

Master Plan for Trail Development in the Turtle Mountain and Pembina Gorge Areas



December 6, 2005



Prepared for

**North Dakota
Parks & Recreation Department**



Prepared by

SRF CONSULTING GROUP, INC.

in association with
Tom Crimmins

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Executive Summary

In an effort to enhance North Dakota as a recreational and cultural tourist destination in the upper Midwest, the State developed the *Master Plan for Trail Development in the Turtle Mountain and Pembina Gorge Areas*. The plan is a resource for state and local agencies who are implementing multi-use trails in the scenic Turtle Mountain and Pembina Gorge areas, which are attracting a growing number of trail users.

The Pembina Gorge and Turtle Mountain areas are developing recreational centers with a wealth of captivating natural and cultural resources. Typical users groups, such as bicyclists and snowmobilers, as well as the emerging off-highway vehicle and equestrian user groups are interested in enjoying these resources. Trail development in the region offers several significant contributions, including:

- Boosting economic development.
- Enhancing health, recreation, and quality of life.
- Preserving cultural and natural resources.
- Providing educational opportunities.
- Improving regional transportation.

During the cooperative development of this comprehensive trail plan, input was solicited from private landowners, state agencies, tribal officials, local officials, and the general public. Their contributions provided valuable information on the direction of trail development and on their concerns regarding the need for better enforcement of trail regulations and the education of existing trail users.

Descriptions of existing trail corridors, proposed regional corridors, issues facing the development of proposed projects, and opportunities for trailheads and local trails in the Turtle Mountain and Pembina Gorge areas are also presented in the plan. This information will be used to assist local and state agencies in their implementation efforts.

Trails in the Turtle Mountain region range from the large, multi-use system in Lake Metigoshe State Park to municipal trails for pedestrians and bicyclists to the multi-use system with support services in the International Peace Garden. Many opportunities for developing regional corridors exist in the Turtle Mountain region, including accommodations for off-highway vehicle users. Some specific corridors include multi-use trails from Bottineau to Lake Metigoshe State Park along the rail corridor from Rolla to St. John, and St. John to the International Peace Garden.

In the Pembina Gorge region, opportunities for non-motorized and snowmobile trail use currently exist. Of particular note, several



Wildlife Management Areas are located in this region, which offer informal hiking trails that are limited to non-motorized uses. The Pembina River also provides an opportunity for enhanced river canoeing or kayaking in North Dakota. As in the Turtle Mountain region, there are many excellent opportunities for new multi-use trails.

Successful implementation of recreational trails requires application of credible design criteria. Because a variety of state and local agencies and local trail advocates will be implementing the trail projects over time, it is important that they have a common understanding of how the trails should be designed for the wide range of user groups. By consistently basing trail design on established guidelines, user safety increases, liability is reduced, user experiences are more positive, and universal access is established.

Preliminary construction cost estimates, potential funding and implementation resources, and operation and maintenance recommendations are presented to assist the state and local agencies in allocating appropriate funds for trail developments. Several trail implementation costs are given for each trail segment to suggest a range of costs for trail development of different types or user groups. Unit prices for typical trail development elements allow implementing agencies to finetune cost estimates as project scopes become defined.

Construction costs impact phasing, funding, budgeting, and design. With a clear understanding of the costs of implementing trail segments, users of this plan can effectively address funding and budgeting issues early in the implementation process. Costs include an estimate of costs for adaptive reuse of historic bridges across county jurisdiction. This trail development plan is a substantial undertaking that will require the cooperative efforts and resources of federal, state, and local government agencies as well as local landowners and private interests. To contribute to the successful implementation of the program, the plan identifies and discusses agency coordination issues, roles, and responsibilities. One of the key concerns raised in the development of the master plan is the issue of enforcement of trail rules and regulation. Responding to this concern, the plan calls for the establishment of a dedicated enforcement presence in the Pembina Gorge area.

Ongoing maintenance, such as managing stormwater, mowing, and replacing aggregate, is critical to the success of every trail system. Trail maintenance varies depending on the site context, trail surface material, use, and natural events. Long-term operation and maintenance issues should be considered at all phases of the trail planning and development process to maximize the enjoyment and longevity of trails.



Chapter 1 – Introduction and Purpose

1.1 Introduction

“Together we are working to advance North Dakota’s tourism plan to develop nature-based tourism, multiple use trails, and outdoor recreational opportunities.”

With these words, Governor John Hoeven announced the beginning of the master planning process for the Pembina Gorge and Turtle Mountain trail development. This quote is significant as it succinctly captures three major components of the process as well as the desired outcome.

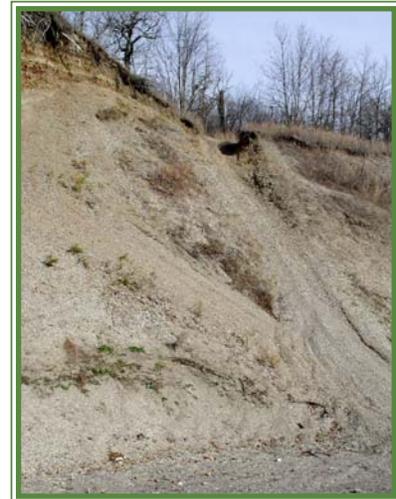
First, it calls to mind that the process is cooperative, relying heavily on the input of the private landowners, several state agencies, local officials, and the general public. The North Dakota Parks and Recreation Department recognizes the importance of landowners to state recreational opportunities and acknowledges that “recreation in the state would not be possible without their cooperation and generosity.”

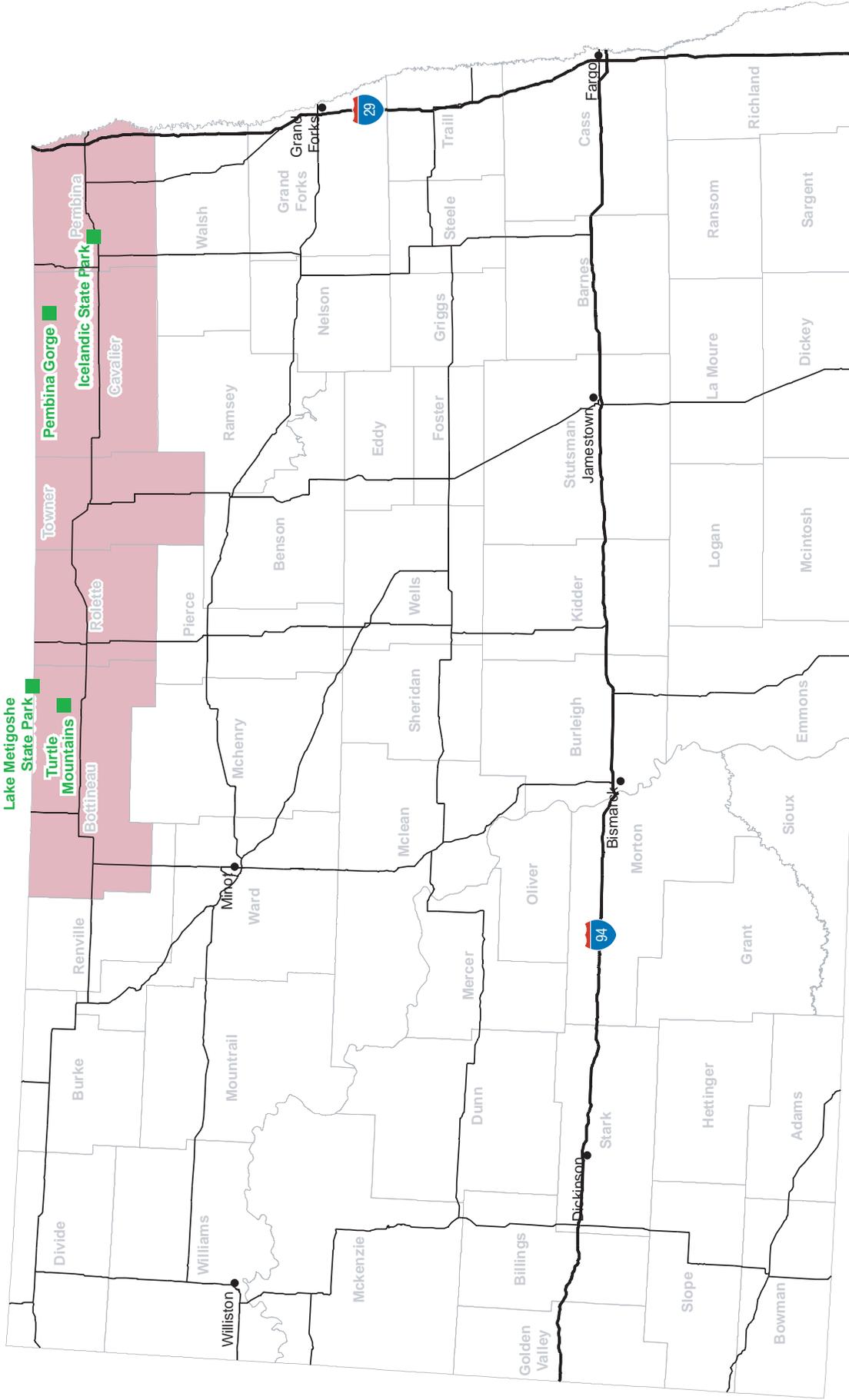
Second, it acknowledges the significant economic benefits of trail development as a component of state tourism plans. The success of the Maah Daah Hey Trail is a great example of the positive impacts that a successful trail system can have on a local economy.

Third, it recognizes that the plan is to look at multiple uses for trails. Trails take many forms, from a winding walking path to a paved multi-use trail. This master plan examines numerous trail types in developing an overall plan for future development.

This document is the culmination of many years of discussion regarding the need for a comprehensive trail plan for the Turtle Mountain and Pembina Gorge areas. These areas are developing recreational centers that attract a large number of trail users who are seeking a variety of trail experiences. There are existing trails in the areas, but growing demand for off-highway vehicles and equestrian trails along with continued demand by traditional trail users, such as bikers, hikers, cross-country skiers, and snowmobilers, supports the need for expanded trail opportunities.

The stated outcome of the trail planning process was to identify potential areas for trail development that provide for connections of existing systems and to develop an overall transportation network for the regions. Specifically, the plan reviews proposed trail routes, appropriate trail types, potential sponsoring agencies, and preliminary estimates of construction costs.





Master Plan for Trail Development

Turtle Mountain and Pembina Gorge Areas

Study Area Figure 1.1



Funding for this planning effort was provided by a Federal Transportation Enhancements award from the North Dakota Department of Transportation (NDDOT) with a local match by the North Dakota Parks and Recreation Department (NDPR). The project was administered through the NDPR with assistance from NDDOT.

1.2 Study Purpose

The purpose of this document is to provide a resource for implementing agencies that identifies multi-use trail development issues and opportunities in the Pembina Gorge and Turtle Mountain areas of North Dakota. In addition, this project was identified as a priority in the Tourism Development Plan.

In order for the plan to be successful, it must accomplish several objectives:

- Engage stakeholders.
- Inventory existing conditions.
- Provide opportunities for connectivity.
- Address the issues of developing user groups.
- Establish clear direction for regulation and enforcement.

1.3 Public Process

The involvement of the public and, in particular, of affected landowners, is an important aspect of this plan. The planning team worked closely with state and local agencies to engage various stakeholders in the process. The following is a summary of this process:

- Work on the plan began in August 2004.
- An initial on-site meeting with local park managers, economic development directors, and government officials, tribal consultation was held in November 2004.
- A second round of meetings with landowners and user group representatives was conducted in January 2005.
- The Citizen Advisory Committee (CAC) revised the preliminary plan in April 2005.
- A third round of meetings was held to present the draft plan in May 2005.
- The final revision was completed in June 2005.



Chapter 2 – Project Vision

2.1 Project Vision

The project's vision was to develop a resource document that provides local communities, state agencies, and user groups with information on multi-use (that is, hiking, bicycle, canoeing, equestrian, off-road vehicle, and snowmobile) trail opportunities, which results in enhanced experiences while also respecting the natural, cultural, and historic resources in the Pembina Gorge and Turtle Mountain areas.



2.2 Goals and Objectives

The goals and objectives of the project were to:

- Engage landowners, community leaders, government officials, and trail users in the development of this resource document.
- Develop an inventory of existing trails and a listing of potential multi-use opportunities that exist in the two areas.
- Explore opportunities for providing connectivity between the Turtle Mountain, Pembina Gorge, and Red River trail systems.
- Identify off-road vehicle corridors and special use (play) areas that are sensitive to natural, cultural, and historic resources; respect the needs of other users; and provide recreational opportunities for this relatively new class of trail users.
- Identify concerns and suggest rules and regulations to be considered for governing the use of off-road vehicles both on and off established trail systems.
- Identify next steps and the roles of various stakeholders in the implementation of the potential projects listed in the master plan.



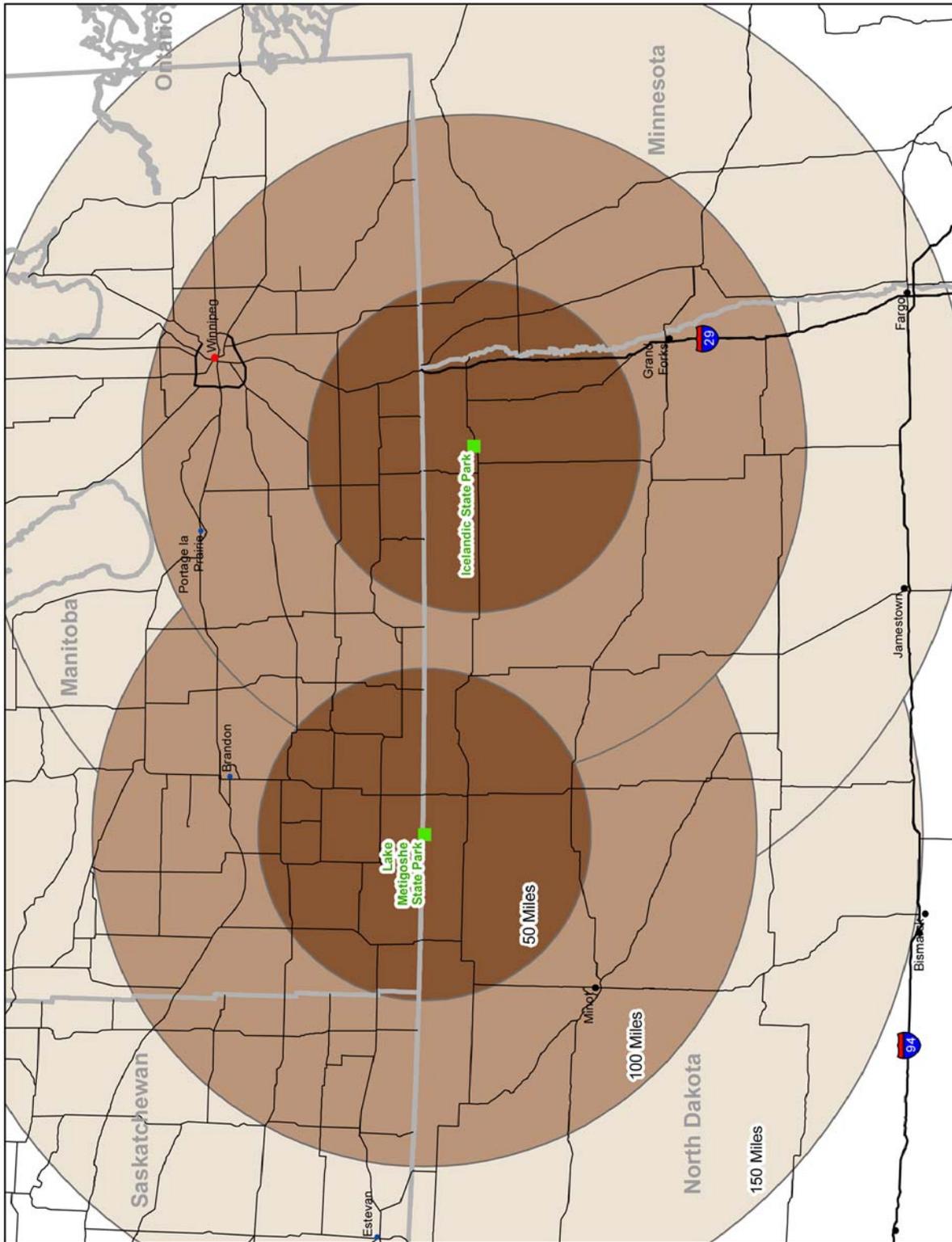
2.3 Project Need and Benefits

The State of North Dakota is seeking to establish itself as a recreational and cultural tourist destination in the upper Midwest. This effort is a response to a greater awareness of the captivating natural and cultural amenities that exist in North Dakota. The State has undertaken several planning studies to identify the needs and desires of the public, and the success of projects, such as the Maah Daah Hey Trail, have provided shining examples of the drawing power of quality recreational amenities.



Photo credit: Agency MABU/Annette Tait August 2004





Master Plan for Trail Development

Turtle Mountain and Pembina Gorge Areas

Distance to Major Cities – Figure 2.1



Project Need

The North Dakota Parks and Recreation 2003-2008 State Comprehensive Outdoor Recreation Plan (SCORP) indicates that trail use is increasing, and populations across the state have indicated that recreational opportunities are a major component of the amenities that enhance quality of life. Recreational activity is an opportunity to increase local employment and improve the local and state economy while preserving and protecting open space and natural areas.

At the local level, meetings with park managers, economic development directors, government officials, landowners, and user group representatives indicated that the priorities within the study area include:

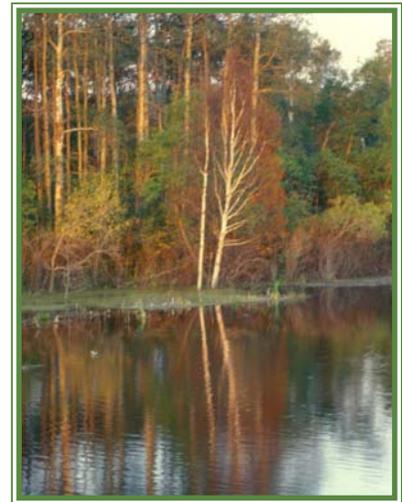
- Improving trail access and connectivity to state parks as well as local communities.
- Increasing trail management and enforcement to prevent erosion and degradation.
- Increasing designated, managed ATV riding opportunities to minimize impacts.
- Developing year-round multi-use trail facilities.

The need to increase legal ATV opportunities is based on the rising sale of ATVs, the increased demand for riding opportunities, the limited number of legal riding opportunities, and the impacts of illegal use. Increasing sales and limited opportunities create both a substantial challenge and an economic opportunity for the study area. Sales records from the Motorcycle Industry Council indicate the following:

- From 1995 and 1999, the rate of growth in ATV sales was just under 8 percent per year: in North Dakota, 1,400 ATVs were sold in 1995 and 1,800 ATVs were sold in 1999.
- From 1999 and 2003, the rate of growth was approximately 19 percent per year, with 3,590 ATVs sold in the state in 2003.

This increase in sales is consistent with trends across the country and is expected to continue.

Riding opportunities for the general public in North Dakota are extremely limited. There are few legal trails on public land and a few private commercial ventures that provide limited opportunities for intensive uses. There are also limited opportunities on private land, but they are generally not available for public use. For the average rider, there are virtually no legal opportunities available within the state.



Challenges occur as ATV use increases on both public and private lands, which increasingly subjected to abuse from unregulated ATV use. Unregulated ATV use is impacting riparian zones, wildlife habitat, and farm fields as well as other areas. At this point, not developing a trail system is possibly the worst option. However, these impacts do not have to be the result of ATV use. Many recreation areas provide a quality recreation experience and protect the environment by offering legal opportunities while actively managing ATV use.

An active management, enforcement, and education program is critical to minimizing the impacts of an ATV trail. One important aspect of this program is providing riders with information on rules and appropriate behaviors. The majority of riders will follow the rules and behavior guidelines if they have the information. However, there is a small group of ATV riders who do not follow the rules and cause damage to private and public property alike. Establishing legal riding opportunities in appropriate locations with access to pertinent information makes effective management and enforcement possible.

Benefits

The contributions of high quality recreational trails to the quality life in North Dakota and other states across the country are well documented. Some of the significant contributions offered by trails include the following:

- Economic development
- Health, recreation, and quality of life
- Preservation of cultural and natural resources
- Educational opportunities
- Transportation

Economic Development

In addition to the direct economic impacts of various trail types discussed later in this chapter, trails also contribute to the broader economic development of the communities that they serve. The local economies of the Turtle Mountain and Pembina Gorge areas significantly depend on tourism. The development of support businesses, such as bike shops and guide services, contributes new dollars to the local economy, while the increase in the overall number of visitors enhances the profitability of existing restaurant and lodging businesses.

