DEPARTMENT OF NATURAL RESOURCES:

Blufflands/Rochester Plateau
Subsection Forest Resource Management Planning

ADDENDUM

High Biodiversity Area Management Plan

Money Creek Bluff

Public Review Draft

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This document is on the Internet at http://www.dnr.state.mn.us/forestry/subsection. Information about the DNR Subsection Resource Management Plan process can be found at the same web address. This information is available in an alternative format upon request.

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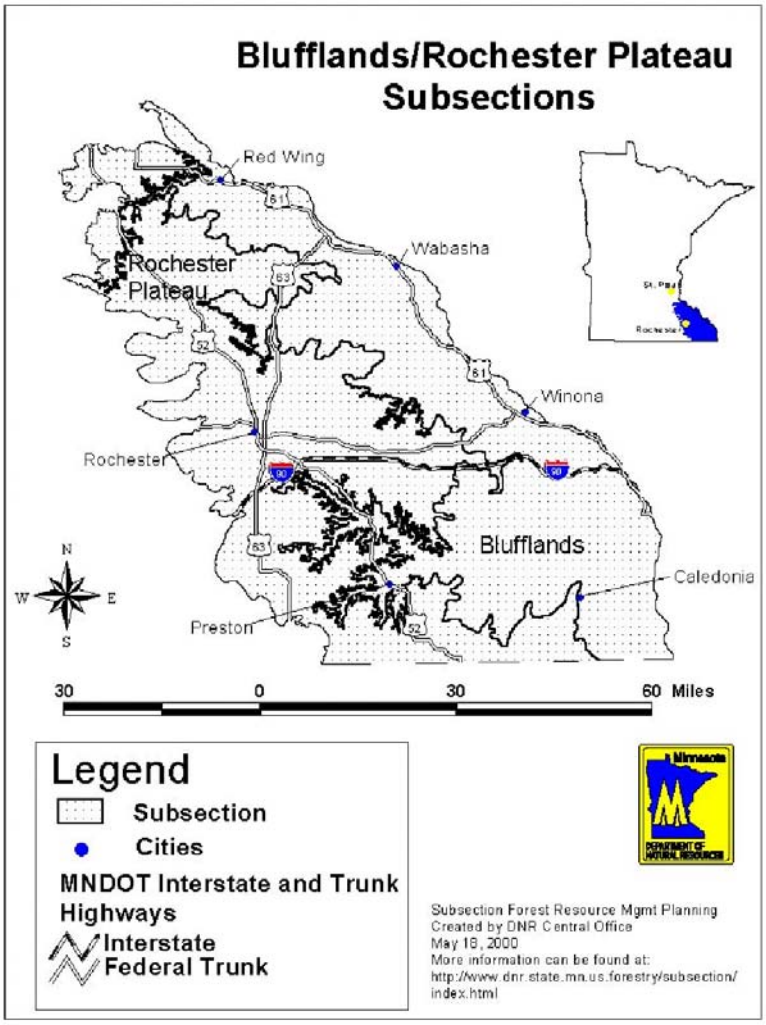
Introduction

This plan will guide management decisions and practices on state owned land in the Money Creek Bluff/Vinegar Ridge area in Houston county Minnesota (Appendix 1). The Money Creek Bluff/Vinegar Ridge area is one of 13 Minnesota County Biological Survey (MCBS) sites of outstanding biodiversity on lands administered by the DNR Divisions of Forestry and Wildlife in southeastern Minnesota. The management philosophy for this area is based on a landscape level perspective of ecosystems and the species that use these ecosystems. This plan is intended to be used in conjunction with the Blufflands/Rochester Plateau Subsection Forest Resource Management Plan (SFRMP) that was completed by the DNR in 2002, and will be revisited every 10 years as part of an adaptive management process.



The Blufflands/Rochester Plateau SFRMP addressed management of vegetation on State Forest and Wildlife lands. There were 13 "priority areas of significant biodiversity" identified during the process as areas requiring detailed plans that would address vegetation management and biodiversity protection needs. Most of these priority areas consist of more than one MCBS site. Of the 745 sites of biodiversity significance in the 2 subsections, 62 sites are contained within these 13 priority areas. Ecological evaluations that mapped and described the rare natural features were prepared by MCBS ecologists for these 13 sites prior to the SFRMP planning process.

Division directors for the DNR Divisions of Forestry, Wildlife, and Ecological Resources determined that long-term management plans would be developed for the 13 identified high biodiversity areas. The division directors also provided that management of these sites should focus on the area as a whole, employ practices that perpetuate endangered, threatened, or special concern species, and native plant communities while following the mandates of forestry or wildlife administered lands.

Following the completion of MCBS fieldwork in 2001, the Money Creek Bluff area was noted as being one of 13 sites in southeast Minnesota with significantly high biodiversity. The project site area at Money Creek Bluff is 1307 acres in size of which 885 acres is in state ownership as part of the Richard J. Dorer State Forest. The remainder of the project area consists of 371 acres of privately owned land, 51 acres of the Root River, and 31 acres of the Root River State Bike Trail. The Critical Habitat Zone boundary contains the core area of rare natural feature locations and encompasses the entire 1307 acres at Money Creek Bluff.

The management philosophy for the state forestland within this area is the same as for all other forestry lands within the Richard J. Dorer Memorial Hardwood Forest and is based on the landscape level perspective of ecosystems and the species that use those ecosystems. The goals are to maintain natural communities while providing the multiple uses that healthy forest ecosystems can provide.

The resource managers who work in and manage Money Creek Bluff developed the management plan for this area cooperatively. It will be an adaptive management plan. As scientific knowledge increases regarding management of ecosystems, plant communities, and individual species, some management recommendations within this plan may change.

The overall goal of writing the plans for this and the other 12 high biodiversity areas is to perpetuate the plant communities that support the unique flora and fauna that make these areas exceptional. Recommendations in this plan are written for state-owned land. Private landowners within the project boundary may be contacted and offered management assistance for their land if they desire it.

Background History and Site Description

The Money Creek Bluff/Vinegar Ridge area is located approximately 4 miles southeast of Rushford, Minnesota. It lies within the Blufflands Subsection and is made up of a block of state land within the Richard J. Dorer State Forest as well as privately owned property (Appendix 4). The Root River flows along the southern edge of the plan area.

Humans have been impacting the Money Creek Bluff area for thousands of years. An archeological survey done along the Root River at the project site was done in 1979 and significant evidence of past human use was found. Native American habitation and artifact sites were found on some sand terraces and a series of 11 mounds were also found on some higher terraces that overlook the Root River. Another lone mound was just discovered by DNR foresters in the spring of 2010. Evidence of early European settlement was also found in the form of harness hardware, nails, glassware, and other random items. The last documented Native American use of this area was by the Winnebago Tribe of the Dakota in 1852.

Early settlement of the area began approximately in the 1830's with fur trappers. Slowly others followed and claimed the cold-water springs and adjacent tall grass prairies to graze their livestock. In 1854-1855 contracted surveyors hired by the Public Land Survey surveyed the land. The whole area was then homesteaded and intensively farmed. All the acreage found at Money Creek Bluff was burned on a regular basis by the landowners to help with grazing. This continued until the 1930's when the Township Fire Warden system was established to help control woodland fires.

