS inventory of roadless areas compiled last year. Litigation is being considered.

The National Forest Preservation Group (NFPG) also maintained its pressure on the Forest Service and the Montana Department of Highways. The group recently prevailed in litigation forcing lower courts to review the administrative procedures in the USFS-Burlington Northern (Big Sky) land exchange. The exchange was further boosted to national prominence when, during the Watergate hearings, it was revealed that there may have been some capricious administrative action in the exchange decisions. NFPG is using that information in prosecuting its case. NFPG also was successful in recent litigation proscribing the publicly funded construction of a primary spur road to the Big Sky development.

The increased probability of coal energy development has led to heightened concern on both the Northern Cheyenne and the Crow reservations. The Northern Cheyenne Landowners Association was instrumental in the recent tribal council demand for termination of allegedly illegal permit and leasing activity on the reservation. Members of the Crow tribe are proceeding in a similar fashion in an effort to assure that the principles of Indian self-government, tribal sovereignty, and cultural diversity are not overlooked in coal energy decision-making.

Both the League of Women Voters (LWV) and the American Association of University Women (AAUW) continued to expand their environmental activities. The groups testified on a number of issues in the last legislative session—weather modification, coal development moratorium, strip mining regulation, and subdivision controls. The league recently became plaintiff with the Sierra Club and other groups in an effort to halt coal mining activities pending the preparation of a comprehensive

federal environmental impact statement. LWV is also initiating a land use policy study. AAUW conducted a tour of the coal country in an effort to inform its members firsthand of the serious and unanswered questions surrounding coal development.

The League of Conservation Voters (LCV) continued its efforts to provide voter information on candidates and elected officials, circulating voting records and ratings. In the future, LCV will be assisted by the newly formed Montana Committee for Public Information. This committee, a coalition of low-income, social service, and environmental groups, is compiling voting records and legislative profiles from the 1973 legislature. These were discussed at a fall conference on political power in Montana.

The Student Environmental Research Center (SERC), funded by the Associated Students of the University of Montana, was active in air and water quality studies in the Missoula area and prepared a number of analyses of the environmental effects of coal energy development. SERC provides an effective forum for student research and advocacy.

The Northern Rockies Action Group (NRAG) was formed in early July to back up citizen environmental groups in Montana, Idaho, and Wyoming. The group uses a team approach stressing four major skills: legal, research, fund-raising, and organizing. Goals of NRAG include focus primarily on environmental issues that have social equity aspects, aid in the development of an environmental ethic, broaden effective citizen involvement in environmental decision-making, and create a new prototype for effecting social change. The group's current activities include research on possible hard rock mining near Bull Lake in northwestern Montana and elsewhere, assistance on coal and land use issues on the Blackfeet, Northern Cheyenne, and Crow reservations, research on conservation easements, participation in the Yellowstone River study conducted by the Bureau of Outdoor Recreation, aid in the establishment of the Helena Environmental Information Center and an environmental lobby in Idaho, and assistance to Flathead Tomorrow, the Northern Plains Resource Council, and Trout Unlimited.

Citizen Participation and the Legislature

Citizen participation can be encouraged or discouraged by the legislature. In general, the rules of the last session, providing for open committee meetings, helped citizens follow events more closely. However, groups and individuals should attend not only the committee hearings at which testimony is taken, but also the meetings at which the committees deliberate on bills. In addition, the legislative rule providing three-day consecutive notice prior to receiving testimony on a bill was weakened by the fact that the rule did not specify full 72-hour notice. For example, under the 1973 rule, a committee could post a hearing notice at 4:30 p.m. Wednesday and conduct the hearing at 8 a.m. Friday.

Increased attention to citizen participation was indicated in several measures enacted by the 1973 legislature. The Utility Siting Act (HB 127) contains some explicit citizen participation procedures. For example, applications for facilities certification must be accompanied by proof that public notice has been given to affected municipalities and has been published in "such newspapers as will serve substantially to inform" persons residing in those municipalities. Amendments to applications also require public notice.

A more important provision is the definition of "parties" in a certification proceeding. They include the applicant, affected municipalities, and government agencies, residents of such municipalities, and

... any nonprofit organization, formed in whole or in part to promote conservation or natural beauty, to protect the environment, personal health, or other biological values, to preserve historic sites, to promote consumer interests, to represent commercial and industrial groups, or to promote the orderly development of the areas in which the facility is to be located, or any other interested person . . .

In other words, nearly everyone, including citizen environmental groups, can become parties to utility siting proceedings. However, a crucial subsequent provision stipulates that parties are presumed to have waived their right to be a party if they do not participate orally at hearings held on the department's findings or on application for amendment. That is, parties could lose their right to intervene or litigate if they do not testify.

During a public hearing on the facility application, the common law and statutory rules of evidence do not apply. This was done to encourage expressions of public opinion as well as technical data. In addition, cross-examination will not occur at the hearings.

A party aggrieved by a final decision on a facility may obtain judicial review in state district court. Additionally, residents who believe the Utility Siting Act is not being enforced can subscribe a sworn statement bringing the alleged violation to the attention of the public official responsible for enforcement. Should the public official then refuse or neglect to enforce the law, the resident can bring a mandamus action in the district court of the first judicial district (Lewis and Clark County).

The Montana Strip Mining and Reclamation Act is less specific on citizen participation. Applicants for mining permits must include the name and date of a daily newspaper of general county-wide circulation in which the applicant has prominently published an announcement of application. Residents can pursue agency nonenforcement in a manner similar to that of HB 127. Hearings are required when the Board of Land Commissioners decides remedial measures are necessary to comply with the act or when the board decides to revoke a permit.

Beyond the above, no comprehensive statutory effort has been made to implement the new constitutional provisions covering the right to know and the right of participa-

tion (An attorney general's opinion on the new right-to-know provision — exempting from scrutiny corporate information on file with government agencies — has come under fire but is as yet without definitive resolution.) The broad wording of the two provisions invites innovative implementation to guarantee the effectiveness of citizen access to governmental processes.

Citizen Suits

As noted above, some citizen environmental groups have been involved in litigation on a variety of issues. A number of difficulties attend the use of citizen suits in pursuit of environmental quality. One of the most immediate and critical difficulties concerns the legal notion of "standing to sue." The determination of standing is the court's effort to decide who is an appropriate party to an action — to decide that there is a genuine case or controversy. Standing to sue has been decided primarily by the courts and developed through a long history of cases.

Several states — Connecticut, Michigan, Indiana, Florida, Minnesota, and Massachusetts — have adopted statutes to expand and clarify the developing common law. Congress is currently considering a citizen suit measure. Montana has not adopted such a law. In the 1971 legislative session, a Senate-passed measure allowing citizen suits was killed in the House of Representatives. By 1973 the tables were turned: the House passed a measure only to have it defeated in the Senate. The 1974 session of the legislature will debate the question again when hold-over HB 88, The Montana Environmental Protection Act, is considered.

Although Montana has not adopted a liberalized standing statute, the new Criminal Code enacted by the last legislature significantly broadens the definition of public nuisances and the persons who may abate them:

94-8-107. Public nuisance. (1) 'Public nuisance' means: (a) a condition which endangers safety or health, is offensive to the senses, or obstructs the free use of property, so as to interfere with the comfortable enjoyment of life or property by an entire community or neighborhood, or any considerable number of persons . . .

(5). Action to abate a public nuisance. (a) Every premise upon which a public nuisance is being maintained may be abated, and the persons maintaining such nuisance and the possessor who permits the same to be maintained may be enjoined from such conduct by an action in equity in the name of the State of Montana by the county attorney, or any resident of the state (5).

Prior to the enactment of this statute, persons could generally abate a public nuisance only if they could show injury beyond that sustained by society in general. This change expands an important legal handle for citizen environmental suits (1). The Criminal Code goes into effect on January 1, 1974.

One of the leading environmental cases on standing was decided in U.S. district court in Montana. In 1970, the

Environmental Defense Fund, Inc. (EDF) filed an action against the Hoerner-Waldorf Corporation of Missoula alleging excessive emission of sulfur compounds and other substances. (4) EDF alleged that the constitutional rights of the persons suing were being violated. Judge Murray, who granted EDF standing to bring the action, stated:

"I have no difficulty in finding that the right to life and liberty and property are constitutionally protected. Indeed, the Fifth and Fourteenth Amendments provide that those rights may not be denied without due process of law, and surely a person's health is what, in most significant degree, sustains life. So it seems to me that each of us is constitutionally protected in our natural and personal state of health.

Since both the Fifth and Fourteenth Amendments to the U.S. Constitution bind only governmental action, the court dismissed the suit for lack of alleging governmental action (6). However, the working of the judge's grant of standing is an important liberalization for citizen suits in Montana.

Research has been done on the basic question of whether citizen actions will flood the courts with litigation or harassment suits (3). A recent study by the Consumer Interest Federation surveyed the attorneys general (or other public officials) in states having citizen suit laws. The results were consistent and unanimous. No state felt overburdened by the legislation. A Massachusetts assistant attorney general responded, "I can categorically state that the idea that there would be a flood of cases is a myth that has been exploded." The attorney for the Florida Department of Pollution Control stated that "the number of suits has not clogged the courts. It is too expensive and time-consuming a process for frivolous suits to be brought (3)."

Joseph Sax, author of the Michigan Environmental Protection Act, recently wrote that "enough cases have been resolved speedily and intelligently to mark the Act as a success (70)." His statement is endorsed by Michigan Assistant Attorney General Charles Alpert (3).

Experience such as all the above should help reduce the unsubstantiated fears about legislation granting citizens the standing to sue.

The United States Supreme Court recently had its first occasion to rule directly on citizen standing to raise litigable environmental questions. Environmentalists and industry had awaited the decision with interest. The Sierra Club filed an action seeking to enjoin federal permits granted to Walt Disney Enterprises, Inc. (8). The Forest Service had issued permits for the construction of a \$35 million complex of motels, restaurants, swimming pools, parking lots, and other structures on Forest Service land in the Mineral King Valley of California. The Sierra Club did not allege that its members were users of the valley or that they would be adversely affected in their aesthetic and recreational use of the area. The U.S. district court granted standing and a temporary restraining order. The

Court of Appeals denied standing and threw out the order. So the matter proceeded to the U.S. Supreme Court on appeal. The Supreme Court ruled that a party must allege direct injury to his own interests (including recreation or conservation interests). Thus the Supreme Court (by 4-3 decision) upheld the ruling of the appeals court. However, the court invited the club to amend its complaint to include the proper pleadings. At this time, the matter is being reintroduced to the courts.

The importance of the case for citizen environmental groups is the court's ruling that standing (and hence the right to sue, will be granted to those environmental groups who show an injured interest — economic or otherwise). The federal case law had not been clear on this point before. It is equally important that a sizable minority of the court would have gone further, granting to any sincere, dedicated, and established conservation group the status of plaintiff in an environmental action. Justice Douglas would have admitted recognized groups to represent the environment itself, in essence, he would grant standing to trees, a novel and compelling idea (9).

The above rulings are only two indications that the citizen law suit has become a permanent feature of citizen environmental activities.

Citizens and the Pursuit of Environmentally Sound Life Styles

One other area of citizen activity needs mention. Although part of the pursuit of an environmental ethic can be effected through public advocacy activities of the type described above, a good portion of the ethical questions are matters of personal and collective life-style change. Although the impact of personal or group life-style changes are often derogated, serious analyses of their long-term potential impact on production and distribution have yet to appear. There is a substantial and unrecognized possibility for fundamental alterations in consumer demand, consumption habits, use patterns of residential and commercial appliances, residual disposal practices, and transportation habits. Since an economic system shares some of the complex and newly recognized interdependencies of ecosystems, the ultimate effects of altering life-styles could be as far-reaching as even the most substantial legislative changes.

The EQC's First Annual Report noted that the Falls Creek Project was working on environmentally sound life styles. Aside from that group, the Round River environmental education experiment at the University of Montana, and the recent appearance of recycling centers in several Montana cities, there are no publicized examples of alternative life styles in the state. The pursuit of personal and cultural changes — using Montana's rich cultural diversity as a starting point — would be a very important complement to the advocacy work being done by Montana environmental groups.

Conclusion

Keith Caldwell has aptly summarized the challenge of citizen efforts in environmental decision-making:

The high level of public indignation that environmental catastrophe arouses cannot indefinitely be sustained, whereas the activities and behaviors that destroy environmental quality proceed for the most part unremittingly and with powerful economic incentives and assistance. Social concern with the state of the environment cannot have continuing effect unless it is institutionalized. For protection of the environment to be effective, it must be established as a continuing public function — not merely reactive to disaster but anticipatory of possible threats. To become an effective public function, environmental management must obtain the type of institutional and organizational resources to enable it to develop and maintain a broad public constituency. Only in this way can the role of government

be sustained in competition with other public needs and functions (2).

Citizen environmental activities — public advocacy and personal/cultural changes — are the most important form of institutionalization and will continue to determine the success or failure of the important public pursuit of environmental quality.

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The Arbiter Process of Copper Reduction

by
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The Arbiter process is a unique hydrometallurgical process developed by the Anaconda Company for extracting copper from copper concentrates, using a low-temperature and low-pressure ammonia leach. Unlike a conventional pyrometallurgical process, this process does not emit significant quantities of gas or dust to the atmosphere. Instead, all waste products are carried in solution to a tailings pond.

In a conventional pyrometallurgical process, copper concentrates are fed to roasters to form a calcine. The calcine is then fed to a reverberatory furnace and then to the converters, where gases and particulates are discharged to the atmosphere via a stack. The output of the converter is impure blister copper that is subsequently purified in an electrolytic process.

In the Arbiter process, the sulphide concentrates are leached with ammonia in the presence of gaseous oxygen at a pressure of five pounds per square inch (psi) and at a temperature of 75 degrees Fahrenheit. The copper bearing solution (ammonium sulfate) is treated by solvent extraction in a liquid ion-exchange circuit, and the resulting liquor is sent to an electrolytic process where pure copper metal is recovered in cathode form. Sulfur is removed from the process as ammonium sulfate solution, formed during this process. The solution is mixed with lime to form gypsum, which is subsequently added to the tailings and discharged to a tailings pond. Large quantities of live steam are used to boil off free ammonia from the residual solution for recovery and reuse in the leach reactors. The efficiency of the copper extraction process is about 98 percent, whereas the ammonia recovery is about 95 percent efficient (3).

A \$22 million prototype plant that will employ the Arbiter process is under construction at Anaconda, Montana, in the vicinity of the existing pyrometallurgical plant, and is scheduled for completion in September 1971 (2). This plant is scheduled to handle 560 ton/day of low grade, high sulfide (32 percent) concentrates from the Butte and Victoria operations. It will produce 100 ton/day of metallic copper of a quality equal to that produced by the pyrometallurgical plant (1).

