Appendix E Research Natural Areas

Introduction

One of the key principles of ecosystem management is called "adaptive management." Adaptive management recognizes that land and resource management decisions need to be made, even though the knowledge needed for making these decisions and the consequences are incomplete or uncertain. Under adaptive management, managers decide the best course with the available information, but monitor to ensure that the original decision has the desired effect. Research Natural Areas (RNAs) are key components of adaptive management, because they represent ecosystems in a natural condition. RNAs serve as reference areas to allow managers to assess the consequences of management on other similar areas. Scientists use RNAs to understand how ecosystems function. RNAs are also important for conserving biological diversity.

The first Forest Service RNA was established in 1927 on the Coronado National Forest in Arizona. Since then, the RNA system has grown to about 420 established RNAs nationwide. Forest plans will propose additions to the RNA network, because of the essential role of RNAs in ecosystem management to provide reference areas, research opportunities and protection for biological diversity. Currently, there are only four RNAs in the Northern Great Plains.

What RNAs Represent

The goal of the RNA program is to represent the ecological diversity that occurs on National Forests and National Grassland units so that we can assess the impacts of management and conserve biological diversity. An ecosystem can roughly be defined as the plants, animals, and environment of a given area. Some of the major ecosystem types that help define this ecological diversity on the Northern Great Plains include ponderosa pine, oak savanna, shrublands, grasslands, and aquatic and riparian (streamside) ecosystems. At a finer scale, ecosystem types can be defined by several of their dominate plant species, such as eastern ponderosa pine, limber pine, cottonwood, oak, sagebrush, western wheatgrass, green needlegrass, and carex. At this level, ecosystem types are referred to as plant associations or community types. More than 300 plant associations and community types have been identified on National Forest and Grassland units in the Northern Great Plains, and few of these are represented by RNAs.

Broad geographical differences in ecosystems are also recognized by performing RNA targeting of different ecosystem types within each Ecoregion Section (see Hierarchy of Ecological Units). Variations in geology, soils, landforms, and climate influence the kinds of plants and animals that live in different regions and can also be used as features for establishing a representative RNA system. The climatic differences that occur between the north and south areas along with differences in the east and west areas of the Northern Great Plains affect ecosystems and are typical of the kind of significant ecological differences that the RNA system tries to represent.

Function of RNAs

RNAs serve at least three important functions for the Forest Service:

1. Reference Areas: RNAs serve as benchmarks or reference areas for monitoring and evaluating the sustainability and impacts of land management practices on lands with similar ecosystem types. To determine the impact of management on an area, it is desirable to have a similar area maintained in natural condition for comparison. RNAs make one of their most important contributions to ecosystem management serving as a representative system of controls for land managers.
2. Biological diversity: RNAs provide protection for biological diversity. A representative RNA system provides some degree of assurance that a wide array of plant and animal species are being given a high degree of protection for the future. This protection may be most important for the forms of biological diversity that ecosystems often depend upon the most and about which we know the least, such as soil micro-organisms, fungi, and insects. RNAs can also be selected to provide a high degree of protection for specific populations of threatened, endangered, and/or sensitive species.
3. Research: RNAs provide sites for research into how ecosystems function. This research is often best accomplished in areas where ecological and evolutionary processes are functioning as naturally as possible. RNAs serve as sites for monitoring long-term change in ecosystems, such as global climate change and shifting patterns in the landscape resulting from natural disturbances by fire, floods, and insect epidemics. When scientists perform a variety of research projects in an identified RNA, the cumulative results of such work can greatly increase our understanding of particular ecosystems. One of the results of ecosystem management is that lands will be managed with the best information available. Over the years, scientific research in RNAs has helped provide that information. RNAs also serve an important educational function by providing excellent examples of ecosystems in relatively natural conditions with functioning ecological processes.

RNAs help the Forest Service maintain the long-term health, productivity, and diversity of lands entrusted to its management by the public.

Identifying RNAs

Units and resource specialists were asked to identify potential RNAs based on what potential community types could exist on their units. This was done using the descriptions in Ecological Subregions of the United States: Section Descriptions by Bob Bailey and Johnston 1987. On the Dakota Prairie Grasslands units, Forest Service personnel worked with the North Dakota Natural Heritage Program in conducting ecological field evaluations of potential RNAs chosen. On the Nebraska National Forest units along with the Thunder Basin National Grassland, district personnel identified potential RNAs and then worked with The Nature Conservancy in the development of ecological field evaluations of potential RNAs.

The following steps were used in determining potential RNAs:

1. The *Rare Plant Communities of the Northern Great Plains* assessment and *Northern Great Plains Steppe Assessment Map*, both prepared by The Nature Conservancy, provided ecological information that aided in the determination of potential RNAs.

2. Districts determined potential RNAs based on what vegetation community types exist on both their units and the Northern Great Plains and their potential to provide vegetation community types for representation. Region 2 units did this by using a matrix of community types derived from Johnston, 1987. In Region 1, target assignments were made as to what vegetation community types need to be represented and located on various units.
3. Work with The Nature Conservancy and state Natural Heritage programs to accomplish field evaluations of potential RNAs.
4. Preliminary evaluation by personnel at district offices and supervisor offices to either add or eliminate from consideration RNAs based on knowledge and judgement from the information from the field evaluations and using the identifiers as criteria that are listed below. In some cases this also involved the evaluation of various sizes in order to capture vegetation conditions, maintain ecological processes and meet management concerns. Other areas can be proposed based on the public scoping process; however, evaluations of these areas may not be completed by the time the final environmental impact statement is released as a result of many factors, including limits on time and budgets and may have to wait for future planning efforts.
5. Proposed RNAs are then submitted as RNAs to be carried forward in the draft environmental impact statement.

Proposed RNAs were reviewed by the RNA coordinators from each unit in context to the Northern Great Plains within the overall planning area. All RNAs were nominated regardless of any current management practices occurring in the area; that is, current management did not diminish conditions to a point that the areas could not meet the established RNA criteria, including quality, condition, viability and defensibility.

Criteria

The following criteria were used in evaluating potential RNAs:

1. Quality: How well a site represents the targeted ecosystem type or protected biodiversity elements.
2. Condition: How much the site has been degraded or altered from natural or optimal conditions.
3. Viability: The likelihood of long-term survival for the ecosystem and its protected biodiversity.
4. Defensibility: Extent to which the ecosystem and biodiversity elements can be protected from extrinsic human factors.

