

DATA ADEQUACY STANDARDS

for

POWDER RIVER COAL REGION

Bureau of Land Management

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INTRODUCTION

The purpose of these proposed data adequacy standards is to define the general data base that is necessary to make coal leasing and mitigation decisions in the Powder River Region. The public needs a knowledge of regional data adequacy standards to help make a meaningful contribution to the coal leasing processes. The Bureau of Land Management resource specialists need these standards in order to adequately inventory and analyze coal development conflicts associated with their respective resources. The coal decision makers, including the Powder River Regional Coal Team, need these standards to help assure that their coal leasing decisions and recommendations have a solid data foundation.

The leasing and mitigation decisions which these standards would support include the following:

1. a decision on whether or not to lease a delineated coal tract;
2. a determination on the fair market value for a given tract, if offered for lease; and
3. a determination of the specific set of lease stipulations for a proposed lease tract.

These determinations are based on the site-specific and cumulative impacts and threshold level restraints (if any) associated with proposed lease offering(s). In turn, an adequate data base is essential for the identification of such impacts.

The need for data adequacy standards was identified by the Office of Technology Assessment (OTA). In OTAs report of May 1984, Environmental Protection In the Federal Coal Leasing Program, data adequacy standards were recommended for all stages of the coal leasing process. In Secretary Clark's response to this OTA report dated July 1984, the Department concurred with the need for data adequacy standards. In March 1985, the Federal/State Coal Advisory Board in a public meeting, discussed the need and scope of data adequacy standards. At that meeting, the Board recommended that the Regional Coal Team design data adequacy standards for their respective regions. During its public discussions on this item, the board reached a consensus that the Regional Coal Teams would focus on tract-specific data adequacy standards rather than land use planning standards. In June 1985, the Powder River Regional Coal Team (RCT) held a public discussion on a preparation plan for the development of Powder River data adequacy standards. These discussions resulted in the Powder River RCTs endorsement of a Federal/State task force effort to develop data adequacy standards necessary to make tract leasing and mitigation decisions. To this end, the Federal/State task force conducted a series of meetings among the task force members and with other Federal/State specialists on particular subjects (i.e. wildlife and geology). This interdisciplinary and intradisciplinary approach resulted in this product.

One issue that the task force identified was that much of the data required for a given resource was also germane to other resources. For example, data necessary to assess reclamation potential is in part a composite of soils, hydrology and wildlife information. Also, overburden geology overlapped with soils data. Given these and numerous other interrelationships, the task force was asked to consolidate overlap areas where possible into logical chapters. This consolidation is intended to avoid redundancy. It is not intended that the resource specialists for other resources will only rely on the data set out under their particular chapters when evaluating the impacts of coal development. All resource specialists will have access to any data necessary, except that which is confidential, to conduct environmental impact analyses. An important factor to keep in mind when reviewing these proposed standards is that they are limited to data level quantifications necessary for making coal leasing recommendations and decisions.

These standards are applicable to the potential lease tracts which result from the activity planning process. They should not be confused with the data standards necessary for the Bureau's Land Use Planning (LUP) procedures. Land use planning is an earlier tier, prior to activity planning, in the overall leasing process. The vehicles for data adequacy reviews at the land use planning stage are (1) the development planning criteria for specific plans, (2) plan-specific public review procedures, (3) the Governors consultation procedures, and (4) the National Supplemental Program Guidance. These vehicles accommodate the intraregional variations in the data necessary to address the planning issues for large geographic areas with development potential for coal. On the other hand, the standards proposed in this paper identify the minimum data necessary to offer specific tracts for lease.

The Powder River Regional Coal Team will eventually adopt these standards (or the final version thereof). The RCT will not adopt standards for or guide the Bureau's land use plans, because such actions are beyond the RCT charter. The RCT will, however, use the Bureau's land use planning (LUP) summaries to pursue activity planning in those LUP areas that are identified for further consideration for coal leasing. From these areas the RCT will guide tract delineation, guide the preparation of regional EISs, and ultimately make leasing recommendations on specific tracts.

These standards should also not be confused with the data necessary for a State mining permit. In many cases additional data will be necessary prior to mining authorizations, which can occur up to 10 years after the lease is issued. During this interval environmental conditions may change. Detailed site-specific mining and reclamation techniques are also specified. Therefore, more current and intensive site-specific data are essential at this later tier in the coal management process. BLM shall coordinate data collection methodology for all renewable and geological resources with the state mine permitting agency prior to data collection to assure consistency of approach.

This paper contains data adequacy standards for the Powder River Coal Region. As OTA indicated there should not be "cookbook" standards for all regions, but guidelines with sufficient flexibility to accommodate regional differences in data needs. Professional discretion on the part of the resource specialists

and coal leasing decision-makers must be a key ingredient to any data adequacy determination. In summary, these standards serve as a starting point for determining whether sufficient data exists to lease coal. Any significant variation from these standards may be permissible but warrants justification.

The remainder of this paper sets out the data adequacy standards by resource for leasing coal in the Powder River Coal Region. It concludes with a summary of the comments and responses to comments, which resulted from the public review of proposed data adequacy standards.

GEOLOGY

These minimum data standards are designed to provide sufficient geologic data necessary to make coal leasing recommendations for the Powder River Coal Production Region. The following geologic data are needed to evaluate the coal overburden, interburden, and recoverable reserves.

Tasks

1. Define geologic resource: quantity and quality.
2. Assure adequacy of data for tract delineation and economic evaluation.
3. Assure adequate coal resource data and stripping ratio data for tract delineation and fair market value determinations.
4. Define overburden and interburden parameters for reclamation assessment (i.e., overburden quality, and ability to achieve acceptable post mining topography).

Scope and Intensity

1. Within a designated area, assemble coal data by plotting outcrop measurements, any previously conducted drilling (rotary and core, burn data, sandstone channels, faults, etc.)
2. Then evaluate this data to determine if any further drilling and/or field data is needed to provide a sufficient data base.

A complete drilling program is composed of three aspects: density of the drilling which is determined by the coal geology, geophysical logs, and coal analyses.

The drilling density in areas where the coal is flat-lying, thick, very little faulting and very little splitting should be no more than one mile between drill holes with staggered lines of drilling (Figure 1). At least a drill hole per section should be a core hole. In areas where there is more faulting, splitting, etc., drill hole spacing should be no more than one-half mile between drill holes, staggered lines of drill holes, with at least two core holes per section (Figure 2). It is the project geologist's responsibility to make a decision on the adequacy of the data within the tract. If there is a need for additional data, the geologist should gather the needed data by drilling and/or field data.

While drill hole cuttings provide some coal information, the best information on the coal beds can be derived from the geological logs and core analyses. Geophysical logs must be run on each drill hole to aid in determining the thickness of the coal, overburden, and interburden. At minimum, the following suites of logs should be produced: gamma, density, and caliper.

A coal analysis program should be developed prior to the drilling season. This program should define the size samples and what kind of analyses are needed from each coal bed. The cores should be analyzed on an as-received basis for at least the following items: BTU, sulfur, ash, moisture, fixed

carbon, methane, coal gases, volatile matter, density, and rank of coal. Minor trace elements such as Na_2O may also need to be included. The project geologist may occasionally, wish to plan for a few chemical analyses to be made on representative core samples of overburden and interburden. These data would complement soil analyses in reclamation planning.

Along with drill hole data, geologic field work may be needed to provide a complete picture. Burn data should be gathered from aerial photography (infrared and true color) and field reconnaissance. Sandstone channels should be noted in areas where they completely cut out or thin a coal bed. Outcrops should be measured, sampled, and mapped. Faults within the area should also be mapped.

The geologic information will be included as part of the data in the tract profile reports which contain such information as: tract type (new mine, expansion, or bypass), competitive status, mine information (i.e. mining royalties, etc.), and detailed geologic information on the coal resource (i.e. isopachs, cross-sections, tonnages of coal, overburden and interburden, quality, etc.). In addition, the area geology shall be considered in order to determine if there are any geologic characteristics conducive to surface venting of coal gas, if present.

FIGURE 1

DRILLING DENSITY FOR 'SIMPLE' COAL STRATIGRAPHY

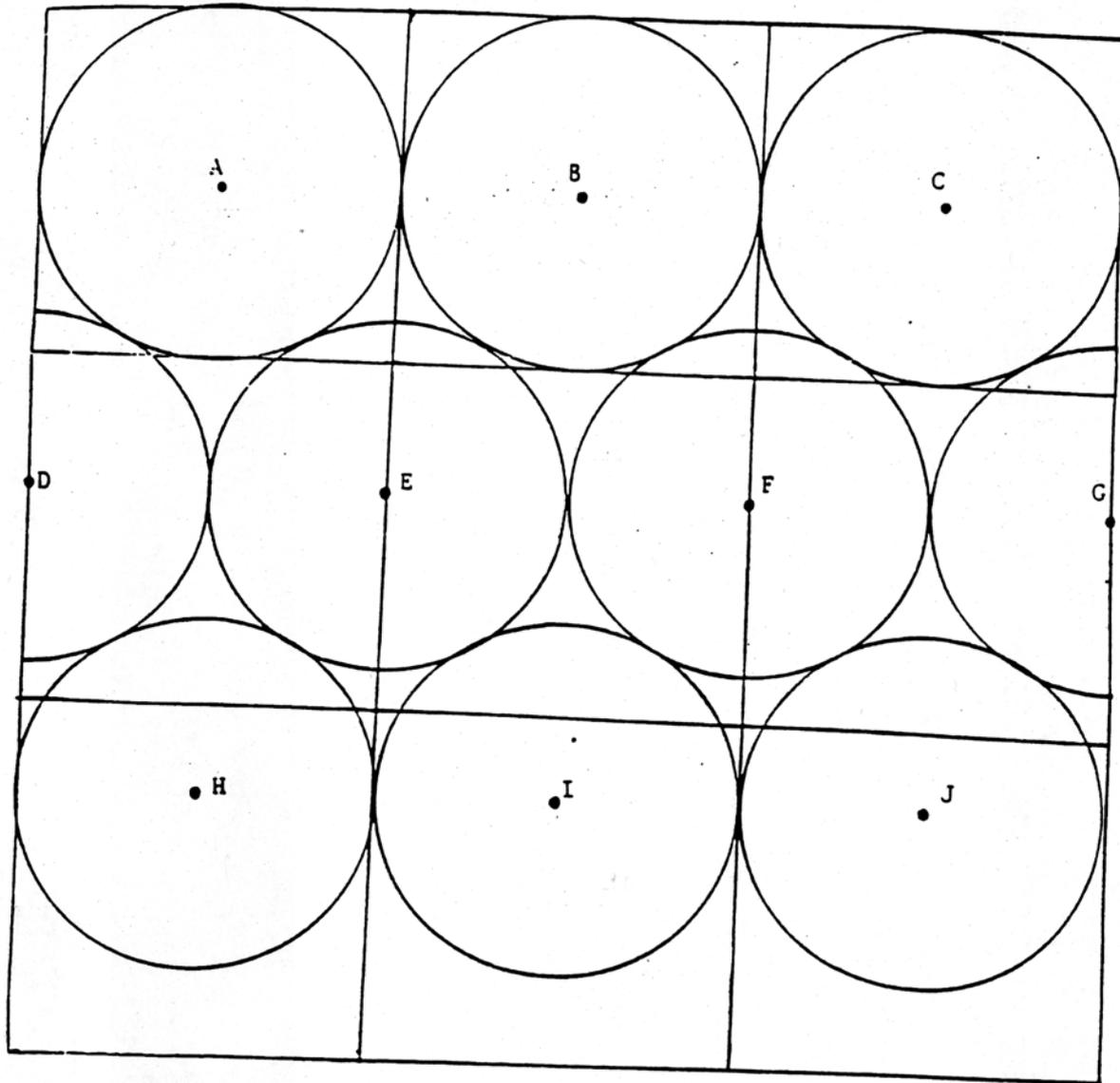


Figure 1: Points A through J are drill holes (points of measurement). The circle covers $\frac{1}{2}$ mile radii of information with one mile distance between points of measurement. Points A through J are also core holes.
Scale: 2" = 1 mile.

