Scoping Comments for Revision of the Rawlins Resource Management Plan (BLM): Plant Biodiversity Issues

prepared by

Hollis Marriott, Botanist
Poorperson's Enterprises
655 N. Cedar St.
Laramie, WY 82072

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Abstract

The Rawlins Field Office (RFO) of the Wyoming Bureau of Land Management is preparing to revise its Resource Management Plan, and currently is soliciting public comment during the scoping phase. This paper discusses plant biodiversity issues that should be addressed in plan revision. It also includes detailed information on rare plants, vegetation and conservation sites that will be useful for planning and management in general.

Eleven plant species found on RFO lands are considered highest priority for conservation. These are listed by the FWS, BLM or tracked as high conservation priority by WYNDD. An additional five listed species are known from areas near the RFO; survey for these species on RFO lands is needed. Another 50 state-tracked species (WYNDD medium or low conservation priority) are found on RFO lands.

In Wyoming, comprehensive vegetation classification is available only at a coarse scale. Although the information base is incomplete, it is possible to identify types and sites that are of concern. The analysis step of WY-GAP resulted in a list of cover types prioritized by protection status and vulnerability. At least five of the highest priority cover types, as well as six second-priority and two third-priority, are found on RFO lands.

In the multiple-use context, a network of designated natural areas is the most effective approach to protection of rare plants and vegetation types of concern. Conservation sites should be designated with withdrawals, or other equally strong stipulations, and restrictions on existing and potential conflicting uses. To expect to maintain natural conditions and develop resources at the same time is unrealistic. Furthermore, designation and appropriate management design are needed even where there are no existing conflicts. It is much easier to apply restrictions *before* uses become established.

Nine recommended conservation sites have been identified, based on presence of one or more of the following values:

(1) Endangered, BLM Sensitive or WYNDD high conservation priority plant species;
(2) clusters of WYNDD medium or low priority plant species of concern;
(3) vegetation types of concern.

Site boundaries are approximate; for most sites survey is needed to determine extent of populations and communities of concern, as well as suitable boundaries. Five other areas with potential for the above criteria need survey.

Resource extraction is the major source of existing and potential threats to plant biodiversity values on lands managed by the RFO. Recreation, grazing and logging are of concern in some areas. Almost all of the resource area is available for oil/gas leasing, and much of it is considered oil/gas habitat. There are extensive coal deposits also. Development activity is focussed in about half the area. For some of the recommended conservation sites, only limited protection is available even with designation, as much of area is already leased. However, the BLM does have the ability to add restrictions and requirements as the need arises.

Acknowledgments

I would like to thank former WYNDD botanist Walt Fertig for much helpful information and review of this document. Bonnie Heidel and George Jones, botanist and ecologist with WYNDD, also provided information. Thanks once again to the staff of the Rocky Mountain Herbarium, University of Wyoming, for continued access to their fine facilities.

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1. Introduction

The Rawlins Field Office (RFO) of the Wyoming Bureau of Land Management is preparing to revise its Resource Management Plan, and currently is soliciting public comment during the scoping phase. This paper is being submitted as part of that process. It discusses plant biodiversity issues that should be addressed in plan revision. It also includes detailed information on rare plants, vegetation and conservation sites that will be useful for planning and management in general. This information also will be of interest to the conservation community.

*Conventions. S*cientific names are used for plant species, and nomenclature follows that of the Wyoming Natural Diversity Database. Common names are included in the lists of species in the appendices. The following acronyms are frequently used:

BLM	Bureau of Land Management
RMP	Resource Management Plan
RFO	Rawlins Field Office, WY BLM
WYNDD	WY Natural Diversity Database, University of WY
RM	Rocky Mountain Herbarium, University of WY
FWS	Fish and Wildlife Service
FS	Forest Service
WNC	WY Nature Conservancy
WY-GAP	Wyoming Gap Analysis project
WYG&F	Wyoming Dept. of Game and Fish

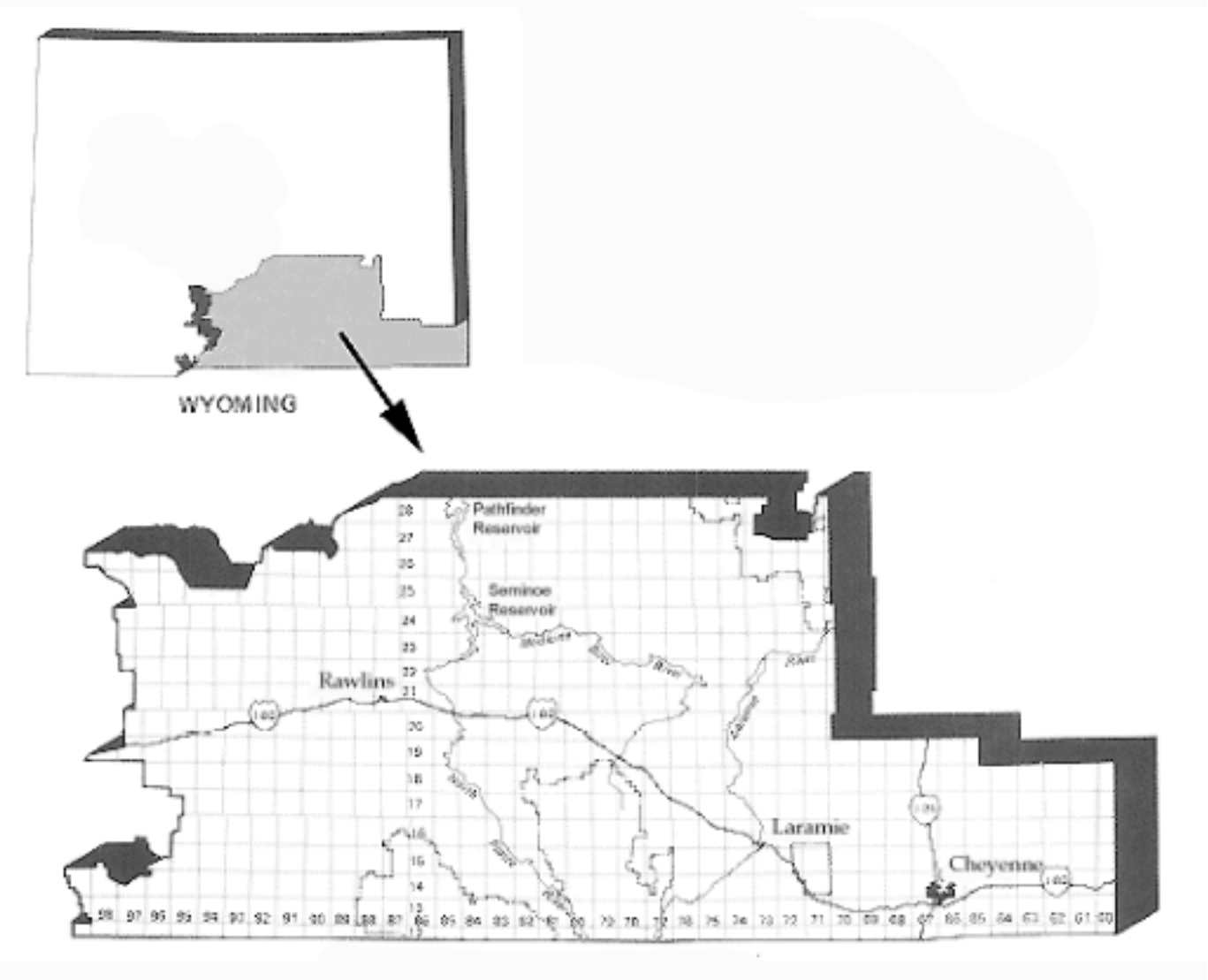
2. Project Area

The Rawlins Field Office manages lands and minerals in Laramie, Albany, Carbon and eastern Sweetwater Counties in southern Wyoming (Figure 1). Before recent reorganization, the area was called the Great Divide Resource Area; the modified RMP will be called the Rawlins RMP. Land ownership within the perimeter is mixed. Forest Service (FS) manages lands at higher elevations in the Sierra Madre, Medicine Bow Mountains and Laramie Range. Private ownership dominates in the eastern part with only scattered BLM parcels. The western part is managed predominantly by BLM. In the western part, the corridor along the Union Pacific Railroad (roughly Interstate 80) is a checkerboard of private and public ownership.