State land acquisition in the Money Creek Bluff area began in the early 1960's with the dedication of the first parcel of state land by Houston County Supervisors in section 34 along the Root River. This parcel was tax-forfeited woodland. Other acquisitions of privately owned woodland from 6 local farmland owners quickly followed in the late 1960's and 1970's, eventually forming the 885 acre block of state owned forest land that makes up a good portion of the Money Creek Bluff area.

The DNR cooperative stand assessment (CSA) forest inventory was completed on all DNR Forestry-administered lands within the Money Creek Bluff project area in the mid to late 1980's (Appendix 2). In addition, the Minnesota County Biological Survey was completed for this area in the late 1990's. The results of these two databases provide information regarding the status and distribution of natural plant communities and rare species found in the Money Creek Bluff project area.

Scott Zager and Carol Hall from the Minnesota County Biological Survey provide an excellent description of the project area. The following is excerpted from their description of the high-bio project site:
"Money Creek Bluff is an outstanding example of the geologic and ecological features of the Blufflands Subsection of the Paleozoic Plateau". The "site is within a two-mile wide oxbow meander of an ancient glacial river that cut its valley into the bedrock of the surrounding plateau. The four hundred foot high bluffs resemble a natural citadel or fortress on a promontory surrounded on three sides by the modern floodplain of the Root River. The main bluff has several lateral ridge-spurs whose narrow crests radiate in all directions from a central knoll creating a series of secluded canyons or glens. The Root River State Trail passes through the site on an abandoned railroad bed at the base of the bluff." (Appendix 3).

"The rich biodiversity found at the site is attributed to its varied landscape and geology. The site's unique combination of land formations supports one of the largest areas of native vegetation…Ten different native plant communities cover approximately 900 acres within the Money Creek Bluff…The native plant communities at Money Creek Bluff are continuous across the landscape and include various habitats important to animals and plants. For example, the limestone rock outcrops and dry prairies provide critical den sites for three species of state-listed snakes. In addition, the sand terrace which formed during the ice-age is inhabited by some of Minnesota's rarest species."

"Outside the Mississippi River Valley, few large alluvial forests remain in the Southeast and many of these are comprised of young, early-successional trees. Money Creek Bluff has the largest floodplain forest of mature trees in the Root River watershed and is one of the few places where the river meanders in a natural setting."

"Of further biogeographic interest, Plainfield sand is found in unusual situations at Money Creek Bluff providing habitat for native plant communities such as barrens prairie on knoll crests…This unique phenomenon may have occurred during various episodes when glacial ice reached its farthest extent…winds swept the Root River Valley, they picked up fine sand off the dry floodplain of a then braided stream…Money Creek Bluff acted as a natural drift fence for the valley…Fine particles of eolian sand became deposited on the bluff crests and upper ridge slope-areas that are generally occupied by wind-blown silts or loess. Consequently, Money Creek Bluff has Plainfield sand at all slope positions thereby enlarging and otherwise limited habitat."

The Minnesota County Biological Survey identified many rare species in the Money Creek Bluff area. A list of these species is as follows:

1. State Endangered: Rough-seeded Fameflower (*Talinum rugospermum*)

2. State Threatened: Canadian Forked Chickweed (*Paronychia Canadensis*), Ovate-leaved Skullcap (*Scutellaria ovata*), Three-flowered Melic (*Melica nitens*), Upland boneset (*Eupatorium sessiliforium*), Timber Rattlesnake (*Crotalus horridus*)

3. State Special Concern: Clasping Milkweed (*Ascelpias amplexicaulis*), Cliff Goldenrod (*Solidago sciaphila*), Goat's-Rue (*Tephrosia virginiana*), Plains Wild Indigo (*Baptisia bracteata* var. *leucophaea*), Purple Cliff-brake (*Pellaea atropurpurea*), Rhombic-petaled Evening primrose (*Oenothera rhombipetala*), Sea-beach Needlegrass (*Aristida tuberculosa*), Three-leaved Coneflower (*Rudbeckia triloba*), Witch-hazel (*Hamamelis virginiana*), Gopher Snake (*Pituophis catenifer*), Racer (*Coluber constrictor*), Acadian Flycatcher (*Empidonax virescens*)

The Minnesota County Biological Survey also identified 8 different native plant communities found in the Money Creek Bluff project area. These plant communities are listed as follows: Dry Cliff, Dry oak savanna (barrens subtype), Dry prairie (barrens subtype), Dry prairie (bedrock bluff subtype), Floodplain forest, Oak forest (dry subtype), Oak forest (mesic subtype), and river beach.

More detailed descriptions of these types will be presented in the implementation section of this plan.

Management History

Following is a summary of forest management practices that have occurred on the Money Creek Bluff state forestland from 1963 to present.

Tree Planting

Section Number	FIM Type	Acres/Year planted	Species
27	177	8 / 1965	8,000 White Pine, 8,000 Walnut nuts
27	178	16 / 1965	3,000 White pine, 5,000 Walnut nuts
28	166	5 / 1970	4,000 Walnut
28	173	24 / 1975,1978,1979,1983	Total of 52,000 Red pine, 2500 Ponderosa pine, 1250 White pine
28	93	22 / 1970	20,500 Red pine, 11,500 White pine
28	229	20 / 1997	2,000 Red oak and 2,000 White oak underplanted

Timber Stand Improvement

Walnut pruning and release was done in the mid 1970's throughout the entire base of state forestland located at Money creek Bluff. This includes FIM types 165, 166, 175,180, 187, 192, 193, 196, 203, 223, 224, 225, 226, 227, 228, 229, 256, 257, 258.

Timber Harvest

Section Number	FIM Type	Acres/Harvest Year	Sale Type
27	177, 178	20 / 2001	Pine Thinning
27	170	7 / 1987	Oak Select Cut
27	225	23 / 1997	Oak Select Cut
27	224	6 / 1997	Oak Select Cut
28	228	85 / 2008 to present	Oak Select Cut/Fuel wood Sale
28	229	16 / 1997	Oak Select Cut
28,33,34	227	50 / 1997	Oak Select Cut/Walnut Harvest
28	94	12 / 1975	Oak Select Cut

Recreational Development

Section Number	FIM Type	Recreation Project
27	170	Vinegar Ridge hunter parking lot
27	NA	Vinegar Ridge trail, Root River State Trail
28	171	Vinegar Ridge campground
28	NA	Vinegar Ridge trail, Root River State Trail
33	NA	Vinegar Ridge trail, Root River State Trail
34	201	Root River canoe campsite
34		Vinegar Ridge trail, Root River State Trail

Bluff Prairie Management

Section	FIM Type	Year	Activity	Acres
27	220, 224	2006	Cedar Removal	9
28	87	2006	Cedar Removal	9.75

As evident from the above tables and information, forest management activities have occurred over a large portion of state land on Money Creek Bluff during the period of state ownership. Nearly all of this management activity took place prior to the completion of the Minnesota County Biological Survey. It is also of note that the state forest land located at Money Creek Bluff is also part of an Adaptive Forest Management Project (AFMP)[1], is being managed as High Conservation Value Forest (HCVF)[2], and is part of a Representative Sample Area (RSA)[3] for certain types of plant communities.