FIGURE 2

DRILLING DENSITY FOR 'COMPLEX' COAL STRATIGRAPHY

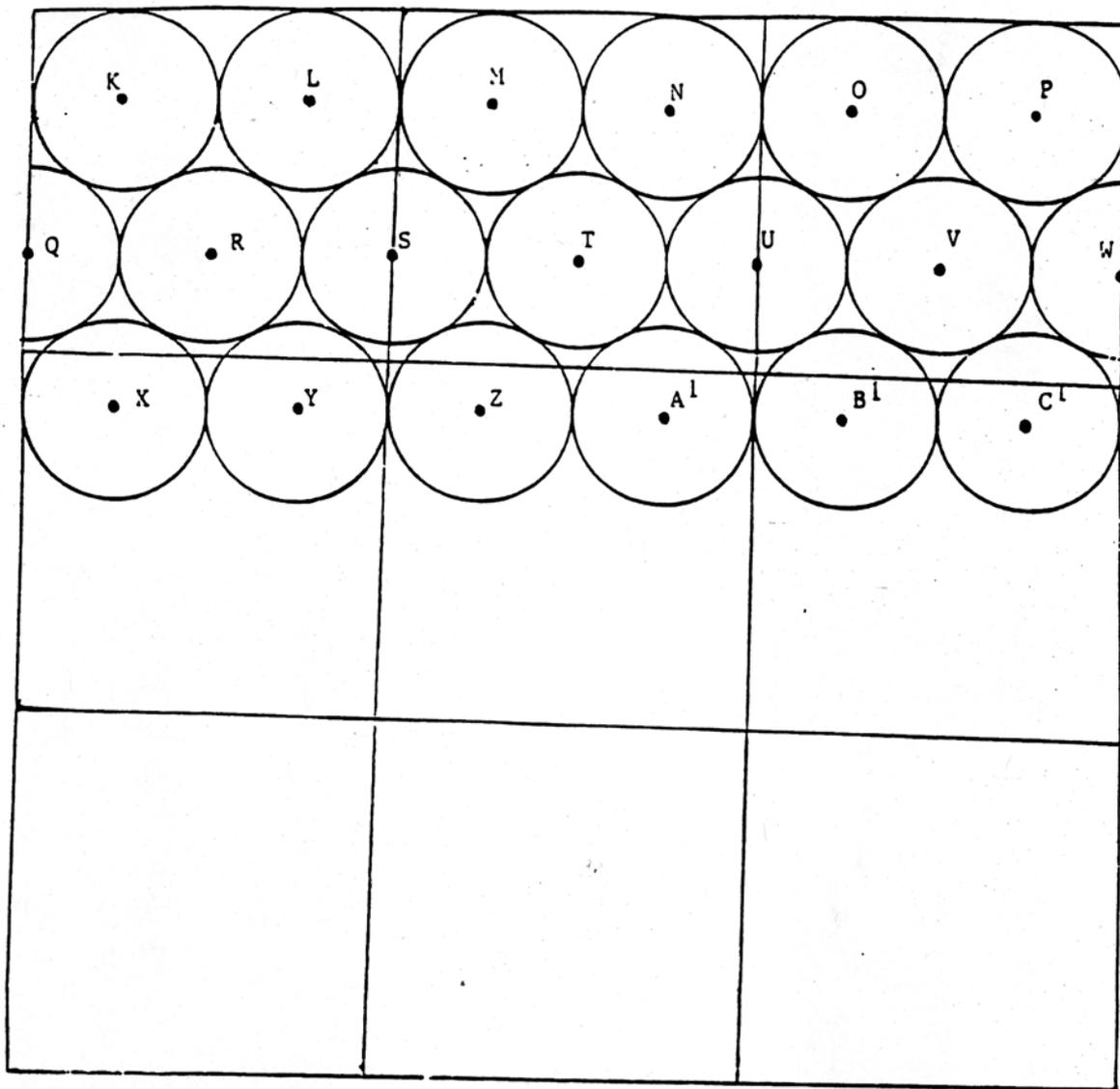


Figure 2: Points K through C¹ are drill holes (points of measurement). The circle covers $\frac{1}{2}$ mile radii of information with $\frac{1}{2}$ mile distance between points of measurement. Points K, R, M, T, O, V, X, Z, and B¹ are core holes. Scale: 2" = 1 mile.

SOILS/RECLAMATION

These minimum soil, topographic, and resource data requirements are intended to provide BLM with sufficient knowledge to make coal leasing decisions in its activity plans for specific tracts.

The use of the soil, vegetation, and topographic data as found in National Cooperative soil surveys and topographic slope maps from USGS are used to rate a tract based primarily on the properties of soil materials. If the premine soils have adverse properties which result in low productivity, the post-mine soils constructed from these materials may also have low productivity. However, if the volume of soil reconstruction is equal to or greater than the premine soil volume, reclamation potential is "good" at that tract, but may not rank as "good" as another tract.

It is well known that some geologic strata in the overburden has chemical and physical properties suitable for use as soil reconstruction material. Additional data for evaluating overburden as soil material may be available in the geology section. Overburden/spoil can and should be evaluated for use in creating a favorable root zone depth to 8 feet or more.

This effort at data interpretation is meant to evaluate and rank, relative to each other, potential coal lease tracts. It is not intended to replace the specific data requirements of a mine plan.

Objective: To determine from soil surveys the quantity and quality of soil material available, within a designated area, for soil reconstruction.

Tasks

1. Determine if a soil survey exists for the area and evaluate according to Tables 1 and 2. An order II survey will provide the information necessary for this assessment.
2. Delineate coal tract boundaries on soil survey sheets, topographic maps, or slope maps if these limited slope maps are available.
3. Determine areal extent of:
 - a. soil mapping units (for Table 3)
 - b. forested areas
 - c. hay/tame pasture
 - d. intensive dryland agriculture
 - e. irrigated areas
 - f. alluvial valleys
 - g. areas of unique or special concern (riparian, wetland, rimrocks, scoria, etc.)

4. Interpretation of soil mapping units to determine:
 - a. soils present in tract
 - b. soil series composition within mapping units (Table 3)
 - c. prime farmland soils
 - d. soils of statewide importance
 - e. saline soils
 - f. sodic soils
 - g. land capability class
 - h. potential natural vegetation community, grasses, forbs, shrubs, and trees, from ecological or range site descriptions.

5. Rating of soils for:
 - a. soil reconstruction material; Table 603-25 of National Soils Handbook
 - b. determine volume (acre-feet) of soil in tract in good, fair, and poor categories; Tables 603-25, 4 and 5
 - c. seeding mixtures; can be generalized from the ecological site and the SCS form 5 for each soil.

Scope and Intensity

This narrative explains a method for acquiring minimum soil resource data and making interpretations, as available from soil surveys published by the SCS and others. The soils in a potential tract are identified, delineated, and the included accompanying reports list the capabilities and limitations of soils for various uses and management. This information must be interpreted by experienced field soil scientists for other disciplines. These data are a combination of background and specific data needed to evaluate and rank potential coal lease tracts. This method is meant for evaluating potential tracts to be ranked relative to each other and should be viewed in that light. It is not intended to replace the site specific data requirements of a mine plan.

Soil surveys done at third order detail, (Tables 1 and 2, on 1:20,000 or 1:24,000 scale maps) will provide sufficient data to evaluate and compare natural resources such as soils, vegetation and topography in potential coal lease tracts. The soil survey may provide data such as soil chemical and physical properties, ecological vegetation types, potential prime farmlands and potential alluvial valley floors (AVFs, Table 6). The data adequacy value of soil survey orders by a particular use is in Table 2 and refers to current soil mapping techniques at 1:24,000 scale.

The delineation of a potential coal tract on soil survey photos will enable a soil scientist to determine extent of soil mapping units, vegetation types, or selected land uses to complete Tables 3 through 6. These tables will provide methods to interpret information to compare potential coal lease tracts.

The required depth of soil material rated good and fair needed for soil reconstruction is arbitrarily set at two times the average annual

precipitation (AAP) the proposed tract receives (e.g. 2 x 15" AAP = 30", Table 7). A narrative ranking is obtained, to facilitate the comparison of potential tracts, by combining the soil material by rating, from Table 5, and by the total acres in the tract, converted to inches and is then divided by two times the average annual precipitation the tract receives. The resulting percentage is compared to Table 7, to obtain a narrative reclamation potential for tract ranking. The information contained in Tables 2 through 6 provides an insight into a potential coal tract's character, enabling comparison and ranking.

Example - If a 262-acre tract in a 14" average annual precipitation zone was: soil mapped at order three, composed of 2 soil mapping units, which identified soil composition, slope, and ecological vegetation type (Table 3), and rated in Table 4 for soil reconstruction material, the values for Table 5 would be determined in this manner:

Soil Map Units: 13C may have 79 surface acres, composed of 1 soil (100% Busby) 129F may have 183 surface acres, composed of 2 soils (65% Birney and 35% Cabbart)

Busby (13C)

79 ac. x 100% x 3.92' (47") x good rating = 310 ac. ft.
 79 ac. x 100% x 1.08' (13") x poor rating = 86 ac. ft.
 396 ac. ft.

Birney (129F)

183 ac. x .65% x .916' (11") x fair rating = 109 ac. ft.
 183 ac. x .65% x 4.084' (49") x poor rating = 486 ac. ft.
 595 ac. ft.

Cabbart (129F)

183 ac. x .35% x 1.5' (18") x fair rating = 96 ac. ft.
 183 ac. x .35% x 3.5' (43") x poor rating = 224 ac. ft.
 320 ac. ft.

Suitable Overburden

acres x strata depth (eg. 46' to 59' = 13 ft) x rating from Table 603-25 = ac ft

The total tract has 310 acre feet of good, 205 acre feet of fair and 796 acre feet poor rated material giving it a "fair" reclamation potential for tract ranking purposes (Table 7). Suitable overburden may raise this rating to "good" for tract ranking purposes.

Table 1
Key for Identifying Kinds of Soil Survey

Level of data needed	Field procedures	Minimum size delineation Hectares 1/ 1 or less	Typical components of map units	Kinds of map units 2/ Mostly consociations; some complexes	Appropriate scales for field mapping and publication	Kind of soil survey
Very intensive (i.e., experimental plots, mine plans)	The soils in each delineation are identified by transecting or traversing. Soil boundaries are observed throughout their length. Remotely sensed data is used as an aid in boundary delineation.		Phases of soil series; miscellaneous areas		1:15,840 or larger	1st order
Intensive (i.e., general agriculture, activity plans)	The soils in each delineation are identified by transecting or traversing. Soil boundaries are plotted by observation and interpretation of remotely sensed data. Boundaries are verified at closely spaced intervals.	0.6 to 4	Phases of soil series; miscellaneous areas; few named at a level above the series	Consociations and complexes; some undifferentiated and associated	1:12,000 to 1:31,680	2nd order
Extensive (i.e., range-land, forest land, community planning)	The soils are identified by transecting representative areas with some additional observations. Boundaries are plotted mostly by interpretation of remotely sensed data and verified with some observations.	1.6 or 256	Phases of soil series and levels above series; miscellaneous areas	Most associations or complexes; some consociations and undifferentiated groups	1:20,000 to 1:250,000	3rd order
Extensive (i.e., regional planning)	The soils are identified by transecting representative areas to determine soil patterns and composition of map units. Boundaries are plotted by interpretation of remotely sensed data.	40 to 4,000	Phases of levels above the series; miscellaneous areas; phases	Mostly associations; some consociations, complexes, and undifferentiated groups	1:100,000 to 1:1,000,000	4th order
Very extensive (i.e., selections of areas for more intensive study)	The soil patterns and composition of map units are determined by mapping representative areas, and applying the information to like areas by interpretation of remotely sensed data. Soils are verified by occasional onsite investigation or by traversing.	1,000 to 4,000	Phases of levels above the series; miscellaneous areas	Associations; some consociations and undifferentiated groups	1:500,000 to 1:1,000,000 or smaller	5th order

1/ This is about the smallest delineation allowable for readable soil maps. In practice, the minimum size delineations are generally larger than the minimum size shown.

2/ Where applicable, all kinds of map units (consociations, complex, association, undifferentiated) can be used in any order of soil survey, and they are not identified as a particular order of map unit.

Table 2
Data Adequacy Value

Soil Survey Order	Land Use Planning	Activity Planning (Tract Ranking)	Mine Plan (Permit Standards)
Order 1	4	4	3
Order 2	4	3	2
Order 3	4	3	1
Order 4	3	1	N/A
Order 5	1	N/A	N/A

4 = exceeds requirements
 3 = data are adequate
 2 = adequacy of data is doubtful
 1 = data are inadequate

Table 3
Soil Mapping Units

Mapping Symbol	Name	Slopes	*LCC	Approximate Surface Acres
eg. 13C	Busby fine sandy loam	2 to 8%	IVe	79
129F	Birney-Cabbart complex, forested	25 to 75%	VIIe	183

This table is to be used to list all soil mapping units mapped in the proposed lease area.