Because of a recent increase in Anaconda's production quota, the company currently plans to operate both the existing plant and the Arbiter plant at capacity (4). Thus,

it is unlikely that the present level of air pollution in the vicinity of Anaconda will show a net decrease from operating the Arbiter plant. However, this new facility will enable increase in production without further degradation of air quality.

In addition to the ammonia leach, ammonia recovery, and solvent extraction circuits, the principal components of the Arbiter plant are the ammonia vent system, the oxygen generating plant, the boiler plant, the lead anode casting facility, the water supply system, and the waste disposal system.

Ammonia vented from equipment in the leach circuit is contacted with fresh water in a single packed tower scrubber and ultimately returned to the leach reactor. The efficiency of the tower is 99 percent, allowing one percent to escape to the atmosphere (5).

The oxygen plant generates the oxygen used in the leach operation. The plant will produce 115 ton/day of gaseous oxygen at 40 psi and five ton/day of liquid oxygen. The compressor for this process is powered by a 3,000 horsepower electric motor (5).

The boiler plant produces the steam required for ammonia recovery. The plant will consume an estimated five million cubic feet of gas a day to produce about 40 pounds of steam required for each pound of ammonia recovered. If necessary, Number 2 grade fuel oil could be used in lieu of gas (5).

The anode casting facility will cast the lead anodes to be used in the electrolytic process. The plant also is fired with natural gas and is designed to cast a complete inventory of 8,000 anodes in 60 days, however, since the life of the anodes is expected to be from two to five years, the plant is expected to be used infrequently (5).

The Arbiter plant will consume between 4.7 and 7.3 million gallons of water a day (5), which is about 60 percent as much water as will be required by Colstrip generating plants 1 and 2. However, it is anticipated that changes in the water distribution systems at both the wood concentrator and the existing smelter will reduce water consumption by these facilities. This reduction should offset the requirement for the Arbiter plant. Hence the net consumption should remain essentially unchanged (4). This water is supplied from Warm Springs Creek at Meyers Dam.

The existing tailings pond system consists of 4,200 acres of ponds that are 60 percent full of tailings. A network of diversion ditches conveys 20 million gallons of water a day from the existing smelter and the Anaconda city sewer system for dust control and revegetation on these ponds. The effluent from these ponds is ultimately discharged to Silver Bow Creek, which flows into the Clark Fork River (5).

A new pond, sealed with bentonite clay, will be constructed to accept the slurry discharged from the Arbiter plant. This pond is connected to existing ponds 1 and 2, which will be isolated from the rest of the existing pond system.

The material breakdown of the slurry discharge from the Arbiter process is estimated to be (5):

Calcium	8,000 lb/day
Sulfates	10,000
Copper	2.7
Zinc	1.6
Nitrogen	1,200 (maximum)

Of the nitrogenous material, 400 lb/day are sulfamate, 750 are ammonia, and 50 are ammonium.

The actual reduction of nitrogen through the existing pond system cannot be accurately assessed now. However, since it is unlikely that there will be sufficient organisms in the system to reduce the ammonia content of the effluent and since ammonia losses to the atmosphere are likely to be the only significant loss, the effectiveness of the existing pond system in reducing ammonia is questionable. Therefore, to preclude the possibility of discharging nitrogenous material to Silver Bow Creek, the liquid from ponds 1 and 2 will be disposed of by evaporation (4).

The new pond, together with ponds 1 and 2, should accommodate the plant discharge for about two years at the anticipated rate of production. During this period, a test program will be established to study various methods for disposal of effluents and to determine the potential for serious water pollution. The test program will include laboratory analysis of the discharge material, bioassays using fish, and greenhouse tests. Also, as part of this program, a series of test wells will be drilled in the vicinity of the pond system to monitor the quality of the groundwater and the level of the water table (4).

At the conclusion of the two-year study period, the method for waste disposal will be reevaluated. If it is deemed that a serious potential for water pollution does not exist, ponds 1 and 2 may be allowed to spill to the rest of the existing pond system and ultimately discharge to Silver Bow Creek. However, if it is determined that a pollution hazard does exist, then an alternate method of disposal must be selected or a change must be made in the method of removing sulfur from the process.

Methods of treatment for removing sulfates and nitrogenous compounds from the effluent would be very costly

and are not presently considered by the Anaconda Company for this installation.

According to Dr. Arbiter (4), there are two alternatives to the lime-boil method of sulfur disposal currently planned for the plant at Anaconda.

One technique converts the waste product to ammonia and elemental sulfur. Plants in Europe are being designed for this method, and the Anaconda Company is studying the economics of employing it in this country.

The other technique is to crystallize out ammonium sulfate and market this byproduct. This method would require less steam and no lime. There would be less investment, less energy required, and no waste disposal problems resulting from nitrogenous material. Obviously, this alternative would also conserve natural gas (or oil) and water. Dr. Arbiter stated that this method was preferred but that it would not be used at the Anaconda plant because there was no market for the byproduct in the area.

Based on pilot plant operations, it appears that airborne emission concentrations from the Arbiter plant will be insignificant. The principal source points for emissions are: the stacks on electrowinning tank house, the boiler stacks, the ammonia scrubber stack, and the stack and roof exhausters on the anode casting facility (5).

Sulfuric acid mist generated in the electrowinning process probably would be the only emission noticeable, but atmospheric concentrations are expected to be considerably below the state standard of four $\mu\text{g}/\text{m}^3$ (micro-grams per cubic meter) for an annual average. During a normal operation, less than 0.75 lb/hr of acid mist will be discharged to the atmosphere via four tall stacks in the roof of the electrowinning tank house (5).

If natural gas is used to fire the boilers, nitrous oxide (44 lb/hr) will be the only emission from the boiler stacks, however, if Number 2 fuel is burned, sulfur dioxide (six lb/hr) and particulates (six lb/hr) will also be emitted (5).

It is anticipated that less than nine lb/hr of ammonia will be released to the atmosphere via the scrubber stack (5).

The anode casting facility is equipped with a baghouse for particulate retention and a 75-foot stack. Particulate emission from the baghouse to the atmosphere is expected to be 0.1 lb/hr or less, which represents a control efficiency of 99.5 percent (5).

The Anaconda Company has applied to the Montana Air Quality Bureau for a permit to build the portion of the plant associated with airborne emissions, and it appears that this permit will be granted. Since the slurry discharge will be contained, a discharge permit will not be required before placing the plant into operation. However, if at the end of the two-year evaluation period Anaconda elects to allow the effluent to flow to Silver Bow Creek via the pond system, a discharge permit will be required.

The Arbuter plant is definitely a big environmental step in the right direction. The process is also being developed for the recovery of nickel and zinc. Furthermore, because of the ability to handle low grades and high pyritic concentrates, the feasibility of processing old tailings is also under study (2). This process has aroused interest among major metal producers, and some are now negotiating with the Anaconda Company for licensing agreements (1). Hopefully, in the near future, the conventional dirty smelting process will be replaced throughout the copper, zinc, and nickel industry with the cleaner chemical reduction process.

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Responsibility



PART III

The Substance of Solutions

Introduction

The activities of the Environmental Quality Council (EQC) in executing the responsibilities imposed by the Montana Environmental Policy Act (MEPA) not covered in Part I are reviewed in this chapter. The council's legislative program, field tours and meetings to view coal development and land use, reorganization, and revision of environmental impact statement guidelines are briefly discussed.

As required by Section 69-6514, this chapter also contains reviews of certain environmental programs and activities of selected state agencies. These reviews primarily relate to agency efforts to implement some of the most significant environmental legislation to pass the 1973 legislature.

The EQC, in response to needs perceived by council members and staff, adopted on September 14, 1973 a number of recommendations for legislation and programs. The list of recommendations concludes this chapter and this report.

EQC Operations

The First Annual Report recorded the council's concern with the problems of coal development. Acting upon this concern, the Environmental Quality Council (EQC) sponsored a field tour of coal development areas in September 1972 that enabled council members, legislators, and guests to observe and discuss situations and to propose solutions. Observers from many state and federal agencies including the Council on Environmental Quality and the Environmental Protection Agency were present. Several recommendations relating to coal development were adopted at the EQC meeting following the tour. Among these were a recommendation that the Coal Task Force prepare a preliminary report on state coal resources and attendant problems of development including recommendations for legislation by January 1, 1973 and a recommendation for a production tax on coal.

In July 1973, the EQC conducted a similar tour of the Flathead Valley to observe a wide variety of land use situations as a perspective from which to view the land use policy study.

The first report concluded with a wide-ranging group of recommendations for legislation, programs, and policies in response to the statutory directions of Section 69-6514.

The EQC staff assisted EQC legislative members and other legislators with research and drafting of proposals to implement the recommendations, and responded to service requests. The services of Albert W. Stone, University of Montana Law School faculty member on sabbatical leave, were retained to facilitate this effort. The paper, "Underground Natural Resources," in Part I is an outgrowth of his research on eminent domain for the Senate Judiciary Committee.

Following the 1973 legislative session, the EQC was reorganized with seven new members. Senator Elmer Flynn of Missoula was elected chairman.

In February 1973, The Ford Foundation awarded the EQC a grant of \$150,000 for administrative support over a two-year period beginning January 1, 1973. The grant supports the EQC's regular administrative work by funding two additional professional staff positions and supporting services and travel for them, as well as providing funds to hire consultants and graduate students from university system units. Most of the investigative effort funded by the Ford Foundation grant will be directed toward the energy and land use policy studies discussed in Part I. Funds also are included to provide partial support of an environmental library and information service in

cooperation with the Western Montana Scientists Committee for Public Information and the University of Montana. A portion of the information service is the production of a biweekly newsletter reporting important environmental actions by state agencies and listing current environmental impact statements (EIS) filed with EQC.

A major responsibility of the EQC is administration of the process of the Montana Environmental Policy Act (MEPA). This function is accomplished through ongoing consultation with executive agencies to interpret MEPA and the guidelines as they apply to specific agency actions. The second annual revision of the guidelines for EIS was tentatively adopted by the council on July 25, 1973, distributed to the agencies for comment, and finally adopted

on September 14, 1973. A tabulation of EIS filed with EQC and copies of MEPA and the revised guidelines appear in the appendix.

A primary purpose of EIS is disclosure of the environmental consequences of a proposed action. This openness in government decision-making alerts other agencies and the public to possible environmental impacts involved in proposed actions and permits closer coordination between agencies. The EQC newsletter is used to inform the public about EIS available for review and comment. The end result of the impact statement process is a systematic balancing of economic, technical, and environmental considerations. Rigorous examination of alternative actions can lead to agency decision-making with significantly less adverse environmental impact.

State Agency Programs and Activities

This section is a review of problem areas of major environment-related programs and activities as well as progression in compliance with important 1973 legislation in the following state departments: Intergovernmental Relations, Health and Environmental Sciences, Highways, Lands, and Natural Resources and Conservation. Time and space restrictions limited this section's breadth and depth.

Department of Health and Environmental Sciences

Subdivision Regulation

Passage of HB 465 expanded state jurisdiction over subdivisions by amending the preexisting law to include solid waste, protection of water quality for agriculture, industry, recreation and wildlife, and subdivisions with parcels up to and including ten instead of less than five acres. The revised rule for approval of water and sewer facilities in subdivisions, only recently approved by the Board of Health, is a decided improvement over the previous rule. For example, the new rule contains a presumption in favor of community water supply and sewage disposal systems, an increase from one-half to one acre minimum lot size for individual water and sewer systems, qualification of the one-acre minimum as usable area, not to include land with periodic flooding or with extensive rock outcroppings, instructions to assure water supply for each site, recognition of irrigation as a means of treating community wastewater, more detailed instructions on determining maximum high groundwater elevation, and new sections on storm drainage and subdivision of land on public water supply watersheds.

Meanwhile, the department continues to have great difficulty in regulating the boom in subdivisions, particularly in areas of surveillance and enforcement. It is questionable whether it can be more effective, even under the

new law and rule, without additional funding and staff and greater cooperation at the local level.

The department does not employ any person to work full time on subdivisions. The handful of people working on subdivisions spend much of their time on other department matters. A supplemental appropriation is proposed for fiscal year 1975 to hire four more people to work full time on subdivisions, one public health engineer to direct the program, two sanitarians for field inspection and to coordinate local action, and one clerk-typist. Subdivisions should receive individual status and a budget should be appropriated for development as a new department activity. A more interdisciplinary staff will be needed to cope with the provision in the new law protecting water quality for recreation and wildlife and for assessing broader environmental impacts of subdivisions.

There is clearly a need to put state people in the field in "hot-spot" or trouble areas, such as Bozeman and Missoula, in a capacity similar to the district field office in Kalispell. Instead, the tendency has been continued reliance on local personnel for surveillance and enforcement, which in many cases has proved ineffectual.

In areas of western Montana where subdivision activity is great, county sanitarians are often unable to keep up with their workload in the face of other duties. They, like department personnel, are unable to get out on a routine basis to make valid, first-hand observations and evaluations of potential or actual violations of regulations. Another frustration is the department's repeated inability to get infractions through the county attorneys and into the courts where action can be taken.

Not only new, but existing subdivisions, add to the burden on department and local personnel. A large percentage of subdivisions in certain areas have not had sanitary restrictions removed. Many violations specifically direct contamination of surface and ground waters remain undetected and unchecked. Problems arising now are at

least partially due to the lack of a wholistic, comprehensive planning approach in the past.

The passage of SB 208 did not ease the load and lessen the responsibility of the Department of Health and Environmental Sciences regarding subdivisions. The new ten-acre requirement in both SB 208 and HB 465 will substantially increase the number of subdivisions that must be reviewed. The broader language in HB 465 provides a statutory base for continued comprehensive environmental assessment of proposed subdivisions and the health department remains the only state agency with authority over subdivisions and thereby the only agency responsible for assessing the wide-ranging environmental impacts of subdivisions under the Montana Environmental Policy Act.

Department of Highways

Action Plan

In response to rising public concern over environmental planning of highway projects, Congress, in the Federal-Aid Highway Act of 1970, included language designed to ensure that each state would fully consider the impacts of all proposals for highways within that state. The guidelines for state compliance with the Congressional directive were transmitted to the Montana Department of Highways (MDH) by the Federal Highway Administration (FHWA) on September 26, 1972.

The guidelines emphasize the process approach rather than the traditional project approach. As their major objective, the states are to be sure that factors of economic, social, and environmental (ESE) significance are incorporated into highway decisions. Four fundamentals must be considered in this procedure:

1. **Identification** of highway impacts;
2. An **interdisciplinary** approach to highway planning and design.
3. **Involvement** of other agencies and the public, and
4. **Alternatives** to the highway proposal.