Long range Goals

The long-range management goal for this area is to maintain native plant communities and plant and animal species that reside in the Money Creek Bluff area. This will be done using processes that mimic the historic disturbances that helped establish and maintain these communities.

The goals of biodiversity protection, timber management, understory species management, recreation development based on demand, and game and non-game species management will all be considered in management decisions to achieve this goal. Management goals and recommendations will be based on current management knowledge and be directed by, Sustaining Minnesota Forest Resources: Voluntary Site-Level Forest Management Guidelines. As new research or management techniques become available, they may be incorporated into management practices prescribed in this plan to achieve long-range goals. This area of high biodiversity significance is also an adaptive forest management project site. New management techniques derived from adaptive forest management may be implemented in managing this high-bio area.

[1] DNR has established a number of AFMPs across the state to help improve the ability to integrate multiple objectives, monitor progress and adapt to change.

[2] Principle 9 in the Forest Stewardship Certification Council (FSC) Forest Management Standard requires certificate holders to identify High Conservation Value Forests (HCVFs) and manage such sites to "maintain or enhance" identified High Conservation Values (HCVs).

[3] RSAs are ecologically viable representative samples designated to serve one or more of three purposes: 1)to establish and/or maintain an ecological reference condition; or 2)to create or maintain an under-represented ecological condition; or 3)to serve as a set of protected areas or refugia for species, communities and community types not captured elsewhere.

Implementation

Introduction

This section is organized into the major plant communities that are found within the Money Creek Bluff area (Appendix 1). Management goals have been shown for state owned lands only but management assistance will be given to those private landowners who desire it.

For each plant community a long-term goal has been set. This will be a statement that describes what managers would like the specific plant community to resemble 50 or more years in the future. In most cases this will be a description of an ideal plant community of the type that is being designated for perpetuation.

Following a description of the plant community, a desired short-term management direction is also provided that describes vegetation management activities that may be prescribed over the next 10 years to help achieve the long-term management goal for that community. Short-term direction will be addressed at least every 10 years when SFRMP plans are completed. Long-term goals will likely remain unchanged. The SFRMP plan for the Blufflands/Rochester Plateau is currently in the first year of a three-year extension to the original seven-year plan. Currently, only one stand in the Money Creek Bluff area is listed as having potential management activities occurring during the next 2 years. The rest of the stands will be assessed for potential management activities on a stand-by-stand basis during the next Blufflands/Rochester Plateau SFRMP planning process.

Management Direction for Native Plant Communities

Oak Forest (mesic subtype)
Native Plant Community: Red Oak – White Oak – (Sugar Maple) Forest (MHs37b)

1. Description

Mesic oak forest types are typically found on north to east facing slopes or on broad ridge crests. The canopy of mesic oak forests is typically dominated by red oak (*Quercus rubra*) and white oak (*Quercus alba*). Other significant canopy species may include basswood (*Tilia Americana*), sugar maple (*Acer saccharum*), black cherry (*Prunus serotina*), and black walnut (*Juglans nigra*). Sub-canopy species may include sugar maple, basswood, red oak, American elm (*Ulmas americana*), and ironwood (*Ostrya virginiana*). Understory species composition can be quite variable in these stands and may depend on slope position and aspect. A few understory species found in these mesic oak forests are nodding trillium (*Trillium cernuum*) and common enchanter's nightshade (*Circaea lutetiana*). The state threatened species ovate-leaved skullcap (*Scutellaria ovata*) and state special concern species witch hazel (*Hamamelis virginiana*) were found in mesic oak forests on Money Creek Bluff during the Minnesota County Biological Survey. FIM stands in the mesic oak forest type at Money Creek Bluff include 175O55, 180O63, 187O62, 223O64, 226O62, 227O62, 258O63,and 257O62.

2. Long-term management objective

The long-term management objective will be to maintain or enhance the mesic oak forest native plant community, including the structure and species composition of all vegetation layers. In addition, habitat for rare species such as the state threatened witch hazel will be maintained in

these forests. In the hardwood forests here in southeast Minnesota we typically see mesic oak stands transitioning to a more maple-basswood type plant community with the absence of fire and other disturbances such as harvests. At Money Creek Bluff however we aren't seeing a lot of that. Most of the mesic oak stands aren't transitioning to the more shade tolerant maple-basswood communities. Sugar maple and basswood are very minor components of the mesic oak stands in this area while red and white oak dominates the canopy.

Those mesic stands that have a high component of oak will be managed to perpetuate that oak resource to ensure its survival and dominance well into the future. Management options for regenerating that oak resource may include the use of prescribed fire, various types of timber harvests (which may include even-aged, shelterwood, or group selection techniques), supplemental understory planting of oak seedlings prior to harvest, and post sale timber stand improvement projects (Appendix 5). For these sites, management options will be chosen that help perpetuate oak as well as help to maintain or improve the mesic oak forest native plant community.

3. Short-term management direction

Currently, as mentioned earlier, there are no mesic oak stands selected for examination at Money Creek Bluff, but stands will be looked at for possible treatment during the next SFRMP planning process. It is worth noting that many of the mesic oak stands were selected for a field exam during fiscal year 2009 but were put on hold pending the completion of this plan. The only management activities that will be occurring in some of these stands during the next two years prior to the next planning process will be prescribed burns to help control brush competition and encourage oak regeneration.

Oak Forest (dry subtype)
Native Plant Community: Oak – Shagbark Hickory Woodland (FDs38a)

1. Description

Dry oak forests are typically found on steep west to south facing slopes and have intermittent to closed canopies dominated by white oak, bur oak, and pin oak (*Quercus ellipsoidalis*) with lesser amounts of red oak and basswood. Other canopy species that may occur in the dry oak forest type at Money Creek Bluff are shagbark hickory (*Carya ovata*), black walnut, american elm, and black oak (*Quercus velutina*). Common sub-canopy species include ironwood, american elm, black cherry, shagbark hickory, and white oak. The understory layer can consist of american hazel (*Corylus americana*), prickly ash (*Zanthoxylum americanum*), and gray dogwood (*Cornus racemosa*). Common herbaceous species include hog peanut (*Amphicarpaea bracteata*), pennsylvania sedge (*Carex pensylvanica*), pointed-leaved tick trefoil (*Desmodium glutinosum*), and honewort (*Cryptotaenia Canadensis*). The state-threatened upland boneset is found in this dry oak forest type where it transitions to more open oak savanna. FIM stands in the dry oak forest type at Money Creek Bluff include 175O55, 212O72, 219OX52, 222O33, 225O21, 228O53, 229O21, and 256O53.