*LCC - Land Capability Classification; ranges from I to VIII, with VIII being "badlands" type topography and soils. Montana and Wyoming do not have Class I agricultural lands.

Table 4

Rating for Soil Reconstruction Material by Soil Series*

Birney	-	0-11" fair, large stones; 11-60" poor, large stones.
Busby	-	0-47" good; 47-60" poor, too sandy.
Cabbart	-	0-18" fair, excess lime; 18-60" poor, weathered bedrock.

This table is used to list all soil series identified in the proposed lease area. This would ignore slope and equipment constraints required to collect and save this resource. This table would be done for the entire tract, preferably by section or partial section.

The series horizon depths would come from the descriptions of the typifying soil pedons mapped in the tract/survey.

*These soils are used as examples only and ratings are determined from Table 603-25, from Section 603.03-3(e)(3) of National Soils Handbook.

Table 5

Soil Available for Reconstruction Material

Soil Mapping Unit	Surface Acres and %	Soil Reconstruction Material**		
		Good Ac. ft.	Fair Ac. ft.	Poor Ac. ft.
eg. 13C (Busby)	eg. 79 Ac., 2.7%	eg. 310*	---*	eg. 86*
eg. 129F (Birney, Cabbart)	eg. 183 Ac., 6.3%	0	205	710

This table would have ALL of the identified soils in the tract rated; the values by use, would be entered, and tract totals could be determined.

* Total volumes here to be used in Table 7

** Ratings are determined from Table 603-25 from Section 603.03-3(e)(3) National Soils Handbook.

Table 6

Tract Resource Data by Slope*

Land Use Characteristics	≤ 15% Slope		>15 ≤ 25% Slope		> 25% Slope	
	Acres	Composition %	Acres	Composition %	Acres	Composition %
- Grazing Land						
- Forested Land						
- Hay/tame Pasture					N/A	N/A
- Intensive Agriculture Dryland					N/A	N/A
- Irrigated						
- flood					N/A	N/A
- sprinkler						
- border dike					N/A	N/A
- other						
- Prime Farmland Soils #					N/A	N/A
- Soils of Statewide Importance					N/A	N/A
- Alluvial Valley Floors #			N/A	N/A	N/A	N/A
- Saline Soils #						
- Sodic #						
Total(s)						

* This table can be done by tract, section or specific landscapes

Preliminary acres, pending further study

Table 7

Tract Reclamation Potential

Reclamation Potential	Reclamation Material Available
Good	$\geq 100\%$ of two times average annual precipitation (2X AAP) of soil material rating good and fair, with 1/5 or more of that volume being soil material rated good for topsoil.
Fair	$< 100\%$ but $\geq 66\%$ of 2 X AAP of soil material rating good and fair; and/or having less than 1/5 of that volume being soil material rated good for topsoil.
Poor	$< 66\%$ of 2 X AAP of soil material rating fair and/or no soil material rating good for topsoil.

eg. A 262-acre tract having 14" as average annual precipitation, which had 515 acre feet of material rating good and fair reclamation potential and $\geq 1/5$ of that volume (103) was material rating good for topsoil would have a fair rating for reclamation.

$$\begin{aligned} 515 \text{ ac. ft.} / 262 \text{ acres} &= 1.96 \text{ (23.6 inches)} / 2\text{X AAP (28")} = 84\% \\ 515 \text{ ac. ft.} / 5 &= 103 \text{ ac. ft. of topsoil material} \end{aligned}$$

If this same tract had more than 100% of the good and fair material and more than 1/5 (103) of that volume was "good" material for topsoil the tract would have a good rating for reclamation.

eg. $675 \text{ ac. ft.} / 262 \text{ acres} = 2.6' \text{ (31")} / 2\text{X AAP (28")} = 110\%$ or 103 acre feet of topsoil material.

APPENDIX 1

From: Part 603 - Application of Soil Information
National Soils Handbook
USDA/SCS/Soil Survey Staff

(a) Soil reconstruction material for drastically disturbed areas.

See Table 603-25. Soil reconstruction of areas drastically disturbed, as in surface mining, is the process of replacing layers of soil material or unconsolidated geologic material or both in a vertical sequence of such quality and thickness that they provide a favorable medium for plant growth.

(1) Most new state strip mine programs emphasize that the land surface be restored to about its natural configuration or better and the soil be reconstructed to maintain or improve its suitability for the intended use. Thus, a knowledge of the soil and underlying material is needed to plan proper reconstruction operations of mined land. This guide for soil reconstruction material evaluates the material as a medium for plant growth. It can be used to rate any segment of the soil profile or unconsolidated geologic material that is thick enough to warrant consideration in planned soil reconstruction. For named kinds of soil, for example, it will be necessary for most purposes to rate the A horizon, the B horizon, and the C horizon separately. If they all rate "good," there may be little justification for keeping them separate for soil reconstruction. If the A horizon is rated better than the B or C, then it generally should be kept separate, depending upon its thickness and the anticipated use of the land. This guide does not cover quarry, pit, dredge, and older surface mine operations that require an offsite source of soil reconstruction material--the guide "Daily Cover for Sanitary Landfill is useful to evaluate the material used in restoration of these operations.

(2) When the soil materials are properly used in reconstruction, a rating of good means vegetation is relatively easy to establish and maintain, the surface is stable and resists erosion, and the reconstructed soil has good potential productivity. Material rated fair can be vegetated and stabilized by modifying one or more properties. Topdressing with better material or application of soil amendments may be necessary for satisfactory performance. Material rated poor has such severe problems that revegetation and stabilization are very difficult and costly. Topdressing with better material is necessary to establish and maintain vegetation.

(3) The major properties that influence erosion and stability of the surface and the productive potential of the reconstructed soil are listed in the guide.

(4) Excessive amounts of substances that restrict plant growth, such as sodium, salt, sulfur, copper, and nickel, create problems in establishing vegetation and, therefore, also influence erosion and the stability of the surface. Other substances, such as selenium, boron, and arsenic, get into the food chain and are toxic to animals that eat the vegetation. Of all these substances, only sodium and salt are criteria in the guide. If relatively high levels of toxic substances are in the reconstruction material, the material should be rated poor. Laboratory tests may be needed to properly identify toxic substances.

(5) Materials that are extremely acid or have the potential upon oxidation of becoming extremely acid are difficult and expensive to vegetate. They also contribute to poor water quality, both in runoff or in ground water. Materials high in pyrite and marcasite without offsetting bases have high potential acidity. Laboratory tests may be needed to properly identify these materials.

(6) Vegetation is difficult to establish on soils that have high pH. Many of these soils also have a high sodium absorption ratio which indicates potential instability and water transmission problems.

(7) The available water capacity also is important in establishing vegetation. Soils that have a low available water capacity may require irrigation for establishment of vegetation.

(8) The stability of the soil depends upon its erodibility by water and wind and its strength. Water erodibility is indicated by the K factor; wind erodibility is rated according to the wind erodibility group. Potential slippage hazard is related to soil texture, and although other factors also contribute, the ratings of soil texture represent one important factor.

(9) USDA texture also influences a number of properties listed above such as available water capacity and erodibility by wind or water. Texture also influences soil structure and consistence, water intake rate, runoff, fertility, workability, and trafficability.

(10) Fraction greater than 3 inches is a weight percentage of rock fragments in the material used for soil reconstruction. Rock fragments influence the ease of excavation, stockpiling, and respreading and suitability for the final use of the land. A certain amount of rock fragments can be tolerated depending upon size and the intended use of the reclaimed area. If the size of rock fragments exceeds 10 inches, the problems are more severe.

(11) This guide does not cover all the soil features considered in planning soil reconstruction, for example, slope, thickness of material, ease of excavation, potential slippage hazard, and soil moisture regime. Slope of the original soil may influence the method of stripping and stockpiling of reconstruction material but may have little effect on the final contour and, therefore, on the stability and productivity of the reconstructed soil. Therefore, slope is not a criterion in this guide.

(12) Thickness of material suitable for reconstruction and ease of excavation are important criteria in planning soil reconstruction operations. However, they are so dependent on the method of mining operations that they cannot be used as criteria in this guide. Potential slippage hazard is related to soil texture, slope, differential permeability between layers, rainfall, and other factors which are not included in the guide. Soil moisture regime, climate, and weather influence the kind of vegetation to plant and the rate of revegetative growth. They are not used as criteria because the relative ranking does not change with variable moisture regimes; that is, the best soil in a moist environment is the best soil in a dry environment. Furthermore, the soil may be irrigated to establish vegetation.

Table 603-25

Table 603-25. Soil reconstruction material for drastically disturbed areas.

PROPERTY	LIMITS			RESTRICTIVE FEATURE
	GOOD	FAIR	POOR	
1. SODIUM ADSORPTION RATIO	< 5	5-12	> 12	EXCESS SODIUM
2. SALINITY (MMHOS/CM)	< 8	8-16	> 16	EXCESS SALT
3. TOXIC MATERIALS	LOW	MEDIUM	HIGH	TOXICITY
4. XVII/ SOIL REACTION (pH) (0-40")	5.6-7.8	4.5-5.5	<u>32/</u> 4.5	TOO ACID
5. AVAILABLE WATER CAPACITY (IN/IN)	> .10	.05-.10	< .05	DROUGHTY
6. EROSION FACTOR (K)	.35	.35	---	ERODES EASILY
7. WIND EROD. GROUP	---	---	1, 2	SOIL BLOWING
8. USDA TEXTURE	---	SCL, CL SICL	<u>5/</u> C, <u>5/</u> SIC, <u>5/</u> SC	TOO CLAYEY
9. USDA TEXTURE	---	LCOS, LS LFS, LVFS	COS, S, FS, VFS	TOO SANDY
10. COARSE FRAG. (WT PCT)				
3-10 IN.	< 15	15-35	> 35	LARGE STONES
> 10 IN.	< 3	3-10	> 10	LARGE STONES

5/ If in kaolinitic family, rate one class better if experience confirms.

32/ Rate "FAIR-TO ACID" if found deeper than 40 inches.

XVII/ Layers with high potential acidity should be rated "POOR-TOO ACID".

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HYDROLOGY

The following data and data standards are designed to provide the BLM with sufficient hydrologic information to make coal leasing decisions for specific tracts of land:

1. Streamflow data for the region.
2. Water resource inventories on lands considered for leasing and adjacent land.
3. Information necessary to apply unsuitability criteria.
4. Data to rank tracts according to significance of water resources and probable levels of hydrologic disruption.

The above data are obviously interrelated. It must also be recognized that site-specific studies needed to assess the hydrologic consequences of mining are dependent upon continued support of regional data collection and topical studies. For example, methods to predict ground water quality changes in the spoil piles in potential lease areas are provided by mine spoil studies at existing mines. These studies need to be continued to verify and refine techniques and to develop methods to predict ground water quality changes off site. Also indirect methods, i.e., channel geometry, can be substituted for long-term monitoring of streamflow.

Essential Streamflow Data

Tasks

1. Identify watercourses flanked by probable Alluvial Valley Floors (AVFs)
2. Evaluate:
 - a. Runoff characteristics (3-years minimum record or use indirect methods such as channel geometry)
 - b. Streamflow quality (3-years minimum record)
 - c. Surface-water/ground water interactions.

Scope and Intensity

Tasks listed above are not tract-specific. They apply to basins in the Region where streamflow is a significant resource for agriculture. Watercourses flanked by probable AVFs are the objects of these investigations, and have already been identified on regional maps such as those by Malde and Boyles (1976), Hardaway and others (1977), and Earth Resource Associates (1983). A minimum of three years of streamflow records (standard USGS techniques) should be available to assess mean annual runoff, peak and low flow conditions, and water quality conditions. Continuous record stations need not be located in the smaller basins if adequate data can be projected statistically or aerially to them. Placement of those stations should be determined by judgments or adequacy of records for modeling purposes to assess cumulative impacts and/or AVF questions.

All perennial, intermittent, and ephemeral stream reaches flanked by probable AVFs should be investigated at least once during low-flow conditions to determine surface-water /groundwater interactions in terms of quantity and quality. Where possible these investigations should be accomplished through synoptic streamflow measurements and sampling. Reaches of gain and loss can be determined for larger streams through comparisons of records from continuous-record stations.

