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I. INTRODUCTION

In recent years, and particularly since the oil embargo and substantial price hikes by the OPEC (Organization of Petroleum Exporting Countries) in 1973, a world-wide energy consciousness has emerged. This consciousness has been heightened by the disruption of economies and spiraling inflation in the costs of goods and services caused by energy shortages. As have all developed and highly energy intensive economies, the United States economy has felt the effects of that disruption, causing attention to be focused on the research and development of all possible energy sources and their respective trade-offs.

Given the present state of knowledge, usable energy sources may be classified under six categories: hydropower, nuclear fission, solar, geothermal, wind, and hydrocarbon fuels (both fossil and non-fossil). It appears to be the consensus among knowledgeable sources that all major conventional hydropower projects have already been developed, and current nuclear fission technology has received considerable criticism of its safety and human health hazards.[1] Solar and wind energy systems are at the developmental stages, although by the turn of the century they are expected to contribute significantly to the nation's total energy supply.[2] Nuclear fusion and tidal and wave action appear to be possible energy sources, but only in the future.[3] Thus, the fossil fuels seem to be the only source available for meeting the nation's short term energy demand.

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* The anaylsis, conclusions, and opinions in this article do not necessarily represent the analysis, conclusions, or opinions held by the employers or research sponsors of the authors.

To avoid ambiguity, key words used in the title convey the following meaning for purposes of this presentation: 1. ecological—pertaining to ecology, the *science* of relationships between organisms (plants, animals, and man) and their environments; 2. legal—of, relating to, or concerned with law; 3. reclamation—rehabilitation of land to biological productivity; and 4. laws—body of rules, state and/or federal, governing reclamation.

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1. *See, e.g.*, Cohen, *Impacts of the Nuclear Energy Industry on Human Health and Safety*, 64 AM. SCI. 550-59 (1976). *But cf.* Weinberg, *The Maturity and Future of Nuclear Energy*, 64 AM. SCI. 16-21 (1976) (disputing the current criticism of nuclear fission).

2. *See* Hamilton, *Can We Harness the Wind*, 148 NAT'L GEO. 812 (1975); Wilhelm, *Solar Energy, the Ultimate Powerhouse*, 149 NAT'L GEO. 381 (1976).

3. Other potential sources of energy have been noted. *See* Calvin, *Photosynthesis as a Resource for Energy and Materials*, 64 AM. SCI. 270-78 (1976); Calvin, *Solar Energy by Photosynthesis*, 184 SCI. 375 (1974).

There are three main categories of fossil fuels: petroleum, natural gas, and coal. Domestic sources of petroleum and natural gas may be exhausted by the 1990's,[4] so it should not be surprising that the United States government looks toward developing the country's vast (about 33% of the world's total) coal resources. Coal represents 88% of the nation's recoverable fossil fuel, and at the current rate of production, it is estimated that the nation's coal reserves should last about 700 years.[5] The argument for development of coal is further strengthened when one considers the high costs of exploration and development of petroleum and natural gas and the political and economic impacts of dependence on imported petroleum.

Much of the nation's coal reserves lie west of the Mississippi River, and a significant portion of this coal is federally owned. In the western coal states, federal coal ownership approaches 60% on a tonnage basis and averages about 55% on a mineral acreage basis.[6] In addition to the abundance of coal in the West, several other features make western coal development relatively attractive. First, there are multiple coal seams, the thickness of which ranges from twelve feet in Colorado to sixty-seven feet in Wyoming.[7] Second, the western coals have a low sulfur content, resulting in less air pollution than high sulfur eastern coals. Third, much of the coal lies close to the surface, thus permitting surface mining.[8]

Surface mining[9] involves the removal of overburden (earthen materials) about the deposits to expose the mineral. It is an economical way to mine coal and results in a better than 90% mineral recovery rate.[10] Also, surface mining is safer than underground mining. The principal disadvantage of surface mining is the disruption to the existing environment. Removal of stabilized soil and vegetation, disturbance to the hydrologic system, erosion, and water pollution are among the many forms of environmental degradation that may occur during and after mining.

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4. Northeast Legislative Energy Project, Northeast Legislative Energy Update, No. 2 (Mar. 1976). This report quotes the National Academy of Sciences and Mobil Oil Corp. as projecting the year of exhaustion of domestic oil and natural gas to be 1994. The National Petroleum Council and the United States Geological Survey, cited in the same report, estimate domestic oil exhaustion to occur in the year 2000 and natural gas to be exhausted between 2003-17. These projections do not include imports and are based on a 2.5% consumption growth rate. A 35% import rate was estimated to extend these dates from 1994 to 2001, 2000 to 2009, and to possibly 2019, respectively.

5. H.R. REP. No. 681, 94th Cong., 1st Sess. 8 (1975).

6. *Id.* at 9.

7. BUREAU OF MINES. U.S. DEP'T OF THE INTERIOR, STRIPPABLE RESERVES OF BITUMINOUS COAL AND LIGNITE IN THE UNITED STATES, INFO. CIRCULAR 8531, at 74-121 (1971).

8. It is estimated that about one-third of the nation's coal reserves lie too close to the surface to permit underground mining. Three-fourths of this amount lies west of the Mississippi River. S. REP. No. 28, 94th Cong., 1st Sess. 240 (1975).

9. For an overview of surface mining techniques in the United States, *see generally* U.S. GEOLOGICAL SURVEY, A GUIDE TO STATE PROGRAMS FOR THE RECLAMATION OF SURFACE MINED AREAS, CIRCULAR 731 (1976) (written by E. Imhoff, T. Friz & J. LaFevers).

10. FED. ENERGY ADMIN., PROJECT INDEPENDENCE BLUEPRINT, FINAL TASK FORCE REPORT ON COAL 5 (Nov. 1974).

The techniques used to minimize environmental degradation and to rehabilitate land may be referred to as reclamation practices. The environmental laws dictating the type, extent, and timing of reclamation practices are referred to as reclamation performance standards. Although recent air and water quality standards were developed under congressional impetus due to the inadequacy of state action,[11] the states have been the frontrunners in establishing reclamation performance standards. However, early indications from the 95th Congress suggest that passage of a federal surface mining control bill may be expected during the first session. The law will be based on previous reclamation bills[12] and will set the stage for a restructuring of reclamation regulation.

This article will focus attention on the laws that are directed toward preventing or minimizing the environmental degradation associated with surface coal mining, and place particular emphasis on land reclamation.[13]

II. CURRENT FEDERAL DEVELOPMENTS

A. THE DEPARTMENT OF THE INTERIOR

Because of the large federal coal estate in the western United States,[14] federal policies and laws will have a significant effect on the scope of coal development. Modification of federal coal resource management has occurred in the last two years,[15] and recently particular attention has been given to the regulation of reclamation of mined land. In May 1976 the Department of the Interior revised its coal mining operating regulations.[16] This revision effected three major changes in the Federal regulatory scheme regarding reclamation.

First, the new regulations established minimum federal reclamation performance standards.[17] Although earlier regulations[18] did provide for the imposition of reclamation requirements, there were no

11. *See* E. DOLGIN & T. GILBERT, FEDERAL ENVIRONMENTAL LAW 1064 (1974).

12. The authors will not discuss potential steep slope mining requirements or surface owner protection provisions that have been proposed in the current Congress, because these provisions are likely to be substantially modified during the legislative process. Discussion, however, will be presented on those provisions relating to mining control and reclamation that, based on development and approval in earlier Congresses, indicate strong possibility of enactment.

13. For a discussion of related energy development, *see generally* Loble & Loble, *The Rocky Road to Water for Energy*, 52 N.D.L. REV. 529 (1976); White & Barry, *Energy Development in the West: Conflict and Coordination of Governmental Decision Making*, 52 N.D.L. REV. 451 (1976).

14. *See* text accompanying note 6 *supra*.

15. *E.g.*, Federal Coal Leasing Amendments Act of 1975, Pub. L. No. 94-377, 90 Stat. 1083 (1976), *amending* Mineral Lands Leasing Act, 30 U.S.C. §§ 181-287 (1970), *as amended*.

16. 30 C.F.R. § 211 (1976).

17. *Id.* § 211.40 (1976).

18. Surface Exploration, Mining and Reclamation of Lands, 43 C.F.R. § 23 (1976). These regulations were originally adopted in 1969.

minimum standards. The imposition of performance standards was handled as part of the Bureau of Land Management's (BLM) mining plan approval process.[19] These regulations are still in force with respect to other leaseable minerals, but with respect to coal they have been superseded by the new regulations.[20] The revised coal mining operating regulations now list the minimum reclamation standards that the Department of the Interior will apply to non-Indian federal coal lands.[21]

Second, the scope of federal reclamation authority over coal operations was extended under the revised regulations. Prior to the revision, surface ownership determined the regulatory authority. If the surface was owned by the state or by private individuals, coal mining operations were regulated by the state.[22] Under the new regulations, ownership of coal determines the primary regulatory authority, so the reclamation performance standards will apply to all BLM coal lands regardless of surface ownership.[23]

Third, the federal-state relationship regarding reclamation administration and performance standards was changed. It had previously been the policy of the Department of the Interior to require federal coal lessees to comply with state regulatory process.[24] The revised regulations set a new procedure by which the Department of the Interior will recognize established state reclamation laws. This procedure is divided into two parts. First, the performance standards of the states will be applied at the federal level if the Secretary of the Interior (the Secretary) determines that they will "afford general protection of environmental quality and values at least as stringent as would occur under exclusive application of [the federal standards]. . . ."[25] The second part of the procedure provides that the Secretary may enter into joint federal-state programs relating to reclamation operations for "administrative and enforcement purposes."[26] However, a state's standards will not apply if the Secretary determines that application would unreasonably and substantially prevent the mining of federal coal and that the over-

19. 43 C.F.R. § 23.5 (1976). *See also* Olsen, *Surface Mining Regulations on Federal and Indian Mineral Leases and Permits*, 17 ROCKY MTN. MIN. L. INST. 149, 151-52 (1972).
20. 43 C.F.R. § 23.2(b) (1976).
21. 30 C.F.R. § 211.40 (1976).
22. *See* 43 C.F.R. § 23.2(b) (1976). In fact, state reclamation authority generally extended onto federal lands under the express terms of federal leases and under the provisions of state laws. *See* H. J. Barry, Extent of State Control Over Reclamation on Federal Land 1 (Mar. 1976) (unpublished study prepared for the Western Governors' Regional Energy Policy Office, Denver, Colo.).
23. 30 C.F.R. § 211.1 (1976).
24. U.S. DEP'T OF THE INTERIOR, FINAL ENVIRONMENTAL STATEMENT: SURFACE MANAGEMENT OF FEDERAL COAL RESOURCES (43 C.F.R. § 3041) AND COAL MINING OPERATING REGULATIONS (30 C.F.R. § 211) at I-25 (1976).
25. 30 C.F.R. § 211.75(a) (1976).
26. *Id.* § 211.75(b) (1976).

riding national interest requires coal production without the imposition of the state standards.[27]

The change in the policy of automatically requiring a federal lessee to comply with state reclamation laws has brought into focus a constitutional issue: whether the new regulations constitute an unauthorized federal pre-emption of state reclamation authority.[28] In *Herschler v. Kleppe*,[29] the State of Wyoming asserted that Congress had not authorized the Department of the Interior, expressly or by implication, to supersede state regulation of surface mine reclamation. Although *Herschler v. Kleppe* would have resolved this jurisdictional issue, the case was settled before the merits were reached. As a result, the constitutional extent of a state's authority over federal lands under its reclamation statute remains unclear.