2. Long-term management objective

The management of these community types at Money Creek Bluff will lean heavily toward a goal of successful regeneration and retention of oak species within the dry oak forest plant

communities. Management will also maintain or enhance the structure and composition of all vegetation layers of the dry oak forest native plant community. The habitat for the rare species that inhabit these forests will also be maintained. Areas with little to no oak that are more of a mixed hardwood stand will be allowed to succeed to that mixed hardwood type while areas with a strong oak component will be actively managed to ensure that strong oak presence remains many years in the future. Management strategies for these stands at Money Creek Bluff will include the use of prescribed fire to reduce brush competition and encourage oak regeneration, timber harvests of varying techniques to release the oak regeneration, planting of oak and other tree species, and timber stand improvement projects to eliminate invasive species and remove undesirable competition from the regenerating oak. Management strategies will be designed to mimic natural disturbances such as large and small-scale wind events, disease mortality, and catastrophic fire. Small and large group selection harvests and shelterwood harvest techniques will be examined for their effectiveness at regenerating oak in these stands. These types of harvest strategies have been used minimally here in southeast Minnesota and little about their success at regenerating oak is known for this region. Due to this fact, even-aged harvest techniques may be used if other harvest strategies fail to deliver adequate oak regeneration.

3. Short-term management direction

Currently, no dry oak type stands are selected for examination during the next two years. All of the oak forest (dry subtype) stands at Money Creek Bluff will be looked at for possible treatment during the next SFRMP planning process. The only management that will take place in the dry oak forest type during the next two years will be the use of prescribed fire.

Lowland Hardwood Forest (Root River floodplain)
Native Plant Community: Elm – Ash – Basswood Terrace Forest (FFs59c)

1. Description

This plant community is found in the seasonally flooded areas of the Root River that flows at the southern portion of the Money Creek Bluff project area. The canopy of this cover type is often quite patchy due to elm mortality and other factors. Old stream channels that divert flood runoff and old oxbows are also very abundant throughout the lowland forest type. Canopy species tend to include silver maple (*Acer saccarinum*), cottonwood (*Populus deltoides*), black willow (*Salix nigra*), and hackberry (*Celtis occidentalis*). The lowland hardwood forest at Money Creek Bluff is a healthy example of this plant community type. The canopy of this floodplain forest along the Root River is quite diverse with a wide range of species occupying space. These species include silver maple, cottonwood, black willow, boxelder (*Acer negundo*), black ash (*Fraxinus nigra*), green ash (*Fraxinus pennsylvanica*), hackberry, sugar maple, black walnut, american elm, red elm (*Ulmus rubra*), and bitternut hickory (*Carya cordiformis*). The subcanopy is sparse and contains mainly boxelder and hackberry with some pockets of young, shade-intolerant cottonwood and black willow found in canopy gaps. Herbaceous cover includes healthy populations of stinging nettle (*Urtica dioica*), tall coneflower (*Rudbeckia laciniata*), Virginia waterleaf (*Hydrophyllum virginianum*), and wood nettle (*Laportea Canadensis*). Reed Canary grass (*Phalaris arundinacea*), a highly invasive species, has been found in numerous locations where canopy gaps were created from elm mortality and other tree mortality. Rare animal species in this forest type include pickerel frogs and bald eagles. Rare plants include the three-leaved coneflower. FIM stands in the floodplain forest plant community at Money Creek Bluff include 166LH83, 193LH42, 196LH52, 200LH52, 201LH11, and 203LH52.

2. Long-term management objective

The floodplain forests in the Money Creek Bluff high biodiversity area are very mature, healthy examples of this type of plant community. This area is one of the largest contiguous floodplain forests along the Root River Valley with much of the other surrounding floodplain converted to agricultural uses. These high quality lowland hardwood forests should be maintained in their current state with an emphasis on filling canopy gaps with quality lowland hardwood tree species. With reed canary grass being such an aggressive invader of these lowland sites, minimal management that opens the canopy up will be recommended to help slow the spread of this invasive plant.

3. Short-term management direction

No stands in the lowland hardwood plant community were selected for field evaluation during the next 2 years. They will be field visited and discussed for future treatment options during the next SFRMP planning process.

Dry Oak Savanna (barrens subtype)
Native Plant Community: Dry Barrens Oak Savanna (Southern) Oak Subtype (Ups14a2)

1. Description

The dry oak savanna (barrens subtype) plant community is a fairly rare community type that happens to be found in a relatively high quantity in the Money Creek Bluff high biological area. Five separate areas of barrens oak savanna are mapped in the Money Creek Bluff area. All of these areas occur on Plainfield Sand on river terraces along the Root River and into some of the larger valleys. Black oak and pin oak dominate the canopy in these plant communities. White oak and bur oak are also found in some locations. The canopy varies greatly with open areas of dry prairie to closed canopy areas dominated by black oak resulting from the elimination of fire from the landscape many years ago. The sub-canopy in the dry oak savanna at Money Creek Bluff is mainly sparse with a few pockets of young white and black oak beginning to develop. Ideally, the understory in this plant community consists of American hazelnut (*Corylus Americana*), smooth sumac (*Rhus glabra*), poison ivy (*Toxicodendron rydbergii*), big bluestem (*Andropogon gerardii*), Indian grass (*Sorghastrum nutans*), little bluestem (*Schizachyrium scoparium*), and gray goldenrod (*Solidago nemoralis*). The state threatened species, Canadian forked chickweed is found in three locations in the barrens oak savanna and this represents one third of all known locations statewide. Additional rare plant species found in this forest type include the rough-seeded fameflower, three-flowered melic, goat's rue, cliff goldenrod, rhombic-petaled evening primrose, sea-beach needlegrass, and clasping milkweed. Rare animal species include the gopher snake and racer. All of these species thrive in relatively open, diverse oak savanna with areas of bare sand. The understory in the barrens oak savanna stands at Money Creek Bluff is somewhat different. Due to the lack of fire in these stands invasive honeysuckle has become a dominant shrub along with young oak seedlings and saplings. These oak seedlings and saplings have also helped close the canopy and encourage Pennsylvania sedge (*Carex pensylvanica* var. *pensylvanica*), a woodland species, to become the dominant ground cover throughout the savanna plant communities. FIM stands in the barrens oak savanna plant community at Money Creek Bluff include 94O14, 222O33, 228O53, and 256O53.

2. Long-term management objective

The long-term objective for this plant community is to restore the areas of barrens oak savanna to native vegetation and community structure. This will include the use of prescribed fire throughout the stands, individual and commercial fuelwood sales to reduce the excess of woody vegetation and invasive species removal through mechanical and chemical treatments.

3. Short-term management direction

FIM stand 228O53 was scheduled for harvest during the last SFRMP planning process. This is the only barrens oak savanna stand selected for treatment. This stand was field visited by representatives from the divisions of forestry, wildlife, and ecological resources and a joint decision was made to try and restore the stand back to oak savanna using small fuelwood permits, prescribed fire, and invasive species removal. The stand was re-visited and leave trees were marked with paint throughout the stand and stand boundaries were established. Currently there are 5 active, individual fuelwood permits in this stand where each individual may harvest up to five cords of firewood. They may harvest any tree not marked with paint within the stand boundary. The marked reserve trees will be the ones that will make up the savanna canopy when the site is fully restored. They include a mix of black oak, white oak, black walnut, and bur oak and include a mixture of young and mature individuals. The first prescribed fire for this stand is scheduled to occur in the spring of 2010. The remaining barrens oak savanna stands will be discussed for future treatment options during the next SFRMP planning process.