Water Resource Inventory

Tasks

3. Identify water reservoirs and designate:
 - a. Runoff fed
 - b. Spring fed
 1. geologic sources
 2. water quality
 - c. Water uses
4. Identify springs and perennial, intermittent, and ephemeral streams and designate:
 - a. Water quality/quantity
 - b. Water uses
 - c. Geologic sources
5. Identify subirrigation and designate:
 - a. Acreage
 - b. Crops
6. Identify surface irrigation and designate:
 - a. History (since 1977)
 - b. Acreage
 - c. Crops
7. Identify wells and determine:
 - a. Water uses
 - b. Well depths and static water levels, well construction; (i.e., location of perforations, plugs, seals, etc.)
 - c. Geologic sources of water
 - d. Water quality

8. Inventory surface and ground waters in order to:
 - a. Identify future water drawn down potential
 - b. Quantify water consumption impacts

Scope and Intensity

These tasks require 1:24,000 topographic maps, aerial photographs at best available scale (color infrared is best), and limited field work. The objective here is to learn as much as possible about water uses and hydrologic conditions from inventory and field reconnaissance. This should eliminate or minimize the need for test drilling during the initial study. Water uses can also be picked from water rights filings available from state agencies, maps, and from photos; surface-owner or lessee discussions can provide more information. Water-well data can be obtained from ground-water files at appropriate Federal and State agencies, and from field reconnaissance; geologic sources of water can usually be estimated from geologic data earlier collected during coal-resources appraisals. Most of the information obtained in the inventory process will have additional application in applying the unsuitability criteria and/or in judging probable levels of hydrologic disruption, so attempts to obtain all available data are worthwhile here.

Intensity of data collection will depend upon the level of water use in a delineated tract and upon the availability of data. Certainly all reservoirs, springs, and wells can be located easily. Ground-water appropriation data may be available for only a small percentage of the springs and wells. Extra effort may not be required to evaluate irrigation conditions if potential alluvial valley floors do not exist in the area.

Unsuitability Criteria; Alluvial Valley Floors and Floor Plains¹

Tasks

9. Identify and map:
 - a. Active flood plains (perennial, intermittent, and ephemeral), associated channels, and terraces within two miles of tract boundary (apply geomorphic criteria)
 - (1) all areas and evidence of historic surface irrigation
 - (2) nonirrigated land physiographically similar to the irrigated land
 - (3) areas of suspected subirrigation
 - b. 100-year floodplains

¹ Municipal watersheds and National Resources waters are also identified as unsuitability criteria, but neither are known to occur in the Powder River Coal Region.

Scope and Intensity

The objective here is to avoid or minimize any coal leasing of tracts which, pursuant to SMCRA provisions to protect water quality, water quantity and significant farming would be precluded from mining. Leasing might proceed with confidence that AVF or floodplain determinations are not a factor, or with proper cautions that lessees may be faced with rigorous application of AVF and floodplain criteria. A third option is the redelineation of tract boundaries to avoid potential AVF or floodplain problems.

The processes of mapping irrigated and potentially irrigable land (under the AVF definitions) have been described in detail by OSM (1983). Regional maps such as those by Malde and Boyes (1976), Hardaway and others (1977), and by Earth Resource Associates (1983) should be examined, and any other maps of surficial geology should be consulted. Tract-specific mapping may also be necessary. Aerial photos (IR-color preferred) and topographic maps (1:24,000) can be used to draw boundaries of channels and associated irrigable lands. This work would presumably be conducted in conjunction with soils and vegetative investigations having the same objectives.

The recommended two-mile distance from tract boundaries is an arbitrary but safe distance for preleasing evaluations. If suspected AVFs are found within two miles of a delineated tract, some basic considerations of the hydrologic budget become necessary. These cannot be applied, however, until the tasks listed under "Probable Levels of Hydrologic Disruption" have been completed.

One hundred-year floodplain maps are available for many areas from the U.S.G.S.

Probable Levels of Hydrologic Disruption

Tasks

10. Identify aquifers that would be physically disrupted by mining, and describe:
 - a. Depth-range(s) below surface
 - b. Generalized geologic structure
 - c. Generalized potentiometric surface(s)
 - d. Generalized areas of ground-water recharge/discharge
 - e. Estimated rates of ground-water flow
 - f. Water quality

- g. Interrelationships (discharge and recharge) with special hydrologic features
 - (1) clinker
 - (2) watercourses within two-miles of tract
 - (3) possible AVF's within two-miles of tract
- 11. Identify aquifers below the mineable coal (alternate supplies) and describe:
 - a. Depth-range(s) below surface
 - b. Estimated potentiometric surfaces
 - c. Water quality
- 12. Identify probable hydrologic consequences of a theoretical mine by estimating:
 - a. Mine influence rates
 - b. Mine effluent rate and quality
 - c. Probable disposal of effluents
 - (1) watercourses
 - (2) infiltration
 - d. Post-mining water quality
 - (1) chemical concentrations
 - (2) direction and rate of flow
 - (3) effects on off-site conditions
 - e. Site-specific and cumulative effects on quantity and quality of existing water sources

Scope and Intensity

Objectives are to obtain additional tract specific data and to make estimations of probable cumulative hydrologic consequences of mining. These can then be applied to the tract-ranking process and to the hydrologic-balance aspects of the unsuitability criteria. Much of the data obtained during the streamflow, inventory, and unsuitability criteria investigations will be needed along with some or all of the following: (a) detailed geologic information available from the coal-resource appraisals; (b) surface-maps of bedrock, clinker, and alluvium; (c) observation wells; (d) overburden mineralogic and soluble-salt analyses; (e) aquifer tests; (f) water-quality analyses; (g) water-level monitoring; and (h) streamflow measurements.

Scope and intensity during these investigations must be determined by the hydrologic significance and complexity of a given tract and adjacent area. Listed below is a proposed tract classification system followed by a matrix of suggested minimum data standards for each classification:

- CLASS I: Surface mineable coal lies above the water table. There is no suspected AVF within two miles downstream of the tract.
- CLASS II: Surface mineable coal lies above the water table. A suspected AVF is present within two miles downstream of the tract.
- CLASS III: Surface mineable coal lies below the water table. There is no suspected AVF within two miles any direction of the tract.
- CLASS IV: Surface mineable coal lies below the water table. There is a suspected AVF within two miles any direction of the tract.

Minimum Hydrologic Data Standards

STANDARDS	TRACT CLASSIFICATION			
	I	II	III	IV
holes or wells for overburden soluble salt and/or mineralogic analyses	1	3	3	3
post-mining water quality	p	p	p	p
observation wells (bedrock)	3	3	5*	5*
years of water level record (at least monthly measurements)	.5	.5	1	3
aquifer tests			3	3
water analyses			3	3
mine influent rates			p	p
mine influent quality			p	p
drawdowns and affected areas			p	p
wells and springs affected			p	p
evidence of alternative supplies			d	d
hydrologic connection (tract-potential AVF)**		d		d
tract percentage of potential AVF watershed**		d		d
observation wells (potential AVF alluvium)				3
years of water level record (at least monthly measurements)				3
aquifer tests				3
water analyses				3

numbers specify minimum requirements
 abbreviations: d, determine; p, predict

* tracts with multiple aquifers should have at least 3 wells in each aquifer; additional aquifer tests and water quality data would also be necessary.

** decision points; considerations of alluvium may or may not be necessary.

The minimum data standards listed above are, in fact, a combination of data and interpretations which would allow tract ranking and preliminary considerations of hydrologic budget for the AVF question. For predications of hydrologic disruption, a hypothetical mine is superimposed on the tract and estimates of active and post-mining conditions are made. An example of such an analysis is that in U. S. Geological Survey Water-Resources Investigation 84-4239 (McClymonds, 1985) for the Horse Creek Area in southeastern Montana.

Two decision points are shown on the above matrix where it can be decided whether further AVF considerations are necessary. The first of these, hydraulic connection, is a determination whether any aquifers that would be penetrated during mining have hydraulic continuity with any suspected AVF identified within two miles of the tract. Normally, this is already obvious from earlier work. The second, tract percentage of potential AVF watershed is easily determined from topographic maps. If there is no subsurface continuity with an AVF, and if a tract occupies very little or no part of an AVFs watershed, more work is unnecessary. If one of the above associations is found to be-positive, investigations of the AVF alluvium will be necessary and modeling of the hydrologic budget will probably be necessary before AVF determination can be made.

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WILDLIFE

This paper presents the minimum data requirements needed to make coal leasing/mitigation recommendations for wildlife populations and their habitats within the Powder River Coal Production Region. The data standards described herein would be applicable to those tracts under leasing consideration within any given round of Powder River coal activity planning. These data requirements are intended to act as the minimum standard for evaluating the adequacy of wildlife data bases as well as for determining whether additional inventories are required. The data adequacy standards are also intended to assure that a sufficient amount and quality of resource information is available for use at the time a coal leasing decision is made.

Tasks

It must be emphasized that the standard presented herein is the minimum, or threshold level, information required to make informed and proper coal leasing decisions. It should not necessarily be construed as the "norm" or the maximum level of information needed. For example, in the northern Great Plains the climatic and habitat conditions on the winter range are usually the most limiting factor on big game populations. The minimum data standard presented herein calls for one winter season of inventory for big game. It is quite conceivable that a mild winter could occur during the data gathering period yielding a big game data base that was not representative of the most crucial conditions on the proposed lease tract. In this situation, the manager involved and his advisors (i.e., wildlife, watershed staffs) would have to recognize the circumstances and modify their data base by continuing big game winter season inventories until a representative data base was obtained. In this fashion an adequate data base could be acquired even though it required more work than the minimum standards outlined herein. Examples of possible situations that might require a deviation from the minimum standard include, among others: (1) unusual weather conditions during the data gathering period, (2) the occurrence of a "unique" animal population or habitat in the potential lease area, or (3) previous information gathered is considered of inadequate quality. In addition, any data over 5 years of age should be given extra special scrutiny during the evaluation process to determine if it is still relevant.

The following discussion provides general guidance to assist in evaluating the wildlife data adequacy. Before any coal leasing/mitigation decisions are made relative to wildlife populations and their habitats, the following data requirements must be satisfied (where pertinent):

1. Fish Species

- a. Species occurrence
- b. Distribution
- c. Relative abundance
- d. Rearing area
- e. Water chemistry
- f. Habitat condition
- g. Aquatic invertebrates
- h. Spawning areas and movements

Seasonal sampling will identify species occurrence, distribution, relative abundance, spawning areas and movements, and rearing areas. Associated aquatic invertebrates, water chemistry, and habitat condition will be sampled. At a minimum, three seasons (spring, summer, and fall) of inventory will be required with a fourth season (winter) of water chemistry to be conducted.

2. Big Game Species

- a. Species occurrence
- b. Species distribution by season and habitat type
- c. Relative abundance
- d. Migration routes
- e. Important use areas (wintering, fawning, calving, and lambing)

Seasonal inventories will be conducted by vehicle and foot observations with a minimum of one aerial observation flight each month from November through April. Surveys should include at least a 2-mile zone from the perimeter of the lease area. Surveys may extend beyond a 2-mile zone if circumstances warrant. Species occurrence, distribution by season and habitat type, relative abundance, migration routes, and important use areas will be measured. As a minimum, each season will be investigated once. Additional seasons may be investigated if the situation warrants a more detailed evaluation.

3. Small Mammals

- a. Species occurrence
- b. Distribution
- c. Relative abundance

At a minimum, each habitat type in the lease area will be inventoried once for species occurrence, distribution, and relative abundance during the duration of the study (preferably late July or August) for at least three consecutive trap nights. Small mammal techniques including pit falls, pincher type traps, snap traps, Sherman live traps, rat traps, and have-a-heart traps can be used. A variety of trap types and baits, coupled with a sufficient level of sampling effort, should be employed to adequately sample species composition.

4. Nongame Birds

- a. Species occurrence by habitat type
- b. Distribution
- c. Relative abundance
- d. Important habitats for species of high Federal/State interest

Nongame bird surveys for species occurrence, distribution, and relative abundance should be conducted in each vegetation type in the lease area and in each unique or important habitat (i.e., riparian/wetlands, rock outcrops, etc.). Inventory may involve the use of both the vehicle route techniques and walking techniques. Two vehicle routes will be run monthly from April through September. If the area contains unique or important habitat types, transects

will be established in each of these habitat types. One winter season bird survey should also be conducted (i.e., Christmas bird count, etc.). An evaluation should also be made of the "priority" of existing habitats for species of high Federal interest. A concentrated ground search of all identified "priority" habitats for these species will be conducted within the lease boundary and an appropriate "buffer" perimeter.