Several actions have been taken by the Department of the Interior under the new regulations in regard to the applicability of state law. In December 1976 the Department of the Interior published those provisions of the Wyoming reclamation law that were determined to be as stringent as the federal regulations.[30] As this writing goes to print, no other stringency determination has been finalized regarding the western coal states. Before leaving office, however, Secretary Kleppe signed "Cooperative Agreements" with four western states—Wyoming,[31] Utah,[32] New Mexico,[33] and North Dakota.[34] The Wyoming agreement was published as a final rulemaking in January 1977;[35] the remaining three were finalized in April 1977.[36] Review of mine plans, inspection of mine sites, enforcement of reclamation standards, and bonding requirements comprise the subject matter of these agreements.[37] Essentially, these agreements allow the respective states to "be the principle entity, whenever possible, responsible for the administration and enforcement of surface coal mine reclamation operations on Federal coal leases. . . . "[38] Federal reclamation performance standards[39] are unaffected by these agreements. Further discussion of these agree-

27. *Id.* § 211.75(a) (1976).
28. Plaintiffs' Memorandum in Opposition to Defendants Motion to Dismiss 3-4, Herschler v. Kleppe, No. C-76-108-B (D. Wyo., filed Sept. 1, 1976). *See generally*, Shapiro, *Energy Development on the Public Domain: Federal/State Cooperation and Conflict Regarding Environmental Land Use Control*, 9 NAT. RES. LAW 397 (1976).
29. No. C-76-108 (D. Wyo., filed June 9, 1976).
30. 41 Fed. Reg. 53,793 (Dec. 9, 1976). A comparative analysis of the Department of the Interior and Wyoming reclamation standards is found in 41 Fed. Reg. 35,718 (Aug. 24, 1976). A similar comparative analysis for Montana is found in 41 Fed. Reg. 39,038 (Sept. 14, 1976).
31. 41 Fed. Reg. 53,811 (Dec. 9, 1976).
32. 42 Fed. Reg. 1,489 (Jan. 7, 1977).
33. *Id.* at 2,082 (Jan. 10, 1977).
34. *Id.* at 4,493 (Jan. 25, 1977).
35. 42 Fed. Reg. 3,642 (Jan. 19, 1977).
36. *Id.* at 18,065-73 (Apr. 5, 1977).
37. *E.g., id.* at 1,490 (Jan. 7, 1977).
38. Cooperative Agreement, Article I, *supra* notes 31-34.
39. 30 C.F.R. § 211.40 (1976).

ments will not be presented, since pending congressional action in 1977 will likely terminate their effect.

B. CONGRESS

1. *The Proposed Federal Surface Mining Control and Reclamation Act of* 1977.

During the past several sessions, Congress has actively pursued the enactment of a federal surface coal mining law. Surface mining laws were submitted to the President from the 93rd[40] and 94th[41] Congresses. The first was pocket-vetoed[42] and the second was vetoed.[43] The attempted override of the veto fell only three votes short of the two-thirds majority needed in the House of Representatives.[44] Subsequent attempts to resurrect some or all of the provisions in the vetoed bill were unsuccessful. However, two bills, House Bill No. 2[45] and Senate Bill No. 7,[46] based substantially on the vetoed bills, have been introduced in the 95th Congress. Because of executive support of the Proposed Surface Mining Control and Reclamation Act of 1977 (the Bill), the authors are anticipating enactment. House Bill No. 2 as introduced is used herein for analysis, and unless otherwise noted, identical provisions may be found in Senate Bill No. 7 as introduced.

There are thirteen express purposes set forth in section 102 of the House Bill. These purposes include the intent to do the following:

> (a) establish a nationwide program to protect society and the environment from the adverse effects of surface coal mining operations and surface impacts of underground coal mining operations;
>
> . . . .
>
> (c) assure that surface mining operations are not conducted where reclamation as required by [the] Act is not feasible; [and,]
>
> . . . .
>
> (f) assure that the coal supply essential to the Nation's energy requirements, and to its economic and social well-being, is provided and strike a balance between protection of the

40. S. 425, 93d Cong., 2d Sess. (1974).
41. H.R. 25, 94th Cong., 1st Sess. (1975).
42. President Ford did not sign Senate Bill No. 425, which was not passed by Congress until December 16, 1974. Dunlap, *An Analysis of the Legislative History of the Surface Mining Control and Reclamation Act of* 1975, 21 ROCKY MTN. MIN.L. INST. 11, 17-18 (1975).
43. *Id.* at 26.
44. *Id.*
45. H.R. 2, 95th Cong., 1st Sess. (1977).
46. S. 7, 95th Cong., 1st Sess. (1977).

> environment and agricultural productivity and the Nation's need for coal. . . .[47]

Of the congressional findings listed in the Bill, one in particular should be noted. Congress declared as follows:

> [B]ecause of the diversity in terrain, climate, biologic, chemical, and other physical conditions in areas subject to mining operations, the primary governmental responsibility for developing, authorizing, issuing, and enforcing regulations for surface mining and reclamation operations subject to [the] Act should rest with the States. . . .[48]

These purposes and declarations indicate the general nature of the Bill. First, Congress is creating a national program for regulating surface coal mining. As is discussed below, this program is expressly preemptive in nature. Therefore, the extent of state jurisdiction will depend upon compliance with the federal statute when enacted, as opposed to the present constitutional basis. Second, Congress perceives the need to strike a balance between the necessity of producing coal and the importance of preserving environmental integrity and agricultural productivity. Third, Congress recognizes that coal lands in the United States exhibit diverse and localized ecologic, topographic, climatic and geologic characteristics. Because of this diversity, the Bill contemplates a primary role for the individual states.

The Bill creates the Office of Surface Mining Reclamation and Enforcement within the Department of the Interior.[49] Acting through this office, the Secretary of the Interior must, among other functions, do the following:

1. administer the regulatory programs established by the Act;
2. promulgate rules and regulations relating to the implementation of the Act;
3. assist in the development of state programs that are consistent with the Act and reflect local requirements and conditions;
4. approve or disapprove state programs;
5. administer the program for purchase and reclamation of abandoned and unreclaimed mined lands;
6. maintain a continuing study of surface mining and reclamation and develop an Information and Data Center.[50]

The crux of the Bill, however, is the establishment of minimum per-

47. H.R. 2 §§ 102(a),(c),(f), 95th Cong., 1st Sess. (1977).
48. *Id.* § 101(e).
49. *Id.* § 201(a).
50. *Id.* § 201(c).

formance standards and the structuring of the federal-state relationship in the regulation of surface coal mining.[51]

2. *The Land Classification System*

The administrative structure established by Congress in the Bill is based upon the identification of three categories of land: lands within any state (state lands), federal lands, and Indian lands. The category into which a proposed mine will fall determines what administrative process will apply. These categories have been defined in section 701 of the House Bill as follows:

> (7) "lands within any State" or "lands within such State" means all lands within a State *other than* Federal lands and Indian lands;
>
> (8) "Federal lands" mean any land, *including* mineral interests, owned by the United States . . . except Indian lands;
>
> (9) "Indian lands" means all lands, including mineral interests, within the exterior boundaries of any Federal Indian reservation . . . and all lands including mineral interests held in trust for or supervised by any Indian tribe. . . .[52]

It is important to note that the state lands category includes only those lands where *both* the surface and the mineral interest are owned by either the state or non-Indian private interests.

a. *Indian Lands*

Surface coal mines and reclamation procedures on Indian lands are currently regulated by the Bureau of Indian Affairs and the United States Geological Survey.[53] The coal mining operating regulations promulgated by the Department of the Interior in 1976 specifically excluded Indian lands,[54] so there are currently no minimum performance standards for coal mines on Indian lands.[55]

No permanent regulatory structure for Indian lands is created by the Bill, so the present administrative structure will not be affected. The Bill does, however, impose the minimum performance stan-

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51. *Id.* at Title V. Titles III, IV and VI of House Bill No. 2 relate to state research institutes, reclamation of abandoned mines, and procedures for designated lands unsuitable for the mining of minerals other than coal, respectively. Senate Bill No. 7, as introduced, does not contain the provisions in Title III and VI of House Bill No. 2.

52. H.R. 2 § 701(7),(8),(9), 95th Cong., 1st Sess. (1977) (emphasis added).

53. 25 C.F.R. § 177 (1976). There are no minimum performance standards for Indian lands at the present time. Rather, a technical examination of the land involved is made, and the reclamation requirements are then formulated and incorporated in the operator's mining contract. *See* Olsen, *supra* note 19, at 151-54.

54. 30 C.F.R. § 211.1 (1976).

55. The Department of the Interior, however, has proposed new rules that would substantially revise 25 C.F.R. § 177 (1976). The proposed rules would include minimum performance standards identical to those of 30 C.F.R. § 211.40 (1976). *See* 42 Fed. Reg. 18,083, 18,089 (Apr. 5, 1977).

dards and certain procedural requirements on surface coal mining operations on Indian lands.[56] Beyond these basic requirements, the Bill requires only that the Secretary study the question of regulation of surface mining on Indian lands and then submit a report of this study and drafts of proposed legislation to Congress.[57]

Unlike its approach to Indian lands, Congress has extensively defined the process with regard to federal lands and state lands.

b. *State Lands*

The Bill provides that within eighteen months after its enactment, the states must submit state programs to the Secretary if they desire "to assume exclusive jurisdiction over the regulation of surface coal mining and reclamation operations. . . ."[58] Furthermore, the Bill describes six items which are critical to the state program:

1. a state law that provides for regulation in accordance with the requirements of the Act and the Secretary's rules;

2. a state law that provides sanctions that meet the minimum requirements of the Act, "including civil and criminal actions, forfeiture of bonds, suspensions, revocations and withholding of permits, and the issuance of cease-and-desist orders . . .";

3. a sufficiently funded regulatory authority with adequate technical and administrative personnel;

4. a statutorily created permit system that is consistent with the Act;

5. "a process for the designation of areas as unsuitable for surface coal mining . . .";

6. a process for coordinating the operating permit procedures with any other permit process applicable to the proposed operation.[59]

The state program by definition applies only to state lands, which have been defined to exclude federal lands.[60]

If a state fails to submit a program, the Secretary is directed to promulgate a "Federal program" for the regulation of state lands.[61] The federal program pre-empts state statutes and regula-

56. H.R. 2 § 710(c),(d), 95th Cong., 1st Sess. (1977). In addition to incorporating the minimum performance standards, the Bill requires that the procedures for Indian lands relating to application requirements, reclamation plans, bonding, inspections and enforcement be as stringent as those contained in the Bill. *Id.* The impact of the Bill on Indian lands administration cannot be determined until the Department of the Interior promulgates rules and regulations after enactment.
57. *Id.* § 710(a),(b).
58. *Id.* § 503(a).
59. *Id.* § 503(a)(1)-(6).
60. *Id.* § 701(11).
61. *Id.* § 504(a).