Dry Prairie (barrens subtype)
Dry Barrens Prairie (Southern) (Ups13a)

1. Description

These plant communities tend to occur on Plainfield sand scattered throughout the barrens oak savanna communities. They're typically found on southern aspects of some of the sand dunes in the barrens oak savanna communities located at Money Creek Bluff. Many of these prairies in the high biological area are located on the south to southwest edge of the sand terraces that overlook the Root River. The Root River State Trail offers a great vantage point for many of these prairies. Other examples of this plant community type are located on some of the sand dunes located in some of the larger valleys. They can be sparsely vegetated due to unstable sandy slopes and some of the dominant grasses found in this community type are big bluestem, little bluestem, prairie dropseed (*Sporobolus heterolepis*), and Indian grass. Some common forb species include purple prairie clover (*Dalea purpurea*), hoary puccoon (*Lithospermum canescens*), and wild bergamot (*Monarda fistulosa*). Most occurrences of rare plant species documented at Money Creek Bluff occur in the sandy plant communities such as the barrens prairie and barrens oak savanna. Five occurrences of the State Endangered rough-seeded fameflower (*Talinum rugospermum*) were documented in the barrens prairie communities in the project area. These five occurrences represent nearly one quarter of all known occurrences statewide. FIM stands in the barrens dry prairie plant community at Money Creek Bluff include 256O53.

2. Long-term management objective

The management goal for these plant communities will be to maintain the small prairie openings with the use of prescribed fire that follows rattlesnake management guidelines and potentially

enlarge some of the openings by removing encroaching woody vegetation along the prairie perimeters.

3. Short-term management direction

None of these small prairie types were selected for treatment although a few of the prairies located in barrens oak savanna stands will be burned in the spring of 2010. The rest of these plant communities will be looked at for management strategies during the next SFRMP planning process.

Dry Prairie (bedrock bluff subtype)
Native Plant Community: Dry Bedrock Bluff Prairie (Southern) (Ups13c)

1. Description

There are seven different areas classified as Southern Dry Bedrock Bluff Prairie in the Money Creek Bluff area. The three largest areas are on south to west facing bluffs on the southern edge of state ownership, and one larger area on the northern edge of the property, north of River Drive. These prairies are grass-dominated plant communities located on steep south to west facing slopes. They also contain a high diversity of forbs. This plant community is characterized by dry, thin soil covering Oneota dolomite and Jordan sandstone on the middle to upper slopes, and silty limestone of the St. Lawrence Formation is exposed in areas on the lower slopes. FIM stands in the bedrock bluff prairie plant community at Money Creek Bluff include 87RO, 97RO, a small portion of 175O55, 188RO, 191RO, 218RO, 220RC13, 221RC13, a small portion of 226O62, and 231RO.

Many mesic and dry-mesic species occupy open areas where Indian grass (*Sorghastrum nutans*) and big bluestem *(Andropogon gerardii)* are dominant, as well as little bluestem (*Schizachyrium scoparium*) and prairie dropseed (*Sporobolus heterolepis*) in drier areas. Common forb species include sky blue aster *(Aster oolentangiensis),* gray goldenrod *(Solidago nemoralis),* Western sunflower *(Helianthus occidentalis*), purple prairie-clover *(Petalostemon purpureum),* flowering spurge (*Euphorbia corollata*), and hoary puccoon (*Lithospernum canescens*). In dry areas where vegetation is sparse, the grasses poverty dropseed (*Sporobolus vaginiflorus*) and hairy grama (*Boeuteloua hirsuta*) are common, along with forbs lyre-leaved rock cress (*Arabis lyrata*), silky aster *(Aster sericeus*), cylindrical blazing star (*Liatris* cylindracea), green milkweed (*Asclepias* viridiflora), plains wild indigo (*Baptisia* bracteata), and small skullcap (*Scutellaria parvula*).

Compass-plant *(Silphium laciniatum)* is also found on Money Creek Bluff sites, which is an indication of the high ecological quality of this site. Additionally, the abundance of species such as lead plant (*Amorpha canescens*) and showy goldenrod (*Solidago speciosa*) indicate the sites were never severely grazed by livestock, a rare occurrence on many bluffs in southeastern Minnesota.

Historically, Southern Dry Bedrock Bluff Prairies were considerably open with few to no trees or shrubs. Bur oak (*Quercus macrocarpa*) was commonly found toward the top and bottom of the bluffs, with an occasionally tree mid slope. Without fire and grazing to maintain the open nature of this plant community, trees and brush begin to move in. A dominant invader of bluff prairies is red cedar (*Juniperus virginiana*), which can take over and significantly alter the native plant composition. Other species that commonly invade bluff prairies include aspen species (*Populus sp*.), paper birch (*Betula papyrifera*), gray dogwood (*Cornus racemosa*), smooth sumac (*Rhus*

glabra), prickly ash (*Zanthoxylum americanum*), ninebark (*Physocarpus opulifolius*), and two non-native species European buckthorn (*Rhamnus cathartica*) and honeysuckle (*Lonicera sp.*).

Several of the prairies at Money Creek Bluff have large amounts of bush juniper (*Juniperus communis*), which grows over the thin, rocky soils. The bluffs at this site are getting encroached by red cedar (*Juniperus virginiana*), aspen (*Populus sp*), and native brush including smooth sumac (*Rhus glabra*), and ninebark (*Physocarpus opulifolius*). Recent management activity has opened up two of the bluffs north of River Drive and bluffs south of River Drive will be evaluated for cedar removal in the next few years.

Money Creek Bluff contains at least two timber rattlesnake (*Crotalus horridus*) dens, and likely has more. Adult snakes have been documented on site as recently as 2007. Timber rattlesnakes are a state threatened species and depend on bluff prairies for denning sites, which are a critical habitat component for this species. Because larger den sites are becoming increasingly rare in Minnesota, management of Money Creek Bluff should give special consideration to perpetuating the timber rattlesnake.

Scott Zager and Carol Hall provide a great description of the quality of some of the bedrock bluff prairies found at Money Creek in the following excerpt from their description of the site in the Minnesota County Biological Survey:
"…Two-hundred and forty-four bluff prairies were documented in the Southeast. However, only a few of these are considered to be of exceptional quality. Money Creek Bluff has one of the five best prairies in Houston County."

2. Long-term management objective

Maintain and enhance these bluff prairies through the use of prescribed fire and woody vegetation removal. Red cedar is a coniferous woody species that poses a large threat to these plant communities. With the absence of fire they will take over and dominate the prairie habitat over time. Mechanical removal and prescribed fire will be used to combat the intrusive red cedar on the bluff prairies at Money Creek Bluff.

3. Short-term management direction

Many of the bluff prairies will be burned in the prescribed fire planned for the spring of 2010. This burning regime will continue into the future to help maintain the valuable bluff prairies at Money Creek Bluff.