5. Raptors

- a. Species occurrence by habitat type
- b. Distribution
- c. Relative abundance
- d. Nest sites, status, conditions, and, if available, history
- e. Roost/concentration areas

Raptor occurrence, distribution, and relative abundance should be noted from ground and vehicle observation routes. A concentrated aerial and ground search of all rocky cliffs and other potential raptor nesting areas will be made. Nest production will be noted when it can be done without causing stress on the nesting bird. Locations of raptor nests, feeding areas, and any roosting sites should be determined. Raptor surveys should include the baseline study area and at least a 2-mile buffer zone. At a minimum, all seasons should be surveyed at least once.

6. Game Birds

- a. Species occurrence by habitat type
- b. Distribution
- c. Relative abundance
- d. Breeding areas (leks, nesting habitat, and roost areas)
- e. Important seasonal habitat (i.e., wintering areas)

Presence, distribution, and relative abundance should be determined from spring, summer, and fall observation routes and breeding season surveys. For those species with distinct breeding grounds, breeding ground searches of large sites will require both aerial and ground surveys. Once breeding grounds are found, the number of male birds using the site should be determined. Summer surveys should also be made to determine use of the area by hens with young. Winter surveys should be made to determine the number of birds using the site during that season. Grouse leks will be inventoried and a concentrated search using aircraft, vehicles, and foot methods will be made for leks from March through May.

7. Waterfowl

- a. Species occurrence
- b. Distribution
- c. Relative abundance
- d. Special use areas (nesting, roosting, staging, and concentration)
- e. Wetlands by National Wetlands Inventory Classification

After the spring snowmelt, potential waterfowl habitat will be inventoried in accordance with the National Wetlands Inventory Classification and mapped and a record made of wetland areas such as ephemeral streams, perennial streams, reservoirs, surface water, and ponds. Later in the year (after July 15), a recheck of mapping of each site will be done showing location and permanence of water. Reservoirs and creeks will be checked from April through June for waterfowl occurrence. All waterfowl and broods are to be recorded by date of observation, species, location, and size of broods. Surveys for waterfowl species occurrence, distribution, and relative abundance should also be conducted during a fall and winter season.

8. Prairie Dog Towns

- a. Historic Use
- b. Location
- c. Size (acres and number of burrows/acre)
- d. Species of prairie dog towns
- e. Population estimate and trend status

All towns on the lease or within 1/2 mile of the lease boundary will be located, inventoried, mapped, and documented. Occurrence of black-footed ferret sign, burrowing owls, and other associated sensitive species will also be noted. Any ferret sign (plugged burrows, trenches, etc.) will be promptly reported. The prairie dog town surveys will occur once during either the spring, summer, or fall seasons. Prairie dog town locations, size, species of prairie dog occupying the town, relative status (density and trend) of the prairie dog population, and historic use of the prairie dog town would all be noted.

9. Amphibian/Reptiles

- a. Species occurrence
- b. Distribution
- c. Relative abundance

Species occurrence, distribution, and relative abundance should be determined by trapping, capture, observation, and calls during the summer. A variety of sampling methods, coupled with a sufficient level of sampling effort, should be employed to adequately ascertain species composition.

10. T & E Species/State Sensitive Species

- a. Historic use of the area
- b. Species occurrence
- c. Distribution
- d. Relative abundance
- e. Critical habitat

Inventories for T & E species and State sensitive species should only use the latest recognized procedures for surveying the species in question. For black-footed ferrets this would mean the use of Wyoming's BLM Wildlife

Technical Bulletin No. 1, "Handbook of Methods for Locating Black-Footed Ferrets," or the Montana/Wyoming Fish and Wildlife Service guidelines. Each prairie dog town within the lease area and extending out to 1/2 mile beyond the lease area will be inventoried for black-footed ferrets. Survey supervisors and/or field personnel will have attended formal training in ferret survey methods to obtain a minimum experience in conducting surveys and recognizing ferrets and their sign.

Inventories for bald eagles, peregrines, and whooping cranes should include two spring, summer, and fall seasons. Additionally, two winter season surveys for bald eagles should be conducted, as a minimum.

Scope and Intensity

The recommended inventory procedures and habitat typing methods used to collect data to meet minimum requirements are outlined in BLM Manual Sections 1734, 6602, and 6670 and BLM Technical Notes. Level 3 inventories (Attachment A) should be the minimum intensity conducted to gather data for areal baseline information (i.e., deer winter range) while Level 4 and/or 5 should be used for specific site studies (i.e., raptor nest sites, wetlands) (see Attachment A). Riparian and wetland habitats will be sampled as a separate vegetation type. Before any inventories are initiated, a comprehensive review of the literature and data files pertaining to species found in the study area will be made in conjunction with coordination/consultation with appropriate State and Federal resource management agencies. Only after all available data have been evaluated and deemed insufficient to make a coal leasing decision will inventories be initiated. All inventories will obtain, at a minimum, species occurrence, distribution, and relative abundance data. The principal investigator will identify and document seasonal use areas, crucial areas, threatened and endangered species habitat, migration routes, and any other special habitat use areas where such information is needed to meet minimum data requirements for a species occurring in an area. The inventory shall identify apparent land use conflicts, current habitat limiting factors, and unique habitat features, including habitats of species of high Federal and State interest, on appropriate maps with substantiative photos. Habitat currently occupied or potentially suitable for federally listed threatened and endangered species and State listed sensitive species will be delineated on maps and will include documenting photos as appropriate (this includes both game and nongame species). Landowners are to be contacted prior to inventory related entry on their land at which time any information they have about fish and wildlife species on their land can be obtained.

These data levels are not only pertinent to assessing wildlife populations, but are also essential to assess the potential to restore desirable levels of given populations. As such, they are an integral factor to the total reclamation potential for specific areas.

The matrix table in Figure 1 graphically displays the minimum wildlife data adequacy requirements. Attachment A includes excerpts from BLM Manual 1734 which provides a perspective in addressing various levels and intensity of inventory and data gathering efforts.

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MATRIX OF MINIMUM DATA REQUIREMENTS

Data Element	Study Year																			
	Year 1				Year 2				Year 3				Year 4				Year 5			
	Sp	Su	Fa	Wn	Sp	Su	Fa	Wn	Sp	Su	Fa	Wn	Sp	Su	Fa	Wn	Sp	Su	Fa	Wn
1. Fish																				
Species Occurrence	X	X	X																	
Distribution	X	X	X																	
Relative Abundance	X	X	X																	
Rearing Areas	X	X	X																	
Spawning Areas & Movements	X	X	X																	
Habitat Condition	X	X	X																	
Aquatic Invent.	X	X	X																	
Water Chem.	X	X	X	X																
2. Big Game																				
Species Occurrence	X	X	X	X																
Distribution	X	X	X	X																
Relative Abundance	X	X	X	X																
Migration Rte.	X	X	X																	
Important Use Areas	X	X	X	X																
3. Small Mammals																				
Species Occurrence		X																		
Distribution		X																		
Relative Abundance		X																		
4. Nongame Birds																				
Species Occurrence	X	X	X	X																
Distribution	X	X	X	X																
Relative Abundance	X	X	X	X																
Important Habitat	X	X	X	X																
5. Raptors																				
Species Occurrence	X	X	X	X																
Distribution	X	X	X	X																
Relative Abundance	X	X	X	X																
Nest Site & Condition	X	X																		
Roost/Conc. Area				X																
6. Game Birds																				
Species Occurrence	X	X	X	X																
Distribution	X	X	X	X																
Relative Abundance	X	X	X	X																
Breeding Areas	X																			
Import. Seas. Habitat	X	X		X																
7. Waterfowl																				
Species Occurrence	X	X	X	X																
Distribution	X	X	X	X																
Relative Abundance	X	X	X	X																
Spec. Use Areas	X	X	X	X																
Wetlands	X	X																		
8. Prairie Dog Towns																				
Historic Use	X																			
Location	X																			
Size	X																			
Species of PDT	X																			
Pop. Est. & Status	X																			
9. Amphibians & Reptiles																				
Species Occurrence		X																		
Distribution		X																		
Relative Abundance		X																		
10. T/E Species/State Sensitive																				
Historic Use	X																			
Species Occurrence	X	X	X	X	X	X	X	X	X											
Distribution	X	X	X	X	X	X	X	X	X											
Relative Abundance	X	X	X	X	X	X	X	X	X											
Critical Habitat	X	X	X	X	X	X	X	X	X											

Excerpts from BLM Manual Section 1734
INVENTORY AND MONITORING COORDINATION

The Inventory Levels. Tailoring the inventory level is appropriate if the issues warrant such variation. In the following description of standard levels the most likely use(s) for each level is suggested. The sources of data and the mapping unit intensities identified are general guidelines and not strict criteria.

Level 1 Inventories. Level 1 inventories are broad-based extensive inventories generally of interest to users who desire data on a national and regional level at relatively low cost. Sources for Level 1 data include manually interpreted Landsat imagery and existing literature. Level 1 inventories are capable of differentiating between general land-use/land cover types. Inventory requirements of the Resource Planning Act (RPA) and the regional data needs for BLM under FLPMA could be satisfied by Level 1 inventory.

Level 2 Inventories. These inventories provide data for land-use planning where the planning issue requires a mapping unit between 160 acres and 1,000 acres. Depending on the resource values, Level 2 criteria may be suitable for baseline inventories. Level 2 and subsequent levels often employ sampling procedures. Landsat digital data or high to medium altitude photography may be used. For Level 2 accuracy, Landsat digital data can be used without extensive aerial photography interpretation or ground sampling. Levels 1 and 2 are further described in USGS Professional Paper 964.

Level 3 Inventories (recommended baseline for coal activity planning). Level 3 inventories provide data for land-use planning where these issues require a mapping unit between 40 acres and 160 acres. Medium altitude photography may be used. Ground sampling is required if on-site production estimates are part of the desired data base. Remote sensing techniques (normally Landsat digital data in conjunction with aerial photographic information) can be used to attain Level 3 detail for land-use and land cover data if supplemented with extensive aerial photography interpretation and ground sampling.

Level 4 Inventories. Level 4 inventories provide the necessary data requirements for critical management issues. These inventories provide data with a mapping unit between 5 acres and 40 acres. Low altitude photography and intensive ground sampling procedures may be used in order to provide Level 4 data needs.

Level 5 Inventories. Level 5 inventories are generally used for detailed activity plans and project design. They develop information with a mapping unit between 0.5 acre and 5 acres and may utilize low altitude photography with intensive ground sampling techniques.

AIR

An analysis of current ambient air quality data available in or near the potential lease areas and an analysis which projects air quality impacts associated with future mining of these lease areas is necessary to make coal leasing decision. This analysis of ambient data and projected impacts is based upon potential generic mining scenarios. The following data/analyses are necessary to make coal leasing decisions:

1. Existing ambient air quality data
2. Ambient Impact Analysis
 - a. Assumptions regarding development
 - b. Impact Analysis

Ambient Air Quality Data

Tasks

1. Identify actual air quality data in the area if available.
2. Evaluate:
 - a. Data for the pollutant(s) reasonably associated with the anticipated development of the coal tract must be used (i.e. TSP and/or PM-10 for coal mine; TSP/PM-10, SO₂, and NO_x for a coal mine + power plant, TSP/PM-10, SO₂, NO_x, + Ozone for a Synfuels Plant, etc.).
 - b. Such data is representative if gathered on the potential lease tract. Data from the vicinity of the lease tract can be used as representative if it can be reasonably demonstrated that the data is not influenced by emissions from facilities in a manner significantly different than the air quality at the lease site is affected by such emissions.
 - c. Data from locations distant from the potential lease site can be used if it can be reasonably demonstrated that both locations are subject to similar meteorological conditions, that the land use in the vicinity of both locations is similar, and that neither location is influenced by local sources, or that such influence is reasonably similar at both sites.
 - d. Data used must be for a period of at least twelve consecutive months collected on a schedule frequency of at least once every sixth day, and meet a data recovery rate of at least 80%.
 - e. Data used must comply with the Quality Assurance Program requirements specified in 40CFR Part 58 Appendix B.