Identifiers

Identifiers help define criteria to a finer scale. They are used as tools for evaluating sites that represent ecosystem types:

- Ecosystem types, plant series and plant association level that are under-represented in the planning unit.
- Impact from human disturbance since settlement.
- Existence of maintained or of primitive roads.
- Status of grazing allotments that are vacant, closed, or degree of current use.
- Recreation impacts are small.

Condition of RNAs

Because RNAs represent ecosystems in their natural condition, they should be located in areas with a minimal amount of impact from human use. RNAs should also contain good examples of the ecosystem types they represent. For some ecosystem types, areas without significant human impact could not be found. In these cases, RNAs were selected from sites in the best available condition. On the Northern Great Plains, a concentrated effort was made to select sites that would have minimal conflicts with existing public uses. Therefore, potential RNAs were primarily selected from lands that are presently roadless, and in vacant or closed grazing allotments, or where grazing levels appear compatible with RNA designation and where areas provide representation of ecosystem types.

Size of RNAs

To serve as benchmarks, to conserve biological diversity, and to serve as research areas, RNAs must be large enough to maintain the natural processes that sustain ecosystems. For example, many of our forest, grassland, and shrubland ecosystems evolved from fire and other natural disturbances producing a landscape that is a mosaic of patches of various sizes and ages. These patches can vary from tens to thousands of acres in size. To maintain ecological processes in many of our fire-dependent ecosystems, land areas of a thousand or more acres in size often work best to incorporate a mosaic of successional stages or to allow for their development in the future. Current ideas in conservation biology also recognize the potentially harmful influence of some outside land uses on the ecological integrity of small natural areas. Small natural areas can degrade easily and suffer species loss.

Larger natural areas provide greater representation for the range of natural variability which occurs in most ecosystem types and makes RNAs potentially more valuable as benchmarks for ecosystem management. Some RNAs that represent these patterns and processes are desirable. Where possible, complete watersheds have been selected for potential RNAs, partially in order to maintain intact and naturally functioning aquatic and riparian ecosystems.

Management of RNAs

Management area prescriptions provide an outline for how RNAs will be managed. The intent of RNA management is to minimize human impacts that will affect the ecosystem and to maintain biological diversity and natural processes. Therefore, most potential RNAs were selected from areas that are roadless, in vacant or closed grazing allotments, or where grazing levels appear compatible with RNA designation, in areas that have not experienced timber harvesting, and in areas that do not experience heavy recreation use. Road building and timber harvesting are not compatible uses in RNAs. Some degree of livestock grazing can be used to maintain grassland ecosystems found on National Grassland units.

Recreational Management

Most of the potential RNAs on the Northern Great Plains planning area were selected in areas that do not receive heavy recreational use. However, it is inevitable that varying degrees of recreational use will occur in all these areas, and recreational use will likely increase. Because RNAs serve as benchmarks and heavy recreational use can alter species populations and affect ecosystem function, recreational use is not encouraged, but not prohibited, in RNAs. For example, use of existing trails in RNAs is permitted, but no new trails will be constructed unless necessary to correct resource damage from existing trails. Existing recreational trails often provide desirable access to RNAs for research, administrative, and educational purposes.

Fire Management

Natural fire frequencies are desirable in RNAs. However, excessive build up of fuels from decades of fire suppression, valuable resources outside RNA boundaries, and special values inside some RNAs, may preclude allowing prescribed natural fires to occur. Site-specific fire management plans may need to be developed for some RNAs in order to identify circumstances during which natural fires can be allowed to burn freely and to design specific management-ignited, prescribed fires to mimic natural fires.

Exotic Species Management

Exotic (non-native) species are not desirable in RNAs. Some particularly invasive and unpalatable plant species, such as knapweed and Canada thistle, could be targets for control in RNAs and elsewhere on public and private lands. Decisions on the threats of exotic plant species to RNA values and possible control techniques, including the use of herbicides, will need to be made on a site-specific basis.

Descriptions of Nominated and Established Research Natural Areas

Short summaries for each of the nominated RNAs are presented below. They are organized alphabetically by administrative units. Complete descriptions of each area were written in 1996, 1997 and 1998, based on "ecological evaluations" developed by the Natural Heritage Programs of North Dakota, South Dakota, Wyoming and Nebraska, and validated by employees familiar with on-the-ground conditions on the Custer National Forest, Nebraska National Forest and Thunder Basin National Grassland. These complete descriptions are part of the "administrative record" on file and available for review at the Supervisor's Office for the Nebraska National Forest in Chadron, Nebraska.

Dakota Prairie Grasslands

Little Missouri National Grassland (McKenzie Ranger District)

Bear Den-Bur Oak

The 2,840-acre Bear Den-Bur Oak area is located about 27 miles north of Killdeer, North Dakota. Bear Den-Bur Oak lies within the Missouri Plateau physiographic region, which includes badlands and unglaciated areas. Two major landform features characterize the area: an intermittent creek and its tributary ephemeral drainages that drain the steep badlands terrain, and rugged badlands. Elevation ranges between 2,000 and 2,535 feet above sea level.

Bear Den-Bur Oak contains representative bur oak habitat intermixed with salt desert shrub and mixed-grass prairie. The area provides excellent representation of the bur oak / chokecherry habitat type. The bur oak communities generally exhibit high-quality condition. Some of the most dense and extensive bur oak communities on the Little Missouri National Grassland are found in Bear Den-Bur Oak. Other vegetation includes paper birch (uncommon in the Little Missouri Badlands), aspen, Rocky Mountain juniper, green ash, silver sage and western wheatgrass. Elk and bighorn sheep utilize the area, as do raptors and reptiles, such as the Northern leopard frog.

This area lies within the Williston Basin, a large sedimentary and structural basin known for its petroleum resources. The area has a high potential for oil and gas, and has a history of oil and gas production. Additional oil development is unlikely due to restrictions and stipulations associated with development within this rugged area. Livestock grazing occurs. Recreational use is limited to some hunting and very infrequent hiking.

Cottonwood Creek Badlands

The 5,880-acre Cottonwood Creek Badlands is located about 22 miles south and 8 miles west of Watford City, North Dakota. The area consists of a rugged and deeply dissected landscape formed within an actively eroding drainage, Cottonwood Creek, which empties into the Little Missouri River. The Cottonwood Creek Badlands lie within the Missouri Plateau section of the Great Plains Province, and is just south of the limit of glaciation. Elevation ranges between 2,020 to 2,520 feet above sea level.