3. Plant Species of Concern

Since completion of the previous RMP in 1990, there have been significant gains in knowledge about rare plants. Through the efforts of BLM, WYNDD, RM, private contractors and others, much survey work has been done, and there is a much better understanding of what plant species are of concern, and where they occur. The WY BLM has expanded its botany program, adding staff at the state and field office level. In 2001, the State Director issued a Sensitive Species List for the state. The list is reviewed and revised annually (the latest revision is included in Appendix A).

Figure 1. Lands managed by the Rawlins Field Office, WY Bureau of Land Management.



3.1. Sources of Information

Most of the information regarding plant biodiversity for the RFO is in the form of field data and unpublished literature. Of the species of concern, only *Penstemon haydenii* has been the subject of much research beyond survey and monitoring, as it is Federally listed as Endangered. All sources used in this paper are included in **Sources of Information** at the end of this document. The most important sources are described here.

Wyoming Natural Diversity Database (WYNDD), at the University of Wyoming, maintains information on biology, location and status of native plants, animals and natural communities. WYNDD distributes information to individuals and organizations involved with conservation, management, and development of the state's natural resources. Information for plant species of concern is available in several formats, some of it online.

Wyoming Plant Species of Special Concern, May 2002. List of species tracked by the program with summarized information on abundance, distribution and trend, as well as status with other programs in the state. Available online.

State Species Abstracts. Detailed abstracts with information on status, description, phenology, distribution, habitat, trends, threats and information sources. Included as links (when available) in the online list of species of concern. Abstracts for RFO highest priority plants are included in Appendix E of this document.

Element occurrence records. WYNDD maintains records of occurrences for all species tracked. A printout for the RFO is included in Appendix D.

Published and unpublished literature. WYNDD has an extensive collection of literature for species of concern, project areas and conservation sites.

Internet Map Server In progress. Provides access to species distribution information. Users can select a species, view its statewide distribution, and query the map to see what information is available. Developed by the Wyoming Geographic Information Science Center (WyGISC), University of Wyoming.

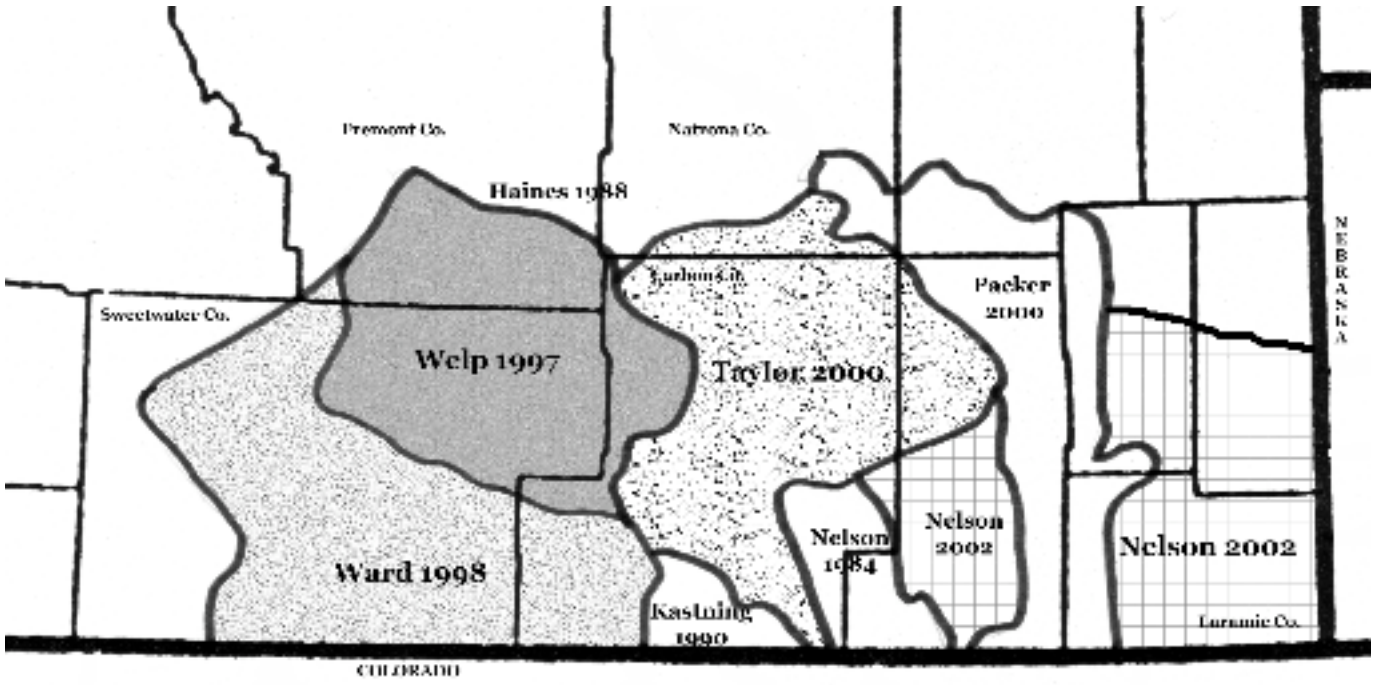
Rocky Mountain Herbarium (RM) at the University of Wyoming, contains the largest collection of Rocky Mountain plants, as well as a good representation of floras of other parts of the Northern Hemisphere. The herbarium is open to students and other qualified researchers, and provides services to the lay and professional communities, such as identifying plants collected in the region. Graduate students associated with the RM have completed general floristic surveys in Wyoming and the surrounding region. Three recent projects included large tracts of land managed by the RFO, including the Great Divide Basin (Welp 1997), south-central Wyoming (Ward 1998), and the upper North Platte River drainage (Taylor 2000). Other studies have included small scattered parcels of RFO lands in northwest Carbon County (Haines 1988), adjacent to Medicine Bow National Forest in the Sierra Madre (Kastning 1990) and Laramie Range (Packer 2000), and in southeast Wyoming (Nelson 2002). Figure 2 shows RM project areas that included RFO lands.

Wyoming Nature Conservancy (WNC). The Nature Conservancy embarked on ecoregional planning several years ago in an effort to prioritize sites for effective conservation of biodiversity. The *Wyoming Basins Ecoregional Plan* (Freilich *et al*. 2001) includes information relevant to the RFO. The ecoregion is much larger, extending from the Bighorn Basin in the

northwest and including small portions of northern Utah and Colorado. However, the plan is organized by site, and summarizes information for species of concern and vegetation types at sites within the RFO.

With so much information available, it is tempting to think that we know much of what we need to know to address management for plant biodiversity, but generally that is not the case. For very few species do we know more than distribution, rough estimates of abundance and general habitat requirements. There are still many discoveries to be made, and the status of some species may change with additional survey. There are taxonomic questions needing resolution. Detailed studies of species biology, and monitoring programs have been implemented in only a few cases. However, it is possible to make some recommendations at this point for species clearly of concern. Additional management actions probably will be needed as more information on rare plants is acquired.

Figure 2. Rocky Mountain Herbarium project areas on RFO lands.