Scope and Intensity

In reviewing the leasing potential of a given coal tract, the federal land manager must have air quality data available to indicate whether or not the tract can reasonably be expected to be developed. Such data must be sufficient to define the state of air quality at and in the immediate vicinity of the coal tract to be leased. It is not, however, necessary for this definition of air quality condition to be made with respect to pollutants which are not reasonably anticipated to be emitted as a result of the development of the lease. In addition, it is also not necessary that the air quality data be gathered on the area under consideration for leasing.

Ambient Impact Analysis

Tasks Assumptions Regarding Development

3. Identify type of facility or combination of facilities which will be associated with the lease, i.e. a coal mine, a coal mine plus a power plant, a coal mine plus a synthetics fuel plant, etc.
4. Determine level of development associated with the potential lease. This includes the rate of coal development plus the rate of production of other products such as power or synthetics fuel.
5. Determine the life of the facility as a function of the production defined in 4 above and the total quantity of coal to be developed.
6. Determine special distribution of the coal production as a function of time. Under some circumstances, it may be possible to assure that the emissions are distributed uniformly over the entire area to be mined in the lease area.

Scope and Intensity

Using the existing air quality data, the federal land manager can determine baseline ambient air quality concentrations in and around the proposed lease area and is thus in a position to proceed to the next step that of analyzing the impact of the development of the potential lease. Obviously, the impact of the development of a given potential coal lease is a function of the activity which will be associated with the development of that lease. Therefore, the federal land manager must be prepared to make a number of assumptions regarding the ultimate development of that potential lease. These assumptions are included above.

Tasks Impact Analysis

7. An Ambient Impact Analysis is required and should include those facilities expected to be constructed and operated as a result of the leasing of the proposed tract plus all other existing facilities in the near vicinity of the tract which may be an influence.

- a. The analysis should project total ambient concentrations of significant pollutants emitted by the facilities to be operated as a result of the proposed lease. These projections should be made both on the lease and in all areas which will receive significant impact due to emissions from the lease.
 - b. The analysis shall represent a generic facility of the type assumed to be associated with the proposed lease.
 - c. The generic facility should be appropriately sized to reflect the assumptions associated with the lease.
 - d. The generic facility (plus any existing local facilities) should be modeled using the appropriate EPA approved dispersion models.
 - e. Meteorological data representative of the area should be used in the model.
 - f. The impacts on baseline air quality should be projected for all time periods for which standards have been established for the pollutant of interest.
 - g. Baseline ambient air quality data meeting the data adequacy standards specified above should be used to define baseline conditions to which the projected impact of the proposed facility is added.
8. A comparison of projected maximum concentrations to applicable Federal and state standards, including PSD increments, is required.

Scope and Intensity

The above tasks are intended to define data and analyses which are adequate for coal leasing decisions which must be made under most sets of circumstances. However, recognizing that the establishment of such standards can only be accomplished to address the normal or general situations, it is clear that for special circumstances the regional coal team may have to define specific standards for both data adequacy and analysis adequacy when special circumstances or special problems arise for a given lease tract consideration.

CULTURAL RESOURCES

Two areas of legislation require cultural resource data during coal planning and decisionmaking. Section 522(e) of the Surface Mining Control and Reclamation Act (SMCRA) establishes that cultural properties listed on the National Register of Historic Places be found unsuitable for mining unless an exception (based on mitigation feasibility) can be found to apply. The National Historic Preservation Act (NHPA) requires agency officials to seek the comments of the Advisory Council on Historic Preservation on all Federal undertakings which would affect cultural properties listed, or eligible for listing in the National Register. The two requirements become part of the coal resource management program during application of two screens (Unsuitability and Multiple Resource Trade-Off) in the Resource Management Plan (RMP) and Activity Planning stages.

The cultural resource data base needed for coal decisionmaking is guided by what is required to comply with these legislative authorities. Methods and techniques of data acquisition must therefore be designed to meet these responsibilities. The following discussion is organized in separate topics, delineating tasks which allow: (1) application of Unsuitability Criterion 7 (historic and cultural features) and (2) compliance with the NHPA and application of the Multiple Resource Trade-Off Screen.

Tasks

1. Completion or Application of Unsuitability Criterion 7

All publicly-owned places on Federal lands which are included in the National Register of Historic Places shall be considered unsuitable (43 CFR 3461(g)). These shall include any areas that the surface management agency determines, after consultation with the ACHP and the State Historic Preservation Officer (SHPO), are necessary to protect the inherent values of the property that made it eligible for listing in the National Register.

An exception to the criterion may be applied. All or certain stipulated methods of coal mining may be allowed if, after consultation with the ACHP and SHPO, they are approved by the surface management agency and, where appropriate, the State or local agency with jurisdiction over the historic site.

An exemption to this criterion is also stated in the regulations. This criterion does not apply to lands to which the operator made substantial legal and financial commitments prior to January 4, 1977; on which surface coal mining operations were being conducted on August 3, 1977; or which include operations on which a permit has been issued.

On July 15, 1985, a Federal district court decision struck down a portion of the above criterion definition as it applies to the Office of Surface Mining. The court held that "the proper construction of the Act requires protection of publicly-owned or privately-owned places in the National Register." The following discussion on data needs assumes that this widening of the criterion definition will be applied to BLM programs.

Prior to preparation of an RMP, a BLM Class I cultural resource inventory should be completed for the areas to be considered for coal leasing. If a District class I inventory has already been done, it should be updated. As stated in BLM Manual 8111, the Class I inventory is designed to provide a compilation of all known cultural resources, and their significance and formal status (such as listing in the National Register, National Historic Landmark, etc.). It will be necessary to consult with the SHPO and other institutions and agencies maintaining cultural resource data during Class I inventory preparation to insure that all data sources reasonably available are included in the document. If not completed during land use planning, the Class I inventory should be completed prior to activity planning.

The Class I inventory should identify all properties within the potential coal leasing areas which have been listed in the National Register. Such properties shall be found unsuitable for surface coal mining. The listed properties can be further considered for leasing, however, if it can be demonstrated in consultation with the ACHP and SHPO, that potential adverse impacts can be adequately mitigated. The preferred method of mitigating potential impacts on a cultural property is through avoidance. However, a final decision on the appropriate means of mitigating impacts must weigh the advantages and disadvantages of preserving site materials in place versus whether an acceptable level of detailed information on human behavior associated with the property can be retrieved using current scientific methods.

2. Application of Multiple Resource Trade-off Screen

Cultural resources are considered at this stage of coal decisionmaking through application of NHPA, Sections 106 and 110; and regulations at 36 CFR 60, 36 CFR 63, and 36 CFR 800. Essentially, these requirements mandate that cultural resources be systematically located and evaluated, and through consultation with the SHPO and ACHP, potential effects upon resources listed in, or eligible for listing in, the National Register be considered in the decisionmaking process.

Using the class I cultural resource inventory as a baseline, and in consultation with the SHPO, the data base should be evaluated prior to the Preparation of an RMP. The data base goal for this stage of coal decisionmaking should be a level of cultural resource information sufficient to understand the range of variability, the resource types, and the distribution and diversity of the cultural resources within areas being considered for coal leasing. Where this data is available from Class I inventory, it should be utilized in applying the multiple resource screen as explained later. Where data gaps occur which cannot be verifiably extrapolated from existing information, a Class II cultural resource inventory (sampling inventory) should be used to supplement existing data. The primary legislative requirement of assessing the effect of potential coal mining cannot be accomplished without adequate information. If these data collection tasks have not been done during land use planning, they should be completed prior to beginning activity planning.

All properties which are found to exist, and not already evaluated for National Register eligibility, must be evaluated as part of the inventory process. Eligibility for the National Register as determined by applying the criteria for evaluation found at 36 CFR 60, and is done in consultation with the SHPO. Where concurrence with the SHPO on property evaluation is not attainable, final decision on National Register eligibility rests with the National Park Service through the Keeper of the National Register (see 36 CFR 63).

For properties found to be eligible for the National Register, the Potential for mitigating adverse impacts should be analyzed similarly to that done for sites found unsuitable. The principle for deciding whether mitigation is feasible would be the same also.

The principle differences between unsuitability application and this screen are (1) scope and (2) consideration of other values.

Application of Unsuitability Criterion 7 is defined in a narrow, formal way: listing of properties on the National Register, all of which must have been published in the Federal Register. The scope of the multiple resource screen is much wider, in that it is based on NHPA and this includes properties eligible as well as those listed in the National Register. If eligible properties exist within the potential leasing area, or are reliably predicted to exist, then law (NHPA, Section 106) and regulation 36 CFR 800) require that the ACHP be given opportunity to comment on the effect of coal leasing on the eligible National Register properties.

Once the ACHP comment has been obtained, the responsible manager in BLM must balance those comments with other public value considerations and reach a decision whether to find the area acceptable for further leasing consideration, and to bring it forward through activity planning and site-specific analysis, to a leasing decision.

Where National Register eligible properties are located, or are reliably predicted to be located, within an area of potential coal leasing, the effect of coal leasing on such properties will likely be found to be adverse. The regulations at 36 CFR 800 require a Memorandum of Agreement to be executed to address adverse effect and to demonstrate what actions the Federal agency (in this case BLM) will take to mitigate the adverse effect.^{1/} BLM decisions, at this point, will likely have to consider either modifying the areas acceptable for further leasing consideration or establishing commitments to historic preservation measures which will be carried out during mine plan development.

1/Although a Programmatic Memorandum of Agreement (PMOA) concerning cultural resource protection with ACHP, BLM, OSM, and National Council of SHPO as signatories has been used to direct cultural resource compliance in the past, it is not used here. The PMOA assumes that unsuitability analysis encompasses both listed and eligible National Register properties. The 1983 SMCRA regulatory change restricted unsuitability analysis to listed properties only. Because eligible properties are now considered only under the Multiple Resource Trade-Off Screen, the PMOA could not be used to accomplish legislative compliance.

3. Analysis in Activity Planning

Conducting Class I and Class II cultural resource inventories will probably result in one of the following categories of results, each of which will require a different management action in subsequent coal planning and lease decisions:

- a. No properties eligible for the National Register are located or are predicted to be present within the potential coal lease area. Documentation of this result, agreed upon with the SHPO, completes cultural resource compliance responsibilities. Coal lease decisions can be made without cultural resource constraints.
- b. Properties eligible for the National Register are present or predicted, but are of such a nature or are within a class of properties that mitigation measures can be demonstrably effective in reducing adverse effect to an acceptable level. After consultation with SHPO and ACHP, the area can be found acceptable for leasing under specified conditions. The most likely conditions would include leasing stipulations requiring further inventory and a site specific mitigation plan.
- c. Properties eligible for the National Register are present or predicted, and include isolated instances of rare, large, or complex cultural resource properties. In these instances, the potential of mitigating measures to reduce adverse effects to an acceptable level may not be possible to develop based on inventory data. Consultation with SHPO and ACHP may result in requirements for further cultural resource evaluation work before a decision can be made whether to lease the area. Alternatively, again in consultation with SHPO and ACHP, activity planning could be carried out within conditions, such as, avoidance of specified properties, evaluative cultural resource work on specified properties, further inventory, etc.
- d. Site complexes which are interrelated, or other widespread cultural resource complexes, are present and eligible for the National Register. Such situations would make unencumbered areas acceptable for further leasing consideration difficult to identify and defend. A decision to postpone identification of areas acceptable for further leasing consideration pending further study could be necessary.

Scope and Intensity

Potential coal lease areas found acceptable for further leasing consideration which have been brought through to the activity planning stage should have either been inventoried by sampling mechanisms or had enough areas of intensive inventory that cultural resource occurrence can be accurately predicted. If cultural resource occurrence cannot be predicted from data used in earlier planning, data must be gathered at this stage. Results of data collection efforts must be taken through the consultation process with SHPO and/or ACHP, similar to the process described for the multiple resource trade-off screen (above).

The data collected must be comprehensive enough that adverse effects to the resource from coal mining can be reasonably assumed to be identified, similar to the four scenarios presented earlier (see analysis in activity planning). This determination involves decisions on levels of risk and adequacy of sampling.

While it is tempting to set a minimum sample fraction for inventories (BLM Manual 8111 suggests that a 10 percent sample will be generally adequate for planning purposes) practice has demonstrated that an adequate sample is extremely variable. Past experience in this area has shown that an adequate sample can range from two percent to full Class III intensive inventory of an entire potential lease area.