tions "which are in effect to regulate surface mining and reclamation operations subject to [the] Act. . . ."[62] Furthermore, the implementation of a federal program vests exclusive regulatory authority in the Secretary.[63] The congressional intent appears clear: if the states do not receive approval of a state program, the Department of the Interior will absorb the permit process and regulation of surface mine reclamation on state lands.

c. *Federal Lands*

Within six months after enactment, the Secretary must develop a "Federal lands program" that will be applicable to all operations on federal lands within a particular state, excluding Indian lands.[64] This "Federal lands" program will hereinafter be referred to as a Section 523 program in order to avoid confusion with the "Federal program" discussed above. The Section 523 program must, in addition to incorporating the Bill's requirements, take into account the "diverse physical, climatological, and other unique characteristics of the Federal lands in question."[65] If a state program has been approved, the Section 523 program must, at a minimum, include the requirements of the state program.[66]

The Senate version of the Bill allows states with approved programs to elect to regulate operations on federal lands.[67] The House version specifically denies this election as follows:

> Except as specifically provided in subsection (d) [joint Federal-State programs] this section shall not be construed as authorizing the Secretary to delegate to the States *any* authority or jurisdiction to regulate or to administer surface coal mining and reclamation operations or other activities taking place on the Federal lands.[68]

This is one of the basic differences between the House and Senate bills. While the Senate version allows state election, this House provision suggests that proposed operations involving only federal lands must be regulated under the Section 523 program. Apparently, state input would then be limited to the substantive requirements of the state's approved program, since these must be included in the Section 523 program.

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62. *Id.* § 504(g).
63. *Id.* § 504(a).
64. *Id.* § 523(a).
65. *Id.*
66. *Id.*
67. S. 7 § 423(d), 95th Cong., 1st Sess. (1977).
68. H.R. 2 § 523(e), 95th Cong., 1st Sess. (1977) (emphasis added).

d. *Joint Federal-State Programs*

Because of divided ownership patterns in the West,[69] state lands and federal lands may be interspersed or checkerboarded.[70] The Bill provides that a proposed operation that includes both state and federal lands may be treated as a single management unit.[71] In order to implement this approach, the Secretary is authorized to enter into a "joint Federal-State program"[72] and accordingly, may "enter into agreements with the States, may delegate authority to the States, or may accept a delegation of authority from the States for the purpose of avoiding duality of administration. . . ."[73]

3. *Designating Areas Unsuitable for Surface Coal Mining*

In order to be eligible to assume regulatory authority under a state program, a state must establish a planning process for the purpose of determining "which, if any, land areas of a State are unsuitable for all or certain types of surface coal mining. . . ."[74] It is incumbent upon the state to demonstrate that it has the following: (1) an agency responsible for surface coal mining lands review; (2) a data base and inventory system sufficient to properly evaluate the capacity of different land areas of the state to support and permit reclamation of surface mined lands; (3) a method to implement land use planning decisions relating to surface mines; (4) proper opportunities for public participation including a public hearing prior to designation; and (5) adopted procedures that will protect the legal interests of affected persons in all aspects of the designation process.[75]

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69. Coal ownership in the West is divided among four owners: the federal government, the states, Indian tribes, and private parties. The pattern of ownership between coal and surface varies significantly in the western states. In North Dakota, for example, the majority of the coal resource is held privately, principally by the Burlington Northern Railroad. These holdings are predominantly on odd-numbered sections. Federal ownership prevails on the even-numbered sections. The state controls the coal under the school lands and other acquired lands, and the coal deposits on the Fort Berthold Indian Reservation are under Indian ownership. The surface in North Dakota coal lands is 90-95% privately owned. In the Wyoming Northern Great Plains coal area, ownership has been characterized as 80-85% private surface, with coal ownership "as predominantly federal as surface ownership is private." R. NEHRING & B. ZYCHER, COAL DEVELOPMENT AND GOVERNMENTAL REGULATION IN THE NORTHERN GREAT PLAINS: A PRELIMINARY REPORT 28-29, 38-53 (Aug. 1976) (prepared in part under a grant from the National Science Foundation, Grant No. OEP-74-07918 AOI and with the support of the Rand Corp.) [hereinafter cited as COAL DEVELOPMENT].

As further examples, in the coal areas of southwestern Wyoming, Utah, and parts of Colorado nearly 100% federal surface ownership is found. In Arizona, the strippable coal lands are 100% Indian owned. NATIONAL ACADEMY OF SCIENCES, REHABILITATION POTENTIAL OF WESTERN COAL LANDS, 105-07, 119-24 (1974) [hereinafter cited as NAS STUDY].

70. The North Dakota coal lands are an excellent example of "checkerboarded" coal ownership. *See* NORTHERN GREAT PLAINS RESOURCES PROGRAM, EFFECTS OF COAL DEVELOPMENT IN THE NORTHERN GREAT PLAINS, PLATE 12 (1975).

71. H.R. 2 § 523(d), 95th Cong., 1st Sess. (1977).

72. *Id.*

73. *Id.*

74. *Id.* § 522(a)(1).

75. *Id.* § 522(a)(4).

A person "having an interest which is or may be adversely affected shall have the right to petition the regulatory authority to have an area designated as unsuitable for surface coal mining operations. . . ."[76] When such a petition is made, the state regulatory authority, following the statutory procedure, may so designate land if it is determined as follows:

1. reclamation as required by the Act is not feasible; or,

2. mining would "be incompatible with existing land use plans or programs"; or,

3. mining "could result in significant damage to important historic, cultural, scientific, and esthetic values and natural systems"; or,

4. mining would affect renewable resource lands potentially resulting in a "substantial loss or reduction of long-range productivity of water supply or of food or fiber products"; specifically included in this category are aquifers and aquifer recharge areas; or,

5. if mining could affect natural hazard land substantially endangering life or property; this category specifically includes geologically unstable lands and lands subject to frequent flooding.[77]

It also appears that the state regulatory authority may commence the designation process on its own motion.[78]

The regulatory agencies in several of the western states currently have authority to deny mining permits for certain lands. In those states that have developed extensive reclamation performance standards, authority is usually granted by statute to deny a permit if reclamation as required is not possible.[79] To a much lesser degree, the other criteria in the Bill may be found in current state laws.[80]

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76. *Id.* § 522(c).
77. *Id.* §§ 522(a)(2),(3).
78. *Id.* § 510(b)(4).
79. *E.g.*, COLO. REV. STAT. § 34-32-115(4)(g) (Supp. 1976) (Colorado repealed and reenacted its reclamation statute in 1976, ch. 149 [1976] Colo. Sess. Laws ——); MONT. REV. CODES ANN. § 50-1042(1) (Supp. 1975); N.D. CENT. CODE § 38-14-50.1(2) (Supp. 1975); WYO. STAT. § 35-502.24(g)(xi) (Cum. Supp. 1975).
80. In Wyoming, a permit may be denied when the regulatory agency determines that mining would irreparably harm lands of "unique and irreplaceable, historical, archeological, scenic, or natural value." WYO. STAT. § 35-502.24(g)(iv) (Cum. Supp. 1975). Montana also allows denial for "critical or unique" lands including lands of critical biological productivity, or ecological fragility or importance, or of scenic, historic, archeologic, topographic, geologic, ethnologic, scientific, cultural, or recreational significance. MONT. REV. CODES ANN. § 50-1042(2) (Supp. 1976). The possibility of "permanent destruction" of agricultural uses, "consequential aesthetic values," and "consequential recreational areas" of adverse impacts to state, national, and interstate parks and historical archeological, or paleontological sites are criteria for permit denial in North Dakota. N.D. CENT. CODE § 38-14-05.1(1), (5) (Supp. 1975). Substantial pollution of water is a denial criterion in Montana, Wyoming and North Dakota under all the above statutes. South Dakota's statute generally incorporates all of these criteria, states them more articulately, and appears highly compatible with the congressional provisions. S.D. COMPILED LAWS ANN. § 45-6A-9.1 (Supp. 1976).

Some states have no statutory criteria on which denial is to be based.[81] Thus, the Bill is significant in that it mandates a designation process to be part of a state program and establishes the general criteria on which designation is to be based.

Specifically excluded from the provisions of the designation process are lands on which a surface mine exists before passage of the Bill, lands for which a permit has already been issued, or "where substantial legal and financial commitments in such operations are in existence prior to September 1, 1974."[82] What constitutes a substantial commitment in an operation is not defined in the Bill.

The designation process in the Bill furnishes a method for determining which "land areas of a State"[83] are unsuitable for mining. "Land areas of a state," which is not defined, appears to be a classification of land apart from the state lands category ("lands within any state"). It may then be argued that for purposes of designation, a state's authority is broader than the regulatory authority of the permit process under an approved state program. However, the Secretary of the Interior is also directed to review all federal lands, using the same designation criteria, to determine if any federal lands are unsuitable for mining.[84] Therefore, extension of the state designation process to federal lands may be deemed to be inconsistent with the Secretary's review process. In any event, where ownership patterns are checkerboarded, a high degree of coordination between the state and federal designation procedures will be necessary to effectuate the policy of protecting qualifying lands.

III. RECLAMATION PERFORMANCE STANDARDS

A. CURRENT STATE LAWS

In the last decade, almost all of the western states in which surface coal mining is taking place have enacted statutes regulating reclamation activities.[85] Fundamental differences exist among these statutes, however. First, the scope of the laws varies. New Mexico[86]

81. *E.g.*, N.M. STAT. ANN. §§ 63-34-1 to 20 (1974); UTAH CODE ANN. §§ 40-8-1 to 23 (Supp. 1975).
82. H.R. 2 § 522(a)(6), 95th Cong., 1st Sess. (1977).
83. *Id.* § 522(a)(1).
84. *Id.* § 522(b).
85. For major reclamation performance standards applicable in the western United States *see* Appendix.