“If you give ATVers a place to ride, they will use it, and they will have fun. If you don’t provide a place to ride, they will still have fun.” The implication is that ATV users will always find a place to ride, whether it is regulated or not.

***– Tom Crimmins,
Trail Consultant***



Health, Recreation, and Quality of Life

The effects of the American public's trend toward a more sedentary lifestyle is a growing issue. News reports of an increasingly obese and inactive population are commonplace. Trails provide a means to reverse these trends by providing opportunities for an inviting and enjoyable recreational experience. Coincidentally, that same quality recreational experience is seen as an amenity by property developers and home or recreational property buyers. Recreational trails are specifically mentioned in the 2003-2008 SCORP as a draw for former and potential residents.

Preservation of Cultural and Natural Resources

One of the common concerns expressed by state agencies, landowners, and the general public is the impact of unmanaged recreation on sensitive natural and cultural environments. The Pembina Gorge and Turtle Mountain regions both provide a wealth of these resources. By developing trail systems that respect noteworthy amenities, the State will provide access while preserving the integrity of sites for future generations.

Educational Opportunities

The key to the long-term preservation of amenities is education. The public needs to be made aware of the significance of the cultural and natural resources that are such an important part of the heritage of North Dakota. Trails provide a means to view features – floral, faunal, geologic, archeological, or cultural – that may otherwise be inaccessible and, therefore, unknown to the general public.

Transportation

A well connected system of trails also provides an alternative transportation option. Residents and tourists would be able to commute or travel between communities as well as to area parks or other recreational areas on foot or horseback or by snowmobile, ATV, and bicycle.

2.4 Economic Impacts of Trails

Recreation activities provide a significant source of revenue for the State, primarily in the form of tourism dollars. As reported by the North Dakota Department of Commerce, Tourism Division, tourism is the state's fastest-growing industry, generating more than \$3 billion in 2002.



ATV Trails

ATV trails provide economic opportunities from increased visitation and in the potential benefit to private investors. A system or systems of quality ATV trails in the study area is anticipated to draw riders from many areas in North Dakota but could also attract riders from Minnesota and other Midwestern states and provinces. By increasing visits to the study area, “new” money would enhance the region's economy.

Studies have shown that the economic impact of ATV use can be quite substantial, particularly for small rural communities. In 2003, the Department of Urban and Regional Planning of the University of Wisconsin-Madison conducted an economic survey in Wisconsin. The goal of the survey was to develop an economic and demographic profile of Wisconsin's ATV users. The survey showed that Wisconsin ATV riders spent an average of \$163.27 per day. These expenditures were broken down as shown in Table 2.1.

Table 2.1 – Economic and Demographic Profile of Wisconsin ATV Users

Type	Expenditure
Lodging	22.5 %
Food and Beverage	16.4 %
Gas/Transportation	15.7 %
Shopping	13.6 %
Other	10.4 %
Entertainment	7.9 %
Gaming	7.3 %
Convenience Store	5.7 %

As noted previously, there are limited legal ATV riding opportunities in North Dakota. Because of this limitation, communities in the region are unable to promote ATV recreation. By designating legal trails, ATV use in the area can be promoted while appropriate use can be maintained through active management and enforcement.

Even though it is not feasible to have completely interconnected ATV trails in the study area, the presence of several smaller systems within a small geographic region would increase the attractiveness of the area to



ATV riders. Because of the limited types of recreational opportunities available in the region, it would be expected that improving ATV trails would attract North Dakota residents. However, a region with a variety of recreational opportunities would also be more attractive to visitors from other states or perhaps other countries.

Snowmobile Trails

The International Snowmobile Manufacturing Association reports on their website (www.snowmobile.org) that an average snowmobiler spends \$88.30 per day while snowmobiling. These expenditures are shown in Table 2.2.

Table 2.2 – Average Daily Expenditures of Snowmobilers

Type	Expenditure
Meals	23.6 %
Accommodations	19.4 %
Retail Stores	13.7 %
Food Stores	7.1 %
Recreational Activities	8.2 %
Ground Transportation	7.7 %
Services and Other	20.3 %

The study area has well established snowmobile trails that contribute to the economy of the region and state by generating recreation tourism dollars.

Bicycle Trails

According to various reports on the economic impacts of bicycle tourism completed for the Adirondack North Country, Northern Wisconsin, Maine, and other locations, out-of-state users of bicycle trails spend an average of \$58.17 dollars a day.



Table 2.3 – Average Daily Expenditures of Bicycle Trail Users

Type	Expenditure
Meals	31.0 %
Accommodations	31.0 %
Retail Stores	28.0 %
Ground Transportation	7.7 %
Services and Other	20.3 %

Other Recreation Activities

The U.S. Fish and Wildlife Service determined that \$4.0 billion was spent in 1980 for the nonconsumptive enjoyment of wildlife (Shaw and Mangun, 1984). Additionally, according to Texas Water Matters (a collaboration of the National Wildlife Foundation, Environmental Defense, and Lone Star Chapter of the Sierra Club), bird watching, fishing, shrimping, sightseeing, and wildlife cruises attract thousands of tourists and contribute \$2 to \$4 billion to the local and Texas economy annually.

2.5 Consistency with Previous Planning

The development of the *Master Plan for Trail Development in the Turtle Mountains and Pembina Gorge Areas* is an outgrowth of several previous planning studies by the State of North Dakota and others. These plans include the:

- *2003-2008 State Comprehensive Outdoor Recreation Plan (SCORP)*
- *ATV Utilization in North Dakota (Strategic Plan 2003-2006)*
- *Tourism Development Plan for North Dakota Recreational, Cultural and Historic Attractions*
- *Snowmobile North Dakota*
- *Nature Tourism Master Plan: Turtle Mountain and Rendezvous Region of North Dakota*
- *ATV Survey Results Market Research Study*
- Local planning initiatives



2003-2008 State Comprehensive Outdoor Recreation Plan

Trails and trail development were identified as the number one priority for recreational development in the North Dakota Parks and Recreation 2003-2008 State Comprehensive Outdoor Recreation Plan (SCORP). The report breaks the state into regions for planning purposes. The Turtle Mountain and Pembina Gorge areas are located in Planning Regions Two, Three and Four respectively. Within these regions, trails development ranks second in Regions Two and Three and third in Region Four. Water access, public use areas, and open space parks also receive high priority in the plan.

ATV Utilization in North Dakota (Strategic Plan 2003-2006)

Prepared by the NDPRD, this report identifies four strategic objectives for establishing a solid foundation for off-highway vehicle development in North Dakota. The strategic plan includes the following objectives:

- Establish an organizational structure.
- Promote the development of designated ATV use areas and supporting facilities.
- Enhance safety education and enforcement.
- Expand public affairs efforts.

Specific goals associated with these objectives include creating criteria for trail design, use, and development; initiation of ATV use area projects; determining responsibilities for enforcement; and working to promote ATV use in North Dakota through the Office of Tourism.

Tourism Development Plan for Recreational, Cultural, and Historic Attractions

Prepared cooperatively by the North Dakota State Historical Society, Parks and Recreation Department, and Tourism Division Planning Team, this report provides a compilation of tourism-related activities statewide in an effort to provide better coordination of planning efforts. A significant number of the projects discussed in the report are recreational in nature. Some of the highlighted projects are nature and off-highway vehicle trail planning efforts, ATV research efforts, and specifically a trail master plan for the Turtle Mountain and Pembina Gorge areas.



Snowmobile North Dakota: Market Research Study

Prepared by Marketing and Advertising Business Unlimited for *Snowmobile North Dakota*, this report summarizes the findings of a survey of North Dakota snowmobilers, covering topics from the amount of snow to registration fees. This study indicates that there is a relatively low awareness of trails in general but that there is a high awareness of trails in the Pembina Gorge and Turtle Mountain areas. In addition, they study reported that the Peace Garden Trail is the most used trail in the State. When asked about satisfaction with trails, respondents indicated that trails shared with ATVs rank poorly.

Nature Tourism Master Plan: Turtle Mountain and Rendezvous Regions of North Dakota

Prepared by FERMATA for the Turtle Mountain Tourism Association and Walhalla Chamber of Commerce, this plan addresses the economic challenges facing the Turtle Mountain and Rendezvous regions by promoting the areas as nature tourism destinations.

ATV Survey Results: Market Research Study

Conducted by Marketing and Advertising Business Unlimited for the NDPRD, this market research study is similar to the study completed for *Snowmobile North Dakota*. One of the issues raised by the study was a neutral or dissatisfactory feeling regarding the opportunities for ATV use in the state. Awareness of existing trails, creation of new trails, and user safety are some of the concerns raised by respondents.



References

2003-2008 State Comprehensive Outdoor Recreation Plan (SCORP)

ATV Utilization in North Dakota (Strategic Plan 2003-2006)

North Dakota State Historical Society, Parks and Recreation Department and Tourism Division Planning Team, *North Dakota Tourism Development Plan for North Dakota Recreational, Cultural and Historic Attractions*, 2004.

“The Economic and Social Benefits of Off-Road Bicycle and Pedestrian Facilities” a summary found on the International Mountain Biking Association website:
www.imba.com/resources/science/econsoc_benefits.html

“Bicycle Tourism in Maine” a summary found at the Maine Department of Transportation website:
<http://mainegovimages.informe.org/mdot/opt/pdf/biketourismexecsumm.pdf>

“Mountain Biking in the Chequamegon Area of Northern Wisconsin and Implications for Regional Development” summary found on the Chequamegon Area Mountain Bike Association website:
www.cambatrails.org/reports/regional_development.html



Chapter 3 – Trail Development Plans

This chapter describes the conditions of existing trail corridors, proposed regional corridors, issues, and opportunities for trailheads and local trails in the Turtle Mountain and Pembina Gorge areas. The intent of this chapter is to identify potential projects in the study area and provide direction to local and state implementation efforts.

3.1 Turtle Mountain Region

This section discusses the existing conditions of trail corridors in the Turtle Mountain region, proposed regional corridors, and opportunities for trailheads and local trails.

3.1.1 Conditions of Existing Trail Corridors

The conditions of existing trail corridors in the Turtle Mountain area are described on the following pages. See Figure 3.1 for the location of the trail corridors in the project area.

Lake Metigoshe Trail

The existing multi-use trail loop around Lake Metigoshe consists of a paved asphalt trail that is approximately six miles long and eight feet wide. The trail occurs within the road right-of-way along the east and north sides of the lake and on an independent trail alignment on the west and south sides of the lake. A current gap in the trail, located in the southwest quadrant of the system, is expected to be completed in 2006.

Lake Metigoshe State Park Trails

Lake Metigoshe State Park is one of the largest of North Dakota's state parks and has a wide variety of trails and other recreational amenities. The trail system consists of a variety of looped multi-use trails with varying degrees of difficulty. In the winter, the trail system provides 11 miles of groomed cross-country trails for use by park patrons. State snowmobile trails also cross through the park. Among the trails in the system is the Old Oak Trail, which is the state's first National Recreational Trail. This trail is 2.4 miles long and provides access to some of the most intriguing natural features in the park.

State Forest Service Trails

The region's two state forests, Turtle Mountain State Forest (7,814 acres) and Homen State Forest (4,184 acres), comprise nearly 12,000 acres of land, which makes the Forest Service the largest state agency landholder in the area. The State Forest includes more than 20 miles of maintained trails and primitive camping at several locations, including the Strawberry Lake and Twisted Oaks campgrounds. Trails are available for hiking, biking, cross-country skiing, snowmobiling, and equestrian uses. ATV use is not currently



allowed on State Forest land. An equestrian campground presently exists at the Strawberry Lake Recreation Area, but this facility will move to Twisted Oaks Campground in 2005.

Game and Fish Trails

The North Dakota Department of Game and Fish (NDGF) is another significant landowner in the region. The largest holding of the NDGF is the Wakopa Wildlife Management Area (WMA), comprising 6,800 acres of primarily aspen forest in northeastern Rolette County. The mixture of lakes, wetlands, grassland, and forest provide excellent habitat for a wide variety of wildlife. The Wakopa WMA provides public access to 14.5 miles of signed nature trails, including canoe trails. These trails are limited to non-motorized uses and are primarily used to provide access during hunting seasons.



Municipal Trails

In addition to the number of recreational trails in the area, numerous communities have trails within their municipal boundaries. The City of Bottineau has an existing walking and biking trail along County Highway 5 at the west edge of town. The community of Dunseith also has a trail along County Highway 5, on the north side from the intersection with County Highway 3 to the government housing east of town.



In Belcourt, trails connect the Indian Heritage Center and the Turtle Mountain Community College to the City Center. In general, these trails are paved asphalt trails, which are suitable for multiple uses.

The community of St. John does not currently have a trail system, but the town is a hub of trail related activity. St. John has an active equestrian group and hosts large trail riding event on an annual basis. The community has also taken a lead in acquiring the abandoned rail corridor along County Highway 30 for trail development.

International Peace Garden

Originally constructed by the Civilian Conservation Corps (CCC), the International Peace Garden is one of the major attractions in the Turtle Mountain region and an obvious destination for any trail system. More than 150,000 visitors visit this 2,300-acre site on the Canadian border annually. In addition to the gardens and other attractions on the grounds, the International Peace Garden has significant hiking, biking, and cross-country ski trail systems as well as support services for equestrian trail users. Camping, bicycle rental, a café, and picnic areas are also available on the grounds. Off-highway vehicles are not allowed. Annual athletic, music, and equestrian camps are held on-site each summer with permanent facilities located in the southern third of the site.



3.1.2 Proposed Regional Corridors

Several regional trail corridors are proposed within the Turtle Mountain region to provide linkage between existing trails and connections to destinations:

Bottineau to Lake Metigoshe

There are two potential routes for a trail corridor connection from the City of Bottineau to the Lake Metigoshe area (Figure 3.2). This corridor is envisioned as a multi-use corridor with a paved trail surface for bicycle, pedestrian, and other non-motorized uses. Motorized use could occur on an adjacent trail as long as appropriate separation is provided between the uses. Both routes would proceed west along County Highway 43 from the southwest terminus of the existing Lake Metigoshe trail loop.

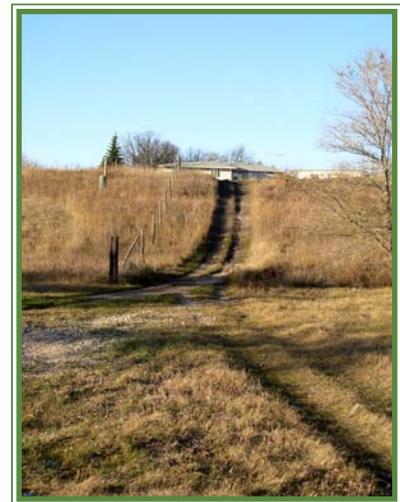


The first route would turn to the south at Lake Road and follow the roadway to the east side of Bottineau. This route would provide interesting scenery and a more curvilinear alignment. However, because of the curvilinear alignment and the rolling terrain, construction may be challenging.



The second route would continue further to the west along County Highway 43 and then turn south at Town Line Road and proceed south to the north side of Bottineau. This road provides a relatively straight alignment with a wide right-of-way. It appears that when the roadway was constructed or reconstructed that a “bench” to accommodate a trail was graded in along the east side of the roadway. This route would provide potential access to the Thunder Mountain Speedway and a large tract of NDFS land located along Town Line Road.

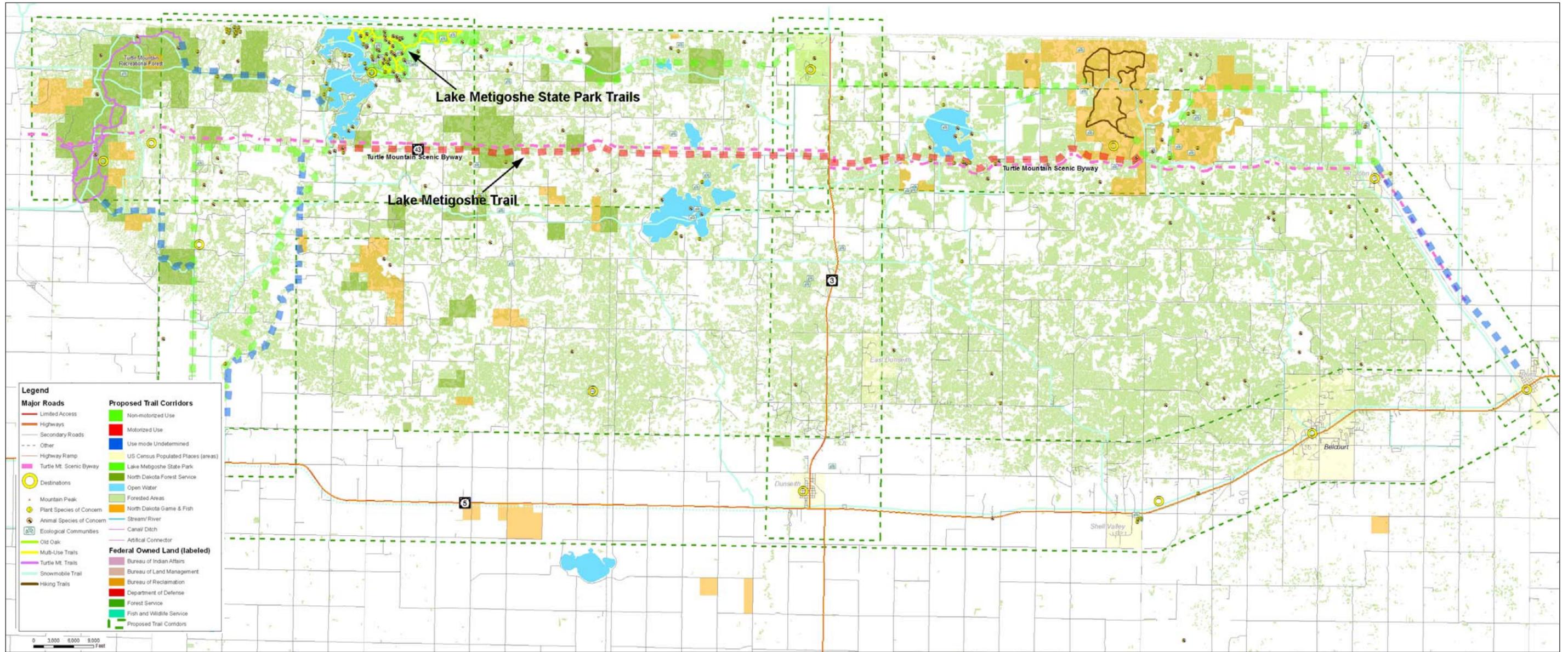
A third route, that may be considered as a hiking trail only, would be a trail along Oak Creek. Discussions with landowners have suggested that there may be public property immediately adjacent to the creek that is available for trail use. If public property does not exist, the development of the route would be challenging as almost the entire corridor is in private ownership.