This area contains one of the largest contiguous areas of high-quality habitats on the Little Missouri National Grassland. Habitats are considered to be in excellent health. This area

captures at least 11 plant communities, providing a mosaic of shrublands, woodlands and grasslands intermingled across a rugged badlands terrain. Habitat types include: green ash / chokecherry woody draw, shadscale saltbrush / big sagebrush badlands, big sagebrush / western wheatgrass, aspen woody draw, plains cottonwood riparian woodland, Rocky Mountain juniper / little ricegrass woodland and silver sagebrush / western wheatgrass riparian. Bighorn sheep and the tawny crescent butterfly, two sensitive species, likely utilize the area.

No oil and gas facilities are found within the boundary of the area, although a good deal of oil and gas activity has occurred historically around the area. Livestock grazing occurs. The Cottonwood Creek Badlands have important recreational value. The Maah-Daah-Hey Trail swings through a portion of the area, but does not permit motorized traffic. Hiking, hunting and horseback riding occurs in the area.

Little Missouri National Grassland (Medora Ranger District)

Bullion Butte

The 3,160-acre Bullion Butte is located about 25 miles south of Medora, North Dakota. Bullion Butte is one of the largest buttes on the Little Missouri National Grassland and sits imposingly against the rolling badlands terrain. It lies within the Missouri River Plateau physiographic region, which includes badlands and unglaciated areas. The butte is capped by bright claystones underlain by sandstone. Bullion Butte rises to 3,358 feet above sea level, dropping about 700 feet to the surrounding plains.

Bullion Butte is highly scenic, and includes wooded deciduous forest communities intermixed with mixed-grass prairie. The massive rock-capped butte supports a variety of high quality grassland and woodland communities, which are common for the Little Missouri Grassland as well as several uncommon plant communities and numerous rare species. The top of the butte provides excellent panoramic views of the surrounding grasslands. Prairie dog towns occur on the toeslopes of the butte. Black-footed ferrets were sighted in these towns up until 1974. Bighorn sheep utilize the area. Habitat probably exists for the western big-eared bat and the spotted bat. Golden eagles, prairie falcons, Baird's sparrow, long-billed curlew and Sprague's pipets have been documented in the area. Bullion Butte provides habitat for three Forest Service plant species and numerous other rare plant species for North Dakota. Bullion Butte and the region of the grasslands around the Bullion Butte escarpment provide one of the last remaining roadless areas in the Little Missouri Grassland.

Historically, American Indians used Bullion Butte for religious practices, including vision quests. Eagle catchment sites are located atop the butte. Current use includes livestock grazing. Oil and gas leasing will occur under No Surface Occupancy stipulations in the near future. Recreational use is limited, but includes hunting, hiking and camping.

Little Missouri River

The 1,190-acre Little Missouri River area is located about 20 miles south of Medora, North Dakota. Unique landforms created by the meandering Little Missouri River as found in the area include: alluvial floodplains, river terraces, steep river bluffs and riverine badlands. Active ecological river processes are visible and include side-cutting, depositional and erosional processes. Elevation ranges from 2,387 to 2,400 feet above sea level.

This area provides excellent representation of the Little Missouri River corridor. The health of vegetative communities is rated between good and excellent. High-quality vegetative types include plains cottonwood / Rocky Mountain juniper, green ash / snowberry, green ash / chokecherry, and silver sagebrush / western wheatgrass. The healthy gallery cottonwood bottoms are significant, especially since cottonwood bottoms seem to be trending downward elsewhere across the Northern Great Plains. A number of wildlife species associated with cottonwood bottoms are found in the area, including the black-billed cuckoo and the gray catbird. Neotropical migrant passerines are also abundant.

Oil and gas exploration has occurred in the area. Some private leases exist. Livestock grazing is allowed. The Little Missouri River corridor is locally a popular hunting area. Some camping and hiking occurs.

Mike's Creek:

The 4,489-acre Mike's Creek area is located about 35 miles northwest of Belfield, North Dakota. It lies within the Missouri Plateau physiographic region and includes badlands and unglaciated areas. Two major landform features characterize Mike's Creek: an intermittent creek with ephemeral drainages and steep badlands spine landforms. Elevation ranges between 2,200 to 2,700 feet above sea level.

Landforms in Mike's Creek contribute to a mosaic of habitats, including some of the most dense and extensive Rocky Mountain juniper woodlands on the Little Missouri National Grassland. These juniper woodlands occur on north-facing slopes created by rugged badlands. Other vegetation includes big sagebrush, shadscale saltbrush, greasewood, silver sage and western wheatgrass. Ecologically, vegetative health in Mike's Creek is considered good to excellent. In addition, the RNA captures nearly an entire watershed and its associated drainages as the system begins high in a steep badlands divide and flows down to the Little Missouri River. Few management activities have affected the quality of watershed processes or vegetative habitats associated with this drainage.

Historical use of the area has been low, due to its remote and rugged characteristics. Livestock grazing occurs, but is generally light. Oil development is limited and is currently declining in the area due to past development and extraction. Recreational use is limited, but does including hunting and hiking.

Ponderosa Pines

The 3,560-acre Ponderosa Pines is located about 30 miles south of Medora, North Dakota. The Ponderosa Pines site lies within the Missouri Plateau physiographic region, including badlands and unglaciated areas. The area is generally characterized by gently rolling uplands interrupted by scattered buttes, knolls and ridges capped by resistant rocks. Dendritic drainage patterns are well developed. Elevation ranges between 2,471 to 2,620 feet.

The ponderosa pine stands contained in this RNA are disjunct from the main range for this species and represent the most northeasterly colonies of native ponderosa pine in North America. The ponderosa pines in this area provide excellent representations of ponderosa pine forests mixed with good quality western wheatgrass / green needlegrass communities. In addition, the upland rolling grasslands contain notable examples of buffaloberry communities, representing a distinctive northern Great Plains shrub species. The bluebunch wheatgrass communities in this area represent the easternmost extent of this species in the United States.

Four wildlife species identified as candidates to the threatened and endangered species list are found in the area: the black tern, ferruginous hawk, Baird's sparrow, and loggerhead shrike.