Because coal mining in Arizona is limited to Indian lands, no statute as such exists at the state level. The authors recognize that coal mining is occurring in the State of Washington. However, because the ecologic, climatic, and other factors in that area are so different from those prevalent in the other western coal states, discussion of Washington law is not presented. *See* McCarthy, *Land Reclamation, Water Quality Control, and Environmental Concern at Centralia (Washington) Coal Mine*, in PRACTICES AND PROBLEMS OF LAND RECLAMATION IN WESTERN NORTH AMERICA 171-72 (M. Wali ed. 1975) [hereinafter cited as PRACTICES AND PROBLEMS]; NAS STUDY, *supra* note 69, at 124.
86. N.M. STAT. ANN. § 63-34-2(b) (1974).

and North Dakota[87] regulate coal only; Montana regulates coal and uranium under the same statute;[88] and the Colorado,[89] South Dakota,[90] Utah,[91] and Wyoming[92] statutes include all minerals (excluding oil, gas, and geothermal resources). Second, the types of operations that are covered differ. The New Mexico,[93] North Dakota[94] and South Dakota[95] statutes regulate surface mining, whereas the Colorado,[96] Montana,[97] Utah,[98] and Wyoming[99] statutes regulate both surface and underground mining. Third, some statutes focus merely on creating a regulatory process for approving mining and reclamation plans and issuing permits;[100] others, in addition to creating an administrative process, establish extensive performance standards.[101]

Although the scope of the laws differs, the statutes provide for a similar administrative process. Basically, the laws direct an administrative body to issue permits and to enforce the statutes and permit conditions. The substantive requirements of the permit process are relatively uniform. Typically an applicant will need to provide the following: (1) a statement or evidence of the applicant's right to mine; (2) scientific and other information regarding the proposed mine site; (3) a mining plan; (4) a reclamation plan; (5) a bond securing compliance with approved plans; and (6) other applicable permits.[102] When the application file is sufficiently complete, the agency will proceed pursuant to the statute and adopted rules. Local notice,[103] opportunity to file objections,[104] hearings,[105] and consultation with the surface owner[106] and other agencies or advisory committees[107] are frequently part of the procedural setting.

Ecologically, the approval of mining and reclamation plans by

87. N.D. CENT. CODE § 38-14-02(3) (Supp. 1975).
88. MONT. REV. CODES ANN. § 50-1036(1) (Supp. 1975).
89. COLO. REV. STAT. § 34-32-103(7) (Supp. 1976).
90. S.D. COMPILED LAWS ANN. § 45-6A-2(3) (Supp. 1976).
91. UTAH CODE ANN. § 40-8-4(3) (Supp. 1975).
92. WYO. STAT. § 35-502.3(e)(ii) (Cum. Supp. 1975).
93. N.M. STAT. ANN. § 63-34-6 (1974).
94. N.D. CENT. CODE § 38-14-03 (Supp. 1975).
95. S.D. COMPILED LAWS ANN. § 45-6A-7 (Supp. 1976).
96. COLO. REV. STAT. § 34-32-103(8) (Supp. 1976).
97. MONT. REV. CODES ANN. § 50-1036(6) (Supp. 1976).
98. UTAH CODE ANN. § 40-8-3(6) (Supp. 1975).
99. WYO. STAT. § 35-502.20(a) (Cum. Supp. 1975).
100. *E.g.*, N.M. STAT. ANN. §§ 63-34-1 to 20 (1974); UTAH CODE ANN. §§ 40-8-1 to 23 (Supp. 1975).
101. *E.g.*, Colo., Mont., Wyo. *See* Appendix A.
102. Imhoff, *Status and Content of State Mined-Area Reclamation Programs*, in NAT'L COAL A., FOURTH SYMPOSIUM ON SURFACE MINING AND RECLAMATION 95 (Oct. 1976).
103. *E.g.*, COLO. REV. STAT. § 34-32-112(10) (Supp. 1976); N.D. CENT. CODE § 38-14-04.1 (Supp. 1975).
104. *E.g.*, N.D. CENT. CODE § 38-14-04.1 (Supp. 1975); WYO. STAT. § 35-502.24(f) (Cum. Supp. 1975).
105. *E.g.*, N.M. STAT. ANN. § 63-34-5B (1974) (providing for a hearing only upon appeal from decisions of the coal surface-mining commission); UTAH CODE ANN. § 40-8-8(1) (Supp. 1975).
106. *E.g.*, N.D. PUB. SERV. COMM'N RULES AND REGS. FOR RECLAMATION OF SURFACE MINED LANDS R-38-14-05.6; S.D. RECLAMATION RULES AND REGS. 12:04:02:13.
107. *E.g.*, COLO. REV. STAT. § 34-32-107 (Supp. 1976); WYO. STAT. § 35-502-14 (Cum. Supp. 1975).

the state authority is the critical point in the permit process. During the plan approval process, the characteristics of the specific site (soil, vegetation, topography, climate, etc.) are considered and the mining and reclamation requirements are finalized accordingly. Since the required reclamation performance bond is contingent upon compliance with the approved plans, the plans also have importance from an enforcement perspective.

If the Proposed Surface Mining Control and Reclamation Act of 1977 is enacted, the present permit structures of the states will remain in effect until the approval of a state program or the implementation of a federal program by the Secretary.[108] Thus, the coal mine operator must still obtain a state mining permit. During the first six months after enactment, the state procedures and performance standards will not be affected by the Bill. However, permits issued after the six month period must contain terms that comply with the performance standards of the Bill relating to segregation of topsoil, restoration of contour, restoration of the land to support pre-mining uses, hydrologic protection, and revegetation.[109] Regardless of the date of permit issuance, if a coal mine operator has not removed overburden from the land within one year after enactment of the Bill, that operator must comply with these same standards.[110]

In varying degrees, most of the western states have adopted performance standards.[111] These standards are found both in statutory form and in the rules and regulations of the regulatory agencies. The congressional standards will be pre-emptive only if the state standards are less stringent.

> (a) No State law . . . shall be superseded by any provision of this Act or any regulation issued pursuant thereto, except insofar as such State law or regulation is inconsistent with the provisions of this Act.
>
> (b) Any provision of any State law or regulation . . . which provides for more stringent land use and environmental controls and regulations of surface coal mining and reclamation . . . shall not be construed to be inconsistent with this Act. . . .[112]

The Bill relates only to coal mining, however. A state's permit proc-

108. H.R. 2 § 502(a), 95th Cong., 1st Sess. (1977). The exact scope of a state's permit process during the interim period is not clear under this section.
109. *Id.* § 502(b).
110. *Id.* § 502(c).
111. Where the statute involved creates only the regulatory process with few or no standards and criteria, specific performance standards are determined as part of the mining plan approval process. *See, e.g.*, In the Matter of the Application of Carbon Coal Co. for a Permit to Surface Mine Coal in McKinley County. N.M., N.M. Coal Surface Mining Comm'n 4-7, 9-11 (July 23, 1976); N.M. STAT. ANN. § 63-34-9 (1974).
112. H.R. 2 § 505(a),(b), 95th Cong., 1st Sess. (1977).

ess and performance standards will be unaffected with respect to other regulated operations.

B. OVERVIEW OF WESTERN MINED LAND REHABILITATION PROBLEMS[113]

To the layman it may appear paradoxical that in the East plentiful precipitation increases the environmental problems associated with surface mining, while in the West lack of precipitation is the prevalent problem. In the West, the problem of low amounts of precipitation is augmented by the pattern of its distribution. In the coal lands of North Dakota, for example, precipitation ranges from 14-16 inches annually, 75-80% of which is received during the growing season (about 131 days from the last frost in spring to the first frost in autumn).[114] However, precipitation is usually limited to short periods, and longer dry periods prevail. High temperatures and winds in these dry periods create high rates of evaporation and plant transpiration, and consequently an increased demand for water.[115] These climatic factors, coupled with the nature of the geologic parent materials, considerably slow the process of soil development. This situation becomes worse in arid regions such as the Arizona coal lands, where the annual rainfall averages about 12 inches, but "which can vary from half to twice this amount." [116]

The problem of soil erosion in the West due to high prevailing winds is also of importance.[117] In the Northern Great Plains, wind erosion occurs somewhat continuously throughout the year, while water erosion occurs more sporadically.[118] Over the years, there has been concern over both the quantity and quality of this loss.[119] Considerations of soil erosion have an important bearing on the question of how much topsoil can be held in place on recontoured surface mines.

Grazing and agriculture are the predominant pre-mining uses of land in the West. Therefore, it is to be expected that revegetation

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113. PRACTICES AND PROBLEMS OF LAND RECLAMATION IN WESTERN NORTH AMERICA (M. Wali ed. 1975); NAS STUDY, *supra* note 69; M. WALI, P. FREEMAN, A. KOLLMAN & W. JOHNSON, AN OVERVIEW OF RECLAMATION IN THE WEST, TECHNOLOGY AND USE OF LIGNITE 294-311 (prepared for U.S. Energy Research & Devel. Admin., GFERC/IC 75-2, 1975).

114. Wali & Sandoval, *Regional Site Factors and Revegetation Studies in Western N.D.*, in PRACTICES AND PROBLEMS, *supra* note 85, at 133, 136.

115. The problems associated with precipitation patterns are discussed in Curry, *Biogeochemical Limitations on Western Reclamation: The High Northern Great Plains*, in PRACTICES AND PROBLEMS, *supra* note 85, at 18, 30.

116. Thames & Verma, *Coal Mine Reclamation on the Black Mesa and the Four Corners Area of Northeastern Arizona*, in PRACTICES AND PROBLEMS, *supra* note 85, at 48-49.

117. Hodder, *Montana Reclamation Problems and Remedial Techniques*, in PRACTICES AND PROBLEMS, *supra* note 85, at 90, 92.

118. *Id.* at 91.

119. *See* references to Wali's research in *N.D. Topsoil Being Stolen by Erosion*, Grand Forks (N.D.) Herald, Jan. 30, 1972, at 27; *Professor Finds "Snirt" Storms Erode N.D. Soil*, Minneapolis Tribune, Feb. 13, 1972, at 10A. *See also* Wali, *The Problems of Land Reclamation in a Systems Context*, in PRACTICES AND PROBLEMS, *supra* note 85, at 1, 9.

efforts will constitute the major thrust of reclamation practices. Vegetation cover will aid in minimizing erosion and attendant water degradation. An established vegetative cover will also provide continuing benefits in the form of wildlife habitat and grazing land. Further, it may prove to be the most economical and successful method of reclaiming affected areas. However, the selection of plant species to be used in the revegetation process presents a difficult problem involving attitudinal as well as ecological considerations. In areas composed of predominantly range-lands, agricultural lands, and wildlife areas, the tendency may be to demand a rapid return of mined lands to their original use. However, wishful thinking alone will not suffice; ecosystem development necessarily takes time. The problem is further compounded by the tremendous lack of information on growth requirements and abundance of desirable plant species. The reclamation of mined lands should involve the use of diverse plant species to ensure the long term stability, biological productivity, and resiliency of these man-made ecosystems.[120]

C. GENERAL RECLAMATION PROVISIONS

An analysis of reclamation performance standards should begin with the standards contained in a pre-emptive federal statute. The Proposed Surface Mining Control and Reclamation Act of 1977 will establish minimum performance standards for surface coal mining.[121] In addition, the Secretary of the Interior is authorized to promulgate further requirements consistent with the Bill.[122] Generally, the Bill requires that the coal mine must be operated to maximize the utilization and conservation of coal. Reclamation practices are to "proceed in an environmentally sound manner and as contemporaneously as practicable with the surface coal mining operations."[123]

The coal mine operator, subsequent to mining, must "restore the land affected to a condition at least fully capable of supporting the uses which it was capable of supporting prior to any mining, or higher or better uses of which there is a reasonable likelihood. . . ."[124] Uses must not present hazards to the public or threaten water diminution or pollution, and they must be consistent with applicable land use plans and policies.[125] The proposed post-mining use is to be set out in the required reclamation plan.[126] The relationship of the post-mining use to existing land use plans and policies must

120. Wali & Kollman, *Ecology and Mining or Mining Ecology*, in DISTURBED LAND RECLAMATION AND USE IN THE SOUTHWEST 108 (J. Thames ed. 1976).
121. H.R. 2 § 515, 95th Cong., 1st Sess. (1977).
122. *Id.* § 201(c)(2).
123. *Id.* § 515(b)(16).
124. *Id.* § 515(b)(2).
125. *Id.*
126. *Id.* § 508(a)(3).

also be discussed in the reclamation plan.[127] If the land is to be reclaimed to an industrial, commercial, residential, or public facility use, certain assurances are required from the operator; that necessary investments in public facilities will be made, and that the use will be properly designed, practical, compatible with adjacent land uses and supported by data regarding expected need and market.[128]

The Bill contains several guidelines for the design and operation of a surface mine. All surface areas, including spoil piles, must be stabilized and protected to effectively control erosion and pollution.[129] Likewise, access roads must be constructed and maintained in a manner that will control or prevent erosion, water pollution, or damage to property and fish or wildlife habitat.[130] Furthermore, the operator must refrain from constructing access roads up stream beds or drainage channels.[131] Debris, acid forming materials, toxic materials, and materials constituting a fire hazard must be treated or disposed of so as to prevent water contamination or sustained combustion.[132]

Analysis of further performance standards may be broken down into four major categories: topographic provisions, handling of suitable plant growth material, revegetation requirements, and hydrologic standards.