3.2. Rare Plant Categories

Rare plants are tracked by several programs in Wyoming, and compiling a list of species of concern requires consideration of multiple lists. In addition, not all rare plants are of equal concern. For these reasons, it is necessary to understand the various classification systems currently in use in Wyoming. These systems all classify rare plants based on multiple factors reflecting abundance, habitat specificity, vulnerability and trends. The Natural Heritage ranking system used at WYNDD is a good example, and is included in Appendix B. There generally is good correlation among systems because the same types of criteria are used, and there is extensive communication among programs. In Wyoming, plants can be listed by WYNDD, BLM, FS and FWS. Categories are summarized in Table 1.

Table 1. Rare plant categories in use in Wyoming.

Program	Category	Explanation
WYNDD	Heritage rank	global (G) and state (S) rank ranging from 1 to 5 in decreasing order of concern; see Appendix B.
WYNDD	Species of Special Concern	species that are sufficiently rare and/or threatened to be of conservation concern at the present time; actively tracked by the program
WYNDD	Watch List	species not sufficiently rare and/or threatened to be tracked at this time, but with potential to become so in the future
WYNDD	Conservation Priority	high, medium, low; based on rarity, threats and degree of protection (Fertig and Beauvais 1999); see Appendix B
BLM	Sensitive	designated by State Director; species that could easily become endangered or extinct in the state; see Appendix A.
FS	Sensitive	designated by Regional Forester; of population viability concern due to significant current or predicted downward trend in population or habitat
FWS	Endangered	in danger of extinction throughout all or a significant portion of its range
FWS	Threatened	likely to become Endangered in the foreseeable future throughout all or a significant portion of its range
FWS	Candidate	sufficient biological information on file to support a proposal to list as TE, but no proposal has been published
FWS	Proposed	formally proposed for TE listing and awaiting a final rule

3.3. Highest Priority Plant Species

In the 1990 RMP, the RFO listed two plant species of sufficient concern to warrant special management attention: *Penstemon gibbensii* and *Rorippa calycina.* These were addressed under "Sensitive Plants Management Decisions" (at that time, there was no official WY-BLM Sensitive list). Rare plant management directed by the 1990 RMP is discussed below under **5.2. Existing RFO Special Management Areas.**

Currently seven species found on lands managed by the RFO are designated BLM Sensitive and one is listed Endangered. In developing recommendations for this paper, the WY BLM Sensitive list was compared with plant species currently ranked "high conservation priority" by WYNDD. Results are shown in Table 2. State Species Abstracts with detailed information for these species are included in Appendix E. Summaries for each species are provided here.

Aquilegia laramiensis
Listed WY BLM Sensitive; considered high conservation priority by WYNDD. No status change recommended. One occurrence currently known for RFO lands, but little information is available for this site and for the species in general. Needs to be targeted for status survey, with identification of conservation sites and monitoring if warranted.

Astragalus nelsonii
Listed WY BLM Sensitive; considered medium conservation priority by WYNDD.

Recommended for removal from the BLM list. Surveys by in 2002 yielded 30 extant populations scattered over a large area - enough to justify down ranking from G2S2 to G3S3, and removal from the Sensitive List (Heidel 2002; Heidel in prep.)

Boechera crandallii (*Arabis crandallii*)
Considered high conservation priority by WYNDD with a heritage rank of G2S1, but not on the WY BLM Sensitive List. One of the RFO sites is in the Poison Buttes mining area west of Baggs. Recommended for addition to the Sensitive list. Needs to be targeted for status survey, with identification of conservation sites and monitoring if warranted.

Cirsium aridum
Listed WY BLM Sensitive; considered high conservation priority by WYNDD. No status change recommended. Needs additional status survey on the RFO, with identification of conservation sites and monitoring if warranted.

Ipomopsis aggregata ssp. *weberi*
Listed WY BLM Sensitive; considered high conservation priority by WYNDD. No status change recommended. However, the single occurrence reported for RFO lands is based on a specimen with vague location data. This report needs to be verified, and status on RFO lands determined. In addition, there remain questions regarding the validity of this taxon.

Machaeranthera coloradensis var. *coloradensis*
Considered high conservation priority by WYNDD with a heritage rank of G2T2?S1, but not on the WY BLM Sensitive List. Listed as FS Sensitive on adjacent lands (Region 2). Recommended for addition to the BLM Sensitive list. Needs survey, with identification of conservation sites and monitoring if warranted. NOTE: This species was not designated BLM Sensitive because no sites were known from RFO lands (Walt Fertig, former WYNDD Botanist, pers. comm. 2003). There are two recent collections from BLM lands in the zone of checkerboard ownership near Rock River. These are included in the occurrence records in Appendix D. Some hybridization occurs between this species and *M. grindelioides* (Ron Hartman, Rocky Mountain Herbarium, Univ. WY, pers. comm. 2003).

Penstemon gibbensii
Listed WY BLM Sensitive; considered high conservation priority by WYNDD. No status change recommended. A recent discovery by Taylor (2000) suggests that additional survey could be productive. The RFO is already managing for this species at one site through withdrawal from mineral entry, and fencing. Additional conservation sites are needed, as well as monitoring programs. Survey of potential habitat on BLM lands north of Saratoga is needed (Fertig pers. comm. 2003).

Penstemon haydenii
Listed Endangered by FWS (and therefore not BLM Sensitive); considered high conservation priority by WYNDD. No status change recommended. Conservation sites on the RFO are needed. The two known sites in Wyoming were found recently, and additional survey is recommended (Fertig 2000, 2001). Monitoring programs should be established.

Phacelia glandulosa var. *deserta*
Considered "high?" conservation priority by WYNDD with a rank of G4T1T2S1?, but not on WY BLM Sensitive list. Fertig (1999) questioned the taxonomic validity, but surveys did not include the area where Ward (1998) found the taxon on RFO lands. Survey and taxonomic study are needed.

Rorippa calycina
Listed WY BLM Sensitive, but ranked medium conservation priority by WYNDD, with conservation status currently under debate. At least 24 populations, some large, have been documented in Wyoming (Fertig and Welp 1998). However, there are enough potential threats (herbicides, invasive exotics, some ORV use) that the species should remain of management concern. No status change recommended. Monitoring programs are needed.

Sphaeromeria simplex
Listed WY BLM Sensitive; considered high conservation priority by WYNDD. No status change recommended. Conservation sites are needed (see **Conservation Sites** below) as well as additional survey and monitoring (Fertig 1993; Mountain West 1996).

Table 2. Status, recommended changes and information needs for highest priority plant species.

Species	**Heritage Rank**	**Conservation Priority, WYNDD**	**Federal Status**	**Recommendations and Information Needs**
Aquilegia laramiensis	G2S2	High	BLM Sensitive	Status survey needed.
Astragalus nelsonianus	G3S3	Medium	BLM Sensitive	Remove from BLM list.
Boechera crandallii	G2S1	High	none	Add to BLM list; status survey needed
Cirsium aridum	G2S1	High	BLM Sensitive	More survey on RFO.
Ipomopsis aggregata ssp. *weberi*	G5T1T2Q S1	High	BLM Sensitive	Survey to determine status on RFO.
Machaeranthera coloradensis var. *coloradensis*	G2T2?S1	High	none	Add to BLM list; status survey needed
Penstemon gibbensii	G1S1	High	BLM Sensitive	monitoring; additional survey needed
Penstemon haydenii	G1S1	High	Endangered	monitoring; additional survey needed
Phacelia glandulosa var. *deserta*	G4T1T2 S1?	High?	none	Survey to determine taxonomic validity and status on RFO.
Rorippa calycina	G3S2S3	Medium/High?	BLM Sensitive	Status under debate (potential threats vs. abundance)
Sphaeromeria simplex	G2S2	High	BLM Sensitive	monitoring

3.4. Other Plant Species of Concern

A complete list of species of concern tracked by WYNDD for the RFO is included in Appendix C. In addition to Sensitive and high conservation priority species, the list includes about 50 species that are of viability concern in the state, or that could become so in the future. Included are species at the northern edge of their range in southern Wyoming, species that occur on the RFO as disjunct populations widely separated from the main range of the species, and species that are endemic (restricted) to the region but that are currently too common to

warrant Sensitive status. Occurrences of all species of concern on the RFO are listed in the database printout in Appendix D.