Dry Cliff
Native Plant Community: Southern Dry Cliff (CTs12a; CTs12b)

1. Description

These plant communities are commonly found on very steep south to west facing slopes and are defined as being vertical rock walls greater than ten feet in height. Only one area was mapped as dry cliff at Money Creek Bluff although smaller examples of dry cliff plant communities can be found in the bedrock bluff prairies in the project area. The cliffs tend to include several layers of exposed bedrock that formed a step pattern going up the steep slope. Some of the cliffs in the high biological area approach 120 feet in height. Vegetation tends to grow on the ledged formed between the bedrock layers and can include the State Special Concern species cliff goldenrod

(*Solidago sciaphila*), harebells (*Campanula rotundifolia*), and the State Special Concern species purple cliff-brake (*Pellaea atropurpurea*). The five documented locations of purple cliff-brake represent one quarter of all known locations statewide. There are also three known den sites for timber rattlesnakes (*Crotalus horridus*) on steep cliffs at Money Creek Bluff. FIM stands in the dry cliff plant community at Money Creek Bluff include 87RO.

2. Long-term management objective

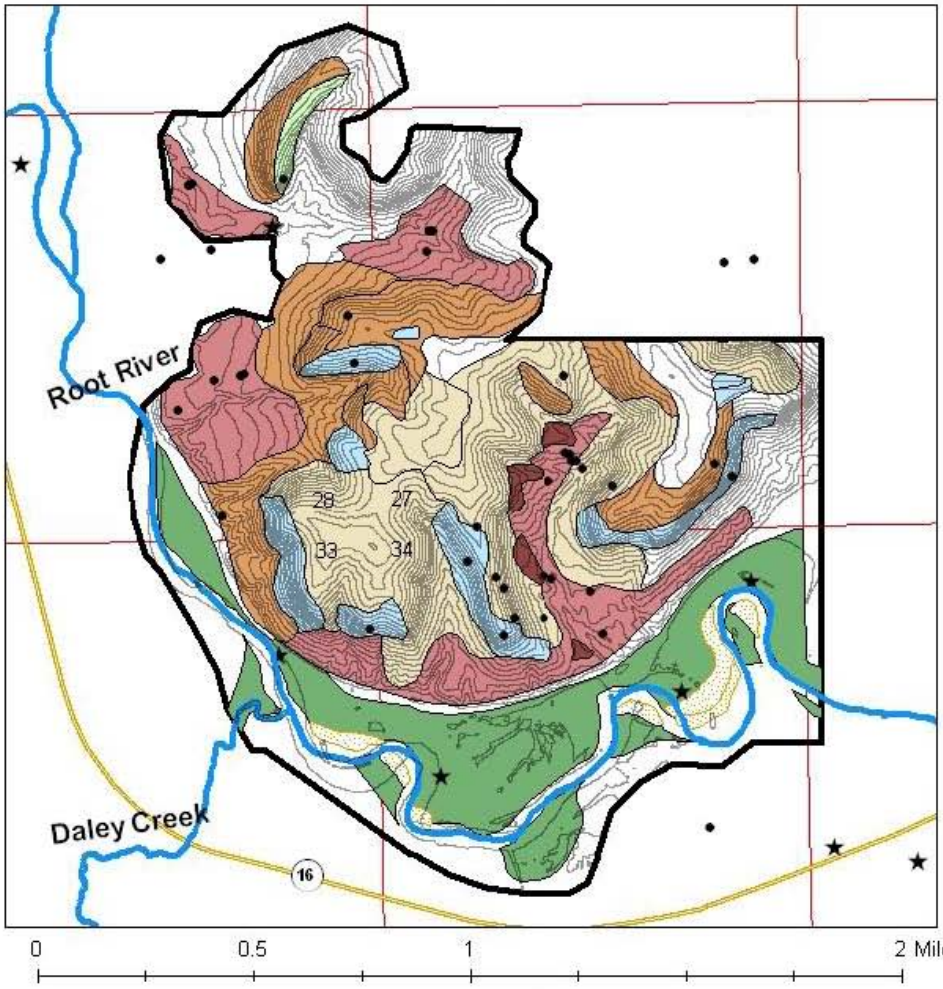
These unique plant communities will be maintained as dry cliffs.

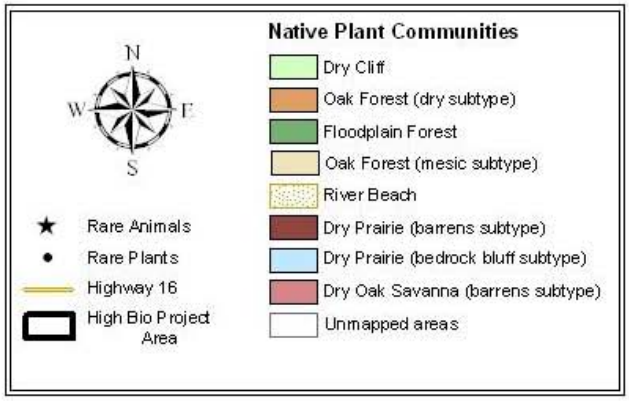
3. Short-term management direction

No management activities are planned for these communities

Appendix 1: Native Plant Communities

Money Creek Bluff, Houston County, Minnesota
T104N R07W





Minnesota
DEPARTMENT OF NATURAL RESOURCES

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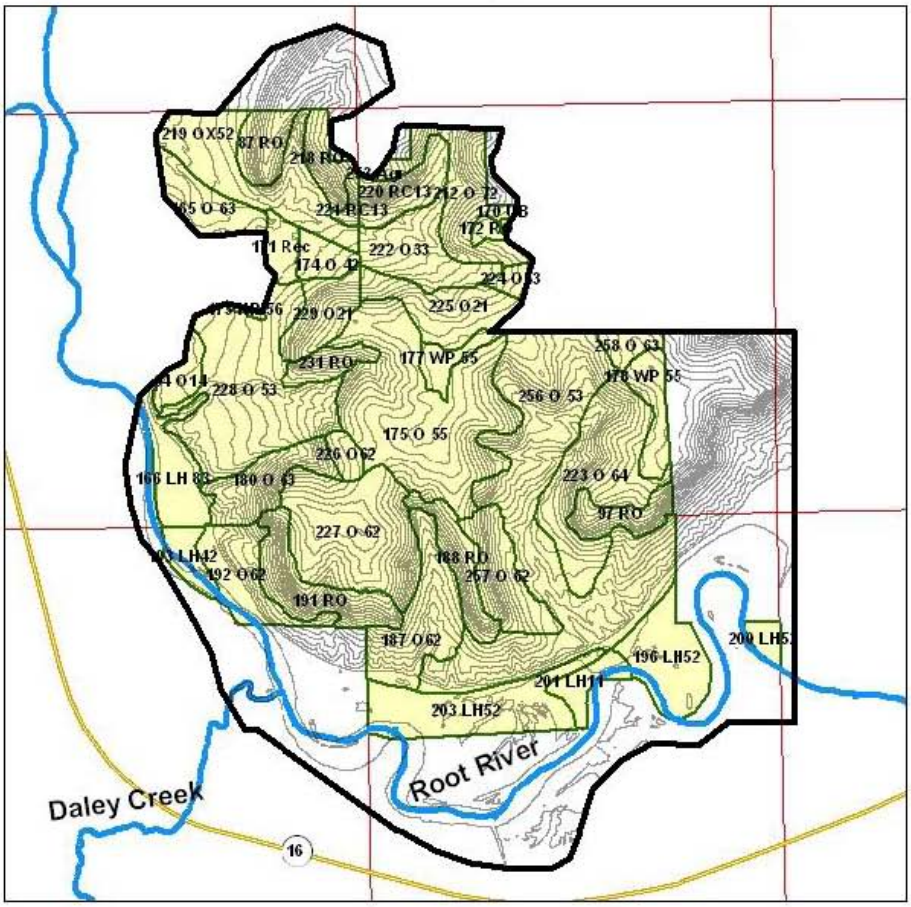
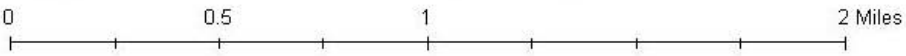
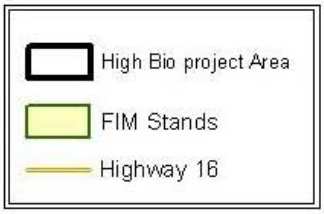
Appendix 2: State Ownership/Fim Stands