All of the above considerations and other more detailed procedures outlined in the federal guidelines must be embodied in a document setting forth the MDH plan of action. This document, commonly called the "Action Plan," had to be submitted for approval to the FHWA by June 15, 1973. The FHWA will not give location approval on projects after November 1, 1973 unless the Action Plan has been approved.

The MDH initiated progress toward development of the Action Plan by appointing an Action Plan coordinator from among the staff of the Preconstruction Bureau, Engineering Division. A Helena consulting firm was then engaged to design the process for achieving agency and public involvement in formulating the plan and to draft the plan itself. The supervisor of the Preconstruction Bureau and

the chief of the Planning and Research Bureau also played key roles in developing the plan for the department.

An initial attempt to enlist agency participation in formulating the Action Plan was made March 1, 1973 in a letter from the director of highways to the heads of appropriate state agencies. A meeting was called for March 7 at which 12 of the 18 invited agencies were represented. This "State Agencies Liaison Group," as it was later called, was briefed on the Action Plan concept and asked to identify specific areas of agency responsibility for ESE concerns.

In an effort to gain maximum interaction between the disciplines likely to be most concerned with the development and implementation of the Action Plan and to provide them with more direct input into the plan preparation, an "Action Plan Steering Committee" was proposed to consist of representatives from the Departments of Fish and Game, Intergovernmental Relations, Natural Resources and Conservation, Health and Environmental Sciences, Highways, and the Environmental Quality Council. The liaison group and steering committee met with the plan coordinator and consultants on several occasions over a three-month period until a draft plan was finally roughed out. Meanwhile, several hundred invitations for comment were mailed to public interest groups, legislators, and other individuals. However, response was meager. Two public hearings were held in Helena but turnout was relatively light for meetings on a topic with such far-reaching implications.

The Montana Action Plan was transmitted to the FHWA on June 15, 1973. Basically, the plan consists of a process for evaluating ESE considerations and for enlisting agency and public involvement, superimposed onto existing MDH procedures for planning, location, and design of highway projects. The functional "heart" of the Action Plan consists of the three impact evaluation groups: the Impact Evaluation Unit — an in-house MDH staff group with ESE expertise, the Impact Evaluation Group — an interagency high-level ESE review group consisting of representatives from appropriate state agencies (an extension of the steering committee with possibly an additional agency or two), and the Impact Evaluation Team — a highly flexible, ad hoc project study team consisting of the Impact Evaluation Unit plus agency representatives and consultant expertise as appropriate on a project-by-project basis. Although the impact evaluation groups are only advisory in capacity with no real decision-making functions, the process would still allow for agency notification and input at a much earlier stage.

Much of the effectiveness of the Action Plan will center on the multi-disciplinary competency of the in-house Impact Evaluation Unit. At the time of this writing the unit consisted of a wildlife biologist, a land use planner, a horticulturalist, and a coordinator. This is the total unit as currently envisioned by the Department of Highways and as such would fall short of the recommendations made by EQC on April 27, 1973. In addition to these positions the EQC advised the department to staff an ecologist,

a landscape architect, an engineering geologist, and an economist. Without these additional positions it is doubtful that the department can fulfill other recommendations made by EQC: involvement of environmental design arts in highway location and design, and assessment of costs and benefits not easily expressed in dollar equivalents, including environmental amenities.

Preliminary feedback from the FHWA indicates general agreement with the Unit-Team-Group concept for impact evaluation. The Action Plan coordinator believes that the minor differences between the FHWA and the department's Action Plan can be resolved, however the plan remained unapproved at the November 1 deadline and the FHWA therefore began withholding location approval on federally sponsored road projects in Montana. In spite of the delay, the Montana Action Plan is reportedly further along than those from other states in this region.

No separate funding has been established for the administration of the Action Plan. All financial support will come from state and federal gas tax revenues that support the department's general operating budget.

The current project study notification letters sent by the department owe their wide circulation and environmental overtones to the Action Plan development process. What had begun as a strictly engineering document has now evolved into a solicitation for general environmental comment. This is probably the first and to date the only concrete accomplishment of the Action Plan process.

In the long run, the process is intended to avoid damaging environmental mistakes and social disturbances, and of course to save money. With the multi-interest, multidisciplinary input envisioned, the Action Plan would enable road builders to avoid conflicts with unstable geologic conditions, prime agricultural land, natural areas, and personal and community values and services and other factors that should be considered in highway building.

Department of Intergovernmental Relations

Implementation of SB 208

The Montana Subdivision and Platting Act (SB 208) was signed into law by the governor on April 2, 1973, and became effective on July 1, 1973. The act directs the Division of Planning and Economic Development, Department of Intergovernmental Relations (IGR) to prescribe minimum rules and requirements for local subdivision regulations and uniform surveying and monumentation standards by December 31, 1973. Before July 1, 1974 every Montana town, city, and county must adopt local regulations that meet these requirements. (See "Environmental Efforts in the 1973 Legislature," by Rick Applegate.)

The division was quick to enlist the aid of other state agencies to develop the content and review procedures for the environmental assessment required by the law. In early May each of the eight agencies represented on

the State Agency Review Committee was asked to identify the conditions under which it may wish to review a proposed subdivision, to identify specific objective information that must be provided by the subdivider to permit meaningful review and comment, and to suggest sources of information that will be required of the subdivider.

With the environmental assessment requirement of SB 208 and the Form ES-91 required by the Department of Health and Environmental Sciences (DHES) for its review of water, sewer, and solid waste aspects of subdivisions (see DHES Subdivision Regulation in this section), a subdivider would have to complete two separate forms for reporting on environmental aspects of a proposed subdivision for local and state review. The IGR staff therefore initiated a cooperative effort with DHES to combine the two forms into one document requesting information of mutual interest to both agencies and of particular interest to one or the other under their separate jurisdictions. This task has been accomplished and should result in substantial savings in time and paperwork.

The role of state agencies in reviewing environmental assessments prepared in accordance with the Montana Subdivision and Platting Act is explained in the following paragraph taken from a May 11, 1973 IGR memo:

The state agencies participating in the review process will not have authority to approve or disapprove subdivisions. They may recommend against a subdivision or suggest design changes which would reduce negative environmental and community impact. The agency review will provide state expertise and information to aid decision making on the local level. Agency review will assist county commissioners and county or city-county planning boards in their review of subdivision and preliminary plats. The reviewing agencies will, in essence, serve as consultants to local governments.

State agency comments on the environmental assessment should also be available to the public to provide for citizen review of the commissioners' decision. Agency comments and transcripts of public hearings on the assessment should be made available to DHES as early as possible. This procedure will help DHES decide whether to file a negative declaration or a draft environmental impact statement (EIS) and in many cases where a draft EIS is necessary this procedure may eliminate the need for a final EIS. It is inevitable that many state agencies will receive for review two documents assessing environmental impact of some of the larger, more controversial subdivisions. For other organizations and individuals, however, the EIS prepared by DHES shall be the only environmental report available.

With the 60-day decision time specified in SB 208 it will be impossible in many cases for DHES, given its obligation under the Montana Environmental Policy Act (MEPA) to prepare impact statements on subdivisions, to come to a decision on the adequacy of water, sewer, solid waste, and other environmental factors before the

subdivision is approved, conditionally approved, or disapproved by the local governing body. Since DHES will not participate in review of SB 208 assessments, and the local governing body and planning board will not have the benefit of such review, the decisions of the three authorities may occasionally be in conflict. The 60-day period under SB 208 is obviously too short to incorporate MEPA, considering the time required for drafting impact statements. The period for agency review can be effectively lengthened, however, by waiting to certify completeness of the assessment and starting the clock at the time it is received by IGR. The division has instead chosen to start the clock at the time of presentation, which shall be at least 15 days prior to the monthly meeting of the local planning board. This was done to avoid more frequent board meetings and will in effect give state agencies only three working weeks to review subdivision assessments.

In August the division prepared a discussion draft of model subdivision regulations and distributed copies to 85 agencies, organizations, and citizen groups for comment. In September the division held 10 seminars across Montana to discuss the regulations and the act. Over 600 copies of the discussion draft were distributed at those meetings. As a result of comments and points of view received during seminars and from reviewing agencies and organizations, the proposed rules were significantly revised.

On October 26 the division circulated proposed rules for the minimum content of local regulations, suggested model subdivision regulations, and a draft EIS prepared in compliance with MEPA. On November 26 the division will hold a public hearing in Helena and on December 14 it will file the revised rules with the secretary of state.

The minimum subdivision regulations, including the community and environmental assessments, are designed to guide local planning officials and to broaden the data base available to local governing bodies so that they may make more informed decisions. The regulations should result in a more uniform quality of development and help to prevent the haphazard and environmentally destructive type of subdivision now common in Montana.

Department of Natural Resources and Conservation

Energy Planning

To deal with the demand for Montana's energy resources and water and at the same time plan for future needs for these resources, the legislature passed the Utility Siting Act of 1973. Responsibility for its implementation was delegated to the Department of Natural Resources and Conservation (DNRC). The legislature showed foresight in providing an adequate level of funding for implementing this act through the energy producers' license tax and the substantial filing fee.

In July, the Division of Energy Planning was formed within DNRC. It is to be composed of an interdisciplinary staff of strong expertise that can deal with all the implica-

tions of energy planning—social, economic, and environmental. To date, only half of the staff positions are filled, which has limited the division's scope.

The division is involved primarily in administering the construction permit system of the Utility Siting Act. Eight applications for permits have been received so far, and of these, the five minor ones have been finished. The magnitude of the remaining three, however, is much greater and will take longer to process. These include a 230 kilovolt transmission line from Billings to Great Falls, the associated facilities for Colstrip projects 1 and 2, and the total facilities for Colstrip 3 and 4.

The division has nearly completed its first draft of proposed rules and regulations for implementing the siting act and expected to release them for comment sometime in November. It was hoped that the division might also suggest amendments to the siting act to improve and strengthen it, but limitations of staff and time have not allowed for this.

Other efforts by the division include information gathering for a total statewide energy gross plan. This plan would provide a long-range projection of the state's energy needs and capabilities for several decades. A computer data bank capable of handling the vast amount of information necessary to process the applications for construction permits is also in the planning stages.

The energy planning division is still very much in the embryonic stage and it is therefore difficult to assess its administration of the siting act. Perhaps its handling of the applications for the Billings-Great Falls transmission line and the Colstrip projects will provide a better means of judging its success.

The vast magnitude of the countless environmental factors inherent in the implementation of the siting act and in the comprehensive exploration of energy planning for the future imposes a tremendous responsibility on this young division. It is not enough to emphasize the significance of the expedient attainment of a broad, interdisciplinary staff with solid expertise. If the proficiency of the staff is less than that of the utilities, it is possible that the best interests of Montanans could be subverted. The responsibilities of the Division of Energy Planning are amplified severalfold in its consideration of the political, social, and economic factors within the delicate balance between energy use and the environment.

Department of Natural Resources and Conservation

Floodway Management

The regulation of land periodically flooded by streams or rivers is a troublesome problem throughout the United States. The 1971 Montana Legislature addressed this problem with the Floodway Management and Regulation Act, which instructed the Montana Water Resources Board to initiate a comprehensive program to delineate floodways for every watercourse in the state and to adopt rules,

regulations, and minimum standards for managing land use within the floodway. The 1973 legislature amended the act, making the 100-year flood (the flood magnitude expected to recur on the average once every 100 years) definitive for the floodway.

The board is further required to establish and record floodway-encroachment lines in the office of the appropriate county clerk and recorder, after holding a public hearing about the location of these lines. These lines represent the estimated outer boundary of the 100-year floodway and within these lines the local government having jurisdiction over the area is allowed one year to promulgate and institute regulations that meet or exceed the minimum standards adopted by the state. If at the end of a year the local government has not acted, the state standards go into effect and are enforced by the state until acceptable local standards are adopted.

The act stipulates types of land uses and activities to be permitted and to be prohibited within the floodway-encroachment lines. With regard to the latter uses, the board and the local government are authorized to issue permits allowing prohibited uses after considering factors outlined by the act. However, under the present state regulations, the board may refuse a permit regardless of local approval and in no case will the board grant a permit when the local government has refused to grant one.

The Floodway Management Bureau in the Water Resources Division of the Department of Natural Resources and Conservation is in charge of the technical aspects of implementing this act. The bureau has been gathering delineation studies undertaken by the Corps of Engineers, the Soil Conservation Service, and the U.S. Geological Survey, and preparing the state regulations and minimum standards. Presently, about 120 miles of floodway have been delineated and the bureau is holding its first hearings on floodway-encroachment lines this November.

The major delineation studies will require many years to complete. In the interim, various land uses — subdivisions in particular — are and will be encroaching on floodplains. Recognizing the timeliness and significance of this problem, the chief of the Floodway Management Bureau has offered his staff's technical services to the Department of Health and Environmental Sciences (DHES) and the Division of Planning and Economic Development (PED) in the Department of Intergovernmental Relations to delineate the 100-year floodplain on a subdivision by subdivision basis. Use of the staff's capabilities will enhance the efforts of the two agencies to implement HB 465 and SB 208, respectively.

Subdividers of land within 2,000 feet of a perennial stream that has not had an official floodway delineation study will be required to supply to DHES and PED four stream channel cross-sections, a water surface profile, and other pertinent information on the stream reach involved. Using a computerized methodology supplied by the Seattle District Office of the Corps of Engineers, the Floodway Management Bureau will calculate the estimated water surface

elevation at that stream reach during the 100-year flood. With this information the floodway-encroachment lines can be delineated and employed in evaluating the proposed subdivision with regard to the Floodway Management and Regulation Act, and other relevant legislation.

Montanans have long occupied the floodplains because they have found them profitable and convenient places to live. But this occupancy has been at a high cost in terms of necessary protection and unpredictable catastrophe. The Floodway Management Act is designed to bring more harmony into this struggle with nature by reserving the floodways for open-space purposes such as recreation and agriculture. Diligent implementation of the act will diminish the conflict as well as the costs of protection and avoid threats to life and property.

Department of State Lands

Reclamation

The authority, responsibility, and regulatory tools given the Reclamation Division of the Department of State Lands increased significantly during the 1973 legislative session.

The Montana Strip Mining and Reclamation Act (SB 94) charges the department with regulation of all exploration, mining, and reclamation of operations involving coal, clay, phosphate rock, and uranium. The department is faced with the evaluation of several applications, since contracts under previous reclamation laws will be cancelled this December. By then, the companies now operating in Montana must be in compliance with the new law.