An effective way to address conservation of these rare plants is to protect sites with multiple species of concern. WYNDD occurrence data were analyzed using Arcview to identify sites with clusters of rare plant species considered of medium and low priority conservation concern. Results are included in **Conservation Sites** below.

3.5. Rare Plants Known from Adjacent Areas

At least five listed plant species occur near the RFO management area, or on non-BLM lands within the perimeter (Table 3). Survey for these species is needed on RFO lands.

Table 3. Listed plant species from areas near RFO lands.

Species	Heritage Rank; Status	Known Location near RFO	Habitat
Antennaria arcuata	G2S2; BLM Sensitive	Sweetwater River valley	moist meadows, springs, seeps
Cleome multicaulis	G2G3S1; BLM Sensive	Pathfinder Reservoir area	semi-moist, saline sites
Gaura neomexicana spp. *coloradensis*	G3T2S2; FWS Threatened	Laramie, Platte Counties	subirrigated alluvial soils in drainage bottoms
Physaria saximontana	G3T2S2; BLM Sensitive	Fremont, possibly Carbon Counties	sparsely-vegetated rocky slopes
Spiranthes diluvialis	G3S1; FWS Threatened	Laramie, Goshen Counties	moist streambanks, meadows

3.6. Rare Plant Information Needs

Essentially all of the lands managed by the RFO have been included in study areas for general floristic surveys by the RM (Haines 1988; Kastning 1990; Nelson 2002; Welp 1997; Ward 1998; Packer 2000; Taylor 2000). These surveys were done over large areas at a coarse scale as a first step in determining what species are found in an area, and which are of concern. More thorough surveys are needed prior to any land-disturbing activities. These inventories insure that species of concern are not affected, and contribute to the large information base needed to adequately identify, assess and manage for rare plants. Surveys must be done at multiple times through the growing season to insure that all species are found. These pre-project surveys should NOT be directed only at Sensitive and T/E species. With the potential for new discoveries still significant, inventories of all species must be required.

Status surveys are directed at species considered to have potential for management concern. Highest priority for survey are Sensitive species and those considered of high conservation concern by WYNDD. Status survey needs for high priority species are summarized in Table 2.

Approximately 50 "non-Sensitive" rare plant species found on the RFO are tracked by WYNDD. Because there are so many "other rare plants" is isn't feasible to do status surveys of all. Instead we must rely on site inventories and incidental takings during status surveys of highest priority species, another reason to require complete inventories of proposed project areas. As more is learned, it will be possible to pick targets for status surveys.

4. Vegetation Types of Concern

It is generally recognized that effective preservation of biodiversity requires more than saving endangered species (e.g. Freilich *et al*. 2001). A comprehensive proactive approach is needed to avoid endangerment, and to preserve functioning ecosystems. The Nature Conservancy developed what has been called the coarse filter / fine filter approach in identifying conservation targets. In coarse filter analysis, vegetation types are targeted, as surrogates for large numbers of species. A fine scale analysis is then used to identify rare species not likely to have been captured using vegetation types as surrogates.

4.1. Sources of Information

Information for vegetation types for the RFO is not as easily compiled as for rare plants. There are many potential sources, and only those relevant to biodiversity conservation were used for this paper.

US Natural Community Classification (USNVC). Plant communities are tracked by programs in the natural heritage network. In the past, vegetation classifications for these programs have been developed at the state or regional level. Recently, the USNVC (Grossman *et al*. 1998), was implemented in an attempt to produce a standardized system. To have any chance of capturing large numbers of species through the coarse filter approach, it is necessary to use the finest practical level of discrimination in classifying vegetation. In the USNVC, vegetation is classified to the plant association level, defined as "a plant community type of definite floristic composition, uniform habitat conditions and uniform physiognomy" (Grossman *et al*. 1998). Types are assigned global and state ranks (see heritage ranking for plant species Appendix B), and ideally occurrences are tracked in each state natural heritage program. However, data availability is inconsistent across the network. Information for plant associations in the USNVC, drawn from the heritage program network, is available on the NatureServe web site (NatureServe 2002).

WYNDD: A vegetation classification for Wyoming was compiled from existing literature in 1992 (Jones). It is based on "plant communities" which are groups of species that regularly occur together in specific habitats, essentially equivalent to the plant association concept of USNVC. Plant associations in the state have been assigned global ranks. However, there currently are no element occurrence records for plant associations in the WYNDD databases. Some site-specific information is available in unpublished reports at WYNDD.

Wyoming Gap Analysis Project (WY-GAP) was a cooperative effort involving the Biological Resource Division of the US Geological Survey, and state, federal, and private natural resource groups. It was designed to describe land cover types, terrestrial vertebrate species distributions, land stewardship, and land management status, and to identify land cover types and terrestrial vertebrate species currently under-protected (Merrill *et al*. 1996a and b).

For the land-cover map, vegetation was classified by cover type, with a minimum mapping unit of one 100 ha (247 ac) for uplands and 40 ha (2 ac) for wetlands. Most of the mapping was done through interpretation of satellite imagery utilizing primary cover type for each polygon delineated. As a result, upland communities occurring as patches smaller than 247 acres were not captured, and some cover types that exist on the ground are not represented at all on the map. The plant communities most affected by this occur in small patches, such as playas, cushion plant communities and linear stands of riparian shrublands.

The scale used for land cover mapping in the gap project (1:100:000) generally is too coarse for delineating conservation sites, as illustrated in the discussion of vegetation target

selection in the WNC's Wyoming Basins Ecoregional Plan (Freilich *et al*. 2001): "... one could expect to find any of five different limber pine plant associations from the [US]NVC at locations mapped as 'Limber Pine' cover-type, or seven different Gardner's saltbush plant associations at locations mapped as 'Gardener's Saltbush' cover-type." While the WY-GAP map scale is coarse, it can help identify areas with potential for plant associations of concern.

Gap analysis also is useful in showing which cover-types are uncommon and/or under-protected. Degree of protection is based on land ownership and designation. Lands were classified based on a scale of 1 through 4 denoting relative degree of management for natural values, with 1 being the highest, most permanent and comprehensive, and 4 being the lowest, or unknown status. For example, most Wilderness areas and lands managed by the National Park Service were ranked 1. Most private lands were assigned status 3 or 4 depending on the availability of information on their intended long-term management.

In Wyoming, comprehensive vegetation information is available only at a coarse scale, and only a small percentage of possible conservation sites for plant communities have been identified. This is an iterative process that will develop as information increases. Recommendations made in this paper are things that can be done now based on current information.

4.2. High Priority Vegetation Types (WY-GAP)

Although information for plant communities still is incomplete, it is possible to identify types and sites that are of concern. The analysis step of WY-GAP is useful in showing which cover-types are uncommon and/or under-protected. Less than 10% of Wyoming is classified as status 1 and 2 lands, and of these, 90% are located in the Greater Yellowstone Ecosystem in the northwest part of the state (Merrill *et al*. 1996a). Nearly half of the land cover types of southwest Wyoming are poorly represented or absent from the network of protected areas in Wyoming (Fertig, Welp and Markow 1998). WY-GAP analysis produced a list of cover types prioritized by protection status and vulnerability (Merrill 1996a). Table 4 shows WY-GAP priority types found on RFO lands.