D. TOPOGRAPHIC PROVISIONS

Restoration of the approximate original contour is required by the Bill for all surface coal mines.[133] Approximate original contour is defined to mean, "that surface configuration achieved . . . so that it closely resembles the surface configuration of the land prior to mining and blends into and complements the drainage pattern of the surrounding terrain. . . ."[134] Although the restoration of a proper contour may involve backfilling, grading, and compaction, the Bill suggests compaction where necessary to prevent leaching of toxic materials or to insure stability.[135] Highwalls, spoil piles, and depressions must be eliminated, but an exception is made for small depressions necessary to retain moisture.[136] This technique, called "gouging,"[137] is simple and effective: small basins are gouged into the regraded area. These basins serve two functions. Not only do they interrupt the movement of water across the regraded area,

127. *Id.*
128. *Id.* § 515(c)(3).
129. *Id.* § 515(b)(4).
130. *Id.* § 515(b)(17).
131. *Id.* § 515(b)(18).
132. *Id.* § 515(b)(14).
133. *Id.* § 515(b)(3).
134. *Id.* § 701(23).
135. *Id.* § 515(b)(3).
136. *Id.*
137. *See* Hodder, *Montana Reclamation Problems and Remedial Techniques*, in PRACTICES AND PROBLEMS, *supra* note 85.

thereby helping to minimize erosion, but they also accumulate water necessary for successful revegetation.

Two general exceptions are made to the approximate original contour requirement. First, where the overburden is more than sufficient, due to volumetric expansion of overburden during mining, the operator must regrade to the lowest grade not more than the "angle of repose."[138] This term, undefined in the Bill, apparently means the angle at which the recontoured land will remain stable. If the overburden is insufficient, due to the mining of a thick coal seam, the operator is required to regrade to the lowest practical grade not more than the angle of repose, and to provide for adequate drainage.[139] A variance from the general standards may be granted when an industrial, commercial, residential, or public facility (e.g., game management area or park) is proposed as the post-mining use.[140] The operator may also design permanent water impoundments into the final contour.[141]

Ecologically, restoration of contour to the rolling topography that is typical in the Great Plains adds several benefits to the reclamation process. Reduction of slope reduces the velocity of water flow on the surface. Consequently, in areas like the West where thundershowers are a predominant form of precipitation, regrading significantly reduces erosion. The reduction in velocity also allows more time for the water to penetrate into the soil profile.[142] Moreover, increased water infiltration will aid substantially in the leaching of salts from the upper soil layers, the major rooting zone.

E. SUITABLE PLANT GROWTH MATERIAL

The removal, segregation, and replacement of topsoil on mined areas (topsoiling) is presently a legally required practice in most of the western coal states.[143] The Bill also requires topsoiling.[144] Unlike several of the western states, though, Congress has not defined "topsoil." The Bill merely requires that topsoil be removed and, if not used immediately, segregated.[145] If the topsoil storage period is so long that deterioration will result, the coal mine operator must plant a successful quick-growing plant cover on the stored topsoil to prevent erosion and maintain it in a usable condition.[146] If the topsoil at the mine site is insufficient or of a poor quality, or if

138. H.R. 2 § 515(b)(3), 95th Cong., 1st Sess. (1977).
139. *Id.*
140. *Id.* § 515(c)(2).
141. *Id.* § 515(b)(8).
142. *See* Hodder, *Montana Reclamation Problems and Remedial Techniques*, in PRACTICES AND PROBLEMS, *supra* note 85, at 93-105.
143. *See* Appendix.
144. H.R. 2 § 515(b)(5), 95th Cong., 1st Sess. (1977).
145. *Id.*
146. *Id.*

deeper strata are more suitable for revegetation, the operator is directed to handle the strata that are best able to support vegetation in the same manner as topsoil.[147]

Recent studies have stressed that prospective topsoiling legislation should take into account several factors before topsoil is removed and respread.[148] These factors include the topography as well as a proper inventory of proposed sites. Replacement of topsoil after recontouring and reconfiguring the spoil materials appears to be a good practice, at least until better knowledge is obtained concerning the reclamation of saline, sodic, and alkali soils.

Research is currently underway in several states on the amount of topsoil removed in a surface coal mining operation and the amount that must be respread. Although none of the studies have been concluded, it appears that some generalizations can be made. In New Mexico, it has been reported that eight inches of topsoil, properly chiseled and gouged, resulted in optimal plant growth.[149] In Montana, one study found optimum yield of wheat using eight inches of topsoil and further pointed out that amounts of more than eight inches did not result in any better conditions.[150] Optimal yields in North Dakota were reported with topsoil between eight and twenty-four inches.[151]

Several general points should be made regarding the widespread acceptance of topsoiling. An undue emphasis on topsoiling will give rise to a false hope of permanent reclamation and may stifle research in developing new and cheaper methods of reclaiming alkali and sodic soils. For example, it may be possible to utilize industrial wastes such as slack coal (low BTU coal discarded in the mining process), crude gypsum and sulphuric acid (byproducts of generation plant air pollution equipment) in the rehabilitation process.[152] Furthermore, the amount of suitable material to be removed in topsoiling is staggering. Three acre-feet of material weighs approximately 6,000 tons.[153] If this amount were removed from 640 acres,[154]

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147. *Id.*

148. *E.g.*, Wali & Freeman, *Ecology of Some Mined Areas in North Dakota*, in SOME ENVIRONMENTAL ASPECTS OF STRIP MINING IN NORTH DAKOTA 25 (M. Wali ed. 1973) (N.D. Geo. Survey, Educational Ser. 5); Wali, *The Problems of Land Reclamation in a Systems Context*, in PRACTICES AND PROBLEMS, *supra* note 85, at 11-12.

149. Gould, Rai & Wierenga, *Problems in Reclamation of Coal Mine Spoils in New Mexico*, in PRACTICES AND PROBLEMS, *supra* note 85, at 107.

150. B. Sindelar, R. Atkinson, M. Majerus & K. Proctor, Surface Reclamation Research at Colstrip, Montana (Mont. Ag. Exp. Station, Res. Rep. 69, 1974).

151. AGRICULTURAL RES. SERV., U.S. DEP'T OF AGRICULTURE AND N.D. AGRICULTURAL EXPERIMENT STATION, NORTH DAKOTA PROGRESS REPORT ON RESEARCH ON RECLAMATION OF STRIP-MINED LANDS—UPDATE 1977 at 15-16 (Mar. 1977) [hereinafter cited as N.D. PROGRESS REPORT].

152. Employment of industrial wastes in the rehabilitation process is currently under investigation at Project Reclamation, University of North Dakota, Grand Forks, N.D.

153. This approximation is based on the estimated weight of four million pounds per acre foot.

154. This is the approximate cumulative acreage currently mined in North Dakota annually.

the total weight would be nearly four million tons. Under North Dakota law, an operator may be required to segregate up to five feet of suitable plant growth material.[155] If applied to one square mile of mined land, this requirement would necessitate handling 3,200 acre-feet[156] of earthen materials (over six million tons).

In addition to the cost associated with the handling, storage, and replacement of such a huge quantity of material, the storage site itself must be considered. Although at first glance storage considerations may not appear significant, a substantial area of land will be needed for stockpiling segregated topsoil. Furthermore, where the law requires a two-step segregation, two stockpiles will be necessary.[157] The proponents of two-step segregation contend that the process more realistically re-creates the pre-mining soil profile after the two layers are respread. This process would necessitate affecting additional land for storage purposes. If not used as storage areas, it is likely that at least some of these lands would be unaffected by mining. In order to minimize the amount of land needed for stockpiles, segregated topsoil may be immediately respread on newly recontoured areas. However, if the law directs that segregated materials be returned to the same surface owner,[158] operators may find it difficult to so plan a mining operation when more than one surface owner is involved.

Another important point must be made regarding the nature of topsoil. Topsoil, when in place, is the result of a complex and constantly changing interaction of physical, chemical, climatic, and biologic factors (man-made or otherwise) on a given parent material. It is not proper to assume that topsoil, once segregated and stored for a period of time, will exhibit its pre-mining characteristics after it is respread on recontoured spoil material. Topsoiling is a good practice, because the respread topsoil is a more suitable plant growth material for desired species than raw spoils. However, the present research indicates that large quantities of topsoil are not necessary.[159] In fact, requiring excess handling, segregation, and storage of topsoil wastes energy, needlessly affects lands that would otherwise remain unaffected, and increases the costs of production.

F. REVEGETATION OF MINED AREAS

As has been mentioned, revegetation efforts will constitute the thrust of reclamation practices in the West. Congress has focused

155. N.D. CENT. CODE § 38-14-05(2) (Supp. 1975).
156. This is the volumetric equivalent of a one acre hole that is 3,200 feet deep.
157. *See* N.D. PUB. SERV. COMM'N RULES AND REGS. FOR RECLAMATION OF SURFACE MINED LANDS R38-14-04.13.
158. *Id.* R38-14-05.2.
159. *See* text accompanying notes 149-51 *supra*.

on two areas in the Bill: (1) intensive agriculture; and (2) establishment of permanent vegetative cover.