The Strip Mined Coal Conservation Act (SB 404) requires that the department evaluate each operation to determine if the operator is recovering all coal economically feasible to surface mine that is suitable for sale in the usual course of trade.

The Open Cut Mining Act (SB 403) requires that the land department enter into reclamation contracts with all sand, gravel, and bentonite operations removing 10,000 cubic yards or more of material. Moreover, recent increases in the price of gold and other locatable minerals have required the department to evaluate hundreds of small mine applications under the Hardrock Act of 1971.

At the time of this writing, the Reclamation Division had not significantly increased its staff beyond the pre-legislation level. The division now consists of seven people with expertise in wildlife, forests, forest ecology, mining engineering, mining geology, and range management. This probably does not constitute an interdisciplinary staff of sufficient breadth to effectively deal with the array of technical and administrative problems imposed by the new legislation. The department has indicated, however, that a soils scientist, a hydrologist, and possibly other specialists will be added soon. The Reclamation Division budget for this biennium apparently includes funding for several new positions. For fiscal

years 1973-74 and 1974-75, \$215,000 and \$225,000 respectively were appropriated to the division. Expenditures for fiscal year 1972-73 totaled about \$98,000.

An intradepartmental reorganization with formation of a Staff Services Division resulted in some personnel shifting and possibly a slight increase in total man-hours available to the Reclamation Division. Staff services is charged with writing environmental impact statements, thereby removing most of that load from the Reclamation Division, and handling all of the legal problems.

Reclamation in the northern Great Plains is still in its infancy, and Montana must be aware of the course of events that has occurred in other mining states. Strong laws have been passed but often have not been stringently enforced. This must not happen in Montana. Solid interdisciplinary expertise will enable the Department of State Lands to cope with pressures from interests regulated by the law. Further the department will need the administration's full support which in turn depends on widespread public insistence on stringent enforcement. The ultimate effectiveness of the new reclamation statutes rests with the resolve of the people.

Department of Highways and Department of State Lands

Sarpy Creek Rail Line

Events leading to the approval of easements for rights-of-way for the Burlington Northern (BN) rail line construction along Sarpy Creek illustrate problems of agency compliance with the procedures and policies of the Montana Environmental Policy Act (MEPA) when agency approval or jurisdiction is restricted to a limited aspect of a major project.

The rail line originates near Sanders, Montana, about five miles east of Hlysham, in Treasure County, and extends south for 36 miles to the proposed site of Westmoreland Resources coal mine in Big Horn County.

The construction involves grading and track placement by BN and its contractors over the 36-mile route. Rights-of-way claimed vary from 100 to 275 feet in width. The alignment as proposed crosses old U.S. 10 as well as secondary and county roads at five locations at grade. The proposed line also crosses Interstate 94 with a grade separation.

Current mining plans anticipate start-up traffic from the mine at one, 110 unit car train each way five days a week. Contracts for coal have been signed with four utilities to supply 76.5 million tons of coal over a 20-year period. The coal reserves proposed for mining have been leased from the Crow Indian Tribe. These reserves total 34,000 acres. An ad by Westmoreland Coal Company in the April 3, 1972 issue of U.S. News and World Report stated that the company had amassed an estimated one billion tons of surface mineable coal in eastern Montana for gasification and electrical generation.

On February 10, 1972, Department of Highways and BN representatives met in Billings. During the discussion the proposed construction plans for the Sarpy Creek line were mentioned with a print describing the Interstate 94 crossing presented to the highway department. This meeting was followed up by a February 25, 1972 letter that officially set in motion the Department of Highways procedures for the consideration of easements (1). In addition to the BN declaration of intent to construct, maps describing the proposed trackage route and proposals for railroad crossings were presented. A desire to maintain confidentiality was expressed in the BN letter:

"We do not desire to publicize our proposed track construction as yet since the right-of-way must still be acquired. However, since our schedule for completion of this track is tight, we must initiate action with the State at this time for approval of the proposed railroad-highway crossings."

The BN desire for confidentiality was in direct conflict with the duty of the highway department to give full disclosure under MEPA requirements.

In a memorandum to the files, the Department of Highways found that the several crossings of highway right-of-way "will have no significant effect upon the quality of the human environment." The memo does concede that "in the areas of the grade crossings, the environment might be considered to be affected due to the added hazard to the traveling public." Assessment of this hazard by the Department of Highways concluded that with the proper warning and signal devices, the hazard should be minimal. It was further concluded that because the project was totally financed and undertaken by BN that "any adverse effects on the environment caused by this project should be taken into account at the time the ICC (Interstate Commerce Commission) approves construction of the new track because the involvement with highway right-of-way is but a small fraction of the railway's total involvement with the environment."

In view of this position, progress toward granting the easement was made when an agreement on the provisions of the Interstate 94-Sarpy Creek Rail Line crossing easement was obtained on April 7, 1972.

On the same day Representative William Christiansen, now lieutenant governor, inquired during an EQC meeting whether an environmental impact statement (EIS) would be required under MEPA inasmuch as an easement to cross state lands would be required from the Department of State Lands. Subsequent to the discussion the EQC director was asked by the EQC to confer with the Department of State Lands and notify it that issuance of the desired easements should be preceded by the preparation of an EIS under the provisions of MEPA. This was done on April 10.

On August 23, 1972 the Department of State Lands received an application from BN for easements across two sections of state school lands. In a September 22, 1972 letter from the state lands department, the EQC was notified that an easement application had been received.

That letter also stated that preliminary assessments of the impacts to state lands attributable to the rail line indicated minimal adverse influences. It was noted, however, that the rail line had much greater significance in its secondary influences — "The rail line is a necessary preliminary to a mining development, which is undoubtedly predicated on a market demand, which in turn may well have some relationship to a national energy crisis, real or imagined." The letter requested further clarification of the extent of review expected by the EQC of the Department of State Lands. This request was made with particular reference to EQC criticism of the manner in which a similar easement application (Montana Power Company application for an easement for the Missoula to Hamilton Bitterroot power transmission line) had been handled.

On September 28 the EQC advised the Department of State Lands that although an exhaustive examination of the total impact of Montana coal development was not expected, the EIS should address not only the specific action in question but also its cumulative impacts.

An alternative that might relieve the Department of State Lands from bearing the entire burden for preparing an EIS was discussed in the letter. This option rested on the contention that the ICC must file EIS's on its permit actions for construction and operation of rail lines. This contention was subsequently conveyed to the President's Council on Environmental Quality through a letter from the Montana Coal Task Force that stated:

"Your assistance is solicited in establishing the policy that any Federal permit, license, or official approval of railroad extension, spur, upgrading, or other construction in relation to Montana's coal fields be preceded by an environmental impact statement from the Interstate Commerce Commission as required by the Environmental Policy Act of 1969."

The letter further requested that the substance of such an EIS not be confined solely to the impact of the railroad bed but that it consider the secondary impacts of the developments served.

However, receipt of the easement application by the Department of State Lands was preceded by receipt of plans for the rail line development. The department, recognizing the controversy surrounding coal development, requested an environmental analysis of the proposed action, which was submitted on June 20, 1972. This impact analysis was rejected by the department as inadequate. BN was directed to prepare a second draft. This draft was circulated for comment on October 5, 1972 and resulted in the preparation of a third environmental impact analysis that was appended to the Department of State Lands draft EIS and released on December 1, 1972. The next day, the department received the order issued by federal court in condemnation action taken by BN against Sarpy Creek landowners, Montana C. Garverich and Leslie Criswell. The court found the Sarpy Creek line to be an industrial spur and not a line extension, and therefore not subject to ICC approval. The order further found that the use for which the railroad sought the property was a public

use and that the taking of the property was "necessary" within the legal definition of that term.

During the course of the state lands department's consideration of the BN easement application, the Department of Highways issued an easement to cross under Interstate 91. Construction of the rail bed was consequently commenced along much of its length. In the draft EIS the Department of State Lands, in response to this agency action, stated:

The Department of Highways, the lead agency, did not think this action significant enough to require an impact statement. Since there is no state control over routing of rail lines, both this Department and the public are now confronted with a fait accompli. The line is being constructed NOW and any assessment of its impact is fundamentally a justification or description of action resulting from a decision that has already been made.

In view of the above statement and upon consideration of the matter during the Land Board meeting of February 20, the easement to cross state lands was issued.

With grade construction progressing, construction of the railroad bed across Montana Secondary Highway 415 south of Sanders began. In response to this action the Treasure County commissioners and the Board of School Trustees for the Hysam Public Schools filed suit in district court on December 4, seeking an injunction against BN, Joe Mayo and Sons, Inc., and Morrison-Knudsen, Inc. from building, constructing, or erecting any road bed grade or fill over any public road in Treasure County, Montana until such time that they shall have a legal right to do so.

This petition rested on the facts that the Montana Secondary Highway No. 415 and the public roads intersecting and coterminous with it would be crossed seven times by the proposed rail line and that Secondary Highway 415 and the other public roads are within the governmental jurisdiction of the county commissioners.

The complaint contended that BN and its contractors in the second week of November began to grade and fill over a county road, creating a hazardous condition, "likely to produce grievous bodily harm to the traveling public and the school children riding school buses, and others lawfully using said public roads." The complaint continued that unless the railroad and its contractors were enjoined, roadbed fills and grade would be constructed over the same public road and other public roads in Treasure County, creating hazardous conditions. The temporary enjoining order was issued on December 6, 1972 with the railroad and its contractor ordered to appear in court on January 23, 1973 to show cause why the temporary restraining order should not be made permanent.

The action resulted in the railroad's agreement to install electronic signal devices on three of the railroad crossings and the elimination of two crossings by route relocation.

On March 12, 1973 the Department of Highways asked the EQC whether the department should proceed with

the granting of the easements across highway properties in view of the action taken by the Department of State Lands after preparation of the EIS. The EQC replied that there was no obvious further reason to delay granting the easement considering that construction had progressed to where further evaluation would be after-the-fact and therefore futile. The letter continued:

Evaluation of the environmental impacts of the Sarpy Creek line should have begun over a year ago when the BN in their letter of February 25, 1972 initiated action with the Department to acquire an easement for crossing Highway 94. This was not done. A number of secondary adverse consequences which could have been identified in an environmental impact statement initiated at that early date and possibly prevented were the result. Among these were the crossing problems which necessitated suit by Treasure County and the apparent encroachment of the Sarpy Creek flood plain by the rail line.

The Department of Highways was then advised that in future cases where other developments like the Sarpy Creek line that are subject to the Utility Siting Act are at issue and will cross highways, the Department of Highways could be lead agency.

In a response to the EQC the Department of Highways again contended that the issuance of an easement is not a significant action requiring the preparation of an EIS.

The final statement of EQC stance was set forth in an April 10 letter that stated that in general the council concurred with the opinion that issuance of an easement is not a major action within the definitions of MEPA. However, in cases where granting on an easement clearly results in cumulative or secondary adverse impacts of significance EIS shall be prepared.

The Sarpy Creek case seems clear. The Department of Highways committed the state to a course of action with secondary environmental consequences so significant that the people of the area had to seek court action for relief. No other state agency had the jurisdiction or the expertise

to evaluate the engineering and safety of the several crossings of the line which became possible through the granting of the easement across Interstate 94. The highway department did concede that the environment might be affected, but this was acknowledged only in a memo to the files, which was not publicly disclosed. An environmental impact statement would have provided the necessary disclosure.

Examination of this case study leads to several conclusions.

A basic problem in the Sarpy Creek case was the lack of comprehensive jurisdiction on the part of any state agency. Since the ICC lacked jurisdiction and therefore responsibility under NEPA for environmental review, it fell to state agencies frustrated by limited jurisdiction to implement MEPA. One agency, Department of Highways, should have been the lead agency but failed to issue an EIS on its key enabling action of granting an easement across the interstate right-of-way. The other, Department of State Lands, made the effort, but too late to do more than discuss a project already underway.

If the environmental impact review process had been implemented at the earliest possible moment by the involved agencies and the draft EIS promptly circulated to other state agencies, the two county governments, and the public, it should have been possible to foresee and forestall some of the adverse consequences of the project such as the suit arising from failure to provide crossing safety and encroachment on the floodplain of Sarpy Creek.

The Montana legislature has established a policy of comprehensive review of one category of major construction projects by its passage of the Utility Siting Act. The same policy should be extended to projects like the Sarpy Creek railroad, major pipelines, and aqueducts not covered by the Utility Siting Act. Effective review could be accomplished and the public interest much better served.

Literature Cited

Personal communications with Mr. R. C. Holmes, Manager, Utilities Unit, Montana Highway Commission, Oct. 9, 1973.

Recommendations

Legislation

Following are the Environmental Quality Council recommendations adopted on September 14, 1973:

1. A Geothermal Resources Act.

As the quest for new and untapped sources of energy accelerates, there will certainly be greatly increased activity in the search for geothermal energy. Exploration and research into technique has already begun experimentally at Marysville.

Several sister states have enacted statutes that pertain to the regulation and control of extracting geothermal

resources. Montana should enact its own "Geothermal Resources Act," which would give authority to the Department of Natural Resources and Conservation to promulgate and issue rules and regulations to control the exploration, drilling, re-drilling, deepening, and abandonment of wells for the discovery and production of geothermal resources.

2. A law to protect Montana's "natural areas."

A natural area is primarily affected by the forces of nature, where human intrusion is not a dominant feature. Such areas are in peril of being destroyed or substantially diminished by misuse and/or overdevelopment. An orderly system for preserving and protecting such lands

is needed to assure that such lands will retain their natural ecosystem integrity.

The natural areas law would require the Department of State Lands to inventory state lands to determine areas for possible protection. The statutory authority for including state lands as natural areas is Title 81, Chapter 1, Section 81-103, R.C.M. 1947, as amended.

“... the guiding role and principle (in the management of state lands) shall be that these lands ... are held in trust for the support of education and for the attainment of other worthy objects helpful to the well being of the people of this state.” (Emphasis ours.)

The Department of State Lands would recommend to the legislature certain state lands for designation as natural areas (giving those lands administrative protection), and the legislature would designate certain areas (ensuring further protection). In defining a natural area, the legislature should ensure that sufficient flexibility is utilized so that such areas will not be foreclosed from many possible uses, natural areas need not be defined as areas of total preservation. Private lands could also be designated as natural areas if the landowner so desired. In no event would condemnation be used as a means of acquiring natural areas lands, except in the case of special legislative action.

The enactment of such a law would make natural area preservation a matter of official state policy. Such a system would be distinct from the state park system, emphasizing natural values and their protection over other uses, including recreation. In light of the astonishing rate of development in Montana today, it is urgent that Montanans honor the trust by which they are bound to future generations and set aside certain natural areas.