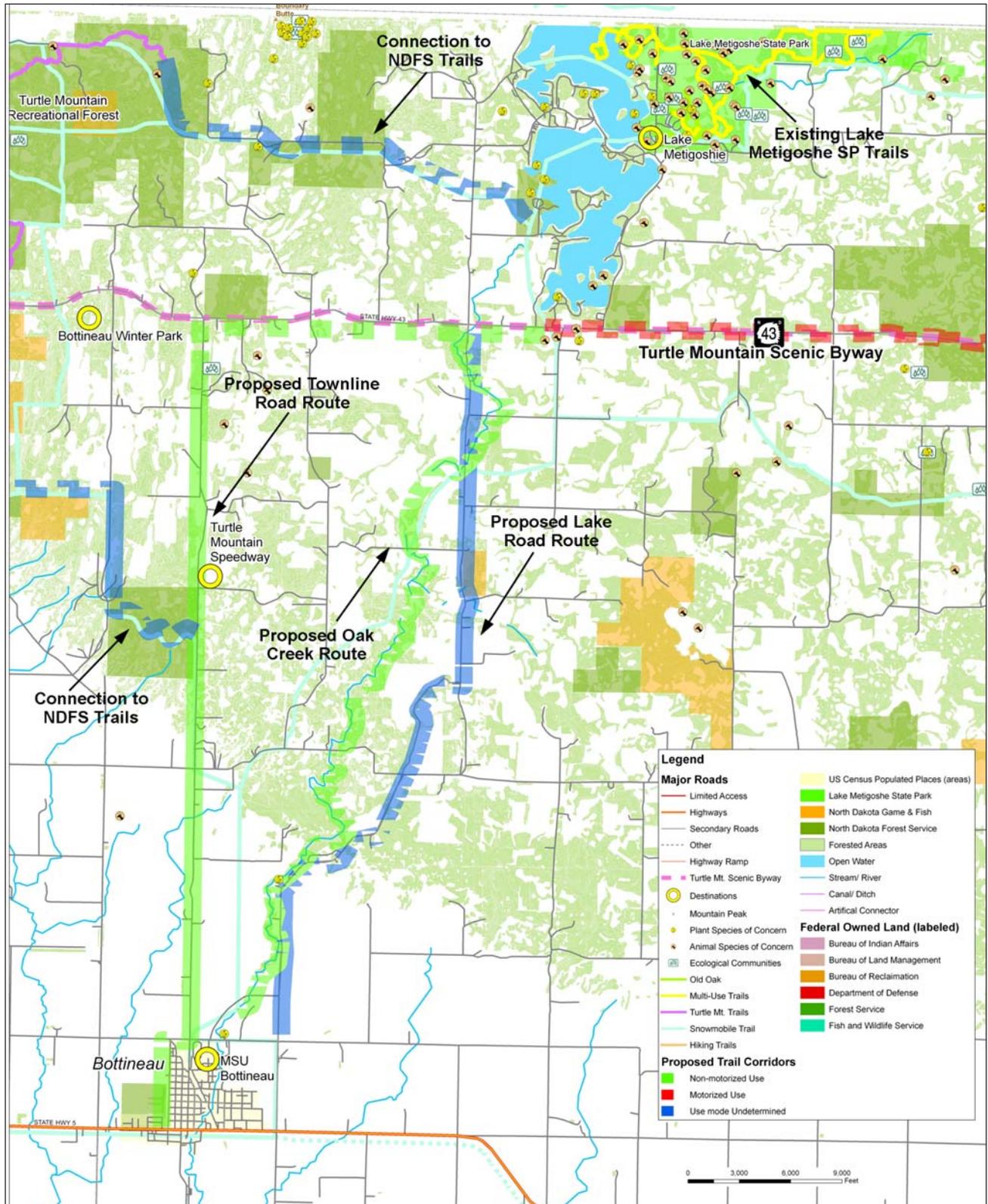


Additional trail connections to be made along this corridor include links to the NDFS lands west of Bottineau and Lake Metigoshe. At the south end of the Turtle Mountain Recreational Forest, a trail connection could be made to proposed Town Line Road corridor trail approximately at the location of the Thunder Mountain Speedway. The connection could occur along the existing snowmobile trail corridor with minimal need for acquisitions or easements of private properties.

A linkage using the existing snowmobile trail at the north end of the Turtle Mountain Recreational Forest would provide a connection to

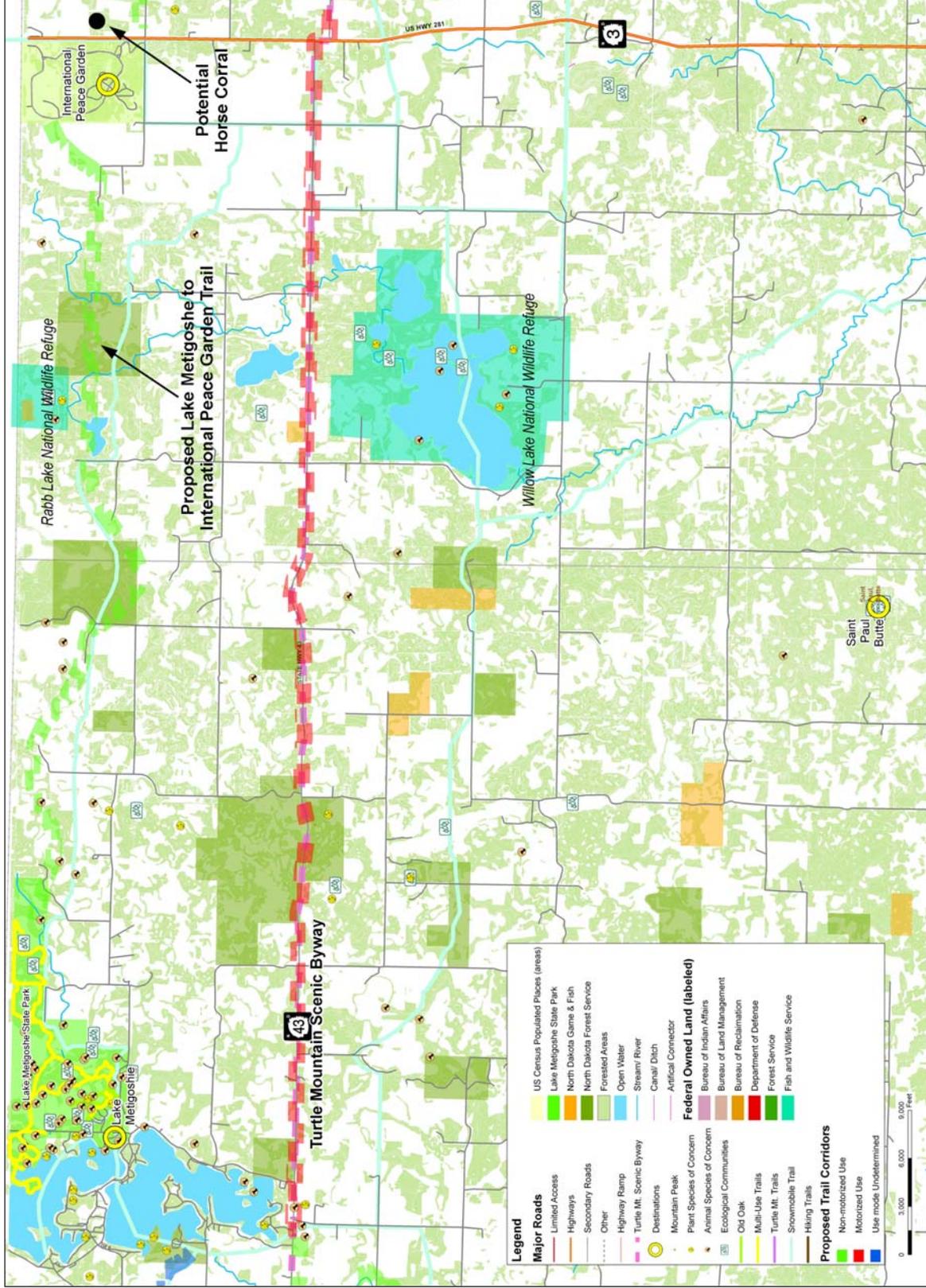






Lake Metigoshe to Bottineau – Figure 3.2





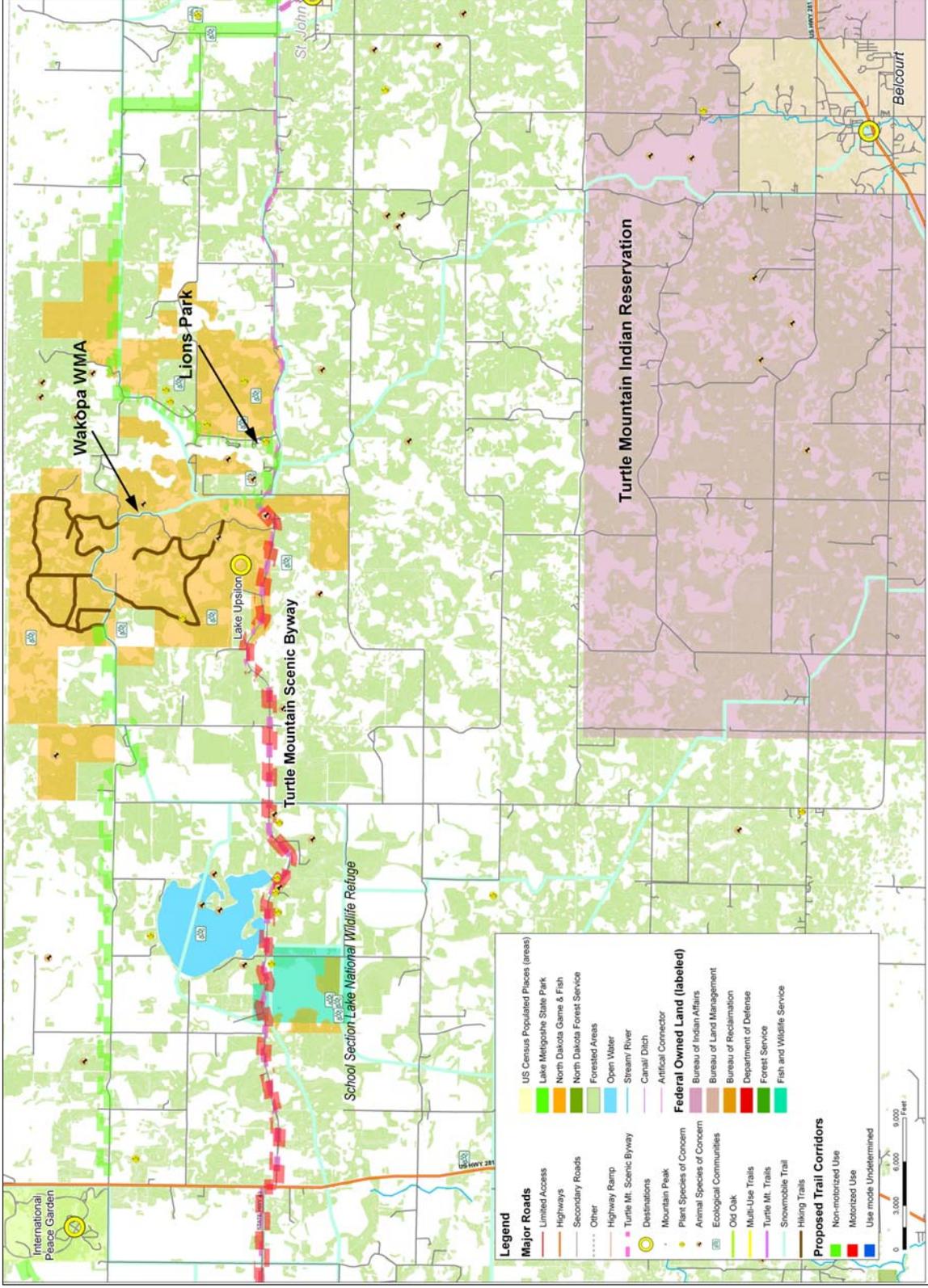
Lake Metigoshe to International Peace Garden Corridor – Figure 3.3



Master Plan for Trail Development

Turtle Mountain and Pembina Gorge Areas





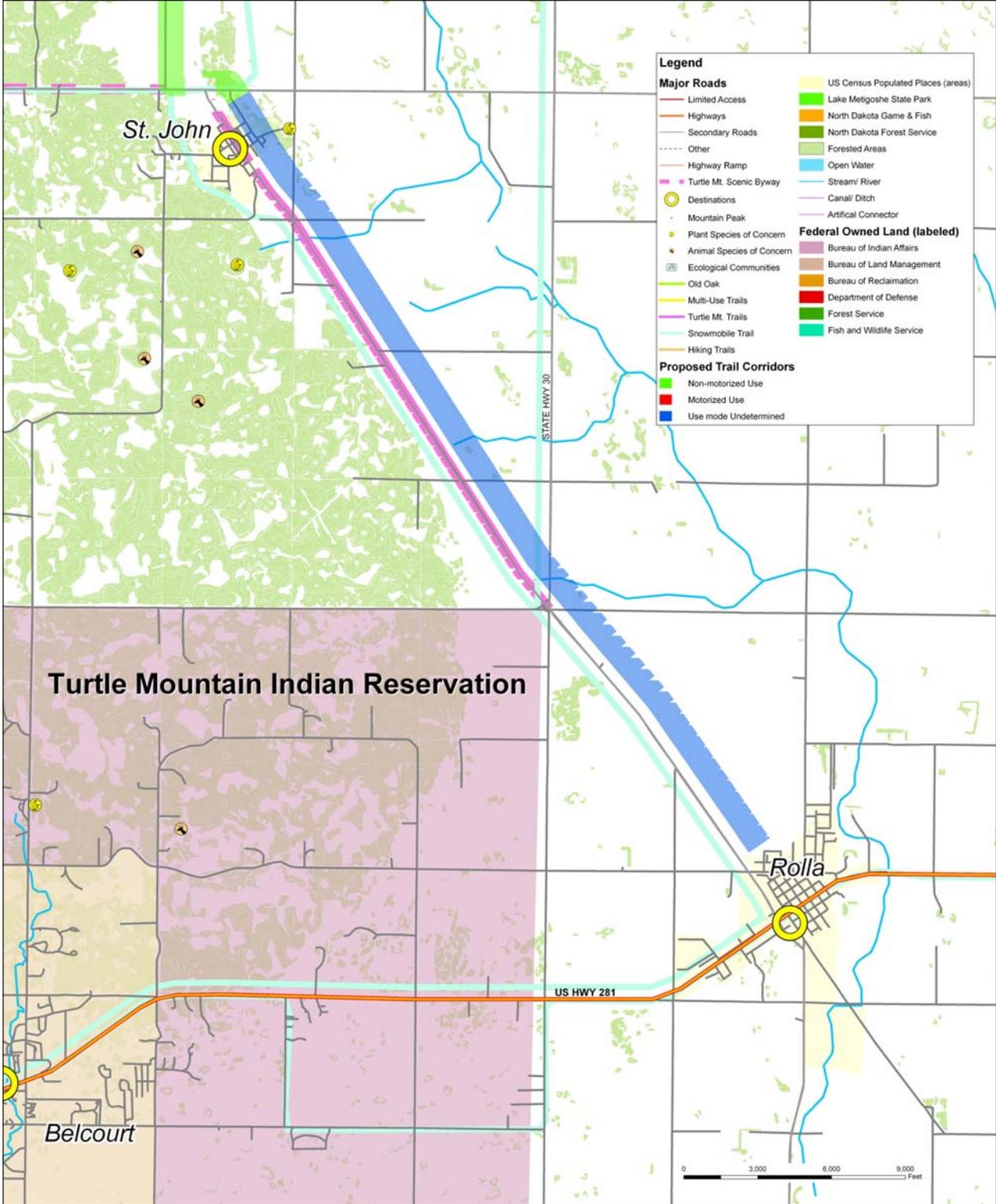
International Peace Garden to St. John – Figure 3.4



Master Plan for Trail Development

Turtle Mountain and Pembina Gorge Areas





St. John to Rolla – Figure 3.5



Lake Metigoshe State Park. This linkage would also create a loop system connecting Bottineau, the State Forest, and Lake Metigoshe State Park.

Lake Metigoshe State Park to International Peace Garden

Discussion of a hiking trail between Lake Metigoshe State Park and the International Peace Garden (Figure 3.3) has been discussed for almost 20 years. This corridor would be located primarily on private property. A multi-use trail could be developed for hikers, mountain bikers, and equestrians. The trail would extend east from the existing Lake Metigoshe State Park trails along the Canadian border through private and NDFS land to the International Peace Garden. Efforts by private parties to develop a hiking trail in the 1980s indicated that there was a commitment by a number of affected land owners at that time to support trail development on their property.

International Peace Garden to St. John

A second border area trail would provide a multi-use trail between the International Peace Garden, the Wakopa Wildlife Management Area (WMA), and the City of St. John (Figure 3.4). From the International Peace Garden, the trail would head east through private property or along township roads to the Wakopa WMA. Within the WMA, the trail would follow existing trails and roadways, continuing to the east and south around Lake Upsilon. The Lion's Park under development on the east side of Lake Upsilon could provide a trailhead. From Wakopa WMA, the trail would continue east along existing road right-of-way and section line roads to St. Cloud Park, then south on road right-of-way to the north side of County Highway 43. The trail would cross 43 at Main Street to connect to the rails to trails trail to Rolla right-of-way to the community of St. John. This trail corridor could provide a variety of trail experiences from paved trails within the County Highway 43 right-of-way to single track trails through Wakopa WMA.

St. John to Rolla

Currently, most viable trail opportunity is the development of a trail between St. John and Rolla (Figure 3.5). A multi-use trail from the City of St. John to the City of Rolla would logically be located along the abandoned railroad right-of-way acquired by the City of St. John. This former railroad grade is located along the east side of County Highway 30. The availability of right-of-way and a relatively flat grade make implementation of this proposed segment of trail relatively straight forward.



3.1.3 Trailhead and Local Trail Opportunities

Trailheads provide the jumping off points for accessing the proposed trail corridors, while local trail systems provide destinations with unique trail experiences. Several opportunities for trailheads and local trails exist in the Turtle Mountain region.

Lions Park

Located on the east side of Lake Upsilon in the Wakopa WMA, Lions Park (Figure 3.4) is envisioned as a local recreational resource for the City of St. John and Rolette County. The master plan for the park includes a swimming beach, camping, picnicking, and other amenities. The availability of parking, restrooms, and camping with close proximity to the proposed International Peace Garden/St. John corridor makes Lions Park a logical choice for a trailhead area.



Bottineau Winter Park

With eight lighted ski runs and a tubing slope all serviced by snowmaking equipment, Bottineau Winter Park (Figure 3.2) is a popular winter destination in the region. Because of the available parking and support facilities, the park is also used as a trailhead for other activities, such as snowmobiling and equestrian events. By developing mountain biking trails for use in the summer months, operations could be expanded to year-round use.



Lake Metigoshe State Park

Lake Metigoshe State Park (Figures 3.2 and 3.5) provides a variety of local trail opportunities, including cross-country, hiking, and biking trails. The park also provides access to the existing Lake Metigoshe loop trail. The park's existing amenities, such as camping, lodging, and parking, make this a logical trailhead for a wide variety of non-motorized trail users.



City of St. John

The City of St. John (Figures 3.4 and 3.5) could also serve as a good trailhead for equestrian events and access to the proposed multi-use trails along Highways 30 and 43. The City has an equestrian center that provides necessary amenities for that user group and serves as a local destination.

St. Claude Park

Located northwest of St. John, St. Claude Park (Figure 3.4) is a 40-acre property that is an opportunity for a trailhead for non-motorized trail users. This property is currently public ownership.



International Peace Garden

The International Peace Garden (Figures 3.3 and 3.4) already provides a number of trailhead facilities for a variety of non-motorized trail users. Specifically, barns and stables exist for use by equestrian groups, while camping, lodging, parking, concessions, and a café are available for all user groups.

Strawberry Lake and Twisted Oaks Camp Areas (Turtle Mountain State Forest)

Currently the Strawberry Lake (Figure 2) camp area provides the primary equestrian trailhead opportunity in the Turtle Mountain area. The equestrian camping facilities will be moved to the Twisted Oaks camp area in 2005 to provide more parking at a more sustainable site. Amenities will include drinking water, toilets, and camping opportunities in addition to equestrian amenities.



Turtle Mountain Speedway / OHV Park

The Turtle Mountain Speedway (Figure 3.2) could provide an opportunity for a private ATV park operation. The location of the speedway along the ridgeline of the Turtle Mountains provides access to varied topography that is well suited to developing an OHV park. Ideally, this would be a 300+ acre site with 10 to 15 miles of looping trails. Trail design should follow the guidelines in Chapter 4 to ensure that the site is sustainable. If property is not available immediately adjacent to the speedway, alternative sites along the ridgeline with access to the proposed Bottineau to Lake Metigoshe corridors should be considered.



St. John ATV Park

Located on the east side of St. John (Figure 3.5), a 20-acre parcel is available for potential development of an OHV park. The location provides access to the trail system along County Highway 43 right-of-way that could make a connection to Thunder Mountain Speedway.



3.2 Pembina Gorge Region

This section discusses the conditions of existing trail corridors in the Pembina Gorge region, proposed regional corridors, and opportunities for trailheads and local trails. The overall image of the project area shown in Figure 3.6 highlights the location of the corridors.

3.2.1 Conditions of Existing Trail Corridors

The conditions of existing trail corridors in the Pembina Gorge region are described on the following pages.

Icelandic State Park

The 912-acre Icelandic State Park is located on the shores of Lake Renwick, five miles west of Cavalier on County Highway 5. Icelandic State Park has 3.9 miles of trails based out of the Heritage Center, which can be used for non-motorized uses, such as cross-country ski trails. These trails include the Basswood and Old Settlers trails along with other hiking trails. A paved multi-use trail along County Highway 5 connects the park to the community of Cavalier.

Tetrault Woods State Forest

Tetrault Woods State Forest consists of 432 acres of land just to the south of the City of Walhalla along the Pembina River. Hiking trails in the State Forest are primarily located on the south side of the Pembina River Gorge (access is from State Highway 32). Small segments of trail and overlooks are on the north side of the gorge (access is from County Highway 55). Comments from local residents indicate that the condition of the trails within the State Forest is poor, with some segments where the trail has been washed out.