Generally, regraded areas must be revegetated under the Bill. The coal mine operator is obligated to establish on affected lands and regraded areas

> a diverse, effective, and permanent vegetative cover native to the area . . . and capable of self-regeneration and plant succession at least equal in extent of cover to the natural vegetation of the area; except, that introduced species may be used . . . where desirable and necessary to achieve the approved post-mining land use plan.[160]

The standard against which post-mining revegetation effects are to be measured is the amount of cover that existed prior to mining. "Thus if the native premining vegetation is sparse due to climatic or other natural conditions, then such conditions would be controlling in the reclamation standard."[161] An exception to these requirements may be granted where the post-mining land use is intensive agriculture.[162]

The Bill realistically recognizes that the revegetation process will take time. Normally, the operator must "assume the responsibility for successful revegetation . . . for a period of five full years after the last year of augmented seeding, fertilizing, irrigation, or other work in order to assure compliance with [the revegetation requirements]. . . ."[163] Where the annual average precipitation is twenty-six inches or less, the period of liability is extended to ten years.[164] This ten year responsibility period will generally apply in the semi-arid West. It is important to note that the responsibility period does not begin until after the last year of seeding, fertilizing, irrigation, or other work. When intensive agriculture is designated as the post-mining use, the five or ten year periods commence with the initial planting for intensive agriculture.[165] If the revegetation is deemed successful by the regulatory authority at the end of this period, the coal mine operator is relieved of further responsibility.

A designation of the post-mining land use as intensive agriculture poses some interesting legal questions. In states such as North Dakota, that prohibit corporate farming,[166] intensive agriculture will presumably be conducted by the surface owner; in those states that do not have this prohibition, it is unlikely that coal mine operators

160. H.R. 2 § 515(b)(19), 95th Cong., 1st Sess. (1977).
161. H.R. No. 189, 94th Cong., 1st Sess. 81 (1975).
162. H.R. 2 § 515(b)(20), 95th Cong., 1st Sess. (1977).
163. *Id.*
164. *Id.*
165. *Id.*
166. N.D. CENT. CODE § 10-06-01 (1976).

will be interested in farming. Therefore, it can be assumed that intensive agriculture will be conducted by surface owners. What then are the coal mine operator's responsibilities to the surface owner after the initial planting of crops? The occurrence of subsurface piping or subsidence[167] would probably fall within the operator's responsibility, since the mining operation would be the proximate cause of the occurrence. Nevertheless, intensive agriculture inherently places added burdens on the soil resource. Exposure of the soil to erosion and nutrient depletion are obvious side-effects of farming. A sense of equity suggests that a coal mine operator should not be responsible for unavoidable erosion or be required to supply fertilizer that would be necessary even if mining had not occurred. If, on the other hand, additional fertilizer is required after mining, it can be argued that the operator should be responsible for the increased needs.

The Bill reflects an appreciation of the importance of agriculture to the western economy. As already mentioned, croplands may be determined to be renewable resource lands and be designated as unsuitable for mining.[168] Coal mine operators are also directed to preserve the hydrologic functions of alluvial valley floors where water is sufficient for subirrigation or flood irrigation agriculture.[169] Obviously, the interpretations placed on these provisions at the regulatory level will affect their impact. At the time of this writing, both Congress and the executive branch of government[170] were attempting to analyze the effect that different interpretations would have on agriculture and coal production.

If the revegetated area is not or cannot be planted to crops, it is incumbent upon the coal mine operator to establish a diverse native vegetative cover.[171] The unequivocal intent of Congress is to require establishment of a permanent, self-sustaining vegetative cover.[172] In order to achieve this, the vegetative cover must be "capable of self-regeneration and plant succession. . . ."[173] Plant succession is an ecological term that refers to the process of plant community development.

Ecological succession has been defined to include three concepts:

> 1. It is an orderly process of community development involving changes in species structure and community processes with time; it is reasonably directional and predictable;

167. For a description of piping erosion and subsidence, *see* N.D. PROGRESS REPORT, *supra* note 151, at 9-10.
168. *See* text accompanying note 77 *supra.*
169. *See* text accompanying notes 188-89 *infra.*
170. *See Current Developments,* [1977] ENVIR. REP. (BNA) 1560, 1633.
171. H.R. 2 § 515(b)(19), 95th Cong., 1st Sess. (1977).
172. *See id.*
173. H.R. 2 § 515(b)(19), 95th Cong., 1st Sess. (1977).

> 2. It results from modification of the physical environment by the community, [i.e., even though the environment limits extent of development and rate of change, the community controls succession];
>
> 3. It culminates in a stabilized ecosystem in which maximum biomass and symbiotic function between organisms are maintained per unit of available energy flow, [i.e., it results in an energy efficient system involving maximum productivity and organism interreaction].[174]

An example of plant succession was recorded in 1917, describing the process on an abandoned Colorado wagon road.[175] It involved four successive stages: (1) annual weed state (2-5 years); (2) short-lived grass stage (3 to 10 years); (3) early perennial grass stage (10 to 20 years); and (4) climax grass stage (20 to 40 years). A parallel succession has been noted on abandoned surface mine spoil piles in North Dakota.[176]

Stated from an ecological perspective, the objective of the reclamation practices is to achieve a community of desired plants as far advanced along the successional path as possible. The "annual weed" stage is unacceptable; nor is it desirable to wait the extended period of time it would take for a natural succession to reach the final or climax stage. However, as has been stressed, the regraded and retopsoiled surface mine is not at all the equivalent of the system that existed prior to mining.[177] The plant community that existed prior to mining may not be able to compete for nutrients in the altered system as effectively as different species. While fertilization may initially aid in establishing desired species, as the ten year period of responsibility proceeds, those species that can more efficiently absorb the decreasingly available nutrients will tend to dominate. If this process is progressive along the successional scale, reclamation is successful. A regressive process would result in an undesirable earlier stage.

Further research into the processes and causes of natural plant succession in native species is vital. Oft-repeated field trials of the same varieties, particularly those of crops, will mean a digression from the development of new genetic strains of plants that are more tolerant of the disturbed soil conditions associated with surface mining. Recent evidence points to the need to promote desirable species that can maintain their productivity in nutrient deficient, toxic, or salt-affected soils.[178]

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174. E. ODUM, FUNDAMENTALS OF ECOLOGY 251 (3d ed. 1971).
175. Shantz, *Plant Succession on Abandoned Roads in Eastern Colorado*, 5 J. ECOLOGY 19 (1917).
176. Wali & Freeman, *supra* note 148, at 25.
177. *See* text accompanying note 159 *supra*.
178. *See* Bradshaw, *Plant Evolution in Extreme Environments*, in ECOLOGICAL GENETICS

The alternative to the ecological approach is to first establish and then constantly nurture a desired plant community through the use of fertilizers, herbicides, irrigation, or periodic reseeding. This alternative seems to have little merit. First, it is expensive. Second, this approach does not advance the process of plant succession; rather, it merely postpones the successional process until the nurturing process is ceased. Third, the scientific knowledge acquired under the ecological approach will have significant beneficial impacts on the management of soil, our most valuable resource. To abandon this approach for the stopgap nurturing process would be a short term gain, but a long term liability.

G. HYDROLOGIC PROVISIONS

The Bill imposes a general duty on the coal mine operator to minimize disturbance to the hydrologic balance and the quantity and quality of water in the surface and ground water systems. Six methods are specified in the Bill by which this general duty is to be met:

1. avoidance of acid or toxic mine drainage;

2. prevention, "to the extent possible using the best technology currently available," of the contribution of suspended solids to streamflow or runoff above natural levels and avoidance of channel deepening or enlargement drainage;

3. removal of temporary or large siltation structures from drainways after revegetation and stabilization;

4. restoration of the mined area's recharge capacity to the approximate pre-mining condition;

5. replacement of water supplies to owners whose supply is contaminated, diminished, or interrupted by a mining operation;

6. preservation of the essential hydrologic functions of alluvial valley floors in arid and semi-arid areas throughout the mining and reclamation process.[179]

Waste water discharges from surface coal mines are presently regulated under the permit provisions of the Federal Water Pollution Control Act.[180] Acid and alkali mine drainage effluent standards have been established by the Environmental Protection Agency,[181] and these regulations, administered under the Water Pollution Con-

AND EVOLUTION 20-50 (R. Creed ed. 1971); Bradshaw, McNeilly & Gregory, *Industrialization, Evolution, and the Development of Heavy Metal Tolerance in Plants*, in ECOLOGY AND THE INDUSTRIAL SOCIETY, 5 BRIT. ECOL. SOC. SYMP. 327-43 (G. Goodman ed. 1965); Lonergan, *The Physiology of Plant Tolerance to Low Phosphorus*, 1976 AGRONOMY ABS. 39.

179. H.R. 2 § 515(b)(10), 95th Cong., 1st Sess. (1977).

180. 33 U.S.C. §§ 1251-1376 (1970) (Supp. V 1975).

181. 40 C.F.R. § 434 (1976).

trol Act's permit system,[182] are the major water pollution control mechanisms for ongoing surface mines. However, the regulations cease to apply when the "final contour" is achieved.[183] Minimization of suspended solids, a prevalent form of water pollution associated with mining, will then depend on whether revegetation is successful. While the Bill refers to acid and toxic drainage and the control of suspended solids, it does not affect the Water Pollution Control Act.[184] Thus, it is to be expected that the EPA will retain its functions relating to ongoing operations.

Ground water systems may also be affected by mining. Mining may intercept aquifers, and thereby expose the water system to mineral degradation. In addition, after recontouring, infiltration of surface water may leach undesirable salts and trace elements into the groundwater system.[185] Two provisions in the Bill relate directly to protecting groundwater systems. First, an aquifer may be designated as a renewable resource of such importance as to justify designation as unsuitable for mining.[186] Second, the hydrologic balance of alluvial valley floors is to be preserved.[187]

For purposes of the Bill, alluvial valley floors are defined as "unconsolidated stream laid deposits holding streams where water availability is sufficient for subirrigation or flood irrigation agricultural activities."[188] The characteristics of these valley floors that make them significant agriculturally include the following: (1) sufficient annual runoff to allow flood irrigation; (2) development of flood plain and low terraces where water can be spread easily without the necessity of significant mechanical surface alteration; and (3) a shallow groundwater system that naturally subirrigates the land.[189] In essence, the Bill as introduced is an attempt to ensure that mining will not significantly disrupt these very productive renewable resource lands. However, whether the provisions survive mark-up and conference remains to be seen.

IV. STRIKING THE BALANCE

The science of ecology stresses the importance and necessity of viewing problems in their total context.[190] It is appropriate, then, to place land reclamation within the broader perspective of energy in general.

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182. 33 U.S.C. § 1342 (Supp. V 1975).
183. 40 C.F.R. § 434 (1976).
184. H.R. 2 § 702(a)(3), 95th Cong., 1st Sess. (1977).
185. COAL DEVELOPMENT, *supra* note 69, at 64.
186. H.R. 2 § 522(a)(3)(C), 95th Cong., 1st Sess. (1977).
187. *Id.* § 515(b)(10).
188. *Id.* § 701(27).
189. H. REP. No. 189, 94th Cong., 1st Sess. 82-83 (1975).
190. *See* Odum, *The Emergence of Ecology as a New Integrative Discipline*, 195 SCI. 1289 (1977).

During the last few years, the importance of adequate energy supplies to the nation's economy has become evident. In order to ensure a healthy national economy, the United States must maintain energy viability. However, domestic reserves of petroleum and natural gas, presently major sources of energy, are estimated to last between seventeen and forty years, depending on the rate of imports.[191] Thus, it is apparent that in the next quarter century major changes will occur in the sources, use, and distribution of energy in our society. The transition to other forms of energy will be accompanied by a host of sociological, political, economic, and environmental problems.