3. Amendment of the Stream Preservation Act (Title 26, Chapter 15, R.C.M. 1947, as amended) to apply to private alterations of stream shape, form, or course.

The present law regarding stream alteration speaks only to the actions of agencies of state government, counties, municipalities, and other subdivisions of the state. Because private activities can have adverse impacts of equal significance to those actions of public agencies, the law should be amended to extend the existing Department of Fish and Game authority to include private alterations of watercourses. The law should cover all private stream alterations with an exception for minor projects that do not seriously affect stream quality.

4. Amendment of county interim emergency zoning procedures to provide for public notice, hearing, and appeal procedures.

Interim zoning is important in the implementation of land use planning. It is certain that sometimes unforeseen circumstances will arise and will need swift, but organized response. There must be procedures to adequately protect the rights of parties involved.

Section 18-4711, B.C.M. 1947 (county interim zoning regulation) should be amended to provide for public notice,

hearing, and appeal procedures as related to the counties' emergency zoning authority.

5. The Resource Indemnity Trust Fund should be irrevocable.

The Resource Indemnity Trust Fund, created by HB 97 (Ch. 197, Laws of 1973), should be made irrevocable by amending Article IX, Section 2 of the Montana Constitution. Giving the trust such status would permanently allow it to fulfill its intended function of recompensing for damage to Montana's natural resources. The idea of an indemnity implies "holding harmless," and this concept relates quite consistently with other constitutional provisions (Art. II, Sec. 3, Art. IX, Sec. 4 and 2) dealing with the environment.

Hold-over HB 576 would submit to Montana electors an amendment to the constitution that would elevate the Resource Indemnity Trust Fund to constitutional status. This bill is hereby endorsed, and should be enacted.

6. A tax on sulfur emissions.

Pricing programs are a fiscal means of achieving a desired state of environmental quality. Such programs charge (or tax) the polluter for each unit of unwanted emission. As opposed to methods of governmental regulation, or subsidies (which in some way positively award polluters for reducing emissions), pricing is a direct attack on the external diseconomies of pollution resulting from breakdowns in the market system. The underlying principle of an emissions tax is clear. "If you charge a person for disposing of his wastes, he will find ways to reduce the amount of wastes he disposes of, and the more you charge him the stronger the incentive he will have to find some less damaging method of disposing of his waste."

A tax on sulfur emissions would internalize the costs of such pollution; the polluter would be paying a per unit fee directly related to the extent of his pollution. Businesses thus taxed could respond in whatever way their business judgment dictated. They could change fuels of production methods, install pollution control devices, pass the cost on to consumers, pollute only at certain times, pay the price, or mix any of these choices. In any event, the human environment would not be suffering without at least some compensation.

7. Reclamation on public and private lands.

The Montana Constitution (Art. IX, Sec. 2) provides: "All lands disturbed by the taking of natural resources shall be reclaimed...." Hold-over SB 387 would amend the constitution to limit the reclamation provision to public lands.

It is clear that contemporary land management practices are oriented toward reclamation even on private land. Moreover, the considerations raised by SB 387 were debated prior to the adoption of the constitution and represent a consensus. We recommend the defeat of SB 387.

8. A pollution disclosure law.

A pollution disclosure law would lessen the burden of state agencies in keeping track of effluents emitted by commercial processes by requiring all businesses responsible for

effluents and emissions that affect environmental quality to file data on pollutants at regular intervals. The data would concern effluents and emissions, business efforts at pollution abatement, and business research activities in pollution control. Monitoring would be initiated at all effluent and emission sources. State agencies would be able to spot-check sampling methods and equipment. To ensure full compliance, appropriate sanctions would be imposed on all businesses that did not meet these requirements.

9. Critical areas protection.

The development of certain areas possessing historical, cultural, or aesthetic values or of natural systems performing functions of more than local significance can often result in severe and irreversible damage ranging from a decrease in value and utility for public purposes to an unreasonable endangering of the human environment.

Legislation is therefore needed authorizing an appropriate agency to identify such areas of critical environmental concern and to provide for their protection by preparing plans and generating standards that would ensure that these critical areas are not abused. The identification and protection process should be continual, with close review at appropriate intervals.

10. A forest practices act.

State and private forest lands make a vital contribution to Montana. They maintain forest ecosystems by providing wildlife and aquatic life with habitat as well as providing jobs, products, and other economic and social benefits. Legislation is needed to regulate the manner in which this essential resource is managed and utilized.

The law should establish standards for practices on forest land relating to reforestation practices, road construction and maintenance, commercial harvesting of trees, disposal of slash, and the use of chemicals and fertilizers. Moreover, the law should include sanctions for violations and other abuse.

11. State lands should be classified in accordance with the multiple use concept.

Since the Department of State Lands classifies state lands and directs how they are to be managed, the legislature should specifically direct such classification to be undertaken in accordance with the multiple use concept embodied in Section 81-103, R.C.M. (1947), as amended in 1969. Multiple use management ensures that the resources of state lands are utilized in that combination which best serves persons using the land while also working for the beneficiaries of the state land trust, the citizens of Montana.

The present method of classifying state lands is by reference to a list of specifically permissible land uses. The problems with this method are that no other types of uses are permitted (other than those listed), and no combinations of use are permitted. This results in administrative inconsistencies as well as undue restrictions that do not maximize the potential of the land.

Multiple classification makes the most judicious use of the land for some or all of those resources over areas large enough to provide sufficient latitude for periodic adjustments to adapt to changing needs and conditions. Multiple use land management coordinates the use of various resources, each with the other, and guards against impairment of the land's productivity. Proper multiple classification will be beneficial since valuable grazing and agricultural land, historical areas, game management and hunting areas, fishing access areas, and watershed and erosion prevention areas can be managed in order to coexist productively and environmentally sound harmony.

12. An environmental protection act that would give to any legal entity the right to sue and to intervene in administrative proceedings in order to protect environmental quality.

Legislation is needed to enable interested parties to enforce their legal rights to a clean and healthful environment. This concept would enable state agencies to have another tool for enforcing the environmental laws for which they are responsible. Moreover, private parties with no other practical remedies could intervene in those cases where state agencies, because they are either unable or unwilling, cannot or will not act.

Argument has been raised that such a law would open the floodgates for many frivolous suits, clogging the courts and consuming the time of agencies. These fears are probably unfounded. Litigation is a serious, costly business and not something undertaken lightly. If the plaintiff wins, he should be awarded in terms of bringing the environmentally offensive action to a halt, in addition to costs. There would be actual or exemplary damages only to the extent the plaintiff is actually harmed (for actual damages) and only if the court finds defendants' actions were willful (for exemplary damages). Under these conditions, few, if any, would lightly undertake litigation. Finally, Michigan (which has such an act) has found that, in three years experience, any fears of agency harassment and of courts flooded with frivolous suits have proved to be baseless.

13. Amendment of the Clean Air Act of Montana to enable the Department of Health and Environmental Sciences to regulate pollution abatement equipment at the earliest possible time.

The Department of Health and Environmental Sciences' authority to control facilities that have pollution potential should be extended. This can be achieved by amending Section 69-3911, R.C.M. 1947 to ensure that such facilities are regulated at the earliest possible time — before construction of the facility is begun. The department's action cannot be effective if it must wait until a building is constructed (necessarily) after all pollution abatement equipment decisions have already been made. While this is especially important for new facilities, it is also critical in the areas of modification and re-design of existing facilities.

14. Enactment of speed limits to achieve energy conservation.

As an emergency energy conservation measure, Governor Judge will seek to have legislation introduced that would, upon a determination by him that a gasoline and/or diesel fuel shortage exists, enable him to declare an emergency fuel shortage. In such case, speed limits on Montana roads would be lowered to 50 miles an hour for a period of up to 90 days. If the emergency prevailed, there could be additional periods (90 days each) of reduced speed limits.

It has been clearly established that vehicles traveling at high speeds consume considerably more fuel than vehicles traveling at lower speeds. If there should be a fuel shortage, reducing speed limits would plainly reduce fuel consumption. Therefore, such legislation is endorsed.

15. A Shoreline Protection Act.

The recommended act would balance construction of shoreline developments with a program of preserving the distinctive natural values of rivers and lakes. Such a law would regulate the construction of bulkheads and dredge and fill projects, moreover, it would direct the Department of Natural Resources and Conservation to adopt shoreline regulations.

It is of great importance that the ecologically fragile land-water edge be protected. This zone of contact is particularly significant for both the species it supports and for its contribution to water quality.

16. Enactment of a scenic waterways law.

An act of this type is an effort to maintain various aspects of free-flowing rivers and important lakes. These include scenic, historic, archaeological, and recreation values, fish and wildlife habitat, and botanical and other conditions. Various classification categories can be established to permit appropriate and flexible management of diverse waterways. These range from areas of strict preservation to areas of environmentally compatible development. Procedures for classifying waters in a more highly protected status once they are restored should also be included.

17. Enactment of a law that would establish a statewide building code to be administered by an appropriate state agency.

In light of forthcoming important decisions relating to land use and energy policy, the need for statewide minimal uniformity in building codes is obvious. Factors complicating construction include various laws, ordinances, rules, regulations, and codes regarding the construction of buildings and the use of materials in those buildings. Many requirements are obsolete and unnecessarily complex. They serve to make construction more complex without providing correlative benefits or safety to builders, tenants, and users of buildings.

Besides establishing reasonable safeguards for the health and safety of building occupants, the law should promote the conservation of energy by encouraging the use of modern methods and techniques of building and insulation

Programs

The Environmental Quality Council recommends

1. That the federal government be urged to comprehensively investigate future transportation priorities, particularly as they affect Montana.

The state's present and future transportation needs are changing. In particular, it is not clear just what role railroads will play in the total picture of future transportation trends. Since this is so, it may be unwise to continue the practice of destroying presently unused or little-used rail facilities until full assessment has been made of Montana's projected needs. There is presently no federal activity in this area, although representatives of the Department of Interior have acknowledged that the problem deserves serious study and consideration.

A resolution from the legislature should be presented to the chairman of the Interstate Commerce Committee as well as to the chairmen of the commerce committees of both houses of Congress urging that a comprehensive investigation of future transportation priorities, particularly as they affect Montana, be undertaken.

2. That the Office of the Superintendent of Public Instruction prepare a state master plan for environmental education for presentation to the 1975 legislature.

An imperative for success in protecting and rehabilitating our environment is an informed awareness of the interrelationships of the social, economic, cultural, aesthetic, and biophysical aspects of life. Essential to inculcating such awareness is the inclusion of environmental education in the curricula at all levels of public instruction.

The superintendent of public instruction should prepare a master plan for statewide implementation of environmental education as an integral part of the public school system. The plan should include public affairs education, informal as well as formal education, and continuing adult education. The master plan should be presented to the 1975 legislature and revisions should be presented at each subsequent session. The plan should stress how the environmental ethic crosses the traditional disciplinary boundaries.

3. That the Department of Health and Environmental Sciences (DHES) be granted additional funding to assist that department in meeting increased responsibilities in the review of sanitary qualifications of proposed subdivisions.

The passage of HB 465 in the 1973 session greatly increased the scope of DHES involvement with proposed subdivisions of land. Under 465, the department is required to review the sanitary plans and specifications of proposed subdivisions prior to filing of the plat for the subdivision with the county clerk (a county clerk may not accept a plat for filing unless and until all sanitary restrictions have been removed by the department).

In some areas of intense development, the department maintains a district office with experienced personnel

available to deal expeditiously with situations arising in the local area. The department should expend a substantial part of any additional funding on the establishment and staffing of new district offices in areas of intense subdivision activity to help alleviate the administrative burden of subdivision review.

4. That a comprehensive erosion and sediment control program be established.

Provisions that deal broadly with controlling damage that is occurring in connection with the large-scale expansion of land-disturbing activities within the state should be made. Existing land use errors have caused and continue to cause and contribute to serious soil erosion problems in Montana, and now is the time to conserve soil resources, control erosion, and prevent flood water and sediment damages from aggravating the present situation.

5. That an interagency environmental monitoring committee be created.

This recommendation involves creation of an interagency environmental monitoring committee that would standardize and coordinate federal and state environmental monitoring. In effect, the committee would define parameters to be measured, standardize methods of observation, coordinate programs, provide data storage and dissemination systems, attempt to eliminate duplication of effort and unwanted omissions, and coordinate with federal monitoring.

It is believed that the governor is going to expand the functions of the Montana Energy Advisory Council (MEAC) to include coordinating interagency environmental procedures. Such action is commended and endorsed.

6. That a state bikeways policy be developed.

An awareness of the bicycle's ascending popularity in utilitarian as well as recreational aspects is not new to Montana. Bike clubs have sprung into existence across the state, and at least one city (Missoula) has a bikeway plan awaiting implementation.

All indications are that the past decade's doubling of bicycle use points toward a more balanced national and local transportation system. Montana, of necessity, must provide and encourage opportunities for safe bicycling. The Department of Highways should explore the potentialities of such a state bikeways program.

7. That a scenic highways program be investigated.

It is recommended that the Department of Highways investigate the possibilities for designating certain Montana highways as "scenic roads." Once so designated, they could not be altered except after public hearings and pursuant to standards promulgated by the department. The highway department should also explore the development of the "Scenic Highways Program" for Montana to prevent overdevelopment of the state's highways, provide opportunities for scenic enjoyment and recreation, and promote energy conservation.

One of Montana's priceless heritages is her scenery and rural landscape, and increasing numbers of citizens wish to preserve and maintain these resources. The scenic quality of many roads cannot be maintained if they are widened, straightened, or otherwise altered to accommodate higher speeds or greater volumes of traffic that, because of fuel shortages, may or may not become a reality. Furthermore, safety will not be sacrificed because of low traffic volume and speed.

8. That the Department of Highways re-evaluate highway reseeded practices and seek new ways to employ safer and more ecologically sound practices in the future.

Present reseeded practices have, in some respects, failed to accomplish their purposes and in other ways raise serious questions about the efficacy of the program in general.

In many cases sod cover on areas disturbed by highway construction has not been established. On many roads, unvegetated rights-of-way invite the incursion of weeds. Some roads have excessively steep borrow pits that are both ecologically unsound and of questionable safety.

This is an area that needs a thorough review. Matters that require deliberate attention include topsoil conservation and reclamation in connection with all highway projects; exploration of the safety or hazard features of borrow pits; exploration of grading of borrow pits from an ecological point of view (best methods of minimizing weed invasion and erosion, and possibilities of maximizing productivity perhaps by planting a leasable crop), and consulting with and advising county commissioners regarding their responsibilities for reseeded practices on county roads under Section 32-2813, R.C.M.