Table 4. Land cover types of conservation concern, RFO (WY-GAP; Merrill *et al*. 1996a).

Land Cover Type	**Priority**
vegetated dunes	highest
active dunes	highest
forest-dominated riparian	highest
shrub-dominated riparian	highest
grass-dominated wetlands	highest
xeric upland shrub	second priority
limber pine woodland	second priority
saltbush fans and flats	second priority
desert shrub	second priority
greasewood fans and flats	second priority
unvegetated playas	second priority
shortgrass prairie	third priority
mesic shrubland	third priority

4.3. Shrubland Management

Shrublands are of conservation concern on RFO lands west of the Continental Divide (Carbon Co.). This area has a history of shrubland conversion (Rick Straw, WYG&F, pers. comm. 2003). Herbicides, chopping and controlled burns have been used to convert shrubland to grassland, providing more palatable species for livestock. Burning is the main method currently in use.

While some burning is desirable for maintaining a diversity of shrubland seral stages, conversion has been done without regard to cumulative impacts. Too much conversion of shrubland to grassland results in significant loss of big game winter range (mule deer, pronghorn); remaining habitat is degraded through overuse. Non-game animals and plants associated with shrubland communities also are lost with conversion.

Cumulative impacts of stand conversion need to be assessed over time as well as geographically. Before a suitable prescribed burn program can be implemented, information is needed regarding recovery time from early to late seral conditions. All documented treatments, recent and older, should be included in analysis, for succession may take several decades at least to produce 'old-growth' shrubland.

A major multi-agency study addressing shrubland conversion in southeast Wyoming is currently underway, and includes RFO lands. The project includes inventory and mapping of current shrub communities, comparison with Landsat images from the 1970s and 1980s, and compilation of records of past treatments. Recovery will be assessed in selected treated stands. One product will be as set of GIS layers that can be used to "identify areas where shrub management activities have become too numerous or frequent that it is potentially adversely affecting associated wildlife species..." as well as to identify areas in need of treatments (Project Description, State Wildlife Grant Program, WYG&F). This information is expected to be incorporated into agency planning and activities.

When the project is completed, a much more extensive knowledge base will be available for assessing impacts of shrubland conversion. However, this does not insure that wildlife and other natural values will benefit. Decisions on shrubland management will still be politically-driven when there is pressure to manage for livestock. This is yet another reason to set aside a network of sites managed for biological values rather than production.

4.4. Cushion Plant Communities

Cushion plant communities constitute another vegetation type of conservation concern on RFO lands. Cushion plant vegetation is found on suitable sites scattered across much of Wyoming. In the cushion growth form, stems and leaves are densely-aggregated near ground level, probably reducing the stress of severe environmental conditions (cold, desiccation e.g.). Cushion plant vegetation has been divided into two broad categories, alpine and lowland, with completely different species compositions (Knight 1994). The lowland type is found on RFO lands. Communities typically occur on shallow soils on windswept sites, such as upper slopes and ridge crests. Vegetation is relatively sparse, often with less than 50% cover. Forbs and small shrubs often are co-dominant with grasses.

In the 1984 WY Natural Area Needs Workshop (Collins 1985), several cushion plant conservation sites were identified, including one near Muddy Gap on RFO lands. However, these were selected based on rare plant species, rather than as exemplary stands of cushion plant vegetation. The Muddy Gap site includes a concentration of WYNDD medium-priority regional endemic plant species. This site was addressed in the 1990 RMP under the "Sensitive Plants" resource program (at that time, there was no official WY-BLM Sensitive list). The Muddy Gap site is discussed in more detail under **5.2. Existing RFO Special Management Areas** below.

The lowland cushion plant community type includes at least several different plant

associations (George Jones, WYNDD Ecologist, pers. comm. 2003). A project currently is underway at WYNDD to classify and characterize cushion plant associations on lands managed by the RFO and the Rock Springs FO. When this project is completed, it may be possible to identify associations endemic to Wyoming, rare types, and sites suitable as conservation targets for cushion plant communities. Cushion plant vegetation is found in several of the recommended conservation sites (below), but specific information about stands is unavailable.

5. Conservation Sites

For effective protection and management of plant biodiversity, the best approach is to develop a network of designated sites, with withdrawal and appropriate restrictions on use. To expect to maintain natural conditions and develop resources at the same time is unrealistic. Agencies often promise to protect "other values" while developing resources, through standards and guidelines. However, there is no guarantee of effectiveness, for the following reasons (personal observations in WY and SD; pers. comm. from Federal and contract biologists):

(1) decisions often are deferred to individual managers, on a case-by-case or project basis;
(2) standards and guidelines developed at the State, Regional or Forest level are not always implemented on the ground;
(3) agencies do not have sufficient resources to direct and monitor conflicting activities in a given area;
(4) for most species and ecosystems of concern, we have insufficient information to say definitively what activities can be tolerated and what mitigation measures are effective; we have no understanding of restoration possibilities.

Designation and appropriate management design are needed even where there are no existing conflicts. We can't forecast future changes in land use, and it is much easier to apply restrictions *before* uses become established.

Sensitive designation does not ensure protection in areas with conflicting uses. When the WY BLM Sensitive species list was released, a memo from the State Director made it clear that Sensitive species management would be opportunistic within the multiple use context (bold font used in original document):

> "By necessity, **the Bureau's posture toward management of sensitive species will usually be more collaborative and derived, and less directive than for proposed or listed T/E species. We should view the management of sensitive species as an opportunity to practice pro-active conservation; this management should not be onerous, or a 'show-stopper' of other legitimate, multiple use activities.** The Bureau's order of priority for the management of all special status species is: first - listed T/E species; second - proposed T/E species; third - candidate T/E species; fourth - Bureau sensitive species; and, fifth - State listed species" (BLM 2001; see also Appendix A).

5.1. BLM Special Management Areas

The BLM manual provides for designation of areas for protective management. The BLM is directed to identify and consider Areas of Critical Environmental Concern (ACECs) during the planning process (43 CFR Ch. 2 [10-1-02 Ed.] 1610.7-2). To qualify, an area must meet two criteria:

(1) *Relevance*. A significant value must be present, including wildlife resources or other natural systems or processes;
(2) *Importance*. "The above described value, resource, system, process, or hazard shall have substantial significance and values" generally beyond local significance.

ACEC designation does not automatically protect values of concern. Management of ACECs is by prescription specified at the time of designation.

5.2. Existing RFO Special Management Areas

Several management decisions addressing rare plants were included in the 1990 RMP. However, lands to be managed for sensitive plants generally were not withdrawn from mineral leasing, and restrictions were to be developed only as conflicts arose.

A "Gibben's Beardtongue Site" of about 10 acres was designated to "maintain or enhance the population of Gibben's beardtongue (*Penstemon gibbensii*) in the site area." This population "...will be protected from disturbance by maintaining the fencing around the population and by intensively managing surface disturbing activities in adjacent areas that could affect the population. Case by case examination of any proposed surface disturbing activity will be made to determine potential adverse effects and appropriate mitigation to minimize those effects. Developments, uses and facilities will be managed temporally and spatially to avoid damage to the sensitive plant species. Established trend studies will be continued. BLM intends to close this area to mineral location. A withdrawal will be initiated to implement this closure." This site is included in the Cherokee/Powder Rim conservation site described below.

The Muddy Gap Cushion Plant Community site nominated by the WY Natural Area Needs Workshop (Collins 1985) was targeted for special management "...to maintain or enhance the population of the Muddy Gap Cushion Plant Community. Notices will be required for locatable mineral exploration and development (except casual use) consistent with regulations. A plan of operations will be required for disturbance of more than 5 acres. The BLM will coordinate management of the plant community with The Nature Conservancy. If a need for protective measures is indicated, they will be taken to protect the plant community." The Muddy Gap area is within the Ferris Mountains recommended conservation site (below).