While the nation develops new methods of producing energy, it is currently believed that increased development of the nation's abundant coal reserves, particularly in the West, will be the significant factor in the short term for ensuring adequate energy supplies.[192] However, coal reserves are not inexhaustible.

> If we put our coal consumption on the same increase (6.69% per year) that occurred for the 50 years following the Civil War, the larger estimate of U.S. coal reserves will be gone in 80 years. . . . United States coal would last forever if we let our consumption decrease at a rate of 3.3% per century.[193]

Increased coal production carries with it diverse problems, including population influx, tax issues, transportation questions, competition for labor and water, significant air deterioration, and other environmental considerations. Although it is beyond the scope of this article to discuss each issue, it is important to note that these issues are not isolated; rather, they are part of the coal development picture, which in turn is a part of the overall energy picture.

In the West the production of coal and converted energy (electricity and synthetic fuels) is intended to a large degree for use outside the region.[194] This has been referred to as energy "colonization."[195] It may thus appear that to remove agricultural lands from actual or potential production for coal mining is not in the regional interest. Agriculture represents a major producing sector in the United States economy and has in recent years contributed significantly to the nation's balance of trade. However, when considering how much agricultural land will be put out of production by coal develop-

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191. *See* note 4 *supra*.
192. *See* FED. ENERGY ADMIN., *supra* note 10.
193. Bartlett, *Coal: No Superabundance for U.S.*, PHYSICS TODAY, Dec. 1976, at 9, 11.
194. COAL DEVELOPMENT, *supra* note 69, at 38-53.
195. *See* Josephy, *The Prairie and Its People: Yesterday's History and Today's Challenges*, in PRAIRIE: A MULTIPLE VIEW 3 (M. Wali ed. 1975); Dix, *Colonialism in the Great Plains*, in PRAIRIE: A MULTIPLE VIEW 7 (M. Wali ed. 1975). *See also* COAL DEVELOPMENT, *supra* note 69, at 153.

ment, the amount of energy consumed in the agricultural process must also be considered.[196]

Energy input is vitally important to agricultural production. Studies now available point out that agriculture in the United States consumes more energy than it produces.[197] Nearly one-sixth of the nation's total energy budget is currently used for agricultural purposes and one study envisages the possibility that "growing raw agricultural commodities might require 60 to 180% more fuel energy in the next quarter century."[198] As depletion of petroleum and natural gas supplies continues, increased coal production in the West will provide an alternative to petroleum for non-agricultural purposes, thereby increasing availability of this fuel for agriculture.

As interest in western coal development has increased, the individual western states have enacted statutes to ensure that mined land is reclaimed to a beneficial use. To a lesser degree, these statutes authorize the deletion of certain lands from mining operations. However, the respective roles of the states and the federal government in this area are unclear at the present time, and the extent to which the states may assert jurisdiction over federal lands has not been adequately defined. The proposed Federal Surface Mining Control and Reclamation Act of 1977, if enacted, would create a national program for regulating surface coal mining. Furthermore, the proposed Act defines the respective roles of the state and federal governments over the regulation of coal mining, thereby resolving the current controversy. In addition, the procedures, criteria, and reclamation performance standards to be used in assessing potential coal mines will be standardized.

The main purpose of the proposed Act is to provide cooperative federal-state mechanisms for balancing needed coal production with the necessity of preserving environmental integrity. To this end, three main processes are mandated. First, mining must be conducted so as to minimize environmental degradation. Second, where revegetation of mined land is planned, the plant cover must be sulf-sustaining, equal in extent to pre-mining conditions, and capable of plant succession. Third, certain lands, including renewable resource lands, may be of such value as to warrant their exclusion from mining operations.

In addition to choosing lands that are to be excluded from mining, part of the balancing process will be choosing lands that can

196. *See* Wali & Kollman, *supra* note 120.
197. *E.g.*, Steinhart & Steinhart, *Energy Use in the U.S. Food System*, 184 SCI. 307 (1974).
198. Heichel, *Agricultural Production and Energy*, 64 AMER. SCI. 64-72 (1976).

be successfully reclaimed. The intent of the proposed Act with regard to mined land is clear; the objective is to achieve long term rehabilitative success. To ensure the long term stability of these man-made eco-systems, laws must be scientifically sound and economically feasible. However, mined land reclamation efforts in the West are of relatively recent origin, and it is to be expected that current and future research will develop new methods of improving disturbed areas. Thus it is vital that laws remain flexible so as to accommodate new techniques and expanding knowledge of the mined land environment.

ADDENDUM

On April 29, 1977, the House of Representatives passed an amended version of House Bill 2[199]; Senate Bill 7 was passed in the Senate on May 20[200]. Though the reclamation performance standards discussed in this article were modified very little, several pertinent issues remain to be settled by the conference committee.

It appears that neither the House nor the Senate has accepted the Carter Administration proposal for a five year moratorium of mining on prime agricultural lands. The House adopted provisions requiring a two-step segregation and replacement of soil layers on such lands. This approach focuses on attempting to restore the pre-mining soil profile. The provisions of the Senate Bill would limit mining on prime agricultural lands to ten percent of any mine area unless the capacity of the land to support pre-mining uses can be fully restored.

Preservation of alluvial valley floors in the western United States will also be an issue before the conference committee. The provisions of the House Bill would ban all mining in these areas. However, operations that have received a mining permit before January 4, 1977, or are producing coal within one year prior to enactment will be allowed to mine. The Senate version would allow mining in alluvial valley floors on undeveloped range lands and where disruption to farming would be negligible. The grandfather clause of the Senate Bill is similar to the House provisions. In addition, however, the Senate Bill authorizes the Secretary of the Interior to exchange lands with an operator when substantial financial commitments have been made, but no production or mining permit exists.

Both the House and the Senate amended the respective bills to recognize cooperative agreements between the Department of the Interior and the individual states that are in existence at the time of enactment. As mentioned in the article, cooperative agreements have

199. 123 CONG. REC. H3837 (daily ed. Apr. 29, 1977).
200. 123 CONG. REC. S8169 (daily ed. May 20, 1977).

been finalized with Wyoming, New Mexico, North Dakota and Utah. Recently, agreements were signed with Montana[201] and Colorado,[202] and these will likely be finalized prior to enactment. Under the bills, the agreements will remain in effect until the adoption of a State or Federal program as provided in the bills. Accordingly, these states will be allowed to administer the mining permit process on Federal lands until programs are adopted. However, the conference committee must still decide whether to allow states with approved programs to elect to regulate mining on Federal lands, as provided in the Senate Bill.

Other key issues that will be considered by the conference committee include the structuring and financing of abandoned mine reclamation, surface owner protection, and the funding of research institutes, laboratories and fellowships. It also appears that some modification of the provisions relating to Indian lands will occur. In any event, it is now evident that, after six years of active consideration, a federal law regulating surface coal mining and reclamation of affected lands will be enacted.

201. 42 FED. REG. 23,855 (May 11, 1977).
202. 42 FED. REG. 26,218 (May 23, 1977).

APPENDIX

MAJOR RECLAMATION PERFORMANCE STANDARDS*

I. GENERAL RECLAMATION PROVISIONS,

A. RECLAMATION DEFINED

Federal[1]	Colorado[2]	Montana[3]	New Mexico[4]
A condition capable of supporting all practical uses which such lands were capable of supporting prior to mining, or equal or better uses. 30 C.F.R. §211.40 (a)(1).	Employment of procedures reasonably designed to minimize mining and disruption, and to provide for rehabilitation of plant cover, soil stability, water resources or other appropriate measures so that affected lands may be put to a subsequent beneficial use. §34-32-103(13).	Backfilling, subsidence stabilization, water control, grading, highwall, reduction, topsoiling, planting, revegetation and other work to restore affected land. §50-1036 (14).	(No formal definition) Affected lands must be graded and revegetated. §63-34-8A.

B. RECLAMATION TIME SCHEDULE

As contemporaneously as practicable with operations. §211.40(a) (1). Surety liability to extend after first planting for variable period from 5 to 10 years. §211.40 (a) (13).	Each phase of reclamation must be completed within 5 years; extension possible. §34-32-116 (1) (r); §34-32-112(7).	To commence as soon after mining begins and to proceed as rapidly, completely, and effectively as technology will allow; backfilling and grading to be completed within 90 days. §50-1045; S10310(1)(g)(iii).	Within a reasonably prescribed time and pursuant to an approved mining plan. §63-34-8B.

II. TOPGRAPHIC PROVISIONS

A. GENERAL CONTOURING REQUIREMENT

Restore approximate original contour; variance possible. §211.40(a)(2).	Create a final topography appropriate to the final landuse. §34-32-116(1)(b).	Restore to the approximate original contour. §50-1044(1). Unless otherwise approved, final grades must be no steeper than 5:1 horizontal to vertical; highwalls, railroad loops, and access roads are accepted from last requirement. S-10310(1)(3).	Produce a gently undulating topography or other topography that is consistent with end use. R Sec. 5(b).

* Current as of January 1, 1977. A comprehensive overview of reclamation statutes in the western United States is presented in FEDERATION OF ROCKY MTN. STATES, INC., SUMMARY OF SURFACE MINING RECLAMATION LAWS IN THE MOUNTAIN-PLAINS STATES, REGIONAL BACKGROUND PAPER, (Oct. 1976). This report contains a table comparing the statutes and a narrative description of each.

North Dakota[5]	South Dakota[6]	Utah[7]	Wyoming[8]
Conditioning affected lands to make them suitable for forestry, grazing, crops, enhancement of wildlife or aquatic resources or establishment of residential, recreational or industrial sites. §38-14-01; §38-14-02(1).	Reconditioning or rehabilitation of affected land pursuant to an approved plan. §45-6A-2(8).	Actions to shape, stabilize, revegetate, or otherwise treat affected lands in order to achieve a safe, stable, ecological condition and use which will be consistent with local environmental conditions. §40-8-4(7).	Process of reclaiming affected land for grazing, agricultural, recreational, wildlife purposes, or any other purpose of equal or greater value. §35-502.3(e)(i).
Shall be completed within 3 years after expiration of mining permit; when revegetation program is determined unsuccessful, mandatory extension on request of up to two years; subsequent extensions are discretionary. §38-14-05(10).	Shall begin as soon as possible after commencement of strip mining. §45-6A-17.2.	Concurrently with mining or within a reasonable time thereafter. §40-8-12(1)(a). Length of surety liability discretionary. §40-8-14(5).	To begin at earliest possible time, and must continue concurrently with mining when possible. Operator must justify delays in completion beyond two years after cessation of mining. §35-502-.21(a)(iii); §35-502.32(b)(ix); Ch. IV(i) and (2).
Regrade to approximate original contour unless different contour required. §38-14-05(1).	No specific statutory requirement; reclamation plan is required to contain grading plans. 12:04:02:12. Grading shall be carried out so as to achieve contour most beneficial to proposed land use. 12:04:04:07.	No specific statutory requirement; manner and extent of grading to be explained in reclamation plan. M-3(2)(d).	Operator to contour consistent with use set out in reclamation plan; the maximum inclination of regraded slopes must not be greater than the average inclination of the natural slopes in the immediate mine area; exceptions possible. Ch. II § 2(1).