Sample size will depend on degree on environmental homogeneity, cultural resource density and diversity, and land ownership patterns. Some examples:

Environmental homogeneity - Most prehistoric cultures, and to a certain degree, historic cultures, were dependent on use of the natural environment, and the present cultural resource pattern of occurrence reflects this. If the environment across the potential coal lease area is not diverse, a simple random sample may predict cultural resource occurrence. Where the environment is diverse, which is the more common situation, a more complex and larger sample may be necessary.

Cultural resource density and diversity - A low cultural resource density may require a sample fraction greater than 10 percent to obtain reliable sample size. Relatively high cultural diversity may indicate complex adaptation to the environment or special use areas and also require sample fraction greater than 10 percent to obtain reliable predictions.

Land ownership patterns - If federal coal ownership in a potential coal lease area is low or scattered, simple random sampling designs could be totally inappropriate inventory devices.

Because of the extreme variability of these dependent variables, decisions on data reliability will always require a degree of judgment by the Bureau cultural resource specialist responsible for the area. Because the decisions on inventory strategy and results require consultation with SHPO and ACHP, there is a degree of check and balance in this decision. The Bureau manual target of 10 percent inventory assumes a great degree of environmental, homogeneity, a medium level of cultural resource density and diversity, and a high level of contiguous federal land ownership. Thus the 10 percent figure can be used as a point of departure for data adequacy decisions. An objective assessment of the three major dependent variables should produce conclusions about the amount of data necessary to make coal leasing tract offering decisions.

Two examples illustrate these decisions, taken where inventory was designed to meet planning needs, rather than data being adapted from inventories intended to meet other needs:

Example 1 - A coal region was inventoried with a two percent random sample fraction, and the highest potential lease areas inventoried with higher sample fractions ranging from 10 to 25 percent. Inventory results indicated small discrete cultural resource properties with no unusual concentrations of highly significant properties. Because of the low variability in the inventory results, and the potential to mitigate effects to significant properties on a site specific basis, the Bureau decision was that all potential lease areas could be brought through to lease offering with no further cultural resource inventory. This preliminary decision was done in consultation with SHPO, which concurred with the cultural resource specialist's recommendation on inventory results.

Example 2 - In another portion of the same coal region, a small area was found to contain nationally significant prehistoric cultural resources on the basis of an early, partial inventory of the area. The Bureau contracted a larger inventory of the immediate area, which led to identification and eligibility determination to the National Register of Historic Places of 10,000 acres of coal lands. Further inventory may be necessary in this area before a lease tract can be identified which is environmentally acceptable from a cultural resource standpoint.

Generally, tract-specific decisions about data adequacy are made after consideration of several factors. Principally these are: previous inventory results, environmental homogeneity, public mineral and land ownership patterns, and required interagency consultations. As the example illustrates, the necessary data will vary from tract to tract.

A wide variety of information sources may be used to identify the existing level of cultural resource information. Following is a partial listing:

1. Federal Register listings of properties on the National Register of Historic Places.
2. State Historic Preservation Office master files of cultural resource inventories and site records.
3. Casper, Wyoming and Miles City, Montana, BLM District Class I Cultural Resource Inventories, and Class II sampling inventories of appropriate areas.
4. BLM land use plans.

SOCIOECONOMICS

These economic and social data adequacy standards are intended to fulfill socioeconomic requirements contained in NEPA and CEQ as well as those contained in the Federal Coal Leasing Act Amendments (FCLAA). Judge Battin's Memorandum Opinion of May 1985 (the Northern Cheyenne Tribe versus Donald Hodel, Secretary of the Interior), also provides direction on various socioeconomic aspects of Interior's responsibilities as they relate to socioeconomic analysis. These standards are intended to satisfy those responsibilities as well. There may exist special economic and social circumstances at the county, community, and Reservation level that could require special attention. Identification of those circumstances will occur during the scoping process associated with activity planning. These economic and social data adequacy standards provide for the collection of a broad spectrum of data that, once collected, will enable the BLM to analyze those special conditions in appropriate detail.

Economic and social impacts associated with the development of federal coal occur primarily as a result of employment from construction and operation of coal mines and any associated coal conversion facilities (e.g., coal fired electric generators, synthetic fuel plants). Western strip mines are frequently found in remote areas with relatively sparse population. Consequently, the demand for labor in this type of situation (especially during the labor intensive construction phase) usually far exceeds the available supply. These conditions can result in workers and their families moving into the area to take advantage of employment opportunities. Rapid growth in population can result in severe impacts to housing, public services (especially schools, water, sewage, police, fire and health systems), wholesale/retail outlets and the general level of social well-being. Some communities are better prepared than others to handle these impacts, depending on their past experience with growth, level of excess public service capacity, and their financial ability to respond to the demands from rapid population growth.

Tasks

The following tasks are necessary to develop the range of socioeconomic information needed for activity planning in the Powder River Region:

- 1) Collect input/output data
- 2) Input/output computer modeling
- 3) Develop gravity model
- 4) Complete gravity computer modeling
- 5) Complete population apportionment in consultation with local experts
- 6) Coordinate with state, federal, and local experts in development of public service adequacy standards
- 7) Develop public service cost estimators
- 8) Collect and analyze information on community resources (i.e., history of development, cultural characteristics)
- 9) Collect and analyze information on community social organization
- 10) Analyze the ability of communities to absorb incoming population based on community resource and community social organization information

Scope and Intensity

The analysis of economic and social impacts in the Powder River Region will initially focus on those locations expected to experience coal related population growth. However, counties/communities/Indian Reservations that do not directly experience employment or population growth could still be affected by nearby development. For that reason, analysis is warranted to determine the nature and extent, if any, of significant local impacts which could result from population growth elsewhere in the Region.

Considerable coordination is required among the BLM economic and social analysts, Montana and Wyoming state governments, other federal agencies (including BIA), local, state, and Northern Cheyenne and Crow Tribal experts, city/county planners, and any other individuals/organizations that can provide information regarding socioeconomic conditions at the community and county level.

The following are proposed economic and social data acquisition techniques and analytical approaches for the Powder River Region:

1. Baseline employment forecasts as well as impact forecasts, by alternative, of employment changes at the Regional level will be developed through input/output modeling. Assumptions will then be developed regarding the percentage of regional labor supply which would be available locally vs. the amount which would in-migrate to the Region in response to job opportunities. A gravity model will be used to apportion incoming employees to Montana and Wyoming communities in the study area. Population estimators (e.g., average family sizes of incoming construction and operation workers who are married and bring families with them, etc.) would be developed and applied to the estimates of incoming workers to provide total population changes in the Region for baseline and impact scenarios at the community level. Gravity modeling will provide a documented process for apportionment of in-migrating workers and families to the Region's counties and communities.

Model-generated employment/population numbers will be forecasted at the community level. BLM would utilize the expertise of those individuals who are best suited to determining the range of local factors which would influence incoming workers' choice of residence (e.g., road conditions, community size, recreational opportunities, shopping availability, school conditions, local planning, etc.). Examples of local experts would include city and county planners, mayors, local administrators, Tribal/BIA experts, and any other knowledgeable individuals or organizations in the Region.

2. Baseline and impact public service adequacy ratings will be developed at the local level. This analysis would focus on the adequacy of those services necessary for maintaining public health and safety:

- a. Sewage treatment
- b. Water storage and distribution systems
- c. Health care
- d. Schools
- e. Police protection
- f. Fire protection.

Much of the information needed to assess and analyze service adequacy (current and forecasted adequacy, both with and without federal coal development) would be obtained from local experts, state infrastructure specialists, BIA/Tribal experts and any other knowledgeable persons/organizations in the Region. Localities with excess service capacity (under baseline and/or impact scenarios) would be noted. Service adequacy will be discussed qualitatively in cases where quantified service data is not available.

3. Estimated revenues and expenditures:

a. Forecasts will be developed at the local level of major baseline and impact expenditures necessary to provide adequate public services in instances where services would fall short of those necessary for provision of basic health and safety. This would require use of regional service adequacy standards and of public service "cost estimators" for the Region.

Forecasts would be developed, at the local level, of significant revenues generated by mineral development (e.g., taxes on mineral extraction and conversion and on mines/facilities). An estimated net fiscal balance would be developed for those revenues and expenditures which are forecasted.

b. Changes in federal coal royalty revenues to state government would be estimated based on federal tonnages, expected mining rates, and assumed royalty rates.

c. Changes in state severance taxes flowing back to Montana and Wyoming communities (i.e., funds which are available for local impact assistance) would be forecast, based on appropriate state severance tax laws and mining rates.

4. Total payroll and company expenditures would be estimated during construction and operation phases. These would be used to examine the regional economic effects from proposed federal coal development. This would be accomplished primarily via input/output modeling.

5. Agricultural impacts would be analyzed in terms of the changes in crops and/or livestock production and value that are directly attributable to the proposed action.

6. Community social conditions would be examined using the methodology developed in BLM's Guide to Social Assessment. The methodology proposes a framework of factors that contribute to a community's ability to absorb change. The "Affected Environment" and "Environmental Consequences" sections would utilize the overall framework found in the Guide.

Summary of Data Needs

1. Summary of Economic Data Elements

<u>Data Element</u>	<u>Scenario</u>	<u>Level</u>
Employment	Baseline & Impact	Region, County, Reservation
Population	Baseline & Impact	County, Community, Reservation
Service Adequacy	Baseline & Impact	County, Community, Reservation
Revenues & Expenditures	Impact	Region, County, Reservation
Income	Baseline & Impact	Region
Agriculture	Impact	Region, County

2. Summary of Social Data Elements

The Guide to Social Assessment provides a list of factors that contribute to community level capacity to absorb change. Using the Guide, the analyst would determine which of the factors would be most relevant to the situation and would focus on those factors that are determined to be most relevant. A complete list of factors includes:

a. Community Resources

- (1) History of development
- (2) Cultural characteristics
- (3) Demographics
- (4) Labor force size and diversity
- (5) Employment and income characteristics
- (6) Relative availability of facilities and services; fiscal resources
- (7) State and local regulations
- (8) Experience of local leadership
- (9) Local attitudes

b. Community Social Organization

- (1) Economic, social and political diversity
- (2) County and community linkages to nonlocal organizations
- (3) Intergovernmental coordination
- (4) Patterns of personal interaction
- (5) Distribution of resources in the community
- (6) Intracommunity coordination and cooperation

c. Levels of Social Well-Being Within the Community

Local social consequences of each alternative would be examined for affected communities. Findings from the "Affected Environment" chapter of the Guide to Social Assessment would be used in concert with population projections from the economic section to describe all significant, expected social changes at the community or Reservation level.

It is expected that the social analysis, as in the economic analysis, will initially focus on those communities that are forecasted to experience coal-related population growth. Analysis of social conditions would be expanded beyond those communities when appropriate.

References

A variety of primary and secondary sources would be used for the economic and social analyses. This includes: private research reports, company reports, federal, state and local studies and/or EISs, official Census Bureau and employment documents, special censuses, city/county comprehensive plans, socioeconomic data and/or reports or studies done by or for the Crow or Northern Cheyenne or by BIA.

An integral part of the economic and social analysis is the BLM-funded Social and Economic Study of the Effects of Coal Development on the Northern Cheyenne Tribe (May 1986). It is designed to analyze the recent historical consequences to the Northern Cheyenne Reservation, the Tribe, and its members, of existing off-Reservation coal development in southeastern Montana. The study will also describe the jurisdictional and cultural differences between the Tribe and its members and off-Reservation communities and residents in the Region. In addition, it is intended that the study will clearly portray any special circumstances which exist on the Reservation regarding provision of and funding for public services. The results will provide the foundation of the social analysis pertaining to the Northern Cheyenne Reservation and people. Additionally, the contractor who performs this work will assist BLM in its population apportionment efforts regarding the Northern Cheyenne Reservation, Tribe, and its people.

Socioeconomic conditions on the Crow Reservation have been documented in the three volume Decker Area Mines Comprehensive Social Sciences Study, 1983. That report, prepared for the Montana Department of State Lands and the U.S. Office of Surface Mining, provides a foundation for socioeconomic and cultural baseline and impact analysis of possible impacts to the Crow Reservation.

Also included as sources would be any other current primary data collection effort and/or studies such as The Economy of Eastern Wyoming, 1983. Local and Tribal experts are especially valuable sources regarding infrastructure and public finance information; they would be asked by the BLM to provide service-specific adequacy information and overall budgetary data, among other things.