Appendix A

Biographies

Members of Environmental Quality Council and Executive Director

Elmer Flynn, chairman of the Environmental Quality Council (EQC), was born in Missoula and is now a rancher near that city. He is a Democratic state senator. In the 1973 session he was chairman of the Public Health, Welfare, and Safety Committee, vice-chairman of the Committee on Committee, and served as a member on the Labor and Employment, Natural Resources, and Rules Committees.

Thomas O. Hager, vice-chairman of the Environmental Quality Council, was born in Minneapolis, Minnesota. He attended Billings public schools and Montana State University. Hager, an egg producer in Billings, is a Republican state representative and served in the 1973 session on the Agriculture, Livestock and Irrigation, and Fish and Game Committees. He is a member of the Montana Egg Council, Northwest Egg Producers, and United Egg Producers.

A. L. (Bud) Ainsworth was born in Webster City, Iowa, but is a long-time Montana resident. He attended Thompson Falls public schools and Stanford University and graduated from the University of Montana. He has been a Republican state representative since 1967. In the 1973 session, Ainsworth served on the Constitution, Elections and Federal Relations, and Natural Resources Committees. The Missoula resident is a retired retail druggist, a member of the Board of Trustees of the Missoula City-County Library, and a past member of Interlocal Co-op Commission, Missoula County.

Dorothy Bradley, a Democratic state representative, was born in Madison, Wisconsin. She came to Montana in 1950 and attended Bozeman public schools and Colorado College in Colorado Springs. Bradley, a student of anthropology, lives in Bozeman. In the 1973 session she served on the Education and Local Government Committees, and was vice-chairman of Natural Resources Committee.

G. Steven Brown, the governor's designated representative on the EQC, was born in Corvallis, Montana. He graduated from the University of Montana in political science and from the George Washington University School of Law with honors. Brown was awarded an Environmental Law Fellowship from the George Washington University School of Law in 1972. While attending law school at George Washington University, Brown served for two years as a legislative assistant to Senator Mike Mansfield. He is now legal counsel on the governor's staff and was admitted to practice law in Montana in October 1973.

George Darrow of Billings is a geologist and resource consultant with degrees in economics and geology from the University of Michigan. Darrow was a Republican state representative from Yellowstone County for the 1967 and 1971 sessions, sponsoring the Water Resources Act, the Floodway Management Act, and the Montana Environmental Policy Act. In the 1973 session Darrow was a state senator from Yellowstone County and served on the Agriculture, Livestock and Irrigation, Natural Resources, and State Administration Committees. Darrow was EQC chairman from 1971 to 1973 and was reappointed as a member of the Senate in 1973. He is the recipient of the 1971 Hilliard Award for outstanding environmental achievement presented by the Rocky Mountain Center on the Environment. He is a member of the American Institute of Professional Geologists, the Geological Society of America, the American Water Resources Association, and a Fellow of the American Association for the Advancement of Science.

Larry Fashbender was born in Great Falls. He attended the University of Montana law school, and graduated from Gonzaga Univer-

sity in philosophy. The Fort Shaw resident is a Democratic state representative and has served since 1967. In 1973 he was House majority leader and as such was an ex-officio member of all committees. He is a farmer-businessman.

Thomas J. Lynaugh is a Billings attorney. He has lived in Montana since 1970. Lynaugh was born in Teaneck, New Jersey, where he attended public schools. He is a graduate of Manhattan College, New York City, and Boston College Law School. Lynaugh is a member of the American Bar Association, Montana Bar Association, and the District of Columbia Bar Association. He is a reservist in the National Guard.

Harriet (Mrs. Donald) Marble was born in Petersburg, Virginia, and now lives in Chester. She came to Montana in 1964, having earned degrees at Cotter College and Muskingum College. She also holds bachelor's and master's degrees in wildlife management from the University of Montana. Marble is a member of the League of Women Voters, the Wilderness Society, and the Montana Wilderness Association.

George McCallum was born in Conrad and now lives in Narada, where he is a rancher and Christmas tree operator. He served as a Republican state senator in 1971-73. In the 1973 session McCallum served on the Agriculture, Livestock and Irrigation, Education, Fish and Game, and Natural Resources Committees.

Gordon McGowan was born in Great Falls and has been a lifetime resident of Highwood where he is a rancher. He attended public schools in Highwood. He has been a Democratic state senator since 1955. In the 1973 session he served as vice-chairman of both the Business and Industry, and Natural Resources Committees. He was a member of the Highways and Transportation and Taxation Committees.

Calvin S. Robinson was born in Kalispell where he practices law. He attended the University of Montana, University of California, and University of Washington and has a law degree from the University of Michigan. He is a member of the Northwest Montana Bar Association, Montana Bar Association, Illinois Bar Association, American Bar Association, and American Jurisprudence Society. Robinson served in the U. S. Navy from 1942 to 1945.

William G. Walter is department chairman and professor of microbiology at Montana State University. He was born in Lake Placid, New York and came to Montana in 1942 after earning bachelor's and master's degrees from Cornell University. He later received his doctorate at Michigan State University. Walter is a member of the American Society of Microbiology, which awarded him the Curski Distinguished Teaching Award in 1973. Walter is also a member of the American Public Health Association and the National Environmental Health Association, which awarded him the Mangold award in 1972.

Fletcher E. Newby, EQC executive director, was born in Eagle, Wyoming and has spent most of his life in Montana. He has a bachelor's degree in wildlife technology from the University of Montana and a master's degree in wildlife management from Washington State University. Before his appointment as executive director, he was supervisor for the Department of Fish and Game in Billings. Newby had previously served in the same agency as state big game manager and state game manager. While in Billings he was deeply involved in Montana's environmental concerns and originated such innovative proposals as state recreational waterways. Newby's major research work, particularly interest has been in natural gas, oil, and uranium environment. He has authored or co-authored many papers on the geology of Montana.

Appendix B

Montana Environmental Policy Act

PUBLIC HEALTH AND SAFETY CHAPTER 65 — MONTANA ENVIRONMENTAL POLICY ACT

Section

- 69-5501 Short title.
- 69-5502 Purpose of act.
- 69-5503 Declaration of state policy for the environment.
- 69-5504 General directions to state agencies.
- 69-5505 Review of legislative authority and administrative policies to determine deficiencies or inconsistencies.
- 69-5506 Specific statutory obligations unimpaired.
- 69-5507 Policies and goals supplementary.
- 69-5508 Environmental quality council.
- 69-5509 Term of office.
- 69-5510 Meetings.
- 69-5511 Appointment and qualifications of an executive director.
- 69-5512 Appointment of employees.
- 69-5513 Term and removal of the executive director.
- 69-5514 Duties of executive director and staff.
- 69-5515 Examination of records of government agencies.
- 69-5516 Hearings by council — enforcement of subpoenas.
- 69-5517 Consultation with other groups — utilization of services.

69-5501. Short title. This act may be cited as the "Montana Environmental Policy Act."

History: En. Sec. 1, Ch. 238, L. 1971.

Title of Act

An act to establish a state policy for the environment and to establish an environmental quality council and setting forth its powers and duties and providing an effective date.

69-5502. Purpose of act. The purpose of this act is to declare a state policy which will encourage productive and enjoyable harmony between man and his environment, to promote efforts which will prevent or eliminate damage to the environment and biosphere and stimulate the health and welfare of man, to enrich the understanding of the ecological systems and natural resources important to the state, and to establish an environmental quality council.

History: En. Sec. 2, Ch. 238, L. 1971.

69-5503. Declaration of state policy for the environment. The legislative assembly, recognizing the profound impact of man's activity on the interrelations of all components of the natural environment, particularly the profound influences of population growth, high-density urbanization, industrial expansion, resource exploitation, and new and expanding technological advances and recognizing further the critical importance of restoring and maintaining environmental quality to the overall welfare and development of man, declares that it is the continuing policy of the state of Montana, in cooperation with the federal government and local governments, and other concerned public and private organizations, to use all practicable means and measures, including financial and technical assistance, in a manner calculated to foster and promote the general welfare, to create and maintain conditions under which man and nature can coexist in productive harmony, and fulfill the social, economic, and other requirements of present and future generations of Montanans.

(a) In order to carry out the policy set forth in this act, it is the continuing responsibility of the state of Montana to use all practicable means, consistent with other essential considerations of state policy, to improve and coordinate state plans, functions, programs, and resources to the end that the state may—

(1) fulfill the responsibilities of each generation as trustee of the environment for succeeding generations

(2) assure for all Montanans safe, healthful, productive, and esthetically and culturally pleasing surroundings,

(3) attain the widest range of beneficial uses of the environment without degradation, risk to health or safety, or other undesirable and unintended consequences,

(4) preserve important historic, cultural, and natural aspects of our unique heritage, and maintain, wherever possible, an environment which supports diversity and variety of individual choice,

(5) achieve a balance between population and resource use which will permit high standards of living and a wide sharing of life's amenities, and

(6) enhance the quality of renewable resources and approach the maximum attainable recycling of depletable resources.

(b) The legislative assembly recognizes that each person shall be entitled to a healthful environment and that each person has a responsibility to contribute to the preservation and enhancement of the environment

History: En. Sec. 3, Ch. 248, L. 1971.

69-5504. General directions to the state agencies. The legislative assembly authorizes and directs that, to the fullest extent possible:

(a) The policies, regulations, and laws of the state shall be interpreted and administered in accordance with the policies set forth in this act, and

(b) all agencies of the state shall

(1) 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,

(2) identify and develop methods and procedures, which will insure that presently unquantified environmental amenities and values may be given appropriate consideration in decision making along with economic and technical considerations,

(3) include in every recommendation or report on proposals for projects, programs, legislation and other major actions of state government significantly affecting the quality of the human environment, a detailed statement on—

(i) the environmental impact of the proposed action,

(ii) any adverse environmental effects which cannot be avoided should the proposal be implemented,

(iii) alternatives to the proposed action,

(iv) the relationship between local short-term uses of resources and the maintenance and enhancement of long-term productivity, and

(v) any irreversible and irretrievable commitments of resources which would be involved in the proposed action should it be implemented

Prior to making any detailed statement, the responsible state official shall consult with and obtain the comments of any state agency which has jurisdiction by law or special expertise with respect to any environmental impact involved. Copies of such statement and the comments and views of the appropriate state, federal, and local agencies, which are authorized to develop and enforce environmental standards, shall be made available to the governor, the environmental quality council and to the public and shall accompany the proposal through the existing agency review processes.

- (4) study, develop, and describe appropriate alternatives to recommend courses of action in any proposal which involves unresolved conflicts concerning alternative uses of available resources;
- (5) recognize the national and long-range character of environmental problems and, where consistent with the policies of the state, lend appropriate support to initiatives, resolutions, and programs designed to maximize national co-operation in anticipating and preventing a decline in the quality of mankind's world environment;
- (6) make available to counties, municipalities, institutions, and individuals, advice and information useful in restoring, maintaining, and enhancing the quality of the environment;
- (7) initiate and utilize ecological information in the planning and development of resource-oriented projects; and
- (8) assist the environmental quality council established by section 8 (69-6508) of this act.

History: En. Sec. 4, Ch. 248 L. 1974.

69-6505. Review of statutory authority and administrative policies to determine deficiencies or inconsistencies. All agencies of the state shall review their present statutory authority, administrative regulations, and current policies and procedures for the purpose of determining whether there are any deficiencies or inconsistencies therein which prohibit full compliance with the purposes and provisions of this act and shall propose to the governor and the environmental quality council not later than July 1, 1972, such measures as may be necessary to bring their authority, and policies into conformity with the intent, purposes, and procedures set forth in this act.

History: En. Sec. 5, Ch. 248 L. 1974.

69-6506. Specific statutory obligations unimpaired. Nothing in section 3 (69-6504) or 4 (69-6504) shall in any way affect the specific statutory obligations of any agency of the state:

- (a) to comply with criteria or standards of environmental quality;
- (b) to co-ordinate or consult with any other state or federal agency; or
- (c) to act, or refrain from acting contingent upon the recommendations or certification of any other state or federal agency.

History: En. Sec. 6, Ch. 248 L. 1974.

69-6507. Policies and goals supplementary. The policies and goals set forth in this act are supplementary to those set forth in existing authorizations of all boards, commissions, and agencies of the state.

History: En. Sec. 7, Ch. 248 L. 1974.

69-6508. Environmental quality council. The environmental quality council shall consist of thirteen (13) members to be as follows:

- (a) The governor or his designated representative shall be an ex officio member of the council and shall participate in council meetings as a regular member.

- (b) Four (4) members of the senate and four (4) members of the house of representatives appointed before the sixtieth legislative day in the same manner as standing committees of the respective houses are appointed. A vacancy in the council occurring when the legislative assembly is not in session shall be filled by the selection of a member of the legislative assembly by the remaining members of the council. No more than two (2) of the appointees of each house shall be members of the same political party.

- (c) Four (4) members of the general public to be appointed by the governor with the consent of the senate.

In considering the appointments of (b) and (c) above, consideration shall be given to their qualifications to analyze and interpret environmental trends and information of all kinds, to appraise programs and activities of the state government in the light of the policy set forth in section 3 (69-6503) of this act, to be conscious and responsive to the scientific, economic, social, ethical, and cultural needs and interests of the state, and to formulate and recommend state policies to promote the improvement of the quality of the environment.

History: En. Sec. 8, Ch. 248 L. 1974.

69-6509. Term of office. The four (4) council members from the house of representatives shall serve for two (2) years and may be reappointed. Two (2) council members from the senate, one from each political party, and two (2) council members from the general public shall serve for four (4) years, and these members may be reappointed for a two (2) year term. Two (2) council members from the senate, one from each political party, and two (2) council members from the general public, shall serve for two (2) years and these members may be reappointed for a four (4) year term. In no case shall a member of the council serve more than six (6) years.

The council shall elect one of its members as chairman and such other officers as it deems necessary. Such officers shall be elected for a term of two (2) years.

History: En. Sec. 9, Ch. 248 L. 1974.

69-6510. Meetings. The council may determine the time and place of its meetings but shall meet at least once each quarter. Each member of the council shall, unless he is a full-time salaried officer or employee of this state, be paid twenty-five dollars (\$25) for each day in which he is actually and necessarily engaged in the performance of council duties and shall also be reimbursed for actual and necessary expenses incurred while in the performance of council duties. Members who are full-time salaried officers or employees of this state may not be compensated for their service as members, but shall be reimbursed for their expenses.

History: En. Sec. 10, Ch. 248 L. 1974.