Persistent sepal yellowcress was recognized as a management target also. "The planning area contains ... populations of the persistent sepal yellowcress (*Rorippa calycina*) plant which has been proposed for threatened or endangered status. Some of this is on land administered by the Bureau of Reclamation (BuRec); therefore, the BLM will coordinate with BuRec to manage populations of persistent sepal yellowcress. In addition, the BLM will coordinate with county weed and pest control districts to ensure that populations of the plant are not affected by weed control programs." The proposed Seminoe Reservoir conservation site includes many of the persistent sepal yellowcress populations under RFO jurisdiction.

5.3. Recommended Conservation Sites

Conservation sites included here were chosen based on presence of one or more of the following values:

(1) Endangered, BLM Sensitive or WYNDD high priority plant species;
(2) clusters of WYNDD medium or low priority plant species of concern;
(3) vegetation types of concern.

Recommended conservation sites are listed in Table 5. A map and detailed descriptions are included in Appendix F. **Boundaries are approximate**; for most sites survey is needed to determine extent of populations and communities of concern, as well as suitable boundaries. Summaries for each site are provided here. Withdrawal or other equally strong stipulations, and restrictions on existing and potential conflicting uses are needed at the time of designation.

Bates Hole/Chalk Mountain Just north of Shirley Basin, approximately 60 miles northeast of Rawlins. Includes populations of *Sphaeromeria simplex* (Sensitive) as well as concentrations of medium and low priority plant species of concern. Recommend ACEC designation with restrictions on surface disturbance.

Chain Lakes Low point of Great Divide Basin, approximately 35 miles northwest of Rawlins. Includes several WY-GAP priority cover types, and has high value for wildlife. All Federal lands within the site are leased for oil and gas. Recommend ACEC designation (cooperative management with State).

Cherokee Rim/Powder Rim Just north of WY/CO state line approximately 12 - 35 miles west of Baggs. Includes two of four Wyoming occurrences of *Penstemon gibbensii* (one currently protected through withdrawal and fencing), at least nine state rare plant species, Fremont cottonwood riparian woodland (rare in Wyoming and ranked high priority by WY-GAP) and at least two WY-GAP priority shrubland types. Most Federal lands are included in oil/gas leases and developed fields. Potential for coal? Recommend ACEC designation with restrictions on surface disturbance.

Ferris Dunes Between Ferris and Seminoe Mountains approximately 30 miles north of Rawlins. Includes the two known Wyoming populations of *Penstemon haydenii* (Endangered), several medium-priority rare plants, and high priority (WY-GAP) land cover types: active and vegetated dunes, graminoid-dominated wetlands, and desert riparian communities (Fertig pers. comm. 2003). Land status is mixed BLM and State; southern part includes oil/gas leases. Recommend ACEC designation, mineral withdrawal, restrictions on ORVs and other major surface disturbance, and management for natural disturbance regimes for viability of the penstemon. Develop cooperative management plan with State.

Ferris Mountains East of US Hwy 287 approximately 35 miles north of Rawlins. Includes a population of *Cirsium aridum* (Sensitive), concentrations of state-rare species, and at least one WY-GAP priority cover type. Recommend ACEC designation with appropriate restrictions.

Flat Top Mountain East edge of Washakie Basin approximately 15 miles northwest of Baggs. Includes one of four Wyoming occurrences of *Penstemon gibbensii*, and state rare species. Most Federal lands are within oil/gas leases and developed fields. Recommend ACEC designation with restrictions on surface disturbance.

Laramie Basin North Roughly 18 air miles northeast of Rock River. Includes multiple populations of *Sphaeromeria simplex* (Sensitive) and *Machaeranthera coloradensis* var. *coloradensis* (WYNDD high conservation priority). Land status is checkerboard BLM and private. Survey is needed at this site as little is known regarding extent of populations.

Seminoe Reservoir Multiple populations of *Rorippa calycina* (Sensitive). Land status is a mix of BLM and Bureau of Reclamation, requiring cooperative management. Much of the Federal land is leased for oil/gas.

Shirley Mountains/Shirley Basin West Basin and mountains west of WY Hwy 77, approximately 50 miles northeast of Rawlins. Includes at least two populations of *Sphaeromeria simplex* (Sensitive) as well as state-rare species. Five WY-GAP priority land cover types included. Recommend ACEC designation with restrictions on surface disturbance.

Table 5. Recommended conservation sites.

Site	Biodiversity Values
Bates Hole/Chalk Mt	high priority rare plant; cluster of medium priority rare plants
Chain Lakes	vegetation of concern
Cherokee/Powder Rims	high priority rare plant; cluster of medium priority rare plants; vegetation of concern
Ferris Dunes	high priority rare plant; vegetation of concern
Ferris Mountains	high priority rare plant; cluster of medium priority rare plants; vegetation of concern
Flat Top Mountain	high priority rare plant; vegetation of concern
Laramie Basin North	high priority rare plants
Seminoe Reservoir	high priority rare plant
Shirley Mts/Basin West	high priority rare plant; cluster of medium priority rare plants; vegetation of concern

5.4. Other Potential Conservation Sites

Other sites may need special management for plant biodiversity values. Several areas with potential for species of concern have been identified based on information from nearby lands (Table 6). Additional survey is needed.

Table 6. Other potential conservation sites (Fertig 1999; Fertig pers. comm. 2003)

Site Name	Location	Comments
Battle Mountain	west Sierra Madre near CO; RFO land on west, south sides of Battle Mt.	potential for *Ipomopsis aggregata* var. *weberi*
Delaney Rim	east end of Rim is within westernmost RFO lands south of Tipton	badlands area with some records for regional endemics (medium priority); needs survey
N. Laramie Range	RFO lands in Laramie Range, e.g. around Government Peak	potential for *Aquilegia laramiensis, Sphaeromeria simplex, Machaeranthera coloradensis*
Saratoga Valley	Saratoga Valley and west side Medicine Bow Mountains	potential for North Park/Laramie River endemic species currently known only from CO
Sheep Rock area	RFO land north of Sheep Rock, ca. 5 mi. north of Saratoga	potential for *Penstemon gibbensii*, concentrations of regional endemics species

6. Existing and Potential Conflicts

Resource extraction is the major sources of existing and potential threats to plant biodiversity values on lands managed by the RFO. Recreation, grazing and logging are of concern in some areas.

6.1. Leasable Minerals, Oil and Gas

Oil and gas development has both direct and indirect impacts on plants of concern. Surface disturbance through road and facility construction is the most obvious problem. However, a more significant concern is damage through increased access. With construction of new roads, and improvement of existing ones, public access can be increased tremendously, and in many areas, this means increased off-road use as well.

Almost all of the resource area is available for oil/gas leasing (BLM 1990), and much of it is considered oil/gas habitat (Figure 3). However development activity is focussed in about half the area. Existing leases are shown in Figure 4.; oil/gas wells are shown in Figure 5.

Of the recommended conservation sites, four are heavily leased, with most or all Federal surface and subsurface ownership taken: Chain Lakes, Cherokee/Powder Rims, Flat Top Mountain and Seminoe Reservoir. Much of the southern part of the Ferris Dunes site is leased. The remaining sites include few or no leases. The Shirley Mountains and the Ferris Mountains sites are among the few areas outside oil/gas habitat.