Wildlife Management Areas

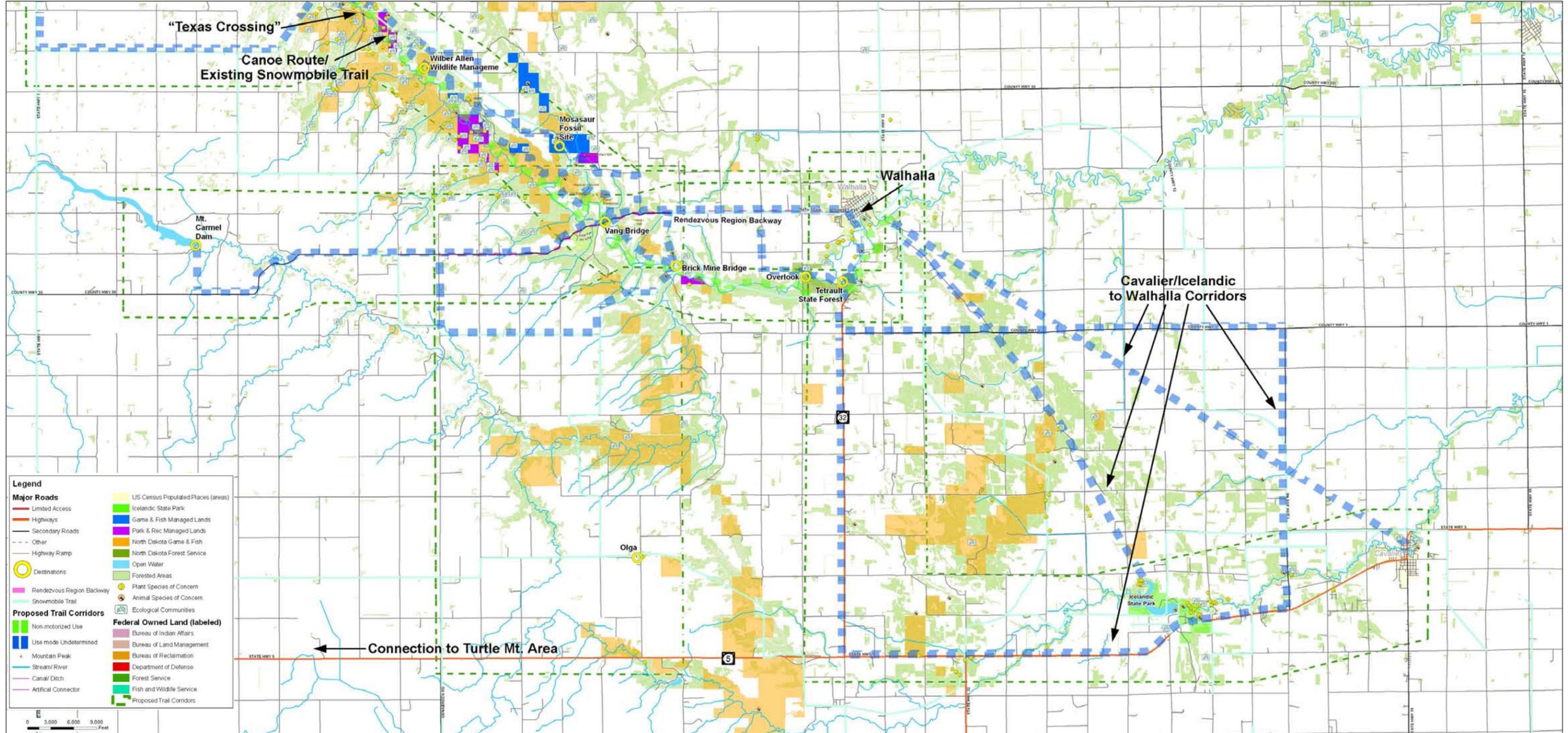
Numerous Wildlife Management Areas (WMAs) exist throughout the Pembina Gorge region, including the Wilber Allen WMA near the Canadian border and the Jay Wessels WMA near Cavalier. These WMAs are managed by the NDGF. While informal hiking trails exist throughout the WMAs, use is limited to non-motorized uses.

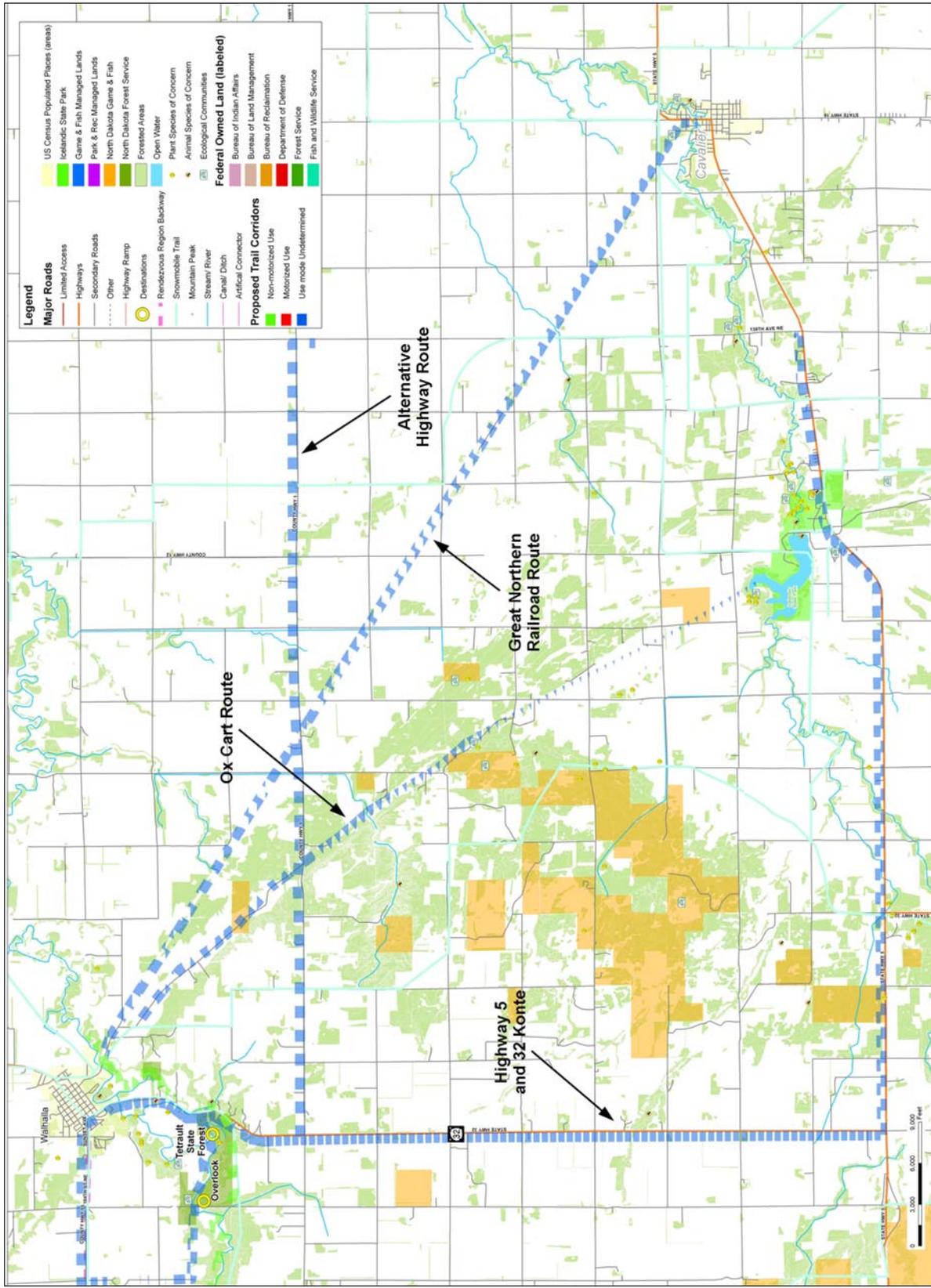
One of the significant features of the WMAs is the presence of a large herd of elk. For this reason, selection of trail corridors through the WMAs, particularly the Jay Wessels WMA, should be carefully considered.



Photo credit: Agency MABU/Annette Tait August 2004







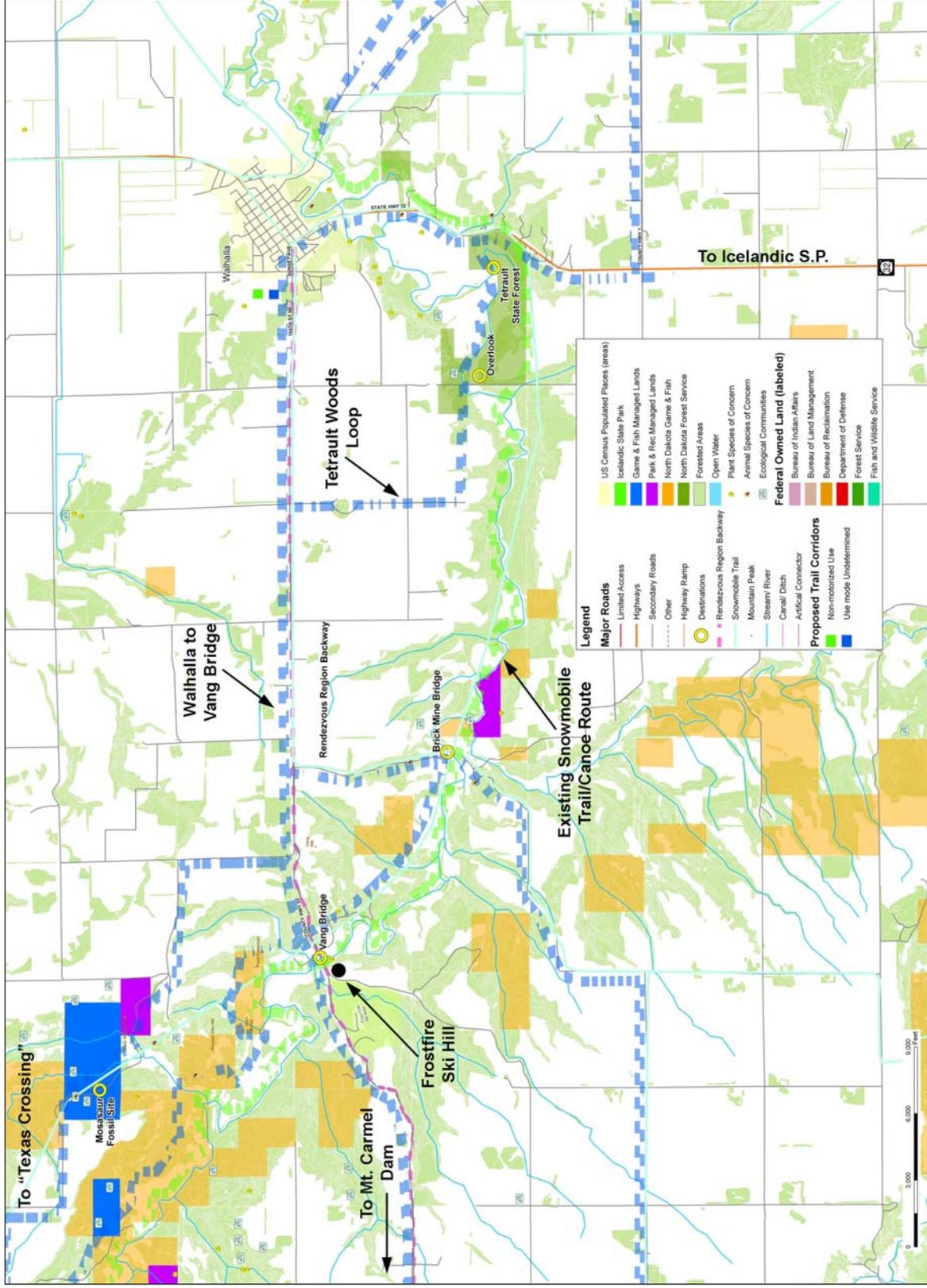
Icelandic State Park / Cavalier to Walhalla – Figure 3.7



Master Plan for Trail Development

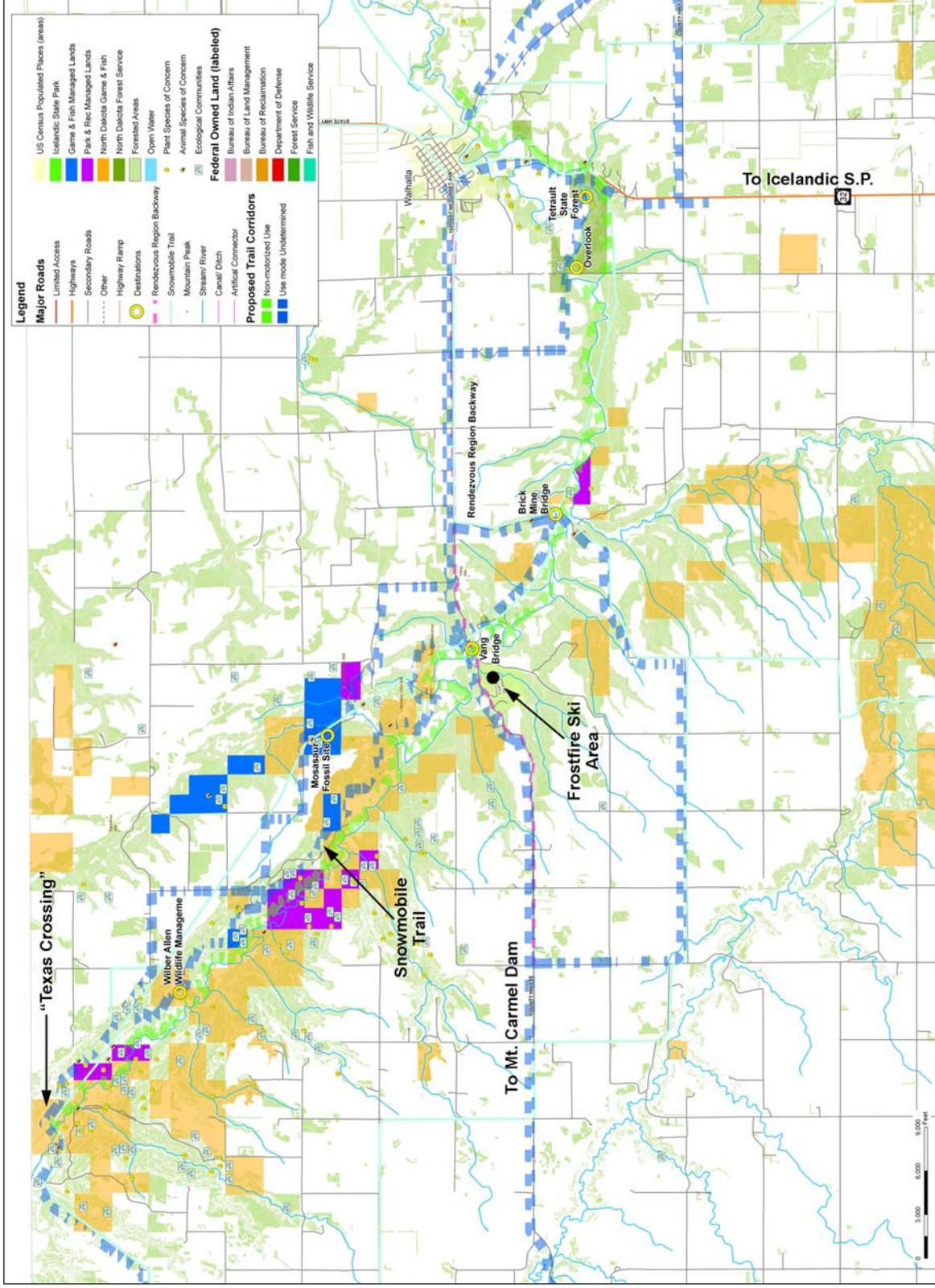
Turtle Mountain and Pembina Gorge Areas



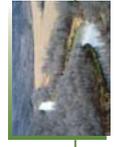


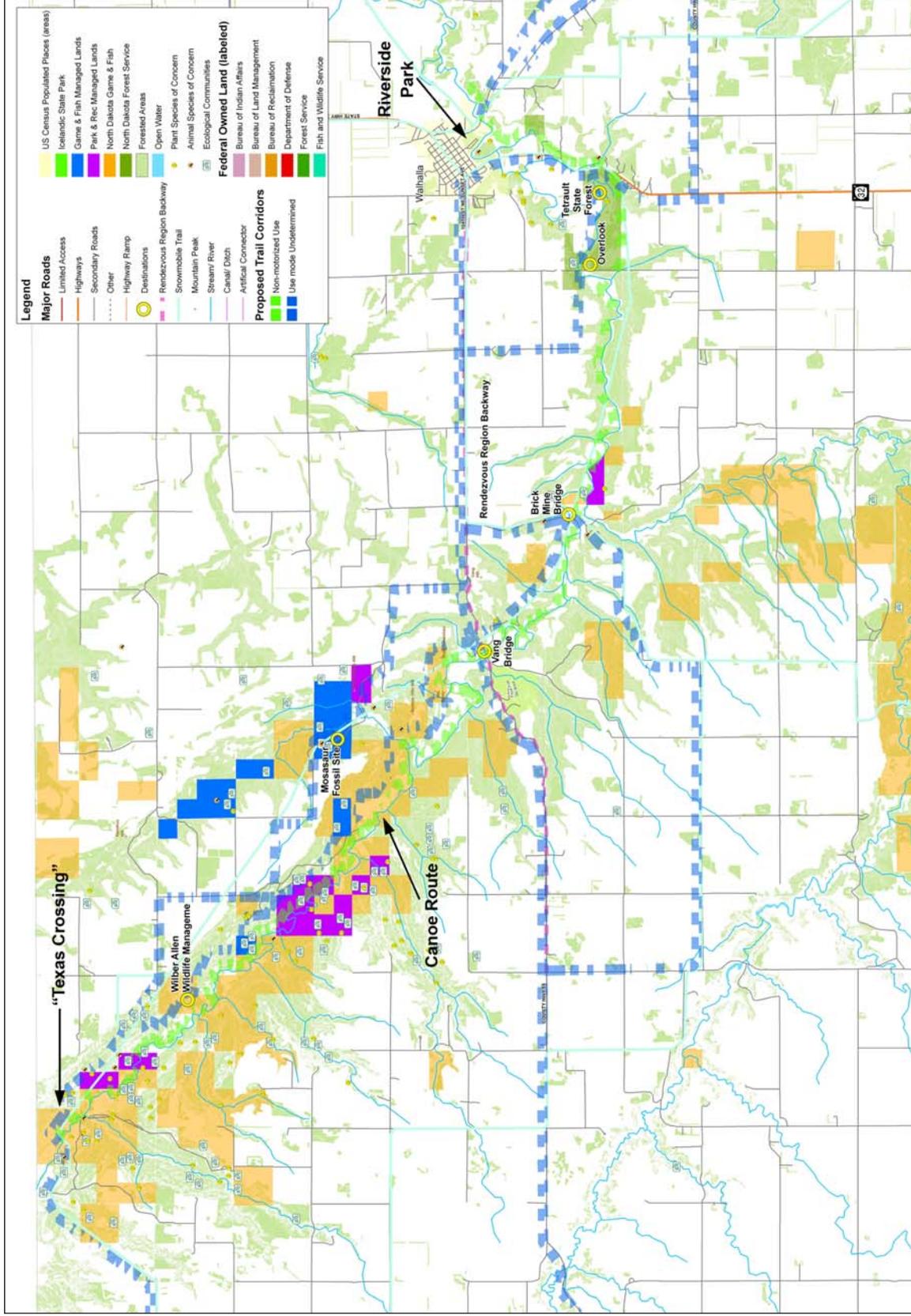
Waihalla to Vang Bridge – Figure 3.8





Snowmobile Trail Conversion to Multi-Use – Figure 3.9





Canoe Trail – Figure 3.10



Master Plan for Trail Development

Turtle Mountain and Pembina Gorge Areas



River Canoe Route

The Pembina River provides one of the few opportunities for river canoeing or kayaking in the state of North Dakota. Local residents and enthusiasts generally use the river from the Texas Crossing at the north end of the gorge near the Canadian border to the Vang or Brick Mine Bridges. There are no existing amenities to facilitate this use, with the exception of picnicking and parking opportunities at Riverside Park. The farm property on the east side of the river at Vang Bridge is sometimes used as an impromptu parking area for groups using the river.

Issues and Opportunities

The following issues and opportunities should be explored for the Pembina Gorge region.

Enforcement of Trail Regulations

The single biggest issue brought out at the community and property owner meetings was the need for better enforcement and the education of existing trail users. Whether snowmobiles or off-highway vehicle riders, landowners were concerned that trail users were leaving the designated trail route through the gorge. There was concern that NDPR officials charged with enforcement did not have the resources or the jurisdiction necessary to adequately enforce trail regulations. NDPR has made a commitment to base law enforcement personnel in the Pembina Gorge region.

3.2.2 Proposed Regional Corridors

Several regional trail corridors are proposed in the Pembina Gorge region.

Icelandic State Park to Walhalla

As mentioned, a paved trail connects Icelandic State Park to the City of Cavalier. A trail is suggested to connect Icelandic State Park with the City of Walhalla and the Pembina Gorge (Figure 3.7). It is suggested that this connection would be made via a paved multi-use trail along Highways 5 and 32.