Money Creek Bluff, Houston County, Minnesota
T104N R07W







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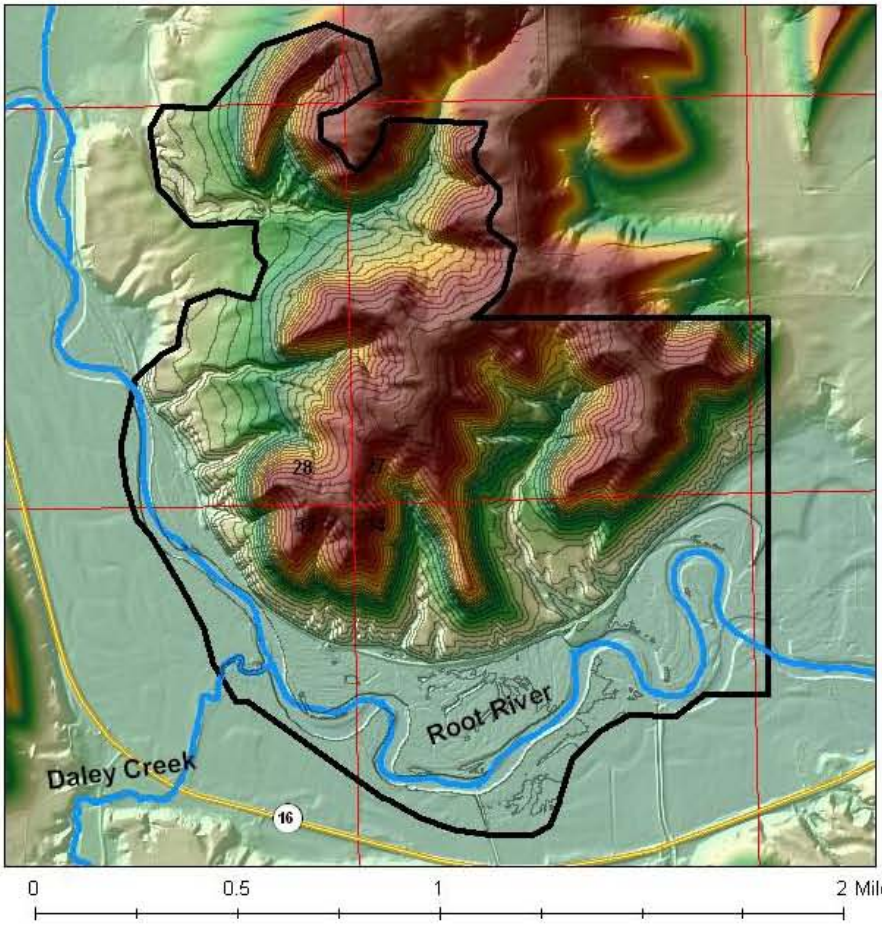
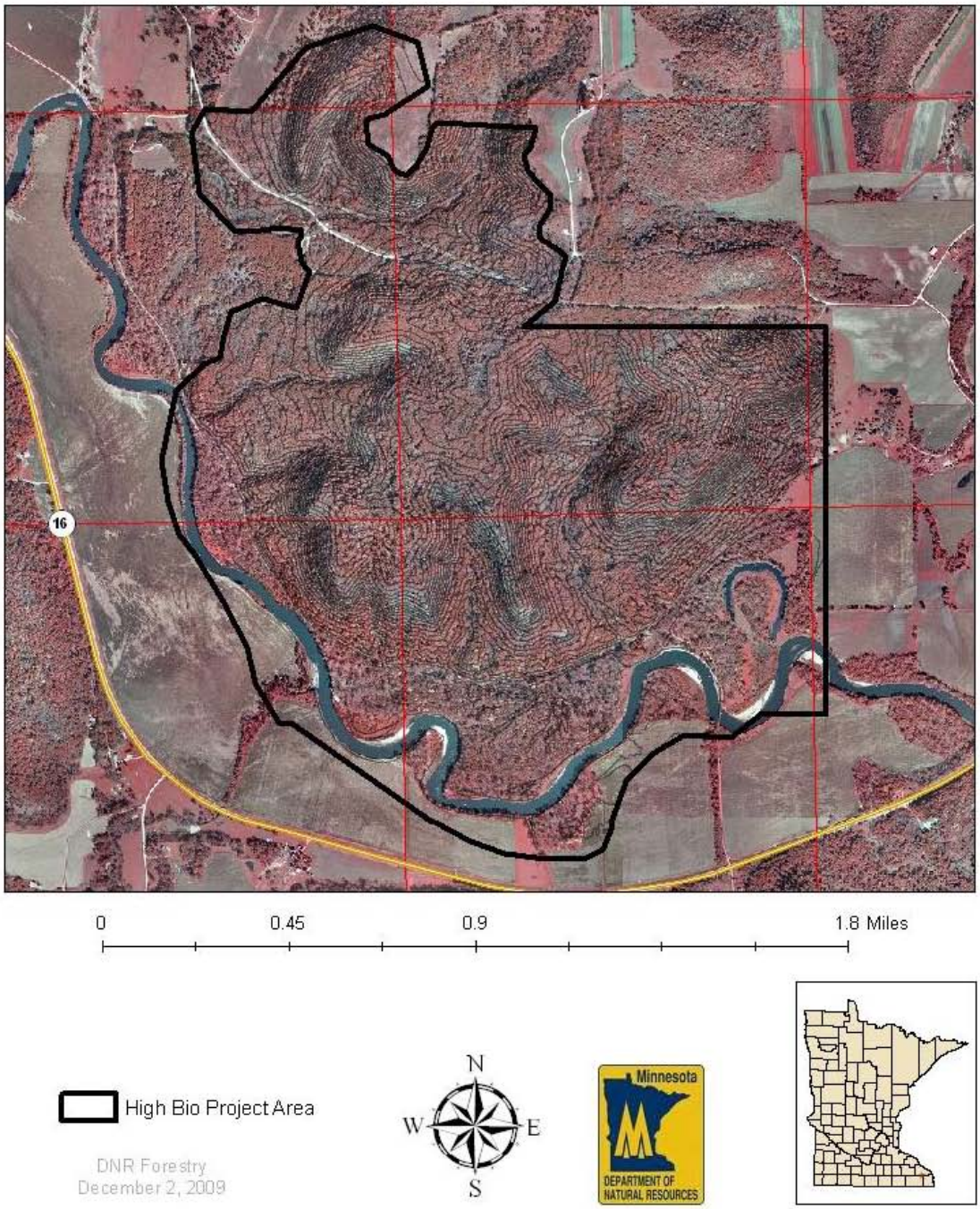
Appendix 3: Topography