Once leased, lands cannot be withdrawn. However, "In cases where Federal oil and gas leases are or have been issued (1) without stipulated restrictions or requirements that are later found to be necessary; or (2) with stipulated restrictions or requirements that are later found to be insufficient; the needed restrictions or requirements may be included in approving subsequent exploration and development activities. These restrictions or requirements may only be included as reasonable measures or as conditions of approval (COA) in authorizing applications for permit to drill (APD), sundry notices, or plans of development (POD)" (BLM 1990). Additional restrictions and requirements are needed within the recommended conservation sites with existing leases, including no-surface-occupancy and no new road construction. Areas in conservation sites not currently leased should be withdrawn.

6.2. Leasable Minerals, Coal

Coal beds are shown in Figure 6. Potential conflicts exist in the Cherokee/Powder Rims and Flat Top Mountain area, which includes strippable coal deposits (Glass 1982). The updated RMP outlines planned development: "A north-to-south coal development sequence will be followed in the entire area west of Rawlins and south of I-80 as needs are identified. The BLM will process all applications for leasing in areas identified as acceptable for further consideration for coal leasing. For each application, BLM will conduct a site-specific environmental analysis" (BLM 1990; revised 1998 online). The recommended conservation sites in this area need to be designated unsuitable for surface mining, for obvious reasons.

The Seminoe Reservoir conservation site also occurs in an area of major coal deposits. However, given the habitat of the species of concern (*Rorippa calycina* grows along the lake shores), potential conflicts are not likely.

6.3. Off-road Vehicle Recreation

Off-road vehicle use generally is not compatible with natural area management. In many of the recommended conservation sites, topography allows easy off-road travel. While some use may be tolerable, heavy use causes significant damage, and it is very difficult to limit use to a suitable level once an area becomes popular. It is far better to close conservation sites to off-road use before it becomes established.

The Ferris Dunes currently receive infrequent off-road vehicle use, with no obvious threats to blowout penstemon (Fertig 2000, 2001). There also have been suggestions that some off-road use is beneficial, to maintain habitat. However, if access were improved, or if the area's popularity increased with off-roaders, there soon would be problems with too much disturbance. Instead, habitat should be maintained through fire or appropriate grazing levels.

6.4. Livestock Grazing

Tolerance of livestock grazing varies among plant species. At the present time, we know little about impacts of grazing and stocking levels for species of concern. Some livestock use may be desirable in maintaining habitat, for example for the blowout penstemon.

Of concern, however, is conversion of shrublands for the benefit of livestock. In Carbon Co. west of the Continental Divide, enough shrubland treatments have been done to cause concern about significant loss of shrubland communities and wildlife habitat (see **4.3. Shrubland Management**).

6.5. Timber Harvest

The 1990 RMP included programs for intensive management for forest products. "lands will be managed to achieve a highly productive forest by implementing activities that will enhance tree growth and health. Full consideration will be given to multiple-use values. Timber sales will be concentrated in these areas ... practices such as timber harvesting, regeneration of disturbed sites, stand replacement and precommercial thinning will be carried out to meet the forest management objectives. Stands of unmerchantable, nonproductive lodgepole pine will be replaced with young, vigorous trees." This approach is incompatible with natural area management. Conservation sites should be removed from intensive timber management programs. The Shirley Mountain/Basin West site has potential for timber conflicts.

7. Author's Biography

Hollis Marriott has worked as a botanist in Wyoming and South Dakota since 1977, including stints with the Wyoming Natural Diversity Database (Botanist and Coordinator), the Wyoming Nature Conservancy (Public Lands Planner), and the Midwest Regional Office of The Nature Conservancy (Black Hills Vegetation Ecologist). Since 1998, she has worked as a free-lance botanist, doing diverse projects in field botany and plant conservation with funding from Federal and State agencies, and private foundations.

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Figure 3. Oil/gas habitat, southeast Wyoming (WOGRA 2003).

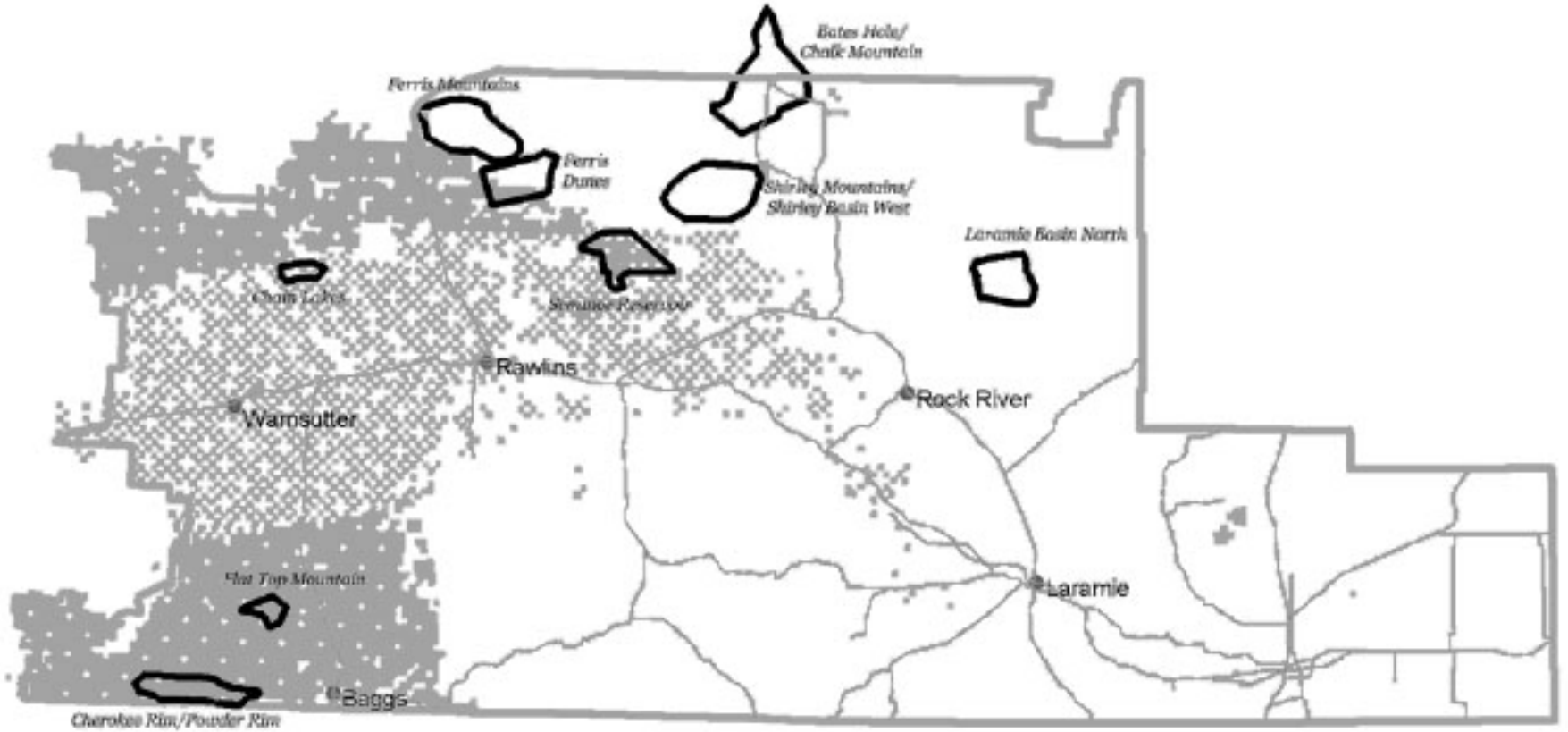

Figure 4. Authorized Federal oil/gas leases, Rawlins Field Office (data from BLM LR2000 website).