69-6511. Appointment and qualifications of an executive director. The council shall appoint the executive director and act in advisory. The executive director shall hold a degree from an accredited college or university with a major in one of the several environmental sciences and shall have at least three (3) years of responsible experience in the field of environmental management.

He shall be a person who, as a result of his training, experience, and attainments, is exceptionally well qualified to analyze and interpret environmental trends and information of all kinds, to appraise programs and activities of the state government in the light of the policy set forth in section 3 (69-6503) of this act, to be conscious of and responsive to the scientific, economic, social, ethical, and cultural needs and interests of the state, and to formulate and recommend state policies to promote the improvement of the quality of the environment.

History: En. Sec. 11, Ch. 248 L. 1974.

69-6512. Appointment of employees. The executive director, subject to the approval of the council, may appoint whatever employees are necessary to carry out the provisions of this act.

within the limitations of legislative appropriations.
History: En. Sec. 12, Ch. 248, L. 1971.

69-6513. Term and removal of the executive director. The executive director is solely responsible to the environmental quality council. He shall hold office for a term of two (2) years beginning with July 1 of each odd-numbered year. The council may remove him for misfeasance, malfeasance or nonfeasance in office at any time after notice and hearing.

History: En. Sec. 13, Ch. 248, L. 1971.

69-6514. Duties of executive director and staff. It shall be the duty and function of the executive director and his staff:

- (a) to gather timely and authoritative information concerning the conditions and trends in the quality of the environment both current and prospective, to analyze and interpret such information for the purpose of determining whether such conditions and trends are interfering, or are likely to interfere, with the achievement of the policy set forth in section 3 (69-6503) of this act, and to compile and submit to the governor and the legislative assembly studies relating to such conditions and trends;
- (b) to review and appraise the various programs and activities of the state agencies in the light of the policy set forth in section 3 (69-6503) of this act for the purpose of determining the extent to which such programs and activities are contributing to the achievement of such policy, and to make recommendations to the governor and the legislative assembly with respect thereto;
- (c) to develop and recommend to the governor and the legislative assembly, state policies to foster and promote the improvement of environmental quality to meet the conservation, social, economic, health, and other requirements and goals of the state;
- (d) to conduct investigations, studies, surveys, research, and analyses relating to ecological systems and environmental quality;
- (e) to document and define changes in the natural environment, including the plant and animal systems, and to accumulate necessary data and other information for a continuing analysis of these changes or trends and an interpretation of their underlying causes;
- (f) to make and furnish such studies, reports thereon, and recommendations with respect to matters of policy and legislation as the legislative assembly requests;
- (g) to analyze legislative proposals in clearly environmental areas and in other fields where legislation might have environmental consequences, and assist in preparation of reports for use by legislative committees, administrative agencies, and the public;
- (h) to consult with, and assist legislators who are preparing environmental legislation, to clarify any deficiencies or potential conflicts with an overall ecologic plan;
- (i) to review and evaluate operating programs in the environmental field in the several agencies to identify actual or potential conflicts, both among such activities, and with a general ecologic perspective, and to suggest legislation to remedy such situations;
- (j) to transmit to the governor and the legislative assembly annually, and make available to the general public annually, beginning July 1, 1972, an environmental quality report concerning the state of the environment which shall contain:
 - (1) the status and condition of the major natural, man-made, or altered environmental classes of the state, including, but not limited to, the air, the aquatic,

including surface and ground water, and the terrestrial environment, including, but not limited to, the forest (dryland, wetland), range, urban, suburban, and rural environment;

- (2) the adequacy of available natural resources for fulfilling human and economic requirements of the state in the light of expected population pressures;
- (3) current and foreseeable trends in the quality, management and utilization of such environments and the effects of those trends on the social, economic, and other requirements of the state in the light of expected population pressures;
- (4) a review of the programs and activities (including regulatory activities) of the state and local governments, and nongovernmental entities or individuals, with particular reference to their effect on the environment and on the conservation, development and utilization of natural resources; and
- (5) a program for remedying the deficiencies of existing programs and activities, together with recommendations for legislation.

History: En. Sec. 14, Ch. 248, L. 1971.

69-6515. Examination of records of government agencies. The environmental quality council shall have the authority to investigate, examine and inspect all records, books and files of any department, agency, commission, board of institution of the state of Montana.

History: En. Sec. 15, Ch. 248, L. 1971.

69-6516. Hearings by council — enforcement of subpoenas. In the discharge of its duties the environmental quality council shall have authority to hold hearings, administer oaths, issue subpoenas, compel the attendance of witnesses, and the production of any papers, books, accounts, documents and testimony, and to cause depositions of witnesses to be taken in the manner prescribed by law for taking depositions in civil actions in the district court. In case of disobedience on the part of any person to comply with any subpoena issued on behalf of the council, or any committee thereof, or of the refusal of any witness to testify on any matters regarding which he may be lawfully interrogated, it shall be the duty of the district court of any county or the judge thereof, on application of the environmental quality council to compel obedience by proceedings for contempt as the case of disobedience of the requirements of a subpoena issued from such court on a refusal to testify therein.

History: En. Sec. 16, Ch. 248, L. 1971.

69-6517. Consultation with other groups — utilization of services. In exercising its powers, functions, and duties under this act, the council shall:

- (a) consult with such representatives of science, industry, agriculture, labor conservation organizations, educational institutions, local governments and other groups, as it deems advisable; and
- (b) utilize, to the fullest extent possible, the services, facilities, and information (including statistical information) of public and private agencies and organizations, and individuals, in order that duplication of effort and expense may be avoided, thus assuring that the commission's activities will not unnecessarily overlap or conflict with similar activities authorized by law and performed by established agencies.

History: En. Sec. 17, Ch. 248, L. 1971.

Effective Date.
Section 18 of Ch. 248, Laws 1971 provided the act should be in effect from and after its passage and approval. Approved March 9, 1971.

Appendix C Revised Guidelines

For Environmental Impact Statements Required by the Montana Environmental Policy Act of 1971

Adopted by Environmental Quality Council, September 14, 1973

1 PURPOSE

The purpose of Section 69-6504 (b) (3) of the Montana Environmental Policy Act (MEPA) and of these guidelines is to incorporate into the agency decision-making process careful and thorough consideration of the environmental effects of proposed actions, and to assist agencies in implementing MEPA in a uniform, deliberate, and systematic manner.

2 POLICY

a. As early as possible and in all cases prior to any agency decision concerning major action or recommendation or a proposal for legislation that significantly affects the environment, state agencies shall, in consultation with other appropriate agencies and individuals, in both the public and private sectors, assess in detail the potential environmental impact in order that adverse effects are avoided and environmental quality is maintained, enhanced, or restored to the fullest extent practicable. In particular, it is especially important that alternative actions that will minimize adverse impacts shall be explored, and both the long- and short-range implications on the human environment and on nature shall be evaluated in order to avoid, to the fullest extent practicable, undesirable consequences for the environment as a whole.

The language in Section 69-6504 is intended to assure that all agencies of the state shall comply with the directives set out in said Section "to the fullest extent possible" under their statutory authorizations and that no agency shall utilize an excessively narrow construction of its existing statutory authorizations to avoid compliance.

b. The term "human environment" shall be broadly construed to include not only social, economic, cultural, and aesthetic factors, but also, and particularly, the biophysical properties of natural ecosystems, including plants, humans, and other animals, their relationship to each other, and with all environmental components of air, water, and land.

3 AGENCY PROCEDURES

a. Each agency shall establish its own formal procedures for

- (1) Identifying those agency actions and decisions requiring environmental statements, the appropriate time prior to decision for the consultation required by Section 69-6504 (b) (3) and the agency review process for which environmental statements are to be available.
- (2) Obtaining information required in the preparation of environmental statements.
- (3) Designating the officials who are to be responsible for the environmental statements.

(4) Consulting with and taking account of the comments of appropriate agencies, private groups, and the public, whether or not an environmental statement is prepared.

(5) Preparing draft environmental statements

(a) In accordance with the policy of MEPA, agencies have a responsibility to develop procedures to provide to the public timely information and explanation of plans and programs with environmental impact in order to obtain the views of any interested parties. Initial assessments of the environmental impacts of proposed action shall be undertaken concurrently with initial technical, energy-use, and economic studies, and when required, a draft environmental impact statement shall be prepared and circulated for comments in time to accompany a proposal through the agency review process. During the process, agencies shall

- (1) Make provision for the circulation of draft statements to other appropriate agencies, selected private groups and individuals, and for their availability to the public. (Where an agency has an established practice of declining to favor an alternative until public comments on a proposed action have been received, the draft environmental statement may indicate that two or more alternatives are under consideration.)
- (2) Give careful consideration to the comments elicited from the aforementioned sectors, and
- (3) Issue final environmental impact statements which clearly evidence a responsiveness to such comments. The purpose of this assessment and consultation procedure is to provide agencies, their decision-makers, and the public with an understanding of the potential environmental effects of proposed actions.

Agencies should attempt to balance the results of their environmental assessments with their assessments of the net economic, technical, and other benefits of proposed actions, and use all practicable means to avoid or minimize undesirable consequences for the environment.

(b) If an agency relies on an applicant for the submission of initial environmental information, the agency shall assist the applicant by defining the type and quality of information required. In all such cases, the agency must make its own determinations on the applicant's evaluation of the environmental issues and the

agency must assume responsibility for the scope and content of draft and final environmental statements.

- (b) Meeting the requirements of Section 69-6504 (b) (3) for providing timely public information on plans and programs with environmental impact, including procedures responsive to Section 8 of these guidelines. These procedures should be consistent with the guidelines contained herein. Each agency should file a copy of all such procedures with the Environmental Quality Council (EQC) which will provide advice to agencies in the preparation of their procedures and guidance on the application and interpretation of the council's guidelines.

4. STATE AGENCIES INCLUDED

Section 69-6504 (b) (3) applies to all agencies of the State government. Each agency shall comply with the requirements unless the agency demonstrates that existing law applicable to its operations expressly prohibits or makes compliance impossible.

5. ACTIONS INCLUDED

The following criteria shall be employed by agencies in deciding whether a proposed action requires the preparation of an environmental statement.

a. Actions include, but are not limited to:

- (1) Recommendations or favorable reports relating to legislation, including that for appropriations. The requirement for following Section 69-6504 (b) (3) procedure as discussed in these guidelines applies to both:
 - (a) agency recommendations on their own proposals for legislation, and
 - (b) agency reports on legislation initiated elsewhere. (In the latter case only the agency which has primary responsibility for the subject matter involved will prepare an environmental impact statement.)
- (2) Projects, programs, and continuing activities: directly undertaken by state agencies; supported in whole or in part through state funds or involving a state lease, permit, license, certificate or other entitlement for use,
- (3) Policy, regulations, and procedure making.

b. The statutory clause "major actions of state government significantly affecting the quality of the human environment" shall be construed by agencies from the perspective of the overall, cumulative impact of the action proposed (and of further actions contemplated). Such actions may be localized and seemingly insignificant in their impact, but if there is a potential that the environment may be significantly affected, the statement shall be prepared.

In deciding what constitutes "major action significantly affecting the environment," agencies should consider that the effect of many state decisions about a project or a complex of projects can be individually limited but cumulatively considerable. By way of example, two suitable illustrations can be drawn. (1) one or more agencies, over a period of years, commits minor amounts of resources at any single instance, but the cumulative effect of those individually minor commitments amounts to a major commitment of resources, or (2) several government agencies individually make decisions regarding partial aspects of a major action. The guiding principle is that the whole can be greater than the sum of the parts. The lead agency shall prepare an environmental impact statement if it is foreseeable that a cumulatively significant impact on the

environment will arise from state action. "Lead agency" refers to the state agency which has primary authority for committing the state government to a course of action with significant environmental impact. As necessary, the Environmental Quality Council will assist in resolving questions of lead agency determination.

Finally, the determination of what constitutes "major action significantly affecting the human environment" will unavoidably involve considerable judgment on the part of the responsible agency. To assist in that judgment, the following points should be general considerations (but not viewed as final determinants):

- (1) Is the action under consideration the first or the only governmental decision to be taken on the proposal?
- (2) Is the action decisive, could it substantially change the nature of the proposal, stop the proposal, or allow it to proceed to full implementation?
- (3) Is the action expected to have direct statewide or regional implications?
- (4) Is the action fixed for a certain period of time not to be modified except under new conditions not previously known, or conditions of an emergency nature?
- (5) Does the action deal with environmental conditions (physical, social, biological) which have been clearly recognized as being endangered, fragile, or in severely short supply, or clearly approaching a precarious level of quality, hardship, or public safety?
- (6) Is the action intended as environmentally regulatory or protective?
- (7) Does the action involve considerable expenditure?
- (8) Would environmental conditions be substantially altered in terms of size, quality, well-being, availability, or type or use?
- (9) Would environmental conditions be affected over a large geographical area?
- (10) Would environmental effects be beneficial, adverse or both?
- (11) Would environmental effects be short-term, long-term, or permanent?
- (12) Would environmental effects be reversible?
- (13) Will the action involve a reasonably important "segment" of opinion in a controversy?

c. When an agency responsible for the issuance of a state lease, permit, license, certificate, or other entitlement for use, should be able to foresee that the issuance of a large number of such entitlements will cumulatively, have a significant impact upon the environment, an environmental impact statement shall be prepared. Normal agency procedures, as delineated in Section 3 above, shall be used in the preparation of such an impact statement. Information supplied by applicants for these entitlements may be used or considered in the preparation of an impact statement, but such information may not be submitted by itself in place of an impact statement.

d. Section 69-6504 of the MEPA indicates the broad range of aspects of the environment to be surveyed in any assessment of significant effect. The MEPA also indicates that adverse significant effects include those that degrade the quality of the environment, and curtail the range of benefi-

cial uses of the environment, and serve short-term, to the disadvantage of long-term, environmental goals. Significant effects can also include actions which may have both beneficial and detrimental effects, even if, on balance, the agency believes that the effect will be beneficial. Significant adverse effects on the quality of the human environment include both those that directly affect human beings and those that indirectly affect human beings through adverse effects on the environment.

6. CONTENT OF ENVIRONMENTAL STATEMENT

a. The following points are to be covered

- (1) A description of the proposed action including information and technical data adequate to permit a careful assessment of environmental impact by commenting agencies and the public. The amount of detail provided in such descriptions should be commensurate with the extent and expected impact of the action, and with the amount of information required at the particular level of decision-making (planning, feasibility, design, etc.).
- (2) The probable impact of the proposed action on the environment, including impact on ecological systems. Both primary and secondary significant consequences for the environment shall be included. A primary impact is one which generally results from the project input, a secondary impact is one which generally results from a project output. Primary impacts are usually more susceptible to measurement and analysis by an agency proposing an action because the primary impacts are more immediately related to an agency's area of responsibility and expertise. Secondary impacts, on the other hand, usually require analyses by a number of agencies because they are not within any single agency's area of responsibility or expertise.
- (3) Any probable adverse environmental effects which cannot be avoided, should the proposal be implemented. If there are adverse environmental effects which are unavoidable, mitigative measures shall be proposed to minimize such adverse environmental impact.
- (4) Alternatives to the proposed action.