The unique ponderosa pine stands led to the only national forest ever conceived in North Dakota, the Dakota National Forest (1908-1917). Prior to its establishment, the stands on this now-decommissioned national forest were harvested. No appreciable volume of timber has been harvested since. Livestock are currently grazed in the area. Hunting is popular, especially for wild turkey. A privately owned ranch provides nearby lodging, outfitting and guiding into the area. Any future oil and gas leasing will carry no-surface-occupancy stipulations.

Two Top/Big Top RNA (Existing)

The 100-acre Two Top / Big Top buttes are located about 37 miles north of Belfield, in Billings County, North Dakota. Also called the "Twin Buttes", these flat-topped buttes lie within the Missouri Plateau physiographic region of the Great Plains Province, which includes badlands and unglaciated uplands. The RNA consists of two steep-sided buttes rising almost 400 feet above the surrounding landscape and covered with mixed grass prairie vegetation typical for the Little Missouri National Grassland. The steep side slopes of these badland buttes have restricted access over the years and have protected the natural features of the butte tops and sides. Livestock grazing has not affected the native vegetation, and fire disturbances have occurred sporadically.

Two Top / Big Top contains representative wheatgrass / needlegrass and little bluestem / juniper vegetation communities considered in relict condition. Processes and conditions occur that would be typical of a grassland that has received limited use by wildlife, no use by domesticated livestock, and has experienced a sporadic fire regime. The area is noted for its dense grass canopy cover, high abundance of butterflies and skippers, rodent activity, plentiful snakes, and grassland communities trending towards a high seral stage. In addition, the butte sides contain undisturbed communities of big sagebrush, longleaf sagebrush, rabbitbrush, and shadscale saltbush.

Established in 1972, Two Top / Big Top was the first natural area proposed and established on the Little Missouri National Grassland. In addition, the area has been registered in the national Registry of Natural Landmarks, as administered by the National Park Service. Research interest in the area has been steady, beginning with the study published in the Ecology Journal by Quinnild and Cosby entitled "Relicts of climax vegetation on two mesas in western North Dakota" in 1958. Researchers, naturalists, and an occasional hiker are the primary users of the area. No oil and gas exploration or livestock grazing occurs on the buttes.

Limber Pines RNA (Existing)

The 681-acre Limber Pines area is located about 12 miles north of Marmarth, in Slope County, North Dakota. The Limber Pines area contains the only native population of limber pines to occur in North Dakota and one of only two sites to occur in eastern Montana. This naturally occurring pine community is highly disjunct from the natural distribution range for this species. Consequently, the population and site have been of interest to researchers for studies involving genetics, historical evolution, and physiologic adaptation of the species. The pines area is located within the Missouri Plateau physiographic region characterized by badlands and unglaciated uplands. The boundaries of the site are located along the southern reach of the Little Missouri River after it enters the badlands of the Little Missouri National Grasslands. Elevation ranges from 2,620 feet to 2,940 feet, which is considerably lower than the 5,000 to 9,000 foot elevation zone usually preferred by limber pine within its range of the western U.S.

The limber pine community occurs in conjunction with the needlegrass / wheatgrass and salt desert shrub habitat types more commonly found in the Little Missouri National Grasslands. The pines were first identified as a unique community in 1949 and have been the source of considerable research interest since. The site was proposed for an RNA in 1986 and established in 1991. The RNA contains several Forest Service sensitive plant and animal species, as well as numerous state rare plant and animal species. In addition, the area receives considerable use by wildlife, such as deer, eagles, sage grouse, snakes, Clark's nutcracker, and rodents. Culturally, many pre-historic sites are documented in the area.

Although oil and gas development occurs on the adjacent grasslands, no oil and gas activities occur in or immediately adjacent to the Limber Pines area. Livestock grazing occurs within the RNA at low to moderate utilization levels. Although there is high interest from the public in the limber pines, recreational use is affected by the isolated nature of the area. Local schools conduct educational trips to the site for school children. Hiking and hunting occur in the area.

Sheyenne National Grassland

Bluestem Meadow

The 80-acre Bluestem Meadow is located about 10.5 miles east and 3.5 miles south of Lisbon, North Dakota. Bluestem Meadow is found on the flat deltaic sand plain, which formed when the ancient glacial Lake Agassiz existed more than 10,000 years ago. The relief varies less than 10 feet on this landscape and creates a slightly undulating expanse of tallgrass prairie and wetland communities. Elevation ranges between 1,070 to 1,075 feet above sea level.

This site is characterized by a very good condition wet-mesic tallgrass community, with shallow depressions and swales. Tallgrass prairie has undergone vast alteration and estimates of decline in the United States are as high as 98 percent. Ecologically, the site is healthy, although a few undesirable plant species occur, including Kentucky bluegrass, white sweet clover and leafy spurge.

Bluestem Meadow is home to one sensitive plant species, the small white lady's slipper, one state rare plant, the nodding lady's tresses, one sensitive butterfly, the regal fritillary, and one sensitive bird, the greater prairie chicken.

Historically, this area has been hayed. No livestock grazing has occurred for many years. Limited recreational use exists.

Fritillary Prairie

The 240-acre Fritillary Prairie is located about 11 miles east and two miles north of Lisbon, North Dakota. Fritillary Prairie is found on the Sheyenne Delta, an area of fine sand and silt deposited at the mouth of the Sheyenne River where it flowed into the ancient glacial Lake Agassiz late in the Wisconsin glaciation. Some areas are nearly level, while other areas display low dunes and shallow blow-outs, providing a hummocky appearance to the landscape. The Sheyenne River drains the area. Elevation ranges between 1,060 and 1,070 feet above sea level.

Fritillary Prairie contains very good to excellent examples of the tallgrass prairie types. These types include sedge meadow wetlands, wet-mesic prairie types with tall, warm-season grasses, and dry-mesic types with a variety of mid- to tall, warm- and cool-season grasses. Nationally, up to 98 percent of the tallgrass prairie has given way to agricultural or other land conversions. In North Dakota, up to 49 percent of wetlands have been converted to other uses. Rare species found in the area include: the western prairie-fringed orchid, regal fritillary and Dakota skipper butterflies, silky aster and greater prairie chicken. Overall, the area remains in very good ecological condition, although encroachment by Kentucky bluegrass and leafy spurge is a concern.

Livestock grazing occurs, as does haying. Limited recreation, mostly in the form of hiking, also occurs. Two-track trails are found in the area.