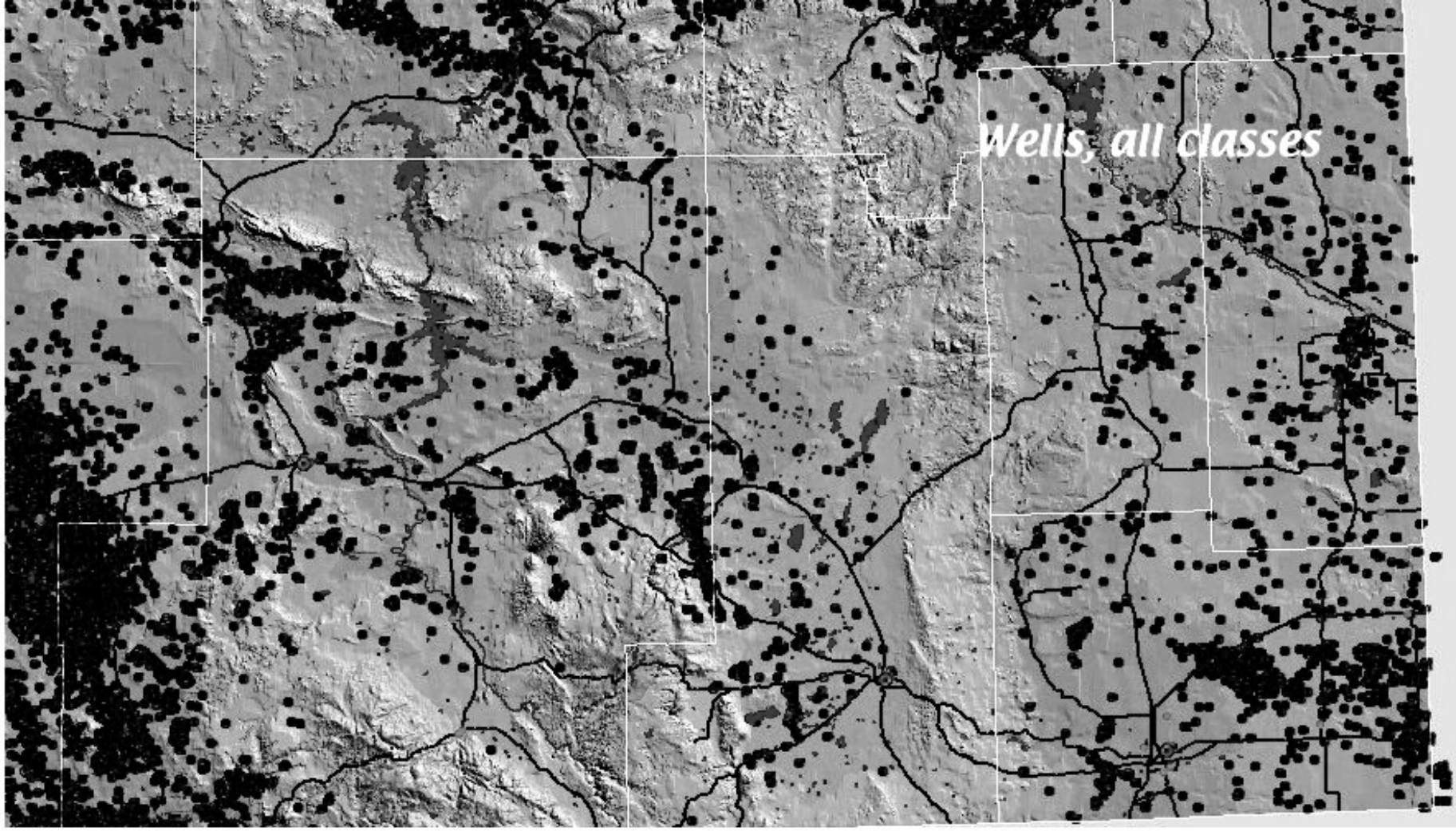

Figure 5. Oil/gas wells (all classes), southeast Wyoming (WOGRA 2003).

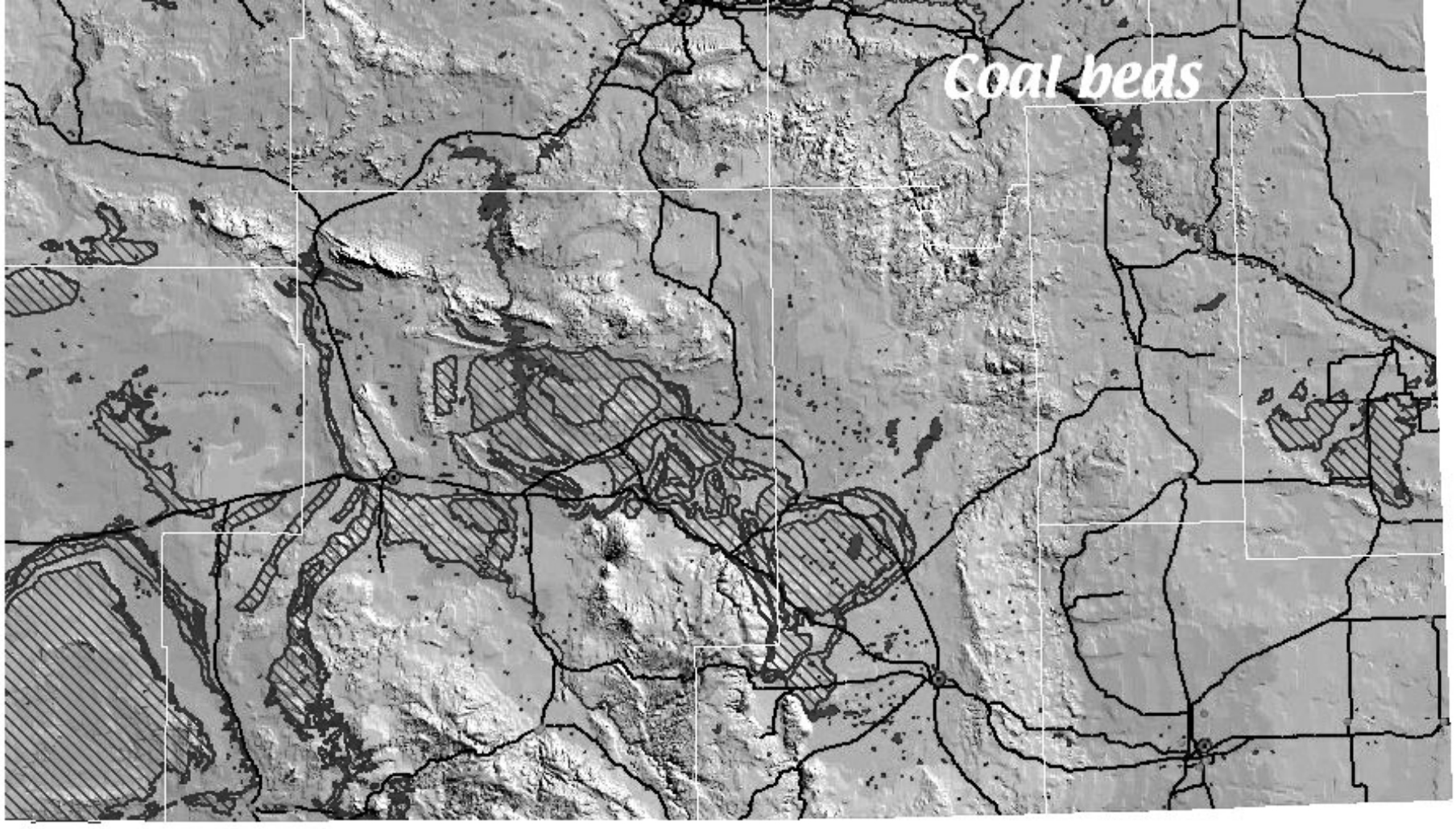

Figure 6. Coal beds, southeast Wyoming (WOGRA 2003).