Alternative routes that follow the alignment of the former Ox Cart trail or the existing rail corridor may be considered. These corridors will provide a more direct connection between the two communities, but will require a more substantial commitment to acquire property or easements for trail development.



Photo credit: Agency MABU/Annette Tait August 2004



Walhalla to Vang Bridge

This trail (Figure 3.8) could potentially be a multi-use trail with a variety of surface types. A paved multi-use trail could be constructed along County Highway 55 west of Walhalla to the turn-off for the Tetrault Woods State Forest overlook. From there the trail could follow the access road to the overlook and then turn east along the top of the ridge back towards the main section of the State Forest. Within Tetrault Woods State Forest, existing trails could be improved to complete a loop trail that would connect back to the City of Walhalla through the forest.



Existing Snowmobile Corridor in River Bottom

The existing snowmobile trail along the river gorge (Figure 3.9) offers opportunities for use as a year-round trail that could serve a variety of user groups. A soft-surface trail could be used by snowmobiles in the winter and off-highway vehicles, hikers, and bikers during the remainder of the year. The design of the trail cross-section and water runoff would be an important consideration in developing a trail that would provide an enjoyable riding surface for all user groups.



OHV Park

Ideally, the OHV park (Figure 3.9) would be developed on a 300+ acre site with 10 to 15 miles of looping trails, a variety of topography, and parking or access from a spine trail along the river bottom. Location along one of the faces of the gorge would provide a variety of trail experiences along with views of the gorge area. The site could be located on existing property owned by a state agency or property acquired specifically for the OHV development. Trail design should follow the guidelines in Chapter 4 to ensure that the site is sustainable. The abandoned gravel pit west of Vang Bridge along County Highway 55 is an example of a potential site.



Pembina River Canoe Route

The canoe route (Figure 3.10) commonly used by local residents is the stretch of river from the Texas Crossing at the north end of the gorge to the Vang or Brick Mine Bridges at the south end of the gorge, with some traveling in to Riverside Park in Walhalla. A canoe trail would require minimal effort to establish beyond developing access points, with the primary expense being acquiring the required property or easement to develop access points. The proposed access points would generally coincide with those that are currently used: Texas Crossing, Vang Bridge, Brick Mine Bridge, and Riverside Park.



3.2.3 Trailhead and Local Trail Opportunities

Several opportunities for trailheads exist in the Pembina Gorge region.

Walhalla

Walhalla (Figures 3.7 and 3.8) is the hub of activity in the Pembina Gorge region. It provides the closest available food, lodging, and other supplies. The City Chamber of Commerce is a strong promoter and supporter of activities in the region. The Pembina River flows through the south side of town and Riverside Park is adjacent to the river, which provides an opportunity for a take-out point for canoeists and kayakers. The City could also provide a trailhead location for a bicycle loop along County Highway 55 and the ridgeline through Tetrault Woods State Forest.



Vang Bridge

The farm property adjacent to Vang Bridge (Figures 3.8 to 3.10) on the east side of the river and south of County Highway 55 has been used as an impromptu trailhead for groups that get permission from the owner on an event-by-event basis. An existing snowmobile trail traverses the property. This location is popular as a put-in and take-out location for canoeists and as a staging area for equestrian events. Its proximity to both the river and the existing snowmobile trail make it a good location for serving multiple user groups. Trailhead facilities do not currently exist on the site, which is currently in private ownership.



Brick Mine Bridge

The area north of the river and east of Brick Mine Road (Figures 3.8 to 3.10) is another area that is frequently used as a staging area for various user groups. This location is also a site that could serve several user groups, including canoeists, bikers, and off-highway vehicles. Trailhead facilities do not currently exist on the site, and the site is currently in private ownership.

Texas Crossing

The northerly most of the trailhead opportunities is the Texas Crossing (Figures 3.8 to 3.10) at the north end of the gorge. This is a popular put-in location for canoeists and could also provide a trailhead for other trail users. Trailhead facilities do not currently exist on the site, which is currently in private ownership. Potential trail head amenities would include parking and potentially vault toilets.



Icelandic State Park

Icelandic State Park (Figure 3.7) is a trailhead for both trails within the park and the multi-use trail that connects the park with the City of Cavalier. The park is not located in close proximity to the gorge, so its development as a trailhead is predicated on the development of a trail connection to Walhalla. The park currently provides a full range of trail head facilities including parking, camping, water, and restrooms.

Tetrault Woods State Forest

A trailhead at Tetrault Woods State Forest (Figures 3.7 to 3.10) could provide amenities for several of the trail corridors previously identified. No trailhead amenities currently exist at Tetrault Woods. At a minimum, trail development should consist of parking, river access, and potentially vault toilets. Additional features may include more developed restroom facilities and camping opportunities.



Chapter 4 – Design Criteria

4.1 Purpose

Consistency in trail design is important in any trail planning project. Because a variety of state and local agencies and local trail advocates will be implementing the projects over an extended period of time, it is important that these parties have a common understanding and expectation of trail design when developing trail segments.

Consistent trail design based on established guidelines provides a number of benefits to those developing the trails, including:

Increased User Safety and Reduced Liability – by using consistent and nationally recognized design guidelines that are the result of extensive testing and evaluation.

Positive User Experience – by recognizing the success of existing systems

Establish Universal Access – by developing trails that accommodate trail users of various skills and abilities

Recognize a Variety of User Modes – by establishing guidelines for specific user groups

4.2 Resources

The guidelines set forth in this plan are based largely on the guidelines established in other national, state, and industry publications. Some of the guidelines most commonly referred to in this document are listed below:

Guide for the Development of Bicycle Facilities, American Association of State Highway and Transportation Officials (AASHTO), 1999

Manual on Uniform Traffic Control Devices, MUTCD, 2004

Recommendations for Accessibility Guidelines: Outdoor Developed Areas Final Report, U.S. Architectural and Transportation Barriers Compliance Board, 1999

Minnesota Bicycle Transportation Planning and Design Guidelines, Minnesota Department of Transportation, 1996

Trailbuilding Basics, International Mountain Biking Association

US Forest Service Trail Management Handbook

Pennsylvania OHV Guidelines, Pennsylvania Department of Conservation and Natural Resources website:
www.dcnr.state.pa.us/brc/patraildesignmanual.pdf



4.3 General Trail Placement

While subsequent sections of this chapter discuss design criteria for specific trail types, there are general guidelines for placing trails that are generally applicable to developing all types of trails. In some cases, such as the abandoned rail corridor between Rolla and St. John, the trail placement is well defined. In other cases, such as the location of a trail in the Pembina Gorge area, greater flexibility is allowed

Some of the primary considerations in placing trails include:

Be Sensitive to Natural and Cultural Resources

- Avoid wetlands, sensitive plant and animal communities, and highly erodible soils.
- Attempt to minimize grading and impacts to existing trees in wooded areas.
- Create vegetative buffers adjacent water bodies.
- Avoid known cultural, historical, and geologic resources.

Manage Water Runoff

- One of the primary principles of all trail design, particularly soft-surface trails, is controlling and managing water. In any situation where water begins to affect the trail, water will win and the environment or the experience will suffer.

Provide Scenic, Cultural, and Educational Value

- Locate trails to provide a wide variety of experiences.
- Provide connections to points of scenic, cultural, or historical interest where possible.
- Provide interpretive signage.

Consider Adjacent Property

- Work with adjacent property owners early in the trail planning process.
- Provide access across the trail, where necessary.
- Provide vegetative buffers or fences, where necessary.

4.4 Hiking and Walking Trails

Hiking and walking trails are designed to be used exclusively by pedestrians and are typically located in more primitive natural areas. These trails provide a low-impact means for pedestrians to enjoy the natural environment. Hiking and walking trails are used by a wide variety of people with a broad range of abilities and interests; therefore, they should be designed to accommodate all persons.



New and reconstructed trails should be made as accessible as possible while the essential character of the trail is maintained. In addition, trail amenities, such as restrooms, drinking fountains, and picnic tables, should comply with ADA accessibility guidelines or recommendations. Because of the primitive nature of hiking trails, the guidelines for hiking and walking trails are broadly defined to accommodate a variety of site conditions and desired experiences.

In this and the following section the Figure 4-1 provides a general visual depiction of a typical trail design while the tables at the end of the chapter provide more detailed information on commonly accepted design guidelines.

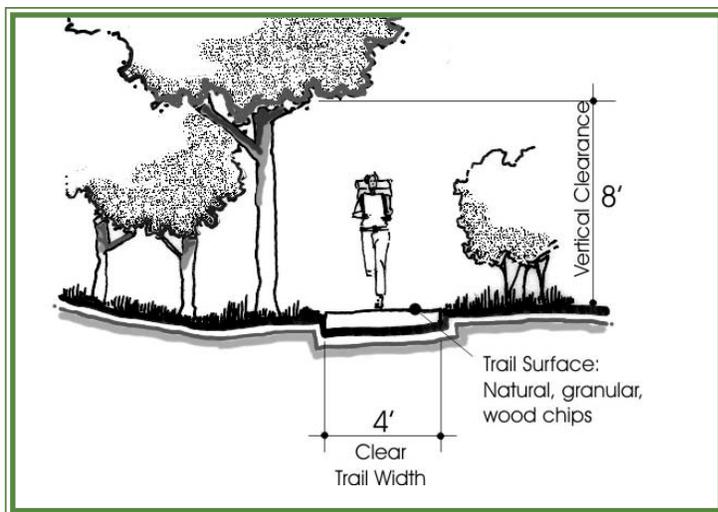


Figure 4.1 – Trail Dimensions for Hiking and Walking Trails

4.5 Multi-Use Trails

The most common type of trails to be implemented in the Pembina Gorge and Turtle Mountain region are likely to be multi-use trails. The most common user groups for multi use trail are bicyclists, walkers or runners, and in-line skaters. Winter use of multi-use trails may include snowmobiles or cross-country skiing. There are basically two types of multi-use trails:

- Single-treadway corridors that have only one trail facility and are planned to accommodate all desired modes
- Dual-treadway corridors that accommodate a variety of modes on two separated trails

Single-treadway corridors are the most cost effective, but they can only be used when the user modes are reasonably compatible.



Dual-treadway corridors allow separate uses within a corridor, thereby reducing conflict while still accommodating varied users. Dual-treadway corridors may also provide for economy in trail development providing the same support services, such as trailheads, restrooms, and rest areas, for many different users within a single corridor. However, a wider right-of-way is required.

4.5.1 Single-Treadway Corridors

Single-treadway corridors provide a single recreational facility within a minimal corridor that may not be much wider than the actual trail. For single-treadway facilities it is important to be aware of the compatibility of various user modes to prevent serious conflict on a relatively narrow facility.

The following are examples of situations where multiple user modes occur on a single-treadway corridor:

- **Pedestrians, bicyclists, and in-line skaters on a paved multi-use trail facility.** This is the classic example of a multi-use trail. Depending on the volume of traffic, however, striping may be considered to separate pedestrians from faster-moving bicyclists and skaters.
- **Pedestrians and bicyclists on a soft-surface trail with snowmobile use in the winter.** The seasonal offset of these uses makes them compatible.
- **Pedestrians, bicyclists, and in-line skaters on a paved trail with snowmobilers in winter.** Consideration should be given to the prevalence of snowmobiles with studs as these may cause severe damage to the trail. In some areas, paved trails are plowed to provide a recreation or transportation amenity even in winter. In this case, snowmobiles would not be compatible.
- **Equestrians and snowmobiles.** The seasonal offset of these uses makes them compatible.

Depending on the trail design and community desires, there may be other possibilities for multiple user modes.

There is a simple guideline for single treadway design: given the planned user modes, the most stringent guidelines should be applied. If pedestrians are one of the designated corridor users, accessible facilities should be developed that meet the needs all potential users, including older adults and those with disabilities. This is the case even if pedestrians are not the primary trail users. Additionally, this applies to multi-use trails where users have a seasonal offset.



4.5.2 Dual-Treadway Corridors

Dual-treadway corridors are suggested when there is a desire to provide for incompatible uses in the same corridor. In this case, it is important that each trail is tailored to the unique needs of a use mode or a group of use modes in order to avoid significantly compromising the trail experience of either user group.

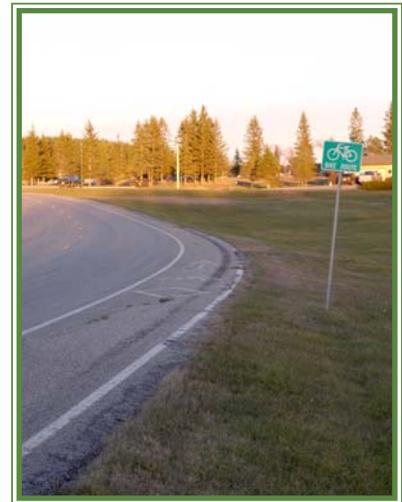
Incompatible uses include modes with drastically differing speeds, trail surface needs, or user volume. Some examples of incompatible modes that typically warrant dual treadways include:

- **Bicyclists/pedestrians and equestrians.** These uses are not compatible because of the different trail surface requirements and the potential for bicycles and pedestrians to frighten horses, creating the potential for serious injury to horse and users alike.
- **Bicyclists/pedestrians and OHV/motorbike users.** Users operate at greatly different speeds, and different trail surface requirements are also a consideration.
- **Equestrians and OHV/motorbike users.** Despite the similarity of trail design for these two modes, the speed and noise of OHVs and motorbikes can also frighten horses.
- **Pedestrians and bicyclists/in-line skaters.** In high-use situations, dangerous conflicts can occur.

When dealing with dual treadways, the design of each treadway and the separation of the various treadways must be considered.

The design of each treadway is similar to that described for single-treadway corridors. Each treadway should follow the appropriate guidelines, based on the user modes it will host. In addition, each treadway should be designed to accommodate two-way traffic.

The opportunity for separating treadways varies with local conditions and the user modes. The following figures depict common dual-treadway corridors and the minimum recommended separations. However, designers should attempt to provide as much separation as conditions allow.



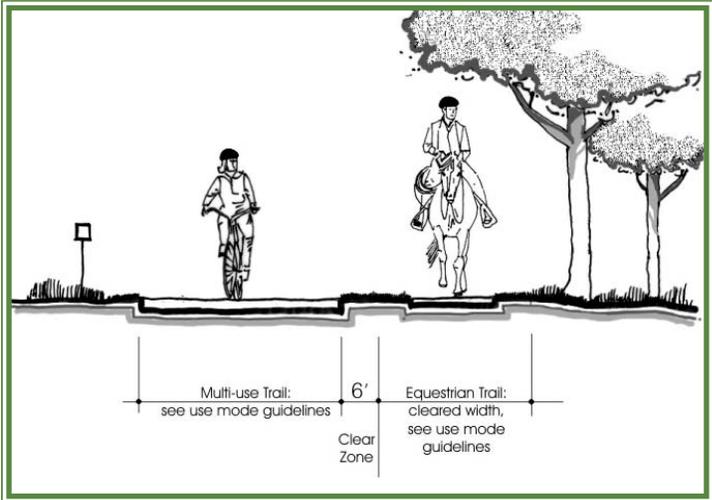


Figure 4.2 – Multi-Use and Equestrian Trails

The recommended separation between multi-use and equestrian trails is six feet or greater, possibly with a fence or planted median between them. Clear zones from each trail to any fence or tree should be maintained at two feet or greater.

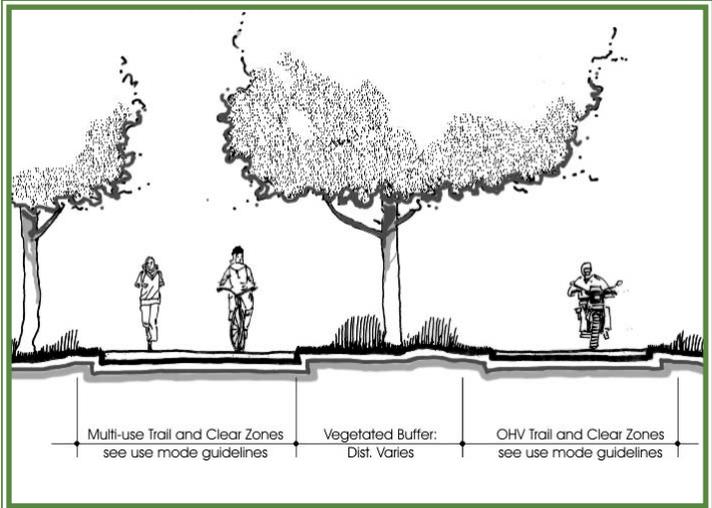


Figure 4.3 – Multi-Use and OHV Trails

The separation between multi-use and OHV/motorbike trails is variable, but a vegetative buffer or fencing should be provided.



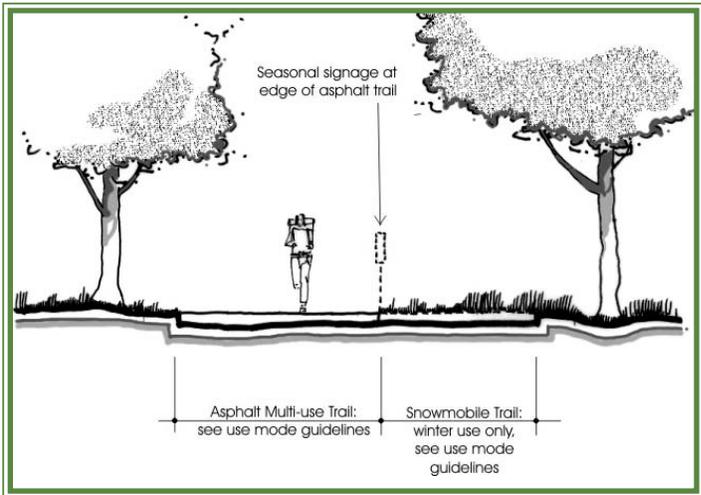


Figure 4.4 – Multi-Use and Snowmobile Trails

No separation between a paved trail and an adjacent snowmobile trail is required, but the edge of the paved surface should be clearly marked in winter.

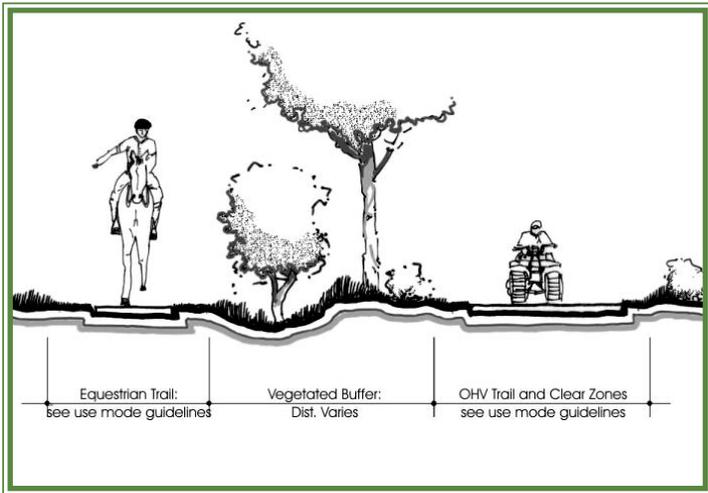


Figure 4.5 – Equestrian and OHV Trails

The separation between equestrian and OHV/motorbike trails should be as far apart as possible, and a vegetative buffer or fencing should be provided.



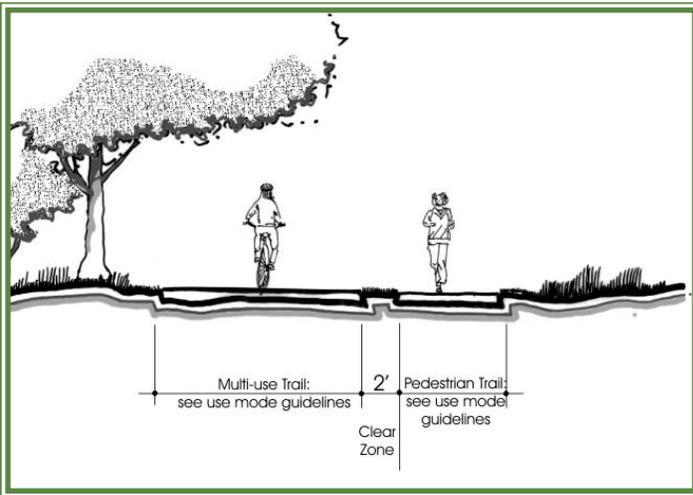


Figure 4.6 – Multi-Use Trail with Separated Pedestrian Treadway

For pedestrian and bicycle/in-line skating trails, a solid white stripe must be used, and a two-foot break in the pavement is preferred.