Oak Hills

The 385-acre Oak Hills area is located about 23 miles east and six miles north of Lisbon, North Dakota. Oak Hills is found on the Sheyenne Delta, an area of fine sand and silt deposited at the mouth of the Sheyenne River where it flowed into the ancient glacial Lake Agassiz late in the Wisconsin glaciation. This delta is characterized by rough and choppy dune topography with relief ranging from five to fifty feet, although variation is usually ten to twenty feet. The Sheyenne River drains this area. Elevation ranges between 1,040 to 1,105 feet above sea level.

Vegetation is strongly influenced by the sandy substrate and variability in soil moisture. Vegetation includes a complex of grassland openings intermixed with bur oak woodland and sand savanna, along with scattered thickets of smooth sumac, plum and chokecherry. Common grasses include needle-and-thread, prairie sand reed, blue grama, sand bluestem, sideoats grama and sand dropseed. The oak savanna is considered critically endangered, estimated to have declined 98 percent over its historic occurrence in the Midwest. Oak Hills is vegetatively one of the best remaining sites within the Choppy Sandhills on the Sheyenne National Grassland. Leafy spurge, an exotic noxious weed, may pose serious management concerns without effective treatment.

Livestock grazing occurs in the area, as do hiking, horseback riding, and unsanctioned dirt bike and all-terrain-vehicle use. Two-track trails used by the livestock permittee occur in the area.

Platanthera Prairie

The 400-acre Platanthera Prairie is located about 18 miles east of Lisbon, North Dakota. The site is found within the Hummocky Sandhills habitat association of the Sheyenne Delta, a geologic landform with vegetation strongly influenced by a sandy substrate and a high water table. The water table is generally about 10 feet below the surface. The site is characterized by rolling and undulating hummocks with variation in relief from five to ten feet. Elevation ranges between 1,065 to 1,070 feet above sea level.

The site is in good ecological condition. The wetland swales and depressions are in excellent condition, with no evidence of draining or filling. The primary vegetation types include: sandhills mixed-grass prairie, wet-mesic tallgrass prairie and sedge meadow wetlands. Two undesirable species, Kentucky bluegrass and leafy spurge, are found in the area. A significant and thriving population of the threatened western prairie-fringed orchid occurs on the site. Platanthera Prairie also is home to the greater prairie chicken and the regal fritillary butterfly.

Historically, the area has provided for uneven livestock utilization, which contributes to lower ecological condition on the hummocks. Cattle tend to over-utilize hummocks while only lightly utilizing swales. Only limited recreational use is made of the area.

Sheyenne Springs RNA (Existing)

The 57-acre Sheyenne Springs area is located about 16 miles west and 8 miles north of Lisbon, North Dakota. The site, consisting of a peatland stream complex interrupted by beaver dams and surrounded by woodlands, lies in a small valley above the Sheyenne River. Sheyenne Springs lies in the physiographic setting of the Sheyenne Sandhills, part of the enormous deltaic plain created by glacial meltwater carried by the Sheyenne River into ancient glacial Lake Agassiz. This glacial deposit is the largest on the continent and is characterized by multiple layers of sand deposited as the glacial lake advanced and retreated. In the RNA, elevations range from 984 feet at the stream on the lower end of the site to 1,099 feet at the highest sandhill.

The spring-fed wetland complex has been protected from livestock grazing since 1974 and is noted for its abundant wildlife and rare species. The wetland complex is characterized by a number of undisturbed, highly restricted, specialized aquatic habitats and their characteristic flora and fauna, including calcium carbonate peat wetland, or fen. Sheyenne Springs hosts the highest known number of state rare plant species in North Dakota--including 18 rare species that are considered relicts with a boreal affinity more closely resembling the paleoflora immediately after the lowering of glacial Lake Agassiz. Beaver are very active in the RNA and significantly shape the ecosystem with ponds and dams.

The area was fenced in 1974 to protect it from livestock grazing. No trails exist within the RNA. The area has received high interest from naturalists, including those interested in birds, butterflies, and plants, as well as researchers.

Medicine Bow-Routt National Forest

Thunder Basin National Grassland

Antelope Creek

The Antelope Creek area is located about 16 miles northwest of Bill, Wyoming. The area encompasses 1,090 acres and lies within the ecoregion classified as the Great Plains-Palouse Dry Steppe Province, Powder River Basin Section, Southern Powder River Basin-Scoria Hills Subsection. Bedrock in the area is claystone and concretionary sandstone of the Paleocene-aged Lebo Member of the Fort Union Formation. The substrate is Quarternary alluvium derived from the surrounding uplands, including outcrops of porcellanite (scoria) west of the area. Elevation in the smaller potential area ranges between 4,310 to 4,390 feet above sea level, while in the larger area between 4,310 to 4,420 feet.

Antelope Creek includes segments of two perennial streams, Antelope Creek and Dry Fork of the Cheyenne River. Vegetation includes plains cottonwood woodlands, shrub vegetation of plains silver sagebrush and black greasewood, grasslands of prairie sandreed and needle-and-thread, and wet meadows of leafy bulrush and alkali cordgrass. One threatened species is known to occur in the area, the bald eagle. Beaver and prairie dogs are also present in the area. The area, in reasonably good ecological condition, contains a high-quality example of a plains stream ecosystem.

Livestock grazing does occur. Several abandoned oil wells and drill holes can be found in the area, but no major conflicts with mineral exploration or production are expected should the area be designated as a Research Natural Area. The cottonwood woodlands do offer attractive primitive camping opportunities to recreationists.

Prairie Creek

The 560-acre Prairie Creek area is located about 12 miles northwest of Clareton, Wyoming. It is located on the eastern side of the broad, shallow valley of the southward-flowing Prairie Creek. The area contains gentle slopes with westward-flowing draws less than 50 feet deep. Slopes in the area face mainly west and southwest. Bedrock in the area is shale of the Tullock Member of the Paleocene-aged Fort Union Formation. Elevation ranges between 4,480 to 4,853 feet above sea level.

Riparian and upland vegetation includes grama / needlegrass / wheatgrass, wheatgrass / needlegrass shrub-steppe, blue grama / western wheatgrass, big sagebrush / western wheatgrass, and nuttall saltbrush / western wheatgrass. Three undesirable plant species are present in low numbers: cheatgrass, meadow brome and yellow alyssum. Ferruginous hawks may utilize the area. Habitat suitable to the black-tailed prairie dog is also present. Prairie Creek provides good representation of the blue grama / western wheatgrass plant association.