Section 69-6504 (b) (4) requires the responsible agency to "study, develop, and describe appropriate alternatives to recommend courses of action in any proposal which involves unresolved conflicts concerning alternative uses of available resources." A rigorous exploration and objective evaluation of alternative action (including no action at all) that might avoid some or all of the adverse environmental effects is essential. In addition, there should be an equally rigorous consideration of alternatives open to other authorities. Sufficient analysis of such alternatives and their costs and impact on the environment should accompany the proposed action through the agency review process in order not to foreclose prematurely options which might have less detrimental effects.

- (5) The relationship between local short-term uses of man's environment and the maintenance and enhancement of long-term effects from the perspective that each generation is trustee of the environment for succeeding generations.

- (6) Any irreversible and irretrievable commitments of natural and economic resources (including energy resources) which would be involved in the proposed action should it be implemented. This requires the agency to identify the extent to which the action curtails the range of alternative and beneficial uses of the environment.
- (7) A discussion of problems and objections raised by other agencies and by private organizations and individuals in the review process where appropriate and the disposition of the issues involved.
- (8) Insofar as it is practicable, a balancing of the economic benefits to be derived from a proposal with economic costs and environmental costs.
- (9) Discussion of potential growth-inducing aspects of the proposed action.
- (10) A listing of all agency personnel having chief responsibility for the preparation of the statement, a brief account of the formal education, training and professional experience of such personnel, and a description of the sources of data, research or field investigation on which the statement and its conclusions are based.

b. Each environmental statement shall be prepared in accordance with the precept in Section 69-6504 (b) (1) that all agencies "utilize a systematic, inter-disciplinary approach which will insure the integrated use of the natural and social sciences and the environmental design arts in planning and decision making which may have an impact on man's environment."

c. Agencies which are required to submit statements under Section 102 (2) (c) of the National Environmental Policy Act may, with EJC approval, substitute copies of that statement in lieu of the Section 69-6504 (b) (3) requirement of the MEPA.

d. Appendix I prescribes the form of the draft environmental statement.

e. Appendix II suggests environmental values to be considered in connection with the preparation of impact statements.

7. STATE AGENCIES TO BE CONSULTED IN CONNECTION WITH PREPARATION OF ENVIRONMENTAL IMPACT STATEMENTS

A state agency considering an action requiring an environmental statement for which it takes primary responsibility shall consult with and obtain comment on the environmental impact of the action of state agencies or institutions with jurisdiction by law or special expertise with respect to any environmental impact involved.

In addition, any state agency responsible for a draft environmental statement may seek comment from appropriate federal and local agencies, from private individuals, organizations and institutions, and in particular from private parties whose interests are likely to be significantly affected by the proposed action.

Agencies seeking comment shall determine which one or more of the agencies or institutions are appropriate to consult on the basis of the areas of expertise. It is recommended that these agencies and institutions establish contact points for providing comments on the environmental statements and that departments from which comment is solicited coordinate and consolidate the comments of their component

entities. It is further recommended that each agency establish a "fund file" of expertise available from the public and private sectors. The requirement in Section 69-6504 (b) (1) to obtain comment from state agencies having jurisdiction or special expertise is in addition to any specific statutory obligation of any state agency to coordinate or consult with any other agency. Agencies seeking comment shall establish time limits of not less than thirty (30) days for reply, after which it may be presumed, unless the agency consulted requires a specified extension of time, that the agency consulted has no comment to make. Agencies seeking comment should endeavor to comply with requests for extensions of time up to fifteen (15) days. Failure of EQC to publicly comment on any agency's environmental statement does not imply tacit approval of that agency action.

5 USE OF STATEMENTS IN AGENCY REVIEW PROCESSES: DISTRIBUTION OF ENVIRONMENTAL QUALITY COUNCIL: AVAILABILITY TO PUBLIC

- a. Agencies will need to identify at what state or stages of a series of actions relating to a particular matter the environmental statement procedures of these guidelines will be applied. It will often be necessary to use the procedures both in the development of a state program and in the review of proposed projects within the program. The principle to be applied is to obtain views of other agencies and the public at the earliest feasible time in the discussion and development of program and project proposals. Care should be taken to avoid duplication but when action is considered which differs significantly from other actions already reviewed pursuant to Section 69-6504 (b) (3) of the MEPA, an environmental statement shall be provided.
- b. Two (2) copies of draft environmental statements, and two (2) copies of the final text of environmental statements (if prepared) together with all comments received thereon by the responsible agency from all other agencies and from private organizations and individuals, shall be supplied to the office of the executive director of the Environmental Quality Council. It is important that draft environmental statements be prepared and circulated for comment and furnished to the Environmental Quality Council, the governor, and the public at the earliest possible point in the agency review process in order to permit meaningful consideration of the environmental issues before an action is taken. It is not the intent of the MEPA that the environmental statement be written to justify decisions already made. No administrative action subject to Section 69-6504 (b) (3) shall be taken sooner than sixty (60) days after a draft environmental statement has been circulated for comment, furnished to the council and except where advance public disclosure will result in significantly increased costs of procurement to the government, made available to the public pursuant to these guidelines. If the originating agency has a full and good faith consideration of the environment in its plans, and if this is reflected in favorable comments from review agencies and the public, the draft statement may be considered as satisfying the requirement of MEPA for a detailed statement. Agencies satisfying the requirement of MEPA with the draft statement must submit two (2) copies of all comments received thereon together with formal notification of the final decision on the proposed action. Agencies must furnish the same information (final decision and all comments on drafts) to all commenting entities, whether public or private, as a logical termination to the process. In cases where the final environmental statement is required administrative action shall not be taken sooner than thirty (30) days after the final text has been made available to the council and the public. If the final text

of an environmental statement is filed within sixty (60) days after a draft statement has been circulated for comment, furnished to the council and made public pursuant to this section of these guidelines, the thirty (30) day period and sixty (60) day period may run concurrently to the extent that they overlap.

In those instances where an agency has, after careful consideration, concluded that a proposed action or project does not require the preparation of a final environmental impact statement, the EQC, through the office of the executive director, may, upon request from the agency, remove any further time restrictions for the implementation of such agency actions or projects.

- c. With respect to recommendations or reports on proposals for legislation to which Section 69-6504 (b) (3) applies, a draft environmental statement may be furnished to the appropriate legislative committee and made available to the public pending transmittal of the comments as received and the final text, if required.
- d. All agencies shall make available to the public all the reports, studies, and other documents that may and should underlie the draft and final impact statements and comments.
- e. Where emergency circumstances make it necessary to take an action with significant environmental impact without observing the provisions of these guidelines concerning minimum periods for agency review and advance availability of environmental statements, the agency proposing to take the action shall consult with the EQC about alternative arrangements. It is important that the agency provide the EQC with a precise, factual statement detailing the nature of the emergency, and the reasons the agency feels it must depart from normal procedural requirements. Similarly, where there are overriding considerations of expense to the state or impaired program effectiveness, the responsible agency shall consult with the EQC concerning appropriate modifications of the minimum period.
- f. In accord with the MEPA, agencies have an affirmative responsibility to develop procedures to insure the fullest practicable provision of timely public information and understanding of agency plans and programs with environmental impact in order to obtain the view of interested and significantly affected parties.

These procedures shall include, whenever appropriate, provision for public hearings, and shall provide the public with relevant information including information on alternative courses of action. In deciding whether a public hearing is appropriate, an agency should consider: (i) the magnitude of the proposal in terms of economic costs, the geographic area involved, the uniqueness or size of commitment of resources involved, and the amount and types of energy required, (ii) the degree of interest in the proposal, as evidenced by requests from public and from state and local authorities that a hearing be held, (iii) the complexity of the issue and the likelihood that information will be presented at the hearing which will be of assistance to the agency in fulfilling its responsibilities under the act, and (iv) the extent to which public involvement already has been achieved through other means, such as earlier public hearings, meetings with citizen representatives, and/or written comments on the proposed action. Agencies which hold hearings on proposed administrative actions or legislation shall make the environmental statement available to the public at least thirty (30) days prior to the time of the relevant hearings. Hearings shall be preceded by adequate public notice and information to identify the issues and to obtain the comments provided for in the guidelines and should in all ways conform to those procedures outlined in the Montana Administrative Procedure Act, where applicable, R.C.M. 1947, 82-4201, et. seq.

- g. The agency which prepared the environmental statement is responsible for making the statement and the comments received available to the public, including inter-agency memoranda when such memoranda transmit comments of agencies upon the environmental impact of proposed actions subject to Section 69-6504 (b) (3).
- h. Agency procedures prepared pursuant to Section 3 of these guidelines shall implement these public information requirements and shall include arrangements for availability of environmental statements and comments at the head and other appropriate offices of the responsible agency.

9. APPLICATION OF SECTIONS 69-6504 (b) (3) PROCEDURE TO EXISTING PROJECTS AND PROGRAMS

The Section 69-6504 (b) (3) procedure shall be applied to major state actions having a significant effect on the environment even though they arise from projects or programs initiated prior to enactment of the MEPA on March 9, 1974. Where an agency demonstrates that it is not practicable to reassess the basic course of action, it is still important that further incremental major actions be shaped so as to minimize adverse environmental consequences. It is also important in further action that account be taken of environmental consequences not fully evaluated at the outset of the project or program.

10. SUPPLEMENTARY GUIDELINES, EVALUATION OF PROCEDURES

These revised guidelines reflect the experience of pertinent state agencies and the EQC subsequent to the time the interim guidelines were issued. It is believed that this experience has made the guidelines more helpful and comprehensive. As more experience is gained, and as more comments are received, these guidelines will, from time to time, be further revised.

Agencies are encouraged to conduct an ongoing assessment of their experience in the implementation of the Section 69-6504 (b) (3) provisions of the MEPA and in conforming to these guidelines. The EQC will welcome comments on these areas at any time, but it would especially like to have such comments by December 31, 1973. Such comments should include an identification of the problem areas and suggestions for revision or clarification of these guidelines to achieve effective coordination of views on the environmental factors (and alternatives, wherever appropriate) of proposed actions without imposing unproductive administrative procedures.

Appendix I of Guidelines

The environment statement submitted to the Environmental Quality Council should cover the following items:

- (Check one) Draft
- Final Environmental Statement
- Name of responsible state agency (with name of operating division where appropriate)
- Name of action (Check one)
 - Administrative Action
 - Legislative Action
- 1. Description of action indicating what geographic area of political subdivision is particularly affected
- 2. Environmental impact

- 3. Adverse environmental effects
- 4. Last alternatives considered
- 5. The relationship between local short-term uses of man's environment and the maintenance and enhancement of long-term productivity
- 6. Any irreversible and irretrievable commitments of resources
- 7. (a) (For draft statements) List all agencies from which comments have been requested
- (b) (For final statements) List all agencies and sources from which written comments have been received. Discussion of comments and disposition of issues involved
- 8. Balance of economic benefits with economic cost and environmental costs
- 9. Potential growth-inducing effects
- 10. List all agency personnel having chief responsibility for the preparation of the statement; a brief account of the formal education, training, and professional experience of such personnel; and a description of the sources of data, research or field investigation on which the statement and its conclusions are based
- 11. Date draft statement and final statement was made available to the governor, the Environmental Quality Council, and public

Draft environmental statements should be concise, but in sufficient detail to allow a reviewer with appropriate expertise to grasp the essence of the action and comment intelligently.

In cases where final environmental statements are prepared, this format should be followed considering in detail the points covered in Section 6 of these guidelines.

Appendix II of Guidelines

The following include some specific values that could be affected by almost every agency action or program

- Terrestrial and aquatic life
- Water quality, quantity, and distribution
- The terrestrial and aquatic habitat
- Aesthetics and natural beauty
- Soil quality, stability, and moisture
- Wilderness values
- Human pressures on resources
- Local and state tax base considerations
- Transportation requirements
- Law enforcement and effectiveness
- Distribution and density of people
- Economic considerations (business, industry, dollar turnover and employment)
- Food and fiber production
- Recreational opportunities and quality of recreational experiences
- Increased suburbanization, or urbanization, or lake and stream-side development
- Noise pollution and tranquility, and any other pertinent social considerations
- Historic and archeological sites and unique and natural areas
- Cultural uniqueness and diversity

Appendix D

Documents Submitted in Compliance with MEPA

July 1, 1972 to June 30, 1973

Lead Agency	Environmental Impact Statements	Negative Declarations*
Department of Fish and Game	20	36
Department of Health and Environmental Sciences	74	99
Department of Highways	12	91
Department of Livestock	2	1
Department of Natural Resources and Conservation	5	
Department of State Lands	8	
Environmental Quality Council	1	
Montana State University	3	1
Planning and Economic Development	1	
University of Montana	1	

*A written document in support of a determination that, should the proposed action be taken, the anticipated effects upon the human environment will not be significant.

Appendix E
Environmental Quality Council
Program Cost Summary

July 1, 1972 - June 30, 1973

General Fund		
Salaries	36,113.26	
Other Compensation	1,200.00	
Employee Benefits	<u>3,651.11</u>	
		40,964.37
Contracted Services	6,257.95	
Supplies	602.33	
Postage & Telephone	1,339.67	
Travel	5,626.31	
Repair & Maintenance	130.60	
Other Expense	257.43	
Equipment	<u>307.25</u>	
		<u>14,521.54</u>
Total - General Fund		\$55,485.91
Grants:		
Emergency Employment Act (EEA)		
Salaries	8,691.78	
Employee Benefits	<u>1,051.62</u>	
		<u>9,743.40</u>
Total - EEA		\$ 9,743.40
Environmental Protection Agency		
January, 1973		
Editing & Printing EQC First Annual Report		<u>7,500.00</u>
		\$ 7,500.00
Ford Foundation		
March 1 - June 30, 1973		
Salaries	7,470.59	
Employee Benefits	<u>816.62</u>	
		8,287.21
Contracted Services	3,998.20	
Supplies	41.21	
Telephone	265.63	
Travel	649.56	
Other Expense	534.78	
Equipment	<u>1,097.32</u>	
		<u>6,586.70</u>
		<u>\$11,873.91</u>
Grand Total		<u>\$87,603.22</u>