4.6 On-Road Biking

There are a substantial number of publications that provide guidelines for on-road bicycle facilities. AASHTO and the Federal Highway Administration (FHWA), as well as many states, have developed guidelines for developing a wide variety of bicycle accommodations. Generally, there are three types of on-road bicycle facilities:

- Paved shoulders
- Shared roadways
- Bicycle lanes

On-road bicycle facilities should always be designed so that bicyclists travel in the same direction as motorists.

User safety in the design of on-road bicycle facilities is a major issue. Conflicts between pedestrians, automobiles, or other bicyclists can lead to serious injury. Maintenance and operations issues, such as deteriorated pavement and snow and/or debris build-up, can also lead to safety problems. The following graphics represent minimum recommendations only, and site-specific conditions may dictate variations for safety purposes.



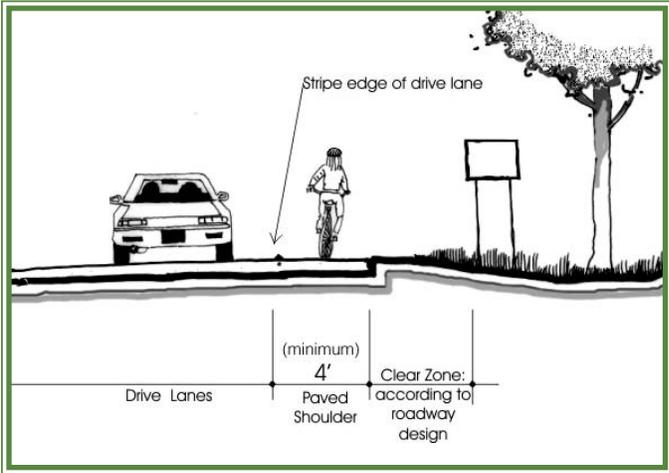


Figure 4.7 – On-Road Biking - Paved Shoulder Dimensions

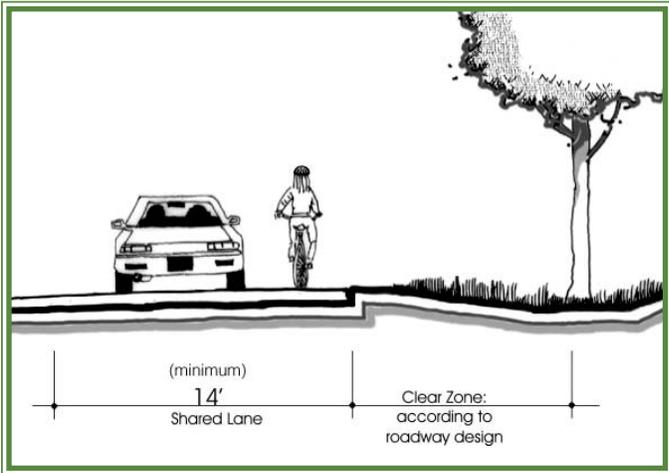


Figure 4.8 – On-Road Biking - Shared Lane Dimensions

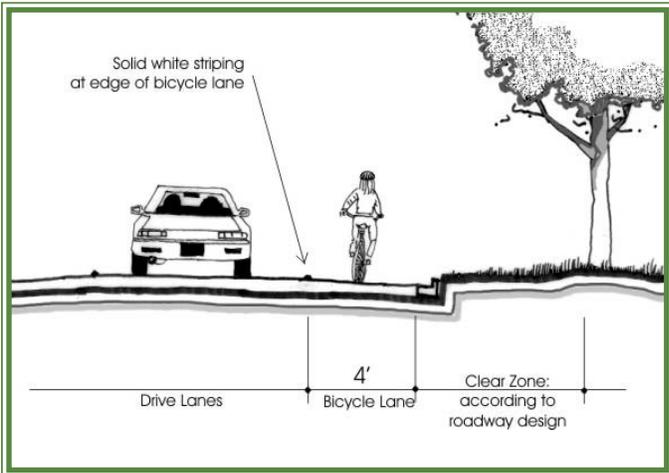


Figure 4.9 – On-Road Biking - Bicycle Lane Dimensions



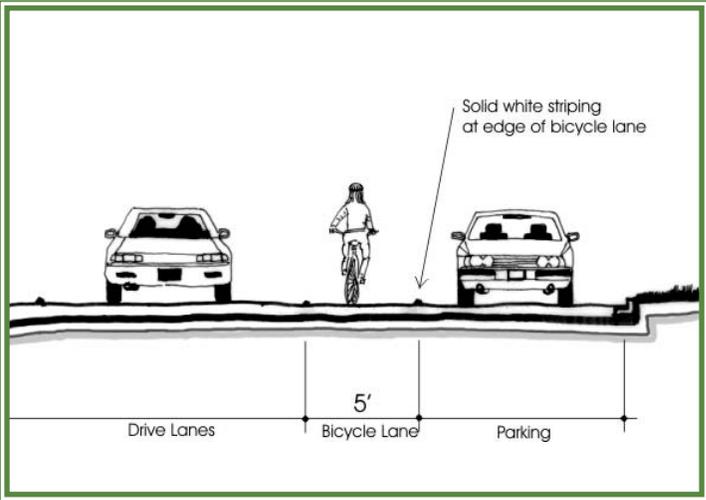


Figure 4.10 – On-Road Biking - Bicycle Lane Dimensions Adjacent to Parking

4.7 Mountain Biking

Because the nature of the sport, mountain bike trails are typically challenging off-road facilities. Guidelines for developing these trails are far less stringent than those for non-motorized multi-use trails, but limit accommodation to a smaller group of bicycle users. While these trail may limit the number of user by defining the type of bicycle used, mountain bike facilities can still vary greatly in their difficulty. Trails can range from extremely challenging “single track” with many hills and sharp turns to trail routes that follow gravel roads and accommodate many skill levels.

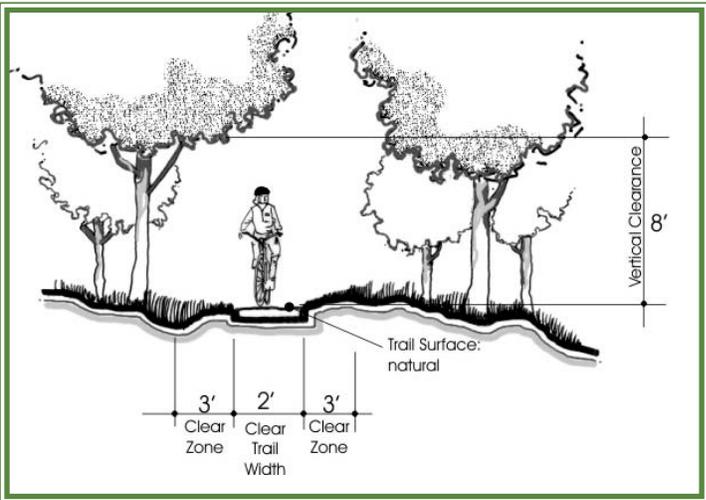


Figure 4.11 – Trail Dimensions for Mountain Bike Trails



4.8 Equestrian Trails

The most important consideration for equestrian trails is the surface, which should be designed to reduce injuries to animals and riders. Vertical clearance is another important consideration. Attention to the clearing of adjacent brush, snags, and low hanging limbs is necessary. In all design elements, the overriding factor is the safety of both the horse and the rider.

Equestrian trail routes should ideally be divided into segments of approximately five miles in length with connection to other segments to create longer rides. This suggestion is based on the understanding that five miles represents a typical half-day ride.

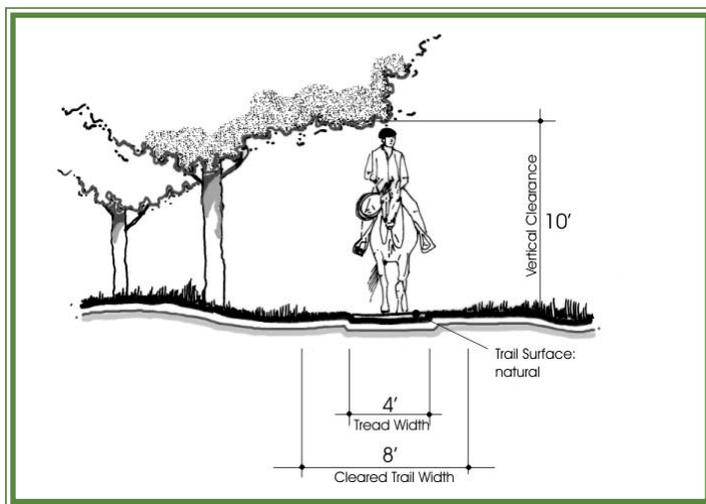


Figure 4.12 – Trail Dimensions for Equestrian Trails

4.9 OHV Trails

OHV trail design and construction is another site-specific activity. Because each trail is different, it must be developed to meet the requirements of the land. However, the general guidelines, such as water management and respect for natural amenities, apply to motorized trails as well. Furthermore, because of the power of motorized vehicles, erosion issues can be more significant.

For motorized trails, an undulating trail that allows multiple places for water to drain off the trail is superior to trails that are built on a consistent grade. Where variations in trail grade are not possible, long rolling dips must be incorporated in the trail to provide water control.

The trail riding experience is a significant portion of overall OHV recreation. Trails and trail systems that are located through a variety of terrains provide an enhanced trail riding experience.



OHV parks provide another opportunity to manage OHV use by limiting intense use, such as mudbogs, play areas, obstacle courses, or race tracks, to a relatively small area. Similar to other trail systems, an OHV park provides a series of interconnected loops that offer a variety of trail experiences and difficulties. By concentrating use in small area, OHV parks also make enforcement and noise mitigation efforts more efficient.

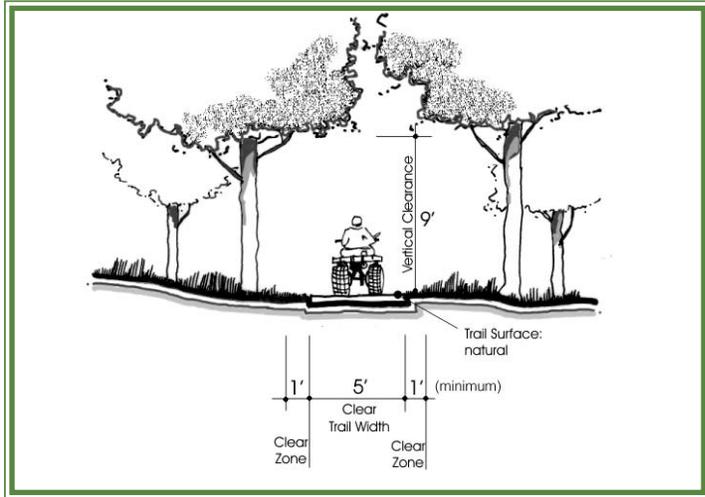


Figure 4.13 – Trail Dimensions for One-Way OHV Trails in Wooded Areas



The following tables have been adapted from the U.S. Forest Service Trail Management Handbook and provide general design criteria for the design of ATV trails.

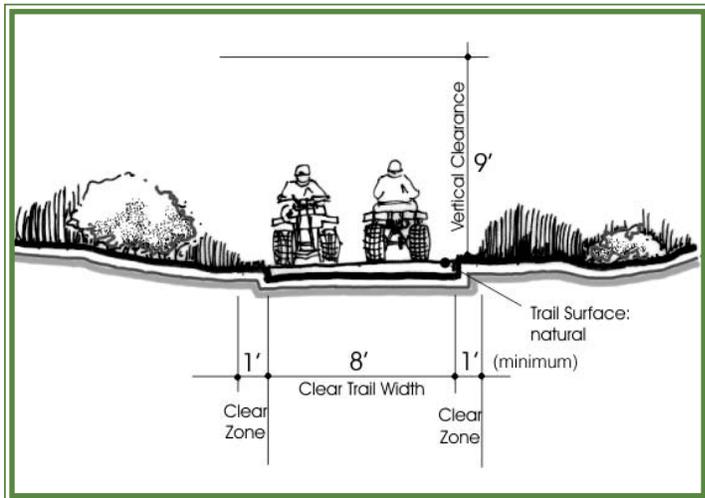


Figure 4.14 – Trail Dimensions for Two-Way OHV Trails in Open Areas



Table 4.1 – Heavy Use Access OHV Trail Design Criteria

Design Criteria	Easiest	More Difficult	Most Difficult
Grade			
Maximum	15%	25%	35%
Length	200'	300'	500'
Tread			
Minimum Width	84" with turnouts	72" with turnouts	60" with turnouts
Surface	Relatively smooth, no roots or rocks over 3". Tread plane flat. Sweeping curves no holes wider than 24" or deeper than 6". Loose material is OK.	Sections of relatively rough surface. No roots, rocks, or obstacles over 6". Tread plane can be insloped 5%. Climbing turns. No holes wider than 36" or deeper than 10". Loose material OK.	Relatively rough, short sections very rough. No roots, rocks, or obstacles over 10". Tread plane can be insloped or outsloped 10". Switchbacks. No holes wider than 36" or 12" deep.
Clearing Width			
Minimum	2' each side	1.5' each side	1.5' each side
Maximum	3' each side	3' each side	3' each side
	Trees over 4" may be cut if needed to maintain alignment.	Same	Same



Table 4.2 – Moderate Use Access OHV Trail Design Criteria

Design Criteria	Easiest	More Difficult	Most Difficult
Grade			
Maximum	15%	25%	35%
Length	200'	300'	500'
Tread			
Minimum Width	60"	50"	50"
Surface	Relatively smooth, no roots or rocks over 3". Tread plane flat. Sweeping curves no holes wider than 24" or deeper than 6". Loose material is OK.	Sections of relatively rough surface. No roots, rocks, or obstacles over 6". Tread plane can be insloped 5%. Climbing turns. No holes wider than 36" or deeper than 10". Loose material OK.	Relatively rough, short sections very rough. No roots, rocks, or obstacles over 10". Tread plane can be insloped or outsloped 10". Switchbacks. No holes wider than 36" or 12" deep.
Clearing Width			
Minimum	1' each side	Clear of tread	Some overhanging material OK.
Maximum	3' each side	3' each side	3' each side
	Only cut trees over 4" in diameter if needed to get through. Use trees as trail anchor points.	Same	Same



Table 4.3 – Light Use Access OHV Trail Design Criteria

Design Criteria	Easiest	More Difficult	Most Difficult
Grade			
Maximum	15%	25%	25%
Length	200'	300'	300'
Tread			
Minimum Width	60"	50"	50"
Surface	Relatively smooth, no roots or rocks over 3". Tread plane flat. Sweeping curves no holes wider than 24" or deeper than 6". Loose material is OK.	Sections of relatively rough surface. No roots, rocks, or obstacles over 6". Tread plane can be insloped 5%. Climbing turns. No holes wider than 36" or deeper than 10". Loose material OK.	Relatively rough, short sections very rough. No roots, rocks, or obstacles over 10". Tread plane can be insloped or outsloped 10". Switchbacks. No holes wider than 36" or 12" deep.
Clearing Width			
Minimum	1' each side	Clear of tread	Some overhanging material OK.
Maximum	3' each side	3' each side	3' each side
	Only cut trees over 4" in diameter if needed to get through. Use trees as trail anchor points.	Same	Same



4.10 Cross-Country Skiing

The existing cross-country ski trails at Lake Metigoshe and Icelandic State Parks appear to be sufficient to meet the anticipated need. However, guidelines for the design of these trails should be considered when developing summer use trails that may be used for cross-country skiing in the winter months.

Generally, the guidelines for multi-use trails are consistent with the desire for cross-country skiing. Multi-use trails can be used for skiing with as little as four to six inches of snow cover. If cross-country ski use is anticipated, the layout of the trails should consider the ability of the route to hold snow. Trails specifically for cross-country ski use should have a width of at least four feet for one-way trails and at least seven feet for two-way trails. Clear zones of two feet to both sides and an eight-foot overhead clearance should also be provided. Groomed trails may require wider widths to accommodate grooming equipment.

Trails should be laid out in a loop system to allow for a variety different experiences and skill levels. The length of system can vary from as short as two to six miles to more than 15 miles for a comprehensive system. Cross-country trails should avoid sharp turns, especially at the bottom of hills.

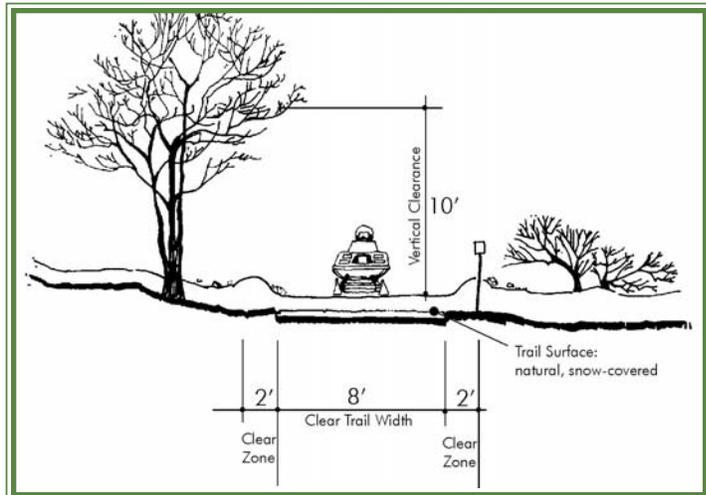


Figure 4.15 – Trail Dimensions for Snowmobile Trail

4.11 Snowmobiles

Snowmobile trails are another well-developed component of the overall trail system, but also bear mention within this plan. Snowmobile trails are unique, because use takes place only in winter. The seasonal reliance requires some unique design considerations, such as design to hold snow, similar to cross-country trails. In



addition, snowmobiles are capable of speeds higher than most other trail uses, increasing the need for safety through trail design.

Many snowmobile trails may be used by other users during the summer months. In these situations, the surface should be designed according to the needs of the additional users. Asphalt trail surfaces for snowmobile routes should be avoided, because of the difficulty of keeping snow on the trail and the potential of studded tracks to damage the trail surface.

4.12 Canoeists and Kayakers

The Pembina Gorge area offers one of the few opportunities in the State for developing a canoe/kayak trail. The trail itself is provided by the river, so the primary considerations in developing a canoe route are adequate signage, support facilities, and the reasonable expectation that the waterway can accommodate small watercraft most of the time.

Signage should be included to direct users to the river and to inform users on the river. Directional signage should be placed on nearby roadways to advertise landing locations. In addition, informational signage should be installed along the river to advertise landings and support facilities and provide distance information. A map of the route that identifies launch sites, support facilities, and points of interest can also be very beneficial.

Support facilities for canoe/kayak routes can be very simple. A natural canoe launch (12 feet wide at the water line) can be constructed of native soil material with sand and gravel added to improve drainage and control erosion. A more significant launch site may include some measure of bank stabilization, such as landscape timbers, to define and protect the landing area. Adjacent slopes should be graded to a 3:1 slope.

4.13 Trail Signage

Trail signage generally falls in to one of three broad categories:

- **Regulatory signage** covers typical signage, such as stop signs, speed limits, and use limitations (for example, no motor vehicles.)
- **Directional signage** typically informs trail users where they are within a trail system and the direction and distance to nearby attractions.
- **Interpretive signs** tell the story of a trail, giving insight into the history, culture, or wildlife of the area in which the trail is located. Possible interpretive sign elements may include themes, such as Native American history, archaeology, native flora and fauna, historic ox cart trails, and the Metis culture.