Livestock grazing occurs. No major impacts associated with mineral exploration or production is expected should the area become a designated Research Natural Area. Recreational use is mostly limited to autumn hunting opportunities.

Rock Creek

The 592-acre Rock Creek area is located about 8 miles northwest of Clareton, Wyoming. It lies within the ecoregion classified as the Great Plains-Palouse Dry Steppe Province, Powder River Basin Section, Southern Powder River Basin-Scoria Hills Subsection. The area contains segments of two intermittent branches of Rock Creek flowing south in valleys about 100 feet deep. Slopes face mainly east or west and are gentle. The bedrock is soft sandstone with small amounts of shale, both of the Tullock Member of the Paleocene-aged Fort Union Formation. The substratum in the intermittent stream valleys is alluvium derived from the surrounding uplands. Elevation ranges between 4,450 to 4,640 feet above sea level.

The principal distinguishing features include rolling hills with vegetation of the big sagebrush / needle-and-thread plant association and the needle-and-thread / blue grama plant association, and draws supporting the silver sagebrush / western wheatgrass plant association. Barr's milkvetch, a plant species of conservation interest but with no federal status, is found in the area. Three undesirable plants occur in the area: cheatgrass, meadow brome and yellow alyssum. Elk may utilize the area. Pronghorn antelope are common.

Only recently did this area become part of the Thunder Basin National Grassland. Livestock grazing has become an allowable use of the area. No major impacts from mineral exploration or production are expected should the area become a designated Research Natural Area. Recreational use is mostly limited to autumn hunting.

Wildlife Draw

The 630-acre Wildlife Draw area is located about 32 miles west of Newcastle, Wyoming. It lies within the ecoregion classified as the Great Plains-Palouse Dry Steppe Province, Powder River Basin-Scoria Hills Subsection. The area contains rolling hills with several draws. Orientation of the area is north to south across a valley with a generally eastward, intermittent drainage. Elevation ranges from about 4,440 feet to 4,630 feet above sea level.

Wildlife Draw is vegetated entirely with grasslands and sagebrush shrub-steppe. Vegetation includes needle-and-thread, blue grama, western wheatgrass and threadleaf sedge. Wyoming big sagebrush is widespread. Three draws contain ephemeral streams and support a silver sagebrush / western wheatgrass association. Four exotic plant species are present: cheatgrass, meadow brome, yellow alyssum and salsify. This area represents the mosaic of the following associations reasonably well: needle-and-thread / blue grama and big sagebrush / needle-and-thread.

No federally listed threatened or endangered plant or animal species are known to be present in the area. Judging by the gentle roll of the grasslands in the area, prairie dogs probably used the are at least intermittently before settlement. The narrow shape and small acreage of the area is too small to support populations of pronghorn antelope, elk and mule deer. Establishment of this area as an RNA might require a change in the current livestock grazing management.

Nebraska National Forest Units

Samuel R. McKelvie National Forest

Steer Creek

The 2,500-acre Steer Creek area is located about 13 miles northeast of the Niobrara Ranger Station on the Samuel R. McKelvie National Forest. The site is within in the Sandhills ecosystem of central Nebraska. The area is represented by dune prairies, dry valleys and wetland communities. Elevation ranges from 2,863 to 2,993 feet above sea level.

The dunes are formed from eolian material. Established hummocks typically give way to sparsely vegetated and shifting depressions of unstable sandy soils, commonly called blow-outs. These blow-outs serve as colonization sites for many specially adapted plant species. Between the sandy dunes lie broad valleys dominated by short grasses and sedges. Blow-outs may occur in these valleys, too. Wetland communities in the area exhibit diverse species associated with wet meadows, freshwater marshes, and aquatic associations of submerged pondweed.

An attractive feature of Steer Creek is that surrounding lands are completely managed by the U.S. Forest Service, which reduces the possibility of conflicts with adjacent landowners. The area is not, however, in pristine condition. Two-track roads do enter the area. In addition, during the grazing period, large reductions in plant leaves and shoots are observed, as well as trampling of creek banks and substantial presence of manure in waterways. Substantial recovery of riparian areas has been observed after the grazing period. Less observable negative and positive effects from grazing likely occur in the area.

Signal Hill RNA (Existing)

The 700 acre Signal Hill RNA is located about 12 miles south and west of Halsey, Nebraska in section 3 and 4, T. 21N., R. 27W. and was established in May of 1950. This tract represents vegetative community types of the Nebraska Sandhills, which is about 20,000 square miles, which makes up about one fourth of the land area of Nebraska. The terrain is that of choppy hills, or sand dunes now supporting a good vegetative cover. The soil is practically pure silica, and contains less than one per cent of organic matter. The dunes in the vicinity of the RNA are described by geologists as being the youngest of the hills and still are affected by the wind, although it is generally agreed that they have become a good deal more stable. Elevation varies from 2,820 to 2,900 feet. There are no lakes, or streams on the area, being an intermingled composition of dunes and small valleys without drainage. The rainfall varies from 15 inches to 26 inches per annum. It is well distributed throughout the season, although heavier in May, June and July. September, October and November are regarded as the "dry months". The mean annual temperature is 49 degrees Celsius. The mean annual humidity averages about 67 per cent.

Sandhill lovegrass is characteristic of the north slopes and in some swales. Sandhill bluestem is a common pioneer in blowouts and on steep south slopes. Sand reedgrass is abundant over a wide range. Other community types include Indian grass, switchgrass, sandhill muhly, needle-and-thread and sedge. Important mixed grass species include western wheatgrass, blue grama, hairy grama, green needlegrass, and red three-awn.

Buffalo Gap National Grassland (Fall River Ranger District)

Hay Canyon Pasture

The 1,010-acre Hay Canyon Pasture is located about 7 miles northeast of Smithwick, South Dakota. It is situated in the Tertiary Table Lands and the Pierre Hills Divisions of the Great Plains. The Pierre Hills area is characterized by nearly level to rolling hills. The Tertiary Table Lands are characterized by very steep badlands formations and gently sloping alluvial fans. The Cheyenne River and its tributaries drain most of the area. The clayey soils of the area allow for rapid run-off but slow permeability. Elevation ranges from 3,050 feet to 3,214 feet above sea level.