II. TOPOGRAPHIC PROVISIONS

B. TREATMENT OF HIGHWALLS AND ENDWALLS

Federal[1]	Colorado[2]	Montana[3]	New Mexico[4]
Eliminate highwalls, variance possible. §211.40(a)(2).	No specific provision.	Highwalls must be reduced to a slope of not greater than 20 degrees from horizontal. §50-1044(1).	No specific provision.

C. SPECIAL TOPOGRAPHIC FEATURES

		Terracing may be required to conserve moisture and control water erosion; additional surface manipulation procedures may be required. S10310(i)(f). Spoil surfaces must be left roughened in final grading to eliminate slippage zones between topsoil and heavy textured spoils. S10340(5).	

III. SUITABLE PLANT GROWTH MATERIALS

A. TOPSOIL DEFINED

Nof Defined.	Not Defined	The unconsolidated mineral matter naturally present on the surface that has been subjected to and influenced by genetic and environmental factors of parent material, climate, macro- and micro-organisms, and topography, all acting over a period of time, and that is necessary for the growth and regeneration of plants. §50-1036(10).	Not Defined

North Dakota[5]	South Dakota[6]	Utah[7]	Wyoming[8]
Final cuts, highwalls, and endwalls must be backsloped to an angle of not greater than 35 percent from horizontal. §38-14-05(4).	Highwalls shall be reduced to a slope not greater than 25 percent, unless impossible, impractical, aesthetically undesirable, or would create a condition more detrimental than preserving the highwall. 12:04:04:08.	No specific provision.	The final pit area shall be backfilled, graded, and contoured to the extent necessary to return land to specified end use. Ch. II § 2a (1).
			Terrace or benches may be used if other methods of contouring will not provide required results. Ch. II § 2a(1).
Uses the term "suitable plant growth material": that portion of the soil material, normally the A and sometimes the upper portion of the B horizon, which is found by the agency to be acceptable for respreading to provide a medium for plant growth. §38-14-02(16). By regulation this is based on an electrical conductivity of the saturation extract of less than 4 millimhos per centimeter, and a sodium absorption ratio of less than 10; the material con-	The uppermost portion of the soil profile which is supportive or capable of supporting vegetation growth. 12:04:01:02(3).	Not Defined	Soil on the surface prior to mining that will support plant life. §35-502.3(3) (xiv). Guideline No. 3, Land Quality Division, sets forth the parameters for determining soil suitability.

Federal[1]	Colorado[2]	Montana[3]	New Mexico[4]
B. TOPSOIL SEGREGATION AND REPLACEMENT			
Yes, §211.40(a)(4).	Yes, §34-32-116 (1) (g).	Yes, §50-1044(3).	Not required in statute or regulations. However, may be required as part of any given mining plan.
C. HANDLING OF TOPSOIL DURING STORAGE			
When storage time too long to avoid deterioration, operator must establish a quick growing cover or use other methods to protect topsoil from erosion and establishment of noxious plant species, and to maintain topsoil in a condition suitable for use in revegetation of affected land. §211.40(a)(4).	When storage time too long to avoid deterioration, vegetative cover or other means must be used to prevent erosion, acid or toxic material contamination, and to maintain topsoil in a usable condition. §34-32-116(1)(g).	Removed topsoil is to be guarded from erosion and pollution, and kept in such a condition as will sustain vegetation of the quality and variety as existed prior to removal. §50-1044. Unnecessary compaction and contamination is to be eliminated and immediate vegetative cover may be required. S10340(2).	No provision

North Dakota[5]	South Dakota[6]	Utah[7]	Wyoming[8]
sidered best for top dressing is based on an electrical conductivity of less than 2 millimhos per centimeter, a sodium absorption ratio of less than 4, a free lime percentage of less than 10 on medium and fine textured soils, and an organic percentage of 1.5 or more (if available). R38-14-04.13.			
Yes, §38-14-05(2).	Yes, 12:04:04:02.	No specific requirement; topsoil handling to be described in reclamation plan. M-3 (2) (c) & (d).	Yes, §35-502.21 (a) (v); Ch. II §4 (a) (1).
No provision	Removed topsoil must be preserved in such a manner as to prevent erosion and loss. 12:04:04:03.	No provision	Must be segregated so as not to become mixed with subsoil or other overburden; stockpiling must be done in a manner to minimize erosion; quick growing vegetative cover mandatory, topsoil is to be protected from acid or toxic materials, and must be preserved in a usable condition for revegetation of affected land. Ch. II § 4(a)(1), (2).

D. SUBSTITUTES FOR TOPSOIL

Federal[1]	Colorado[2]	Montana[3]	New Mexico[4]
If topsoil inadequate, other excavated material can be used if shown to be more suitable for revegetation. §211.40(a)(4).	If topsoil inadequate, or if other strata can be shown to be more suitable for vegetation requirements, such other strata which are best able to support vegetation shall be removed, segregated and preserved. §34-32-116(g).	Any subsurface deposit of material that is capable of supporting vegetation virtually as well as topsoil shall be accorded substantially the same treatment as topsoil. §50-1044(3). A plan which proposes use of such materials, alone or as a mixture, must show that the use (1) will not contribute to or cause water pollution, and (2) will support a diverse cover of predominantly native species equivalent to that which existed before mining. S 10340(6).	No provision

IV. REVEGETATION PROVISIONS

A. TYPE OF VEGETATION

A diverse vegetative cover native to the area. §211.40 (a) (13) (i).	Native species should receive first consideration but introduced species may be found desirable. §34-32-116(i)(f). Specific choice of species will depend on choice of final land use. See §34-32-116(1)(k), (l), (o), (p).	As much legumes, grasses, shrubs, and trees as is necessary to provide a suitable permanent diverse vegetative cover. §50-1045. Operator shall utilize locally grown genotypical seed and seedlings when sufficiently available. S10350(3). Shall utilize certified seed of named varieties that have successfully demonstrated long range viability. 2.10(18)-S10400(5)(c).	Requirements solely determined by regulating authority as set forth in approved mining plan; end use and site analysis to guide determination. §63-34-9A; R Sec. 6.

North Dakota[5]	South Dakota[6]	Utah[7]	Wyoming[8]
No provision	No provision	No provision	When topsoil is virtually nonexistent or is incapable of supporting vegetation, available and suitable subsoil must be segregated. §35-502.32(b) (iii). Subsoil as an addition to or substitute for topsoil may be approved afer chemical analysis. Ch. II § 4b (1).
Such seeds, plants, cuttings or trees, grasses, or legumes as approved by the regulatory authority. §38-14-05(9).	No specific statutory requirement; revegetation to be accomplished pursuant to commission recommendations. 12:04:04:09.	No specific statutory requirement; noxious native plants that will give a quick, permanent, protective cover and enrich the soil shall be given priority in preparing the required reclamation plan. M-3 (2) (e).	Native or superior self regenerating vegetation. §35-502.32(b)(vii). Seed types will depend on the prevailing climatic and soil conditions and the proposed end use; permanent cover species must be self renewing. Ch. II § 5(d).

B. PRODUCTIVITY AND STABILITY

1. *Short Term Considerations*

Federal[1]	Colorado[2]	Montana[3]	New Mexico[4]
Mixture of introduced and native species may be allowed where preferable to achieve quick cover or assure revegetation success; preference given to non-noxious species. §211.40 (a) (13) (i).	No provision	The seeding of annual grasses and-or legumes may be required; mulch must be applied to areas having no permanent or temporary cover if there exists likelihood of substantial erosion or deposition of sediment in state waters. S-10350(8) & (9).	No provision

2. *Long Term Requirements*

Vegative cover should be capable of regeneration and plant succession, and at least equal in density and permanence to the natural vegetation. §211.40 (a) (13) (i).	Revegetation should establish a diverse effective, and long-lasting vegetative cover capable of self-regeneration and at least equal in extent of cover to the natural vegetation of surrounding area. §34-32-116(i)(f).	Vegetation cover must be capable of 1) withstanding a wildlife and livestock grazing pressure comparable to that which existed prior to mining, 2) regenerating under natural conditions, and 3) preventing soil erosion to the extent achieved prior to mining. §50-1045.	No provision

North Dakota[5]	South Dakota[6]	Utah[7]	Wyoming[8]
Operator may be required to use methods designed to minimize subsurface piping in the overburden and slippage at the suitable plant growth material-overburden interface. R38-14-05.7.	No provision	The objective in revegetation should be to stabilize affected land as quickly as possible in order to achieve permanent and protective cover. M-3(2)(3).	No provision.
With respect to lands designated for post-mining agricultural uses, post-mining productivity must be equal to or greater than the pre-mining "inherent productivity." §38-14-01.	No provision	The objective of reclamation is to return affected land to a stable ecological condition compatable with past, present and probable future local land uses. §40-8-12.	Reclamation must restore affected land to a condition equal to or greater than the "highest previous use." Ch. II § 1b(1). Revegetation is deemed complete when cover is capable of renewing itself under natural conditions and is of a density comparable to undisturbed areas in the vicinity; must be able to withstand grazing pressure comparable to that which existed prior to mining; reforestation deemed complete when 75 percent of seedlings have demonstrated contined growth for 5 years. Ch. II § 5(f).

1. Reference to 30 C.F.R. § 211 (1976).
2. Colorado repealed and re-enacted its statute in 1976. Ch. 149 [1976] Colo. Sess. Laws ——. Reference to COLO. REV. STAT. (Supp. 1976) (*e.g.*, § 34-32-115). Rules and regulations pursuant to this statute had not been promulgated as of January 1, 1977.
3. Reference to MONT. REV. CODES ANN. (Supp. 1975) (*e.g.*, § 50-1036) and MONT. ADMIN. CODE 26-2.10(10) (*e.g.*, S10340).
4. Reference to N.M. STAT. ANN. (1974) (*e.g.*, § 63-34-1) and REGULATIONS OF THE STATE OF N.M. COAL SURFACE MINING COMM'N (*e.g.*, R. Sec. 1).
5. Reference to N.D. CENT. CODE (Supp. 1975) (*e.g.*, § 38-14-01) and N.D. PUB. SERV. COMM'N RULES AND REGULATIONS FOR RECLAMATION OF SURFACE MINED LANDS (*e.g.*, R38-14-03-1).
6. Reference to S.D. COMPILED LAWS ANN. (Supp. 1976) (*e.g.*, § 45-6A-1) and S.D. RECLAMATION RULES AND REGULATIONS (*e.g.*, 12:04:01:01).
7. Reference to UTAH CODE ANN. (Supp. 1975) (*e.g.*, § 40-8-1) and UTAH DEPT. OF NATURAL RESOURCES, DIV. OF OIL, GAS AND MINING, MINED LAND RECLAMATION GENERAL RULES AND REGULATIONS (*e.g.*, M-1).
8. Reference to WYO. STAT. (Supp. 1975) (*e.g.*, § 35-502.3) and 1975 WYO. LAND QUALITY RULES AND REGULATIONS (*e.g.*, Ch. II § 1).