Table 4.4 – Hiking Trail Design Criteria

Design Criteria	Hiking
Maximum Grade	<p>8.3% for no more than 1/3 (<5% for any distance) (8.3% for a max of 200') (10% for a max of 30') (12.5% for a max of 10')</p> <p>The trail grade between the maximum grade segments should return to 5% for a minimum distance of 5' to provide resting opportunities. If, due to topography, the trail would be steeper than recommendations permit, switchbacks should be used to lessen the overall slope.</p>
Minimum Tread Width	4'
Surface	<p>Wood chips, crushed stone, or compacted earth (should be firm and stable). Wood chips are not considered an accessible surface. In wet areas, a boardwalk is recommended. Any tread obstacles, such as rocks or roots, imbedded in the trail surface should be less than two inches. Also, any openings in the trail surface, including on bridges, should not permit passage of a 0.5-inch diameter sphere and should be perpendicular to the dominant direction of travel.</p>
Minimum Clearing Width	<p>Widened areas (at least 5' by 5') at regular intervals for passing. Should be set back at least 5' from roadway curbs.</p>
Vertical Clearance	8'
Drainage	<p>To effectively move water off the trail in flat areas, the trail should be cross-sloped or crowned at approximately 2%. Where a trail is benched into a slope, a swale on the uphill side should be considered to catch water before it crosses the trail. Additionally, culverts may be necessary to move water under the trail.</p>
Alignment	Alignment guidelines are not necessary.
Edge Protection	<p>Edge protection is not required; however, if provided it should be at least four inches.</p>



Table 4.5 – Cross-Country Skiing and Snowmobile Trail Design Criteria

Design Criteria	Cross-Country Skiing	Snowmobile
Maximum Grade	10% Varies with difficulty	12% 25% for short segments (<100')
Minimum Tread Width	4' for one-way trail 7' for two-way trail	10' minimum for one-way trail 12' minimum for two-way trail (14' preferred)
Surface	Varies, preferably a natural surface	Varies, preferably a natural surface
Minimum Clearing Width	2'	2'
Vertical Clearance	8' from anticipated snow base	10' from anticipated snow base
Drainage	Similar drainage considerations as hiking and mountain biking trails	Grade to drain water during no-winter month
Alignment	Alignment dependent on difficulty	Cross steep slopes at right angles. Alignment should consider necessary sight lines for high operating speeds of snowmobiles.
Edge Protection	Edge protection not required	Edge protection not required



Table 4.6 – On-road and Mountain Biking Design Criteria

Design Criteria	On-Road Bicycle **	Mountain Bicycle
Maximum Grade		10%
Minimum Tread Width	4' paved shoulder 5' paved shoulder adjacent to guardrail 14' shared lane 15' shared lane on steep hill 5' bicycle lane 5' bicycle lane adjacent to parking	2'
Surface	Hard-surfaced roadways	Preferred surface for mountain bike trails: compacted earth
Minimum Clearing Width	Roadway design standards	3' each side
Vertical Clearance	Roadway design standards	8'
Drainage	Bicycle-compatible inlets should be used. On rural sections, roadway design standards are adequate.	To properly drain trails, they should be cross-sloped at 3-5% or flexible waterbars or swales should be installed and special consideration should be given to trail placement.
Alignment	Roadway design standards	Alignment of trails will primarily depend on desired difficulty. In general, the tighter the turn, the more challenging the trail.
Edge Protection	Roadway design standards	Edge protection is not usually required. In areas where safety is of great concern, fences with a minimum height of 42" should be installed.

** Rumble strips will lessen the usable width of an on-road bicycle facility. Rumble strips “are not recommended where shoulders are used by bicyclists unless there is a minimum clear path of 1' from the rumble strip to the traveled way, 4' from the rumble strip to the outside edge of paved shoulder, or 5' to adjacent guardrail, curb or other obstacle.” (AASHTO Guide, 1999).



Table 4.7 – Equestrian and Multi-use Trail Design Criteria

Design Criteria	Equestrian *	Multi-Use
Maximum Grade	10% (20% if ≤100')	5%
Minimum Tread Width	4'	8'
Surface	Uncompacted natural material free from brush, stumps, logs, large rocks, and other obstructions that may injure horses	Varies, preferably a paved surface
Minimum Clearing Width	2' each side	2' each side
Vertical Clearance	10'	10'
Drainage	Areas where standing water is likely should be drained by sloping the trail or installing ditches.	Grade to drain. Typical 2% cross-slope for paved surface.
Alignment	Horses can maneuver almost any corner and can travel at low speeds. Therefore, no alignment guidelines are necessary.	The guidelines for the most restrictive anticipated use should apply.
Edge Protection	Edge protection is not usually required. In areas where safety is of great concern, fences should be installed.	Edge protection is not usually required. In areas where safety is of great concern, fences should be installed.



Chapter 5 – Construction Cost Estimates

5.1 Introduction

Construction cost is one of the most significant considerations in developing a trail system. Estimated construction costs have an impact on phasing, funding, budgeting, and even design. A clear understanding of the potential cost of implementing proposed trail segments will allow those that use this plan to effectively address funding and budgeting issues early in the implementation process.

5.2 Assumptions

While early construction estimates are beneficial from a planning standpoint, trail construction cost can vary significantly due to factors, such as site conditions, trail material, and the intended user groups. Therefore, it is important to understand the assumptions made in developing the cost estimates provided here. It is also important to understand that cost estimating is an ongoing process and that these cost estimates should be refined at regular intervals throughout the implementation sequence.

Several assumptions were made in developing construction cost estimates of specific segments of the Turtle Mountain and Pembina Gorge trail system:

- All dollar amounts are in 2005 dollars and are not adjusted for inflation.
- Trail design (that is, widths, surfaces, and clear zones) is consistent with the design guidelines presented in Chapter 4.
- Grading costs assume a moderate amount of site preparation.
- Trail grading does not account for unforeseen soils issues (such as exceedingly wet or unstable soils).
- The depth of aggregate subbase is assumed to be four inches.
- The depth of granular surfacing is assumed to be four inches.
- The depth of asphalt surfacing is assumed to be three inches.
- The depth of concrete surfacing is assumed to be four inches.
- The depth of wood chip surfacing is assumed to be two inches.
- Turf establishment assumes seeding and basic erosion control only.
- The per mile costs provided also include an allowance for items such as culverts, waterbars, signage, and pavement markings as well as other items typically associated with trail construction.
- Per mile construction costs include a contingency factor of 15%.
- Per mile costs are for construction only and do not include planning, design, and administration costs. These costs are typically 18 to 25% of the estimated construction cost.
- Per mile construction costs do not include the costs of right-of-way acquisition.



5.3 Typical Trail Construction Costs

The following tables show the estimated general costs associated with trail construction on a unit basis and the estimated per mile cost of constructing various type of trails that may be implemented as an outgrowth of this master plan. The purpose of these tables is to provide implementing agencies or advocates with general information regarding the anticipated cost of trail implementation.

Table 5.1 – General Trail Costs (2005 Construction)

Trail Element	Unit	Unit Price
Clearing and grubbing	Acre	\$2,500.00
Grading for hard-surfaced trails	Mile	\$3,750.00
Grading for natural-surfaced trails	Mile	\$3,125.00
Granular surfacing	Sq. ft.	\$.50
Granular subbase	Sq. ft.	\$.50
Asphalt surfacing	Sq. ft.	\$1.40
Concrete	Sq. ft.	\$2.90
Wood chips	Sq. ft.	\$.50
Seeding/mulching	Acre	\$2,000.00
Pedestrian/bicycle bridge	Sq. ft.	\$100.00
Redecking existing bridges (railroad or other) to accommodate trails	Sq. ft.	\$50.00
Wetland boardwalks	Sq. ft.	\$50.00
Other costs (such as drainage, signage, and support services)	Mile	10% of trail cost
Recycled Bridges	Each	\$100,000-\$250,000 (varies*)
Trail Maintenance Costs	Mile	\$3,000-\$5,000/yr

* Cost varies considerably with the span (length) of bridge, proximity of bridge to new location, and condition of bridge.



Table 5.2 – Estimated Construction Costs for Common Types of Trail Construction (2005 Construction)

Trail Type	Unit Price
5-foot wide hiking/biking trail with natural surface	\$8,250
5-foot wide hiking trail with wood chip surface	\$24,750
5-foot wide hiking trail with granular surface	\$48,750
6-foot wide pedestrian trail with asphalt surface	\$125,000
5-foot wide pedestrian trail with concrete surface	\$85,750
10-foot wide multi-use trail (non-motorized) with granular surface	\$83,750
10-wide multi-use trail (non-motorized) with asphalt surface	\$133,250
10-foot wide multi-use trail (non-motorized) with concrete surface	\$236,500
10-foot wide equestrian or snowmobile trail with natural surface	\$13,500
8-foot wide OHV trail with natural surface	\$7,800
5-foot wide hiking/mountain biking trail with natural surface	\$6,750

The following sections provide estimates of trail construction costs for specific segments identified in the Chapter 3 using the per mile construction cost identified above. For each segment, costs are given for several types of trail so that trail planners can see a range of potential costs.

5.4 Estimated Costs of Turtle Mountain Region Projects

Turtle Mountain State Forest Connections

The connecting trail between the Town Line Road and the Turtle Mountain Recreational Forest trails is approximately 4.6 miles in length. This trail is envisioned to be a soft-surface trail 10-foot wide with natural surface.

10-foot wide multi-use trail (non-motorized) with asphalt surface	\$612,950
10-foot wide equestrian or (non-motorized) with asphalt surface	\$62,100
8-foot wide OHV trail with natural surface	\$35,888



The trail connecting Turtle Mountain Recreational Forest to Lake Metigoshe State Park is approximately 5.0 miles in length. This trail is envisioned to be a soft-surface trail 10-foot wide with natural surface.

10-foot wide multi-use trail (non-motorized) with asphalt surface	\$666,250
10-foot wide equestrian or snowmobile trail with natural surface	\$67,500
8-foot wide OHV trail with natural surface	\$39,000

Bottineau to Lake Metigoshe

The trail connecting Lake Metigoshe to the City of Bottineau along Town Line Road is approximately 13.1 miles in length. This trail is envisioned to be 10-foot wide with bituminous surface.

Dual tread trail 10-foot wide asphalt trail and 8-foot wide OHV trail	\$1,847,755
10-foot wide multi-use trail (non-motorized) with asphalt surface	\$1,745,575
10-foot wide multi-use trail (non-motorized) with granular surface	\$1,097,125

The trail connecting Lake Metigoshe to the City of Bottineau along Lake Road is approximately 9.0 miles in length. This trail is envisioned to be 10-foot wide with bituminous surface.

10-foot wide multi-use trail (non-motorized) with asphalt surface	\$1,119,250
10-foot wide equestrian or snowmobile trail with granular surface	\$753,750
8-foot wide OHV trail with natural surface	\$70,200

The trail connecting Lake Metigoshe to the City of Bottineau along Oak Creek is approximately 10.2 miles in length. This trail is envisioned to be five-foot wide hiking trail with natural surface.

5-foot wide hiking trail with granular surface	\$497,250
10-foot wide equestrian or snowmobile trail with natural surface	\$137,700
5-foot wide hiking / mountain biking trail with natural surface	\$68,850



Lake Metigoshe to International Peace Garden

The connecting trail between the Lake Metigoshe State Park and the International Peace Garden is approximately 9.5 miles in length. This trail is envisioned to be a 10-foot wide trail with asphalt surface.

10-foot wide multi-use trail (non-motorized) with asphalt surface	\$1,265,875
10-foot wide multi-use trail (non-motorized) with granular surface	\$795,625
10-foot wide equestrian or snowmobile trail with natural surface	\$128,250

International Peace Garden to Wakopa WMA

The connecting trail between the International Peace Garden and the Wakopa Wildlife Management Area is approximately 7.6 miles in length. This trail is envisioned to be a 10-foot wide trail with asphalt surface.

10-foot wide multi-use trail (non-motorized) with asphalt surface	\$1,012,700
10-foot wide multi-use trail (non-motorized) with granular surface	\$636,500
10-foot wide equestrian or snowmobile trail with natural surface	\$102,600

Wakopa WMA to St. John

The connecting trail between the Wakopa Wildlife Management Area and the community of St. John is approximately 7.5 miles in length. This trail is envisioned to be a 10-foot wide trail with asphalt surface.

10-foot wide multi-use trail (non-motorized) with asphalt surface	\$999,375
10-foot wide multi-use trail (non-motorized) with granular surface	\$628,125
10-foot wide equestrian or snowmobile trail with natural surface	\$101,250



St. John to Rolla

The connecting trail between St. John and Rolla along the former rail road grade is approximately 7.1 miles in length. This trail is envisioned to be a 10-foot wide trail with asphalt surface.

Dual tread trail 10-wide asphalt trail and 10-foot wide equestrian/snowmobile trail	\$1,041,925
10-foot wide multi-use trail (non-motorized) with asphalt surface	\$946,075
10-foot wide multi-use trail (non-motorized) with granular surface	\$594,625

5.5 Estimated Costs of Pembina Gorge Region Projects

Icelandic State Park to Walhalla

The connecting trail between Icelandic State Park and the City of Walhalla along Highways 5 and 32 is approximately 18.2 miles in length. This trail is envisioned to be 10-foot wide with asphalt surface.

10-foot wide multi-use trail (non-motorized) with asphalt surface	\$2,425,150
10-foot wide multi-use trail (non-motorized) with granular surface	\$1,524,250
10-foot wide equestrian or snowmobile trail with natural surface	\$245,700

The connecting trail between Icelandic State Park and the City of Walhalla along the Great Northern Railroad corridor is approximately 15.6 miles in length. This trail is envisioned to be 10-foot wide with asphalt surface.

10-foot wide multi-use trail (non-motorized) with asphalt surface	\$2,078,700
10-foot wide multi-use trail (non-motorized) with granular surface	\$1,306,500
10-foot wide equestrian or snowmobile trail with natural surface	\$210,600

The connecting trail between Icelandic State Park and the City of Walhalla along the approximate route of the historic Ox Cart trail is approximately 10.6 miles in length. This trail is envisioned to be 10-foot wide with asphalt surface.



10-foot wide multi-use trail (non-motorized) with asphalt surface	\$1,412,450
10-foot wide multi-use trail (non-motorized) with granular surface	\$887,750
10-foot wide equestrian or snowmobile trail with natural surface	\$143,100

Walhalla to Vang Bridge

The connecting trail between the City of Walhalla and the Vang Bridge along County Highway 55 is approximately 7.9 miles in length. This trail is envisioned to be 10-foot wide with asphalt surface.

10-foot wide multi-use trail snowmobile trail with natural surface	\$1,052,675
10-foot wide multi-use trail (non-motorized) with granular surface	\$661,625
10-foot wide equestrian or snowmobile trail with natural surface	\$106,650

An extension of the trail to Mt. Carmel Dam is approximately 12.0 miles in length.

10-foot wide multi-use trail (non-motorized) with asphalt surface	\$1,599,000
10-foot wide multi-use trail (non-motorized) with granular surface	\$1,005,000
10-foot wide equestrian or snowmobile trail with natural surface	\$162,000

The loop trail from Walhalla to Tetrault Woods overlook and back to Walhalla is approximately 8.0 miles in length. This trail is envisioned to be 10-foot wide with asphalt surface.

10-foot wide multi-use trail (non-motorized) with asphalt surface	\$1,066,000
10-foot wide multi-use trail (non-motorized) with granular surface	\$670,000
10-foot wide equestrian or snowmobile trail with natural surface	\$108,000



Existing Snowmobile Corridor in River Bottom

The connecting trail between the Texas Crossing and the City of Walhalla along the river bottom (existing snowmobile route) is approximately 18.3 miles in length. This trail is envisioned to be 10-foot wide with granular or natural surface.

10-foot wide multi-use trail (non-motorized) with asphalt surface	\$2,438,475
10-foot wide equestrian or snowmobile trail with natural surface	\$1,532,625
8-foot wide OHV trail with natural surface	\$247,050

The connecting trail between County Highway 55 and the Texas Crossing is approximately 10.5 miles in length. This trail is envisioned to be a 10-foot wide trail with natural or granular surface or may make use of existing township roads.

10-foot wide multi-use trail (non-motorized) with asphalt surface	\$1,399,125
10-foot wide equestrian or snowmobile trail with natural surface	\$879,375
8-foot wide OHV trail snowmobile trail with natural surface	\$141,750

5.6 Estimated Construction Costs of Other Amenities

OHV Park

This estimate assumes a 15-mile system of looped trails with trailhead/ parking area for 20 vehicles and trailers. Cost is for construction only and does not include cost of property acquisition, design, and administration.

8-foot wide OHV trails with natural surface	\$117,000
Gravel parking lot	\$50,000



Pembina River Canoe Route

Developing three launching areas with a stabilized streambank and small parking area (three to five spaces) at the “Texas Crossing.” Cost is for construction only and does not include cost of property acquisition, design, and administration.

Three launching areas @\$7,500 each	\$22,500
Gravel parking area	\$12,500

Regional Mountain Bike Trail Systems

This estimate assumes development of a regional mountain bike trail system using existing roads and trails. Therefore, development would be primarily limited to providing signage for existing routes and the development of trailheads. The costs are for construction only and do not include costs of property acquisition, design, and administration.

Trail signage	\$7,500
Gravel parking area (10 spaces)	\$25,000



Chapter 6 – Implementation Recommendations

The trail development program for the Turtle Mountain and Pembina Gorge areas outlined in the previous chapters is a substantial undertaking that will require the cooperative efforts and resources of many stakeholders. The continued involvement of federal, state, and local government agencies as well as local landowners and private interests through implementation is critical to the success of the master plan.

This chapter identifies potential resources for funding implementation efforts, discusses agency coordination issues and roles and responsibilities related to implementation.

6.1 Funding Sources

Trail funding is available from a variety of federal, state, and private sources. The funding can be dependent on the type, size, and location of the trail. In addition, some funding may be dedicated only to specific tasks, such as property acquisition, design, or construction. This section describes some of the potential funding sources that may be available to support the implementation of trail projects in the Turtle Mountain and Pembina Gorge area.

6.1.1 Federal

Federal Transportation Enhancements Funds

Federal transportation funds come from a variety of sources, including federal gas taxes. A portion of this money can be used for trail initiatives under the Transportation Equity Act for the 21st Century (TEA-21). This act appropriates a certain amount of money to each state to be used for transportation enhancements. The funds are available on an application basis.

Trails that receive federal transportation funding must adhere to American Association of State Highway and Transportation Officials (1999) guidelines, which are the recognized standard for bicycle design guidelines.

Land and Water Conservation Fund

The Land and Water Conservation fund provides 50% grants for the acquisition and development of outdoor recreation areas and facilities.



National Recreational Trails Fund

The National Recreational Trails Fund is a federal granting program with a 50% local match requirement. It can be used to construct and maintain motorized and non-motorized recreational trails and trail-related projects. Trails must be identified in a State Trails Plan or State Comprehensive Outdoor Recreation Plan.

Wildlife and Conservation Fund

The Wildlife and Conservation Fund is a program of the U.S. Fish and Wildlife Service that seeks to provide opportunities for the public to view and enjoy fish and wildlife. This program recognizes trails and waterways as a means of accessing wildlife areas.

The Rivers and Trails Conservation Assistance Program

The Rivers and Trails Conservation Assistance Program is a program administered by the National Park Service that responds to public demand to conserve rivers and provide recreational trails.

6.1.2 State

North Dakota Recreational Trails Program

This program provides matching funding for a wide variety of trail implementation projects, including property acquisition, trail development and design, and trail maintenance. Approximately \$500,000 is available annually as follows:

- 30% is directed to non-motorized trail efforts.
- 30% is directed to motorized trail efforts
- Remaining 40% is directed to various projects.

Funding is provided at 80% with a 20% local match.

Adopt a Bridge Program

Historic bridges in North Dakota can be adopted by local communities or user groups. To inquire about the availability of historic bridges, contact the Local Government Division of the North Dakota Department of Transportation at 701.328.2540. They can provide information about bridges that are being replaced and may be eligible for use on a trail as well as information on the process for acquiring and revising bridges.



6.1.3 Other Sources

International Mountain Bike Association (IMBA)

The IMBA provides a variety of grants and in-kind services for trail development that are focused primarily on developing mountain bike trails. Grants and services include trail building workshops, trail clearing and maintenance grants and services, and educational programs.

Potential OHV Revenue Sources

Developing an OHV trail system obviously requires investing funds to develop the trails and the supporting infrastructure. However, there is also a long-term cost of maintaining the facilities and managing use. For this reason, it is important to explore a variety of funding sources for off-highway vehicle projects.

OHV Registration Program

Many states, including North Dakota, have an OHV registration program. Based on the experiences of programs in other states, an efficient program with an adequate revenue stream is essential to the long-term survival of an OHV registration program. The actual management of a program varies significantly from state to state, but there are some common elements:

- Dedicated fund
- Administrative transparency
- Grants for OHV management activities
- State crews performing OHV work
- Strong enthusiast involvement

North Dakota's registration fee structure is among the lowest in the nation. As there are few legal trails in the state, the fees are probably reasonable and are all that can be justified. However, as new trails and areas become available and riders see that the money is being used to provide opportunities, support could be generated for increasing the annual fee.

Fuel Tax Transfers

In many states, a portion of the state fuel tax is transferred to an OHV fund. The amounts of these transfers vary, but they are often based on the tax on the fuel burned in off-highway activities. Determining this amount requires a scientific study of fuel use. However, after there is a clear understanding of the amounts of fuel used by OHVs, the ability to enact a transfer may be politically difficult, because of existing needs in the state highway system where the funds are currently being used.



Recreation Trails Program

The Recreation Trails Program is a federally funded program that allocates funds to each state. The funds are derived from the federal fuel tax based on the fuel that is burned in off-highway activities. This funding is administered by the state and is allocated to all trail uses. The federal law indicates that the funding should be split among motorized and non-motorized uses. The allocation suggestion in federal law, which has been adopted by many states, is that 30% of the money will be allocated to strictly non-motorized uses, 30% will be allocated to motorized activities, and 40% will be allocated to multi-use projects. These multi-use projects are defined as accommodating a mix of uses, which can include a mix of non-motorized uses or a mix of motorized and non-motorized activities on the same trail.