In the drier uplands, short- and mixed-grass communities are prevalent. The lower drainages typically exhibit more vegetative growth with some taller grasses and a few isolated cottonwood trees. The predominate species include western wheatgrass, buffalograss, green needlegrass, and blue grama. Three exotic species are present: cheatgrass, Japanese brome, and sweetclover.

Healthy prairie dog colonies are scattered within the area. Burrowing owls and other species associated with prairie dogs are present. The prairie dog colonies of the area are in very good shape due to the amount of native vegetation and the utilization of the burrows by other wildlife. Two stock ponds are present, one of which (Bochert Dam) is fenced off to enhance wetland habitat and encourage waterfowl production. The wetlands present appear to be in a reasonable condition. Prospects for the area's long-term ability to support functioning ecosystems with a minimum of manipulation are good. This site is large and secluded with adequate protection from outside disturbances.

South Pasture (777 Allotment)

The 1,570-acre South Pasture is located about 18 miles west of Fairburn, South Dakota. It is situated in the Tertiary Table Lands and the Pierre Hills Divisions of the Great Plains. The area is characterized by nearly level to rolling hills to very steep badlands formations and gently sloping alluvial fans. Drainages flow into French Creek, which drains into the Cheyenne River. Elevation ranges from 2,950 to 3,250 feet above sea level.

South Pasture contains a wide variety of habitats. In the badlands portions, natural erosion has sculpted mounds, pinnacles, escarpments, overflows and steep drainage banks. Dominant vegetation includes western wheatgrass and needle-and-thread. Nonvegetated badlands outcrops also occur, as do juniper breaks, shrub patches and about one-quarter-mile of deciduous riparian woodland along French Creek. Plant and animal health and diversity are considered quite high, although some exotic grass species, including smooth and Japanese brome, cheatgrass, and Kentucky bluegrass, can be found in isolated patches.

Current use includes holistic grazing management with a herd of more than 1,000 bison. This herd remains in the area for between six and eleven days per year. This grazing system is an attempt to mimic historic, natural grazing patterns of bison on short- and mixed-grass prairies. Some hunting and hiking also occur in the area.

Buffalo Gap National Grassland (Wall Ranger District)

Steer Pasture

The 4,636-acre Steer Pasture area is located about 3.5 miles south of Wall, South Dakota. Steer Pasture is situated in the Tertiary Table Lands and the Pierre Hills Divisions of the Great Plains. The Tertiary Table Lands consist of the Brule and Chadron Formations, distinguished by very steep badland formations and gently sloping alluvial fans. The Pierre Hills region is characterized by nearly level to rolling hills. Steer Pasture lies on the Bloom Basin east of a large, rugged, near-vertical badland wall.

The dominant vegetative species include western wheatgrass, a sod-forming grass, and needle-and-thread, a bunch grass. Dakota buckwheat, a sensitive species, occurs infrequently in the area, as do such exotic species as Japanese brome, cheatgrass and sweet clover. The overall quality of vegetative diversity is low to moderate, due in part to cattle grazing; however, the condition of the land is fair to good. Prospects for the area's long-term ability to support functioning ecosystems and communities with a minimum of manipulation are good. Fire should be reintroduced to remove litter and exotics and to further encourage the growth of native plant species.

Steer Pasture is mainly utilized for livestock grazing and to a lesser extent wildlife production and recreation. The primary recreational activities include hunting and fishing, with bird watching, horseback riding and mountain biking becoming increasingly popular throughout the entire Buffalo Gap National Grassland.

West Wall

The 1,040-acre area is located about 9 miles southwest of Wall, South Dakota. The Cheyenne River drains most of the area. The area is situated in the Tertiary Table Lands and the Pierre Hills Divisions of the Great Plains. Topography varies considerably, from gently rolling uplands to rugged valleys and ravines to the flat Sage Creek floodplain and its terraces. Elevation ranges from 2,456 to 2,963 feet above sea level.

The West Wall area is divided into three pastures containing a wide variety of plant communities. Mixed-grass prairie species dominate, including thick stands of sod-forming grasses and taller native bunch grasses. Woody vegetation is limited to more mesic sites, including the largest area of juniper break habitat on the Buffalo Gap National Grassland. Woody vegetation is common in flat lowlands surrounding Sage Creek and in shallow depressions.

Impacts from past and present livestock grazing are evident. Currently, the stocking level of livestock in the area is considered moderate. Plant community health ranges from fair to good. Some encroachment by exotic grasses can be observed. Hiking and hunting do occur.

Fort Pierre National Grassland

Mallard South:

The 1,030-acre Mallard South area is located about 19 miles south-southeast of Pierre, South Dakota. The landscape is characterized by level to rolling grasslands rising from unglaciated, Cretaceous-aged clay soils, dissected by entrenched intermittent streams. The southern branch of Cedar Creek, an intermittent tributary of the Missouri River, drains the area. Elevation ranges from 1,800 to 2,020 feet above sea level.

Three general types of vegetation dominate the site: mixed-grass prairie hillsides with such grasses as big and little bluestem and porcupine grass, uplands and footslopes of western wheatgrass, and riparian zones supporting a mosaic of grassland, shrub thickets, temporary wetland habitat, and a stringer of widely scattered deciduous trees. Unlike the surrounding landscape, Mallard South contains a relatively diverse, well-vegetated riparian zone. The abundance and vitality of plum, chokecherry and buffaloberry thickets in the area is also a rare feature within the Fort Pierre National Grassland. At least four Forest Service sensitive species occur in the area: regal fritillary butterflies, Northern leopard frogs, greater prairie chickens and upland sandpipers.

The relatively good condition of the riparian zones and high condition of several grassland types suggest that livestock stocking rates have not been excessive in the past few decades. Two exotic plant species, if not actively managed, may pose serious impacts: yellow sweet clover and smooth brome. A lack of natural firebreaks may impede using prescribed fire as an effective management tool.

Oglala National Grassland

Prairie Dog (Pasture 45)

The 940-acre Prairie Dog area is located within Pasture 45 of the Oglala National Grassland about 20 miles north-northeast of Harrison, Nebraska and 6 miles south of Ardmore, South Dakota. The area consists of rolling upland grasslands and riparian communities somewhat representative of the Hat Creek watershed ecosystem as found in northern Sioux County, Nebraska. Mixed-grass prairie occupies most of the upland slopes and hilltops, with shallow-soiled rocky prairie and rock outcrops localized on hilltops and eroded slopes. The topography is fairly mild with elevations ranging from 3,620 to 3,780 feet above sea level.