Money Creek Bluff, Houston County, Minnesota
T104N R07W



Appendix 4: Aerial Photo

Money Creek Bluff, Houston County, Minnesota
T104N R07W



Appendix 5: Additional Management Guidance

Mesic oak communities and oak regeneration

The mesic oak communities should be managed. The benefits of an oak component to wildlife species, particularly game species, are important. These stand types should be individually examined, selecting those with the greatest chance to regenerate oak to actively manage through timber harvest and other silviculture techniques. Those with advanced maple-basswood regeneration should be allowed to succeed to more shade tolerant northern hardwoods. Subsection timber management plans should consider small, medium, and large-scale harvests in these types to provide habitat for game and non-game species, including forest interior birds.

A variety of types of harvests and other silvicultural practices should be practiced as well. Clear-cuts are the norm to regenerate oak in southeastern Minnesota, but efforts to apply group selection and shelterwood cuts should be applied where appropriate. Group selection creates a feathered edge effect that is far different than that created by cutting next to an open agricultural field and mimics those natural blowdowns that occurred in 1998 in the southeast. Look for opportunities to clear-cut the steeper portions of the forested type while scarifying the soil pre-sale. Shelterwood or group selection harvest should be applied on the more level terrain.

Prescribed fire should also promote oak regeneration, either prior to or after a sale in an attempt to reduce shade tolerant competition. Through the use of this tool, we may be able to reduce our pre- and post-sale chemical treatments. The highest quality biodiversity sites for recreation will receive the highest priority for prescribed fire funding. Wildlife will work with the Divisions of Ecological Resources and Forestry to ensure that these sites are regenerated through the application of fire.

Appendix 6. Areas of Significant Biodiversity in the Paleozoic Plateau

The Minnesota County Biological Survey identified 745 sites of biodiversity significance in the Paleozoic Plateau Ecological Section (Blufflands and Rochester Plateau Subsections). The breakdown of sites, their biodiversity significance rankings, and the number of sites of each ranking that contain state lands administered by various DNR divisions is summarized in the following table:

Table 1. MCBS Sites in the Paleozoic Plateau

Biodiversity Significance	**Total Number of MCBS Sites**	**Percent of Total**	**Number of MCBS Sites Containing State Lands**	**Number of MCBS Sites Containing State Forest Lands**	**Number of MCBS Sites Containing State Wildlife Lands**	**Number of MCBS Sites Containing State Park Lands**	**Number of MCBS Sites Containing SNA Lands**
Outstanding	121	16	65	40	22	8	11
High	187	25	91	51	21	8	14
Moderate	437	59	159	95	23	8	2
Total	**745**	**100**	**315**	**186**	**66**	**24**	**27**

For DNR managed state lands in Minnesota, strategies for managing sites of biodiversity significance differ according to the degree of biodiversity significance, statutory restrictions on land designations, and conservation needs of species and communities within the sites. In Scientific and Natural Areas (SNAs), management is done with rare natural features protection as the highest priority. For State Parks, comprehensive planning processes address protection of biodiversity, and in some cases SNAs or Natural Areas Registry sites are designated within park boundaries. [Natural Areas Registry sites are areas of biodiversity significance on public lands, for which a memorandum of understanding (MOU) has been signed by the agency or DNR division that manages the site and by the SNA Program supervisor. This MOU contains information about the management and protection needs of the rare features in the site.] For Wildlife Management Areas (WMAs), state statutes prohibit SNA designation within WMAs. Management is addressed as part of the Subsection Forest Resource Management Planning (SFRMP) process, and in some cases Natural Areas Registry sites are designated within WMA boundaries. For State Forests, management is addressed as part of the SFRMP process, and in some cases SNAs or Natural Areas Registry sites are designated within State Forest boundaries.

The SFRMP process for the Paleozoic Plateau addressed management of vegetation on State Forest and Wildlife lands. There were 13 “priority areas of significant biodiversity” identified during the process as areas requiring detailed plans that would address vegetation management and biodiversity protection needs. Most of these priority areas consist of more than one MCBS site, and in many cases these areas straddle more than one county.

Appendix 7: FIM Key for Money Creek Bluff

FIM cover types on maps and in the plan are identified with a code (e.g., NH57) comprised of three components:

- Main cover type code. This identifies the main type, based on predominant cover or tree species, indicated by a series of letters or abbreviations (e.g., **NH**57).
- Main cover type size class, based on predominant diameter of main species. This is the first numeric digit in the code (e.g., NH**5**7).
- Main cover type density, based on the number of stems, cords or board feet per acre. This is the second numeric digit in the code (e.g., NH5**7**).

Main Cover Type Code

Symbol	Type	Description
LH	Lowland hardwoods	Bottomland hardwoods (ash, elm , Balm of Gilead, silver maple, etc.)
O	Oak	Oak species predominating
WP	White pine	Pine, with white pine outweighing Norway and jack pine.
RC	Red cedar	A type usually found on dry sites in the south half of the state; seldom attains a large size.
OX	Offsite oak	Scrubby oak type below site index 40.
RO	Rock outcrop	Rock ridges or knobs either bare or only sparsely covered with vegetation.

Main Cover Type Size Class (Diameter)

Code	Description	Corresponding Density Units
0	Not applicable for the type	
1	0 to .9 inches	Stems per acre
2	1 to 2.9 inches	Stems per acre
3	3 to 4.9 inches	Stems per acre
4	5 to 8.9 inches	Cords per acre
5	9 to 14.9 inches	Cords per acre
6	15 to 19.9 inches	Board feet per acre
7	20 to 24.9 inches	Board feet per acre
8	25+ inches	Board feet per acre

Main Cover Type Density

Code	Stems/Acre	Cords/Acre	Bd. Ft./Acre
0	0-250	0.0-2.9	0-1,250
1	251-750	3.0-7.5	1,251-3,750
2	751-1,250	7.6-12.5	3,751-6,250
3	1,251-1,750	12.6-17.5	6,251-8,750
4	1,751-2,250	17.6-22.5	8,751-11,250
5	2,251-2,750	22.6-27.5	11,251-13,750
6	2,751-3,250	27.6-32.5	13,751-16,250
7	3,251-3,750	32.6-37.5	16,251-18,750
8	3,751-4,250	37.6-42.5	18,751-21,250
9	4,251 and up	42.6 and up	21,251 and up