6.2 Agency Coordination and Roles and Responsibilities

Critical to the success of this planning effort is the clear delineation of the roles and responsibilities of the state agencies. While individual agencies may be responsible for developing trails within their jurisdiction, the development of a comprehensive system requires the coordinated efforts of various state agencies.

One of the significant outcomes of the planning process was the effort made by the three primary implementing agencies (NDPR, NDGF, NDFS) to discuss various challenges to implementing trails over lands of varying jurisdiction.

While all agencies recognize the current impact of unregulated trail use, the means of responding to this challenge differed by agency.

In the course of developing the plan, the idea that NDPR continues to be the lead agency in regulating trail use was affirmed. As the lead enforcement agency, NDPR is committed to the placement of staff in the Pembina Gorge area, potentially making use of the NDFS housing in Walhalla.

More specific roles and responsibilities will continue to evolve as trails are implemented. Agencies should continue to discuss concerns and challenges so that issues can be resolved in a timely manner.



6.3 Phasing

As a general rule, projects that have right-of-way available, such as the Rolla to St. John Rail Corridor and the Bottineau to Lake Metigoshe Trail along Town Line Road, may be phased sooner than other trails that require right-of-way acquisition.

6.4 Implementation Strategies

- Provide technical assistance towards trail planning and development.
- Initiate cooperative planning for an integrated operation and enforcement strategy in the Pembina Gorge.
- Maintain dialogue with tribal, private, and local jurisdictions.
- Create safety, education, and enforcement promotion for Pembina gorge.
- Establish a proposed development schedule for trail concepts.
- Explore opportunities for linkage of existing trails within corridor concepts.
- Conduct periodic workshops within the two planning regions.
- Update the plan at 5-year intervals.



Chapter 7 – Operations and Maintenance

7.1 Maintenance Requirements

Ongoing maintenance is critical to the success of trail systems. Depending on the site context, trail surface material, use, and natural events, trail maintenance varies. However, consideration of long-term operation and maintenance issues at all phases of the trail planning and development process will maximize the enjoyment and longevity of trails

One of the primary issues for trail maintenance is the same as trail design: managing or responding to stormwater impacts.

Typical maintenance and frequency for soft-surface trails may include:

- Mowing – as needed
- Brush removal – as needed
- Trash removal – as needed
- Trail grooming or plowing – seasonal
- Trail grading at specific – annually, as needed
- Sign replacement and updates – as needed
- Aggregate placement – annually, as needed
- Total regrading – every five years

Typical maintenance and frequency for paved trails may include:

- Mowing – as needed
- Brush removal – as needed
- Trash removal – as needed
- Sign replacement and updates – as needed
- Trail grooming or plowing – seasonal
- Patching and crack sealing – annually, as needed
- Sealcoating – every five years
- Bituminous surface overlay – every 10 years



Photo credit: Agency MABU/Annette Tait August 2004



Photo credit: Agency MABU/Annette Tait August 2004

7.2 Agency Coordination

Agency coordination is a significant issue facing the development of trails in the Pembina Gorge and Turtle Mountain regions. The three primary state landowners (NDPR, NDGF, and NDFS) are all dedicated to providing recreational opportunities for the public, but differ in their approach to trail development.

In order to maximize the trail opportunities afforded in these regions, the agencies need to develop a common strategy regarding trail development, regulation, and enforcement on their respective lands.



Working with the North Dakota Office of Tourism and the local economic development and tourism groups, the agencies also need to coordinate efforts to promote trail use in the Pembina Gorge and Turtle Mountain regions.

Recognizing the specific concerns regarding enforcement issues in the Pembina Gorge area, the NDPR and NDFS are currently exploring the opportunity to base a NDPR office in Walhalla to provide enhanced regulatory enforcement in the region.

7.3 Rules, Regulations, and Enforcement

One of the common concerns voiced during the public process was the need for increased enforcement of trail rules and regulations. Enforcement is certainly a major issue, but the need for education is hand in hand with enforcement. Trail users need to be educated on the laws regulating trail use and made aware of the cultural, historical, and natural significance of the areas that trails pass through.

Education and enforcement is also a coordination effort as the various state agencies with trail systems within their land holdings have varying policies on trail use. Education and enforcement also extends to local businesses that service trail groups, and trail user groups or clubs also have an obligation to educate their clientele or membership.

Another common issue for landowners is landowner liability. Section 53-08-03 of the North Dakota Century Code limits the liability of landowners so long as no fee is charged for using their property. In effect, an owner who allows recreational use on his/her land without charging a fee is not liable for any injuries incurred while using the property. Educating the public regarding this language may help in the effort to form stronger partnerships between the NDPR and local landowners.

7.3.1 Specific ATV Issues

As identified in the State's Strategic Plan for ATV use, regulation, and enforcement of OHV activities are two of the primary goals of the plan. The strategic plan describes the goals as:

- Define and determine the responsibility for monitoring and enforcing laws and regulations in designated ATV (OHV) use areas.
- Engage law enforcement entities in efforts relating to ATV (OHV) use areas and regulations.



Appendix A: Summary of Public Input

Initial site visit and meetings, November 1-3, 2004

Landowner and User Group Meetings, January 18-20, 2005

Landowner and User Group Presentations, May 25-26, 2005

Community Advisory Committee Review of Document, May-July 2005



Appendix B: Technical Resources

National Motorized Recreation Organizations

All Terrain Vehicle Association

www.ATVAonline.com

American Council of Snowmobile Associations

www.snowmobileacsa.org

American Motorcyclist Association

www.AMADirectlink.com

Americans for Responsible Recreation Access

www.responsiblerecreation.org

ATV Safety Institute - ATV Training

www.atvsafety.org

Blue Ribbon Coalition

www.sharetrail.org

International Snowmobile Manufacturers Assn.

www.snowmobile.org

Motorcycle Industry Council

www.mic.org

Motorcycle Safety Foundation - OHM Training

www.dirtbikeschool.com

National OHV Conservation Council

www.nohvcc.org

Specialty Vehicle Institute of America

www.svia.org

United Four Wheel Drive Association

www.ufwda.org

National Nonmotorized Trail Associations

American Hiking Society

www.americanhiking.org

Back Country Horsemen of America

www.backcountryhorse.com

International Mountain Bicycling Association

www.imba.com



National Outdoor Education and Resource Organizations

American Recreation Coalition/surveys
www.funoutdoors.com/research.html

American Trails
www.AmericanTrails.org

Leave No Trace
www.lnt.org

National OHV Conservation Council
www.nohvcc.org

Tread Lightly!
www.treadlightly.org

National Trail Training Organizations

National Trails Training Partnership
www.nttp.net

Professional TrailBuilders Association
www.trailbuilders.org

Government Agencies and Programs

Recreational Trails Program
<http://www.fhwa.dot.gov/environment/rectrails/index.htm>

RTP Publications
<http://www.fhwa.dot.gov/environment/rectrails/publications.htm>

ADA Trail Accessibility Standards
<http://www.access-board.gov/outdoor/outdoor-rec-rpt.htm>

USDA Forest Service
www.fs.fed.us

- USFS Pacific Southwest Research Center
www.rfl.psw.fs.fed.us/recreation/index.html
- USFS Missoula Technology & Development Center
www.fs.fed.us/t-d (user name: t-d/password: t-d)
- USFS Trail Assessment & Condition Surveys
www.fs.fed.us/r3/measures/inventory/TRACS.htm
- USDA FS Trail Publications
www.fhwa.dot.gov/environment/fspubs/index.htm

USDI Bureau of Land Management
www.blm.gov

USDI BLM National Training Center
www.ntc.blm.gov



Appendix C: Representative Case Studies

TNT Motorsports Park

TNT Motorsports Park is a private OHV park located on 228 acres near Chester, South Carolina, in the northeast portion of the state. The area is covered by dense hardwood forest and includes gentle to steep terrain. The park is open seven days a week, weather permitting.

All persons entering the park are required to be a park member at an annual cost of \$10. In addition, individuals riding at the park are required to pay \$10 per day. Riders are required to sign a release of liability whenever they ride.

The park includes 12 miles of motorcycle and ATV trails and six miles of motorcycle-only trails. These trails are maintained on a regular basis with small trail equipment. The trails are interconnected and provide many loop opportunities. Because of the level of use, the trails are identified as directional trails.

The park also includes a Kids Learned Track that is designed for beginner riders on small machines and provides an opportunity for young riders to learn and improve skills. At this track, parental supervision is required at all times.

In this part of the country, motorcycle and ATV racing is a popular activity. To accommodate this, the park provides a natural terrain motocross track, an advanced motocross track, and a supercross style track as well as intermediate and flat tracks. These venues are primarily used for skill building and practice, but commercial events are also held here several times each year.

The park also offers a variety of support services and other amenities. Primitive camping is allowed on the site. Parking, sanitation, and a snack bar are also provided. On holidays or special event days, the park has been used by up to 1,000 people, but normal weekend usage is in the range of 100 people per day.

For more information, contact:

TNT Motorsports Park

4027 Great Falls Highway

Richburg, SC 29729

803.385.5048

www.tntmotorsportsinc.com



Embarrass River ATV Park

Located near the community of Tigerton in northcentral Wisconsin, the Embarrass River ATV Park provides 20 miles of ATV trails on 504 acres of town-owned land. The park provides ATV riding, camping, and hiking in a scenic wooded area. It is located about an hour west of Green Bay, an hour north of Appleton, and 45 minutes east of Wausau.

The park trails provide a range of experiences from easier family trails to challenges that the most experienced rider will enjoy. Trails are open from 8:00 a.m. to dusk.

Camping is available in 37 campsites, many of which are dotted along the banks of the Embarrass River. There is also a family camping area for larger groups. Electrical hookups are available as well as shower and laundry facilities. An RV dump station, potable water, and firewood are also available for campers at the park.

The park charges fees for using the trails or track and an additional fee for camping. In 2004, fees ranged from \$7.00 per day for weekdays and \$10.00 per day for weekend days. Visitors had the option of purchasing a \$25.00 weekly pass or a \$15.00 weekend pas for Saturday and Sunday. Camping fees were \$10.00 per day for tent sites and \$15.00 for RV sites, which includes electricity.

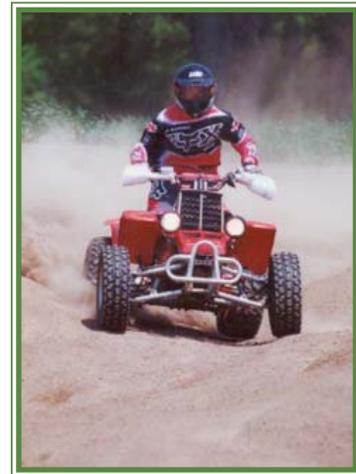
Races are held at the park on a scheduled basis. Three events were held in 2004. In addition to the scheduled races, the park is closed for two weeks in October to provide opportunities for disabled hunters to participate in a special deer hunt.

For more information, contact:

William Berg, Park Manager

888.947.2288

email: tigertonatvpart@frontiernet.net



Niobrara River Canoe Trail

The Niobrara River Canoe Trail can be accessed at the Fort Niobrara National Wildlife Refuge near the City of Valentine, Nebraska, at the approximate midway point of the Niobrara River. At this point, the river runs through a valley that is about 300 feet deep and half a mile wide. The trail runs from the Cornell Bridge to the Norden Bridge, approximately 31 miles. At the refuge, the launch site to the trail is the Cornell Bridge. Public parking and restroom facilities are available.

Once on the canoe trail, there are numerous opportunities to access hiking trails and facilities adjacent to the river, including restroom and parking facilities. Smith Falls State Park has the most extensive facilities that can be accessed from the trail, including a visitor's center, restrooms, showers, and camping.

This is a challenging river with areas of fast flowing water (six to eight miles per hour) through steep sandstone canyons with riffles and rapids. There are also areas with islands and sandbars where the waters are calmer waters. The average depth of the water is approximately two feet.

For more information, contact:

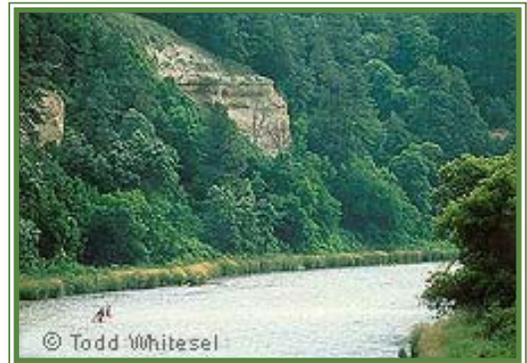
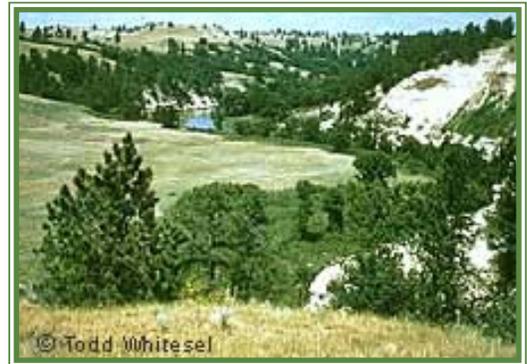
Nebraska Game and Parks Commission

P.O. Box 30370

Lincoln, NE 68503

402.471.0641

www.outdoornebraska.com



Luce Line Equestrian Trail

The Luce Line State Trail is a former railroad corridor that runs through the Twin Cities Metropolitan area from the City of Plymouth to the City of Cosmos, Minnesota, for a total of 63 miles. The trail is developed for biking, hiking, horseback riding, mountain biking, snowmobiling, and skiing. The trail is surfaced in limestone from Plymouth to Winsted, with a parallel treadway for horseback riding. From Winsted to Cosmos, the trail has a natural surface with three missing bridges.

The trail preserves a strip of natural resources, including many varieties of plants and animals. In the east portion of the trail, the landscape is woodland with stands of sugar maple and basswood and many colorful forest floor groundcover plants. In the western portion of the trail, the landscape has remnants of tall-grass prairie, with some prairie plants still visible.

For more information, contact:

Minnesota Department of Natural Resources

Metro Area Trails and Waterways
1200 Warner Road
Saint Paul, MN 55106
651.772.7935
www.dnr.state.mn.us



Chequamegon Area Mountain Bike Association (CAMBA)

Located in and around the Chequamegon National Forest in northwestern Wisconsin, the CAMBA trails network is one of the premier off-road trails systems in the Midwest. The CAMBA trail system consists of more than 300 miles of marked and mapped routes spread over a 1,600 square mile area. The system is divided into six separate trail clusters, each with its own trailheads, with each cluster comprising 40 to 100 miles of trail.

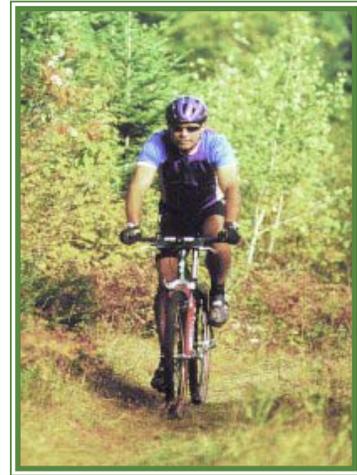
Maps are available that provide an overview of the entire system as well detailed layouts of individual clusters. CAMBA uses a simple user-friendly trail signage system that encourages exploration with frequent “You Are Here” markers and posted trail maps. The marked routes follow a variety of logging roads, fire lanes, snowmobile trails, ski trails, and single track trails that provide quality riding experiences for riders of all abilities.

The system is supported by offering various membership opportunities that include maps, newsletters, and special events. Membership costs range from \$40 for an individual membership to \$100 for a premium business membership. CAMBA also solicits sponsorship from area businesses and communities.

For more information, contact:

Chequamegon Area Mountain Bike Association

P.O. Box 141
Cable, Wisconsin 54821
800.533.7454
<http://cambatrails.org>
camba@cheqnet.net



Lutsen Mountain Bike Park

The Lutsen Mountain Bike Park consists of 32 miles of marked trails over two mountains. The terrain varies to accommodate all skill levels with gravel surface beginner trails to rock surfaced advanced trails with steep descents and obstacles. The trail routes can be combined to create an endless variety of trail experiences.

For novice riders, Mystery Mountain provides scenic rides along gently winding trails. Moose Mountain provides more experienced riders with demanding downhills and challenging single track riding. The North Road provides families with an easy three-mile ride along the Poplar River.

Costs for mountain bike riding at Lutsen vary from \$20 for a one-day trail only pass to \$34 for a trail pass with unlimited rides on the Mystery Mountain chairlift and Moose Mountain tram.

For more information, contact:

Lutsen Mountain

P.O. Box 129
Lutsen, Minnesota 55612
218.663.7281
www.lutsen.com



Appendix D: Snowmobile Efficiency Study

Background

The Snowmobile North Dakota 2002 Survey of North Dakota snowmobile users suggested that most snowmobile users are aware of just a few of North Dakota's snowmobile trails. The two most recognizable trail systems are the Northeast Trail in Cavalier and Pembina Counties and the Peace Garden Trail in Rollete and Bottineau Counties. These two systems correspond to the Turtle Mountain and Pembina Gorge regions identified in the trail study.

According to the survey, one of the distinguishing qualities of the Peace Garden Trail is the quality of trail grooming and maintenance, and the Peace Garden Trail is the most used snowmobile trail in the state. Based on other survey comments, it appears that the quality of grooming is a significant drawing point for snowmobile users.

The North Dakota Parks & Recreation Department (NDPRD) contracts with Snowmobile North Dakota for the maintenance and operation of the State trail system. These services are paid for in part by snowmobile registration fees and gas taxes. In order to provide a better, more efficient trail system, NDPRD asked that an efficiency study to be done on the trail systems in the study area to insure that the resources are being allocated to their highest potential.

Existing Trail Systems

Northeast Trail

The existing Northeast Trail system includes the Pembina Gorge and Icelandic State Park and the communities of Langdon, Walhalla and Cavalier among others. It consists of 450 miles of groomed trails and is the largest snowmobile trail system in the state. The Northeast Trail system has four connections to the Canadian snowmobile trail system, two ties to State of Minnesota trails and ties to the Red River and Lake Regional trails in North Dakota. Seven snowmobile clubs take part in grooming this trail system.

Peace Garden Trail

The existing Peace Garden Trail system includes the Turtle Mountains and Lake Metigoshe State Park, the International Peace Garden and the communities of Bottineau, Rolla and St. John among others. This snowmobile trail is also among the largest in the state and includes 350 miles of groomed trails. The Peace Garden trail includes two connections to the Canadian snowmobile trail system. Four snowmobile clubs groom the trails of the Peace Garden Trail system.



Goals and Objectives

In evaluating the trail systems, a couple of basic criteria were used to determine efficiencies that could be realized. The criteria focused on providing rewarding trail riding experiences that link destinations, providing flexibility in trail lengths and responding to emerging border security issues. Specifically, trails were evaluated on the ability to achieve the following:

- Create loops of a reasonable length (that is, approximately 40 miles).
- Link destinations along loop systems (for example, points of interest, food, lodging, and fuel).
- Reduce redundancy of parallel trails.
- Minimize the number of connections across the Canadian border.

Of these criteria the most subjective is the redundancy of parallel trails. In this case, preference was given to trails that provide visual interest along their length. Generally, the preference is for trails that go overland rather than trails that follow roadway ditches.

Trail Reduction Recommendations

Based on the criteria outlined previously, existing trail systems were evaluated to suggest reductions of selected trail segments. The proposed reductions would amount to approximately 7.5 percent of the existing trail system.

Northeast Trail

- Five miles of trail along County Road 55 between the City of Walhalla and the Vang Bridge. This trail is within the road right-of-way and makes the same connections as the more scenic trail along the Pembina River Gorge.
- 4.5 miles of trail from the City of Walhalla to the Canadian border. This trail appears to be redundant as there are three other border crossings in the system. The other crossing locations are more integrated into loop systems.
- 21 miles of trail connecting the communities of Wales and Hannah. This segment is not part of a loop system.
- Eight miles of trail running north from Adams to the warming hut. This segment of trail appears to be redundant to a trail to the east. The trail to the east appears to go overland while the trail north of Adams is along road right-of-way.
- 4 miles of trail to border crossings at Highway 30 and Highway 14.



Peace Garden Trail

- 1 mile of trail connecting Highway 5 to the Homestead Lodge (segment 3A). This trail is not integrated in to a looped system. It is an out and back trail without any of other connections.
- 3-5 miles of trails in the Turtle Mountain State Forest variously designated as segment 2B. Here it is suggested that the trails in the area be reduced or rerouted to create loop systems of greater length.
- 7 miles of trail along Highway 30 (segment 7B) from the Canadian border to the intersection with trail segment 7 north of Rolla. This is a redundant trail segment that can be served by trail segment 7, which has additional destinations and opportunities for overland trails.
- 3 miles of trail to border crossings at Maida and Neche.
- It is also suggested that the trails in the Lake Metigoshe area that are currently a system of individual out and back segments be revised to create a system.