Whitehead Creek runs northward through the western fifth of the area, draining the uplands through a series of small tributaries. Riparian grasslands and meadows occur on terraces of the creek and its larger tributaries, and floodplain meadow, wet meadow, and small ephemeral wetland communities occur in the streambed of the tributaries. Eroded badlands slopes and clay pan communities are found to a limited extent along the margins of the valley of the main drainage channel. A large active prairie dog town occupies the western third of the upland area east of Whitehead Creek.

Although this area has been mostly ungrazed for the past 10 years, the area still shows signs of past anthropomorphic disturbances, including two impoundments on tributaries of Whitehead Creek. Two-track roads cross the length of the area. Aerial photography seems to indicate past cultivation in the vicinity of the prairie dog town. Exotic plant species are common, including Canada thistle. Controlled burning or short-term, early-season, high-intensity grazing should be explored for thatch removal and control of cheatgrass and sweetclover. Removal of prairie dogs (by shooters or eradication, such as poisoning) could have a negative impact, opening large areas of the prairie dog town to invasion by exotic species.

Pine Ridge Ranger District

West Ash Creek (Pastures 6, 7 and 11)

The 640-acre West Ash Creek area is located within Pasture 6, 7 and 11 of the Pine Ridge unit on the Nebraska National Forest about 18 miles southwest of Chadron, Nebraska. The area consists of mostly successional ponderosa pine forests burned in a 1985 wildfire. In addition, some unburned pine forests, some grasslands and some riparian canyon bottoms exist. The area is within the Pine Ridge ecosystem of the White River watershed of northwestern Nebraska. Topography in the area consists mostly of steep, dissected canyons covered by pine forests and woodlands typical of the Pine Ridge ecosystem. Elevation ranges from 3,880 to 4,440 feet above sea level. Ridgetops are fairly rocky and contain rock outcrops interspersed with mixed-grass prairie. In some places, nearly vertical rock cliffs are present. The area has been nearly continuously ungrazed since 1986, but still shows signs of past overgrazing in the canyon bottoms, which are commonly dominated by exotic species.

The main channel of West Ash Creek, a permanent, spring-fed stream, runs north-northwest along the east boundary, and portions of several tributary canyons are contained within the site. The canyon bottoms contain grassland with scattered patches of deciduous trees, such as boxelder, green ash, hackberry, and cottonwood, and wet-meadow communities.

Although cattle grazing doesn't presently occur in the area, the dominance of exotics in the canyon bottoms due to past overgrazing will continue to impede natural succession. The same is true of the burned slopes seeded to intermediate wheatgrass. Controlled burns would be very difficult to manage due to the rugged nature of the terrain. Management of wheatgrass through grazing may also prove difficult on the uplands and would likely be harmful to the canyon bottoms. Leafy spurge and Canada thistle control measures along West Ash Creek should be planned to avoid accidental spraying of the orchid (such as *Platanthera hyperborea*, commonly called northern green orchid) in the area.

Inventory Summary

The results of the inventory are shown in the following table. Values are rounded to the nearest 10 acres:

Table E-1: Nominated Research Natural Areas

	RNA Name	Type	Acres
Dakota Prairies			
Little Missouri National Grassland McKenzie	Cottonwood Creek-Badlands	botanical / zoological	5,880
	Bear Den-Bur Oak	botanical	2,840
Little Missouri National Grassland Medora	Bullion Butte	botanical / geological	3,160
	Ponderosa Pines	botanical / zoological	3,560
	Mike's Creek	botanical / zoological	4,490
	Little Missouri River	botanical / geological	1,190
Sheyenne National Grassland	Oak Hills	botanical	390
	Fritillary Prairie	botanical / zoological	240
	Bluestem Meadow	botanical	80
	Platanthera Prairie	botanical	370
Medicine Bow-Routt National Forest Unit			
Thunder Basin National Grassland	Rock Creek	botanical	590
	Prairie Creek	botanical	560
	Antelope Creek	botanical	1,090
	Wildlife Draw	Botanical	630
Nebraska National Forest Units			
Samuel R. McKelvie National Forest	Steer Creek	botanical	2,500
Buffalo Gap National Grassland Fall River	South Pasture, 777 Allotment	botanical	1,560
Buffalo Gap National Grassland Wall	West Wall	botanical	1,030
Fort Pierre National Grassland	Mallard	botanical	1,030
Oglala National Grassland	Prairie Dog, Pasture 45	botanical / zoological	940
Pine Ridge Ranger District	West Ash, Pastures 6,7, 11	botanical	640

Demand Assessment

Plan revision alternatives should provide for a range of RNA management by displaying different numbers and sizes of RNA designations. Management direction will be developed for any designated RNA.

Current RNAs do not adequately represent the potential vegetation or geologic types that exist on the national grassland areas.

The decision to be made is which areas, if any, should be designated as RNAs, and how should they be managed?

The following table indicates potential vegetation types (Kuchler types - 1985) in relation to occurrence on the units in the planning area.

Table E-2: Potential Vegetation Types, Kuchler Vegetation Type Occurrence.

Potential Natural Vegetation (Kuchler Types, 1985)									
National Grassland/ Forest	**Section (Bailey, 1994)**	**E. Ponderosa Forest**	**Wheatgrass-Needlegrass**	**Grama-Needlegrass-Wheatgrass**	**Wheatgrass-Grama-Buffalograss**	**N. Floodplain Forest**	**Sandhills prairie**	**Sagebrush Steppe**	**Bluestem Prairie**
Region 1									
Little Missouri NG	NW Great Plains 331F								
Grand River NG	NW Great Plains 331F								
Cedar River NG	NW Great Plains 331F								
Sheyenne NG	Red River Valley 251A								
Region 2									
Nebraska (Pine Ridge)	NW Great Plains 331F								
Nebraska (Bessey)	Nebraska Sandhills 332C								
Nebraska (McKelvie)	Nebraska Sandhills 332C								
Oglala NG	NW Great Plains 331F								
Buffalo Gap NG	NW Great Plains 331F								
Ft. Pierre NG	N Central Great Plains 332D								
Thunder Basin NG	NW Great Plains 331F								
	Powder River Basin 331G								