VEGETATION AND LAND USE

Existing vegetation communities, species composition and relative abundance of species in each community must be determined in each proposed coal lease tract. Existing land uses on all proposed tracts must also be known before leasing decisions can be made. The reclamation potential for each proposed tract must be adequately assessed prior to leasing. The following data requirements and data standards leasing. The following data requirements and data standards (together with data requirements found in the soils, geology, hydrology, and wildlife sections of this document) are a guideline to provide the BLM with adequate information to rank proposed tracts of land for leasing and development of coal reserves with regard to vegetation and land use.

Tasks

1. Identify plant species in each tract
2. Delineate and describe vegetation communities
3. Determine presence/absence of threatened, endangered or undetermined status plant species.
4. Identify existing farmlands.
5. Determine livestock carrying capacity.
6. Determine reclamation potential.
7. Identify existing rights-of-way.
8. Delineate existing railroad or other transportation systems in or near the proposed tracts.
9. Identify any other land use; recreation sites, commercial timber, paleontological sites, cemeteries, defense installations, etc. that would or could be disturbed by mining.
10. Identify any existing or proposed commercial and residential developments in or near proposed lease tracts which could be affected by coal gas from future mining operations.

Scope and Intensity

1-2. Existing vegetation surveys should be utilized and new vegetation inventories should be conducted to delineate vegetation communities (based upon 2 or more dominant species) in each tract. Vegetation surveys for these tracts should be reviewed, and revised as necessary, at five year intervals. All discrete plant communities should be mapped at a scale of up to 1:24000 using soil survey maps or other appropriate maps. All plant species present in each tract, as well as relative abundance (based on cover, production and/or frequency) must be noted. Community descriptions should include information on relative abundance of major life forms (deciduous and coniferous trees, shrubs, grasses, and forbs).

Species (and abundance) data will be used to aid in addressing: type and extent of wildlife habitat, range condition and carrying capacity, and other agronomic and silvicultural aspects of plant materials in each tract. Documentation of sampling methodologies used (i.e. random sampling, stratified random sampling, ocular estimation techniques, size and shape of quadrats or other sampling devices used, community delineation criteria, number of samples-i.e. sample adequacy, etc.) must be incorporated in the narrative description of the plant communities in each tract. Care must be taken to select sampling methodologies that reflect the species composition and relative abundance of the vegetation in the tract as accurately and comprehensively as possible. These steps will provide for accurate interpretation of data and for consistency in future data collection efforts (3,4,6).

3. The species list obtained in meeting the requirements of tasks 1 and 2 must be compared to an appropriate list of threatened, endangered, or undetermined status (TEUS) plant species. An assessment of the potential to isolate areas harboring TEUS plant species from theoretical mining activities, as well as preliminary assessment of potential for reclaiming areas that could support TEUS plants in a post-mine landscape, must be made.

The comparatively intense field survey would be most appropriately conducted during the flowering season of TEUS plant species that may potentially be present in the tract. After the initial vegetation inventory is completed, additional cursory reconnaissance could be conducted throughout the sampled year to best determine presence/absence of TEUS plant species. Reconnaissance should be concentrated on habitats that could potentially harbor TEUS species.

A description of the topography within the tract is necessary. Delineate any unique areas (bench tops, buttes, steep canyons, etc.), including any area in which vegetation is inaccessible to livestock. The above areas may be important "natural areas" and may not be reclaimable. Riparian zones, springs and moist areas should be closely scrutinized. These sites may also harbor TEUS plant species (1,2,5).

4-5-6. Presence or absence of cropland, actual or potential prime farmlands, and alluvial valley floors (AVF) must be determined. If these lands are present; areal extent, type of crops present, annual production, significance to agricultural operations, and volume of suitable soil and spoil available for reclamation must be determined and delineated. Significant AVF's are precluded from mining. A preliminary determination must be made regarding the technological feasibility of restoring disturbed (nonsignificant) AVF's or prime farmlands to equivalent or higher crop yields as compared to predisturbance lands must be made. Irrigated and dryland farming areas can be determined for each tract using color, black and white, and-or infrared aerial photos, ASCS records and personal contact with the farm operator. These same sources are also useful for indentifying the type of crops grown on each tract. Crop yields can be determined using the agricultural statistics developed by each state agriculture department, ASCS Federal Crop Insurance Records, county tax records, or by direct measurement. Additionally, soil capability ratings for soil survey areas are published by USDA SCS.

Range site and carrying capacity can be determined for all acreage within each tract using the vegetation survey in conjunction with USDA-SCS Technicians Guide To Range Sites and Condition Classes, Soil Conservation Service soil surveys, aerial photos, BLM RMP/EIS grazing documents, etc. Livestock carrying capacity may best be determined using the ecological site method (SCS Technicians Guides). This method correlates livestock forage produced on each range site to livestock carrying capacity (animal unit months -AUM's- per acre).

Other questions that must be answered in a pre-lease ranking of tracts include: Is there a "fatal flaw" that would preclude establishing a permanent, diverse vegetative community capable of supporting a post-mine land use for livestock and wildlife? Would any characteristic of the tract preclude reestablishing productive agricultural areas? What is the probable quality and quantity of the reclaimed area root zone medium? All drill hole data should be closely scrutinized and appropriately composited to make a preliminary assessment of post-mine root zone quality and quantity. Specifically, what are the projected soil and spoil chemical and physical characteristics from the surface to at least 8-feet below the reclaimed surface? The probable mining and material handling methods to be used should also be considered in the assessment of reclamation potential. Information gleaned in tract analysis with regard to soil and overburden, hydrology, geology, wildlife and economics, as well as vegetation will be useful in answering these questions (7,8,9,11,12).

7-8. Existing records from utility companies serving the region must be examined for rights-of-way crossing potential lease tracts. Of particular concern in the Powder River region are linear rights-of-way for roads, telephone, power and pipelines. BLM MT plats, appropriate maps, consultation with utility companies and private surface owners, etc. will serve to identify rights-of-way. Potential impacts to these rights-of-way as well as possible mitigations of these impacts must be addressed and documented.

As most of the coal produced in this region is exported, the existence or lack thereof, of suitable transportation facilities becomes important. Transportation related assessments should address potential impacts to property owners and the environment, as well as addressing transportation in relation to potential for mine development. Personal knowledge of existing railroad lines, pertinent maps, industry's intentions state in expressions of interest, and public input will provide necessary information to make this analysis and comparison (10).

9. All existing land uses on a tract must be determined. The potential impact of mining and the reclamation potential regarding each of these uses must be assessed and documented. These land uses may include but are not limited to: recreation sites, commercial timber, paleontological sites, cemeteries, defense installations, and historic sites. USGS topography maps, State/US Department of Transportation County, Maps, Federal and State land resource documents (BLM land use planning documents, regional EIS's, etc.) may be useful in this regard.

10. Potential impacts to existing and future developments include coal gas problems, noise, visual intrusions, and other adverse impacts. Development data is essential to avoid such problems.

Presence or absence of commercial timber must be determined. A preliminary assessment of the likelihood of reestablishing commercial timber in a post-mine situation should be included in the tract assessment/ranking. Commercial timber exists if the tract or part of the tract is capable of producing at least twenty cubic feet of industrial wood under management. The following data is important for categorizing commercial timber: species, age of stand, density by age class, diameter at breast height, height, growth rate, condition (insect infestation, disease, etc.), accessibility, topography, and transportation availability. (10)

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LIST OF PREPARERS

Name	Speciality	Telephone	Address
Al Pierson	Area Manager Task Force	(406) 232-7000	Powder River R.A. Bureau of Land Management Miles City Plaza Miles City, MT 59301
Vickie Niermeier	Geology	FTS 328-2097 (307) 772-2097	Branch of Solid Minerals Wyoming State Office (924) Bureau of Land Management 2515 Warren Avenue Cheyenne, WY 82001
Dave Resources Roberts	Wildlife Biology	FTS 328-2086 (307) 772-2086	Branch of Biological Wyoming State Office (932) Bureau of Land Management 2515 Warren Avenue Cheyenne, WY 82001
Bert William	Cultural Resources	FTS 585-6561	Montana State Office Bureau of Land Management Granite Tower 222 North 32nd Street P. O. Box 368 Billings, MT 59107
Chuck Collins and Randall Wood	Air Quality	(307) 777-6923	Air Quality Division Wyoming Department of Environmental Quality Herschler Building Cheyenne, WY 82002
Loren Cabe	Socio- Economics	FTS 328-5101 (307) 261-5101	Montana State Office Bureau of Land Management Granite Tower 222 North 32nd Street P. O. Box 368 Billings, MT 59107
Wayne Van Vost	Hydrology	(406) 259-9834	Montana Bureau of Mines and Geology 3021 Sixth Avenue North Billings, MT 59101
Bill Volk	Soils	(406) 232-4331	Miles City District Office Bureau of Land Management P. O. Box 940 Miles City, MT 59301
Steve Regele	Reclamation	(406) 259-3264	Reclamation Supervisor Montana Department of State Lands 1245 N. 29th Street Billings, MT 59101

COMMENT/RESPONSE SUMMARY

Socioeconomics

<u>Source</u>	<u>Comment</u>	<u>Response</u>
1. Northern Plains Resources Council	Standards must be parallel Judge Battin Decision.	First paragraph contains a specific reference to Judge Battins' decision and it's use in decision making.
2. Northern Cheyenne Tribe (Steve Chestnut, Atty.)	Standards need to be more specific to Northern Cheyenne Tribe.	Text is revised to clearly show analysis of Northern Cheyenne and Crow Reservations as distinct entities.

Geology

1. Loren Williams	Clarify drill hole densities.	Clarified in Text.
2. Northern Plains Resources Council	Agree with standard. Some clarification needed.	Text clarified.

Soils

1. Northern Plains Resources Council	Agree with standard clarify text.	Text rewritten to clarify and be more specific.
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Hydrology

1. Wyoming Game and Fish Department	Reference to Wyoming stream fishery classification map needed to be added.	Reference added.
	Adequacy of existing data should be determined as well as the need for additional data.	See discussion at the end of "Tract Classification" the determination of additional data needs is discussed there.
2. Powder River Basin Resource Council	Standards should set guidelines on how mining will effect water allocation to surrounding landowners.	The allocation of water rights is an adjudicative function of each state and is beyond the scope of these data adequacy standards.

Hydrology cont.

<u>Source</u>	<u>Comment</u>	<u>Response</u>
3. American Mining Congress	Standards are excessive.	Standards were not changed. The level of data and analysis called for are necessary for making informed leasing decisions.
4. State of Wyoming	Standards are excessive.	See previous response.
5. Northern Cheyenne Tribe	No mention of Northern Cheyenne water rights.	Water rights are adjudicated by the individual states and are beyond the scope of data adequacy standards. This does not imply however that water rights claims could not be considered in an EIS.

Wildlife

1. Wyoming Game and Fish Department	Text specific clarification.	Text revised to reflect comment.
2. Northeast Wyoming Wildlife Association	Inventories for big game, raptors and game birds should include 6 seasons rather than 4.	Four seasons of inventory is the minimum agreed to. The text provides for determining the need for additional inventory if conditions warrant.
3. Powder River Basin Resource Council	Same comment as above.	Same response as above.

Air Quality

1. Northern Cheyenne Tribe (Steve Chestnut)	No mention of Class I Air on Northern Cheyenne Reservation	Ambient air quality data adequacy standards are sufficient to apply to PSD Class I considerations. Comparison of impacts to applicable standards will need to be applied on a case-by-case basis depending on individual state and federal standards, PSD Class I areas included.
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Air Quality cont.

<u>Source</u>	<u>Comment</u>	<u>Response</u>
2. State of Montana Air Quality Bureau	Add other pollutants such as organics, odors and H2S. Need to include PSD increments to applicable	Depending upon development scenarios the list of measured pollutants may need to be supplemented. Text is revised to include PSD increments.
3. State of Montana Department of State Lands	Why is a year's worth of air quality data needed to make leasing decisions?	The accepted practice and requirement in the case of PSD is one year of data to establish a baseline. There likely is historical data available in the area of interest which would be acceptable.

Cultural Resources

1. State of Montana Department of Lands	Why is BLM suggesting a second Class I inventory?	Commentor apparently misread the section on Class I inventory this section explains how existing Class I inventories can be used.
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Vegetation and Land Use

1. Northern Plains Resource Council	Expand analysis to include off-site impacts.	Text revised to include significance to agricultural operations of lands in each tract.
2. State of Montana Department of State Lands	Strengthen Reclamation section.	Text revised to include reclamation and vegetation. Also see soils and hydrology sections.
	Determine potential T & E plants and communities.	Text revised. T & E discussion included.