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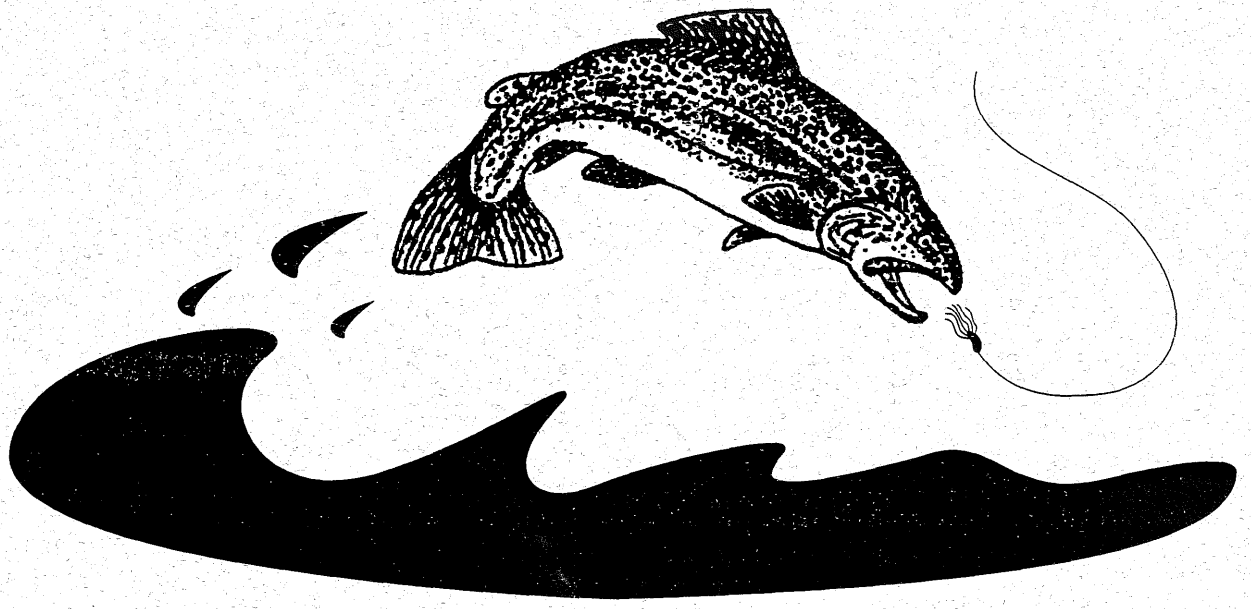

Forestville State Park

Management Plan

Minnesota Department of Natural Resources
Division of Parks and Recreation

JULY 21, 1995

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INTRODUCTION

State Park's Mission/Vision/Goals

The following statements were generated by planning process participants after reviewing the general DNR and Division of Parks and Recreation mission statements.

Park Mission:

To preserve and manage the diverse natural, scenic, and cultural resources of Forestville State Park for present and future generations while providing appropriate recreational and educational opportunities.

Park "100-year" Vision:

- The park's natural scenic beauty, non-commercial atmosphere, and pre-European settlement character are preserved.
- Park development and use is controlled and managed to maximize the natural attractiveness and historic character of Forestville.
- As tourism demand grows and the need for resource protection increases, the park's physical boundaries expand and local partners help to manage resources within an ecological boundary in the main park/Mystery Cave area.
- Park visitors can stay overnight in nearby communities and bicycle to the park.
- The park is an exemplary, healthy ecosystem of unfragmented, closed-canopy forest and karst topography within a sustainable use community.

Park Goals:

(See pages 47 and 52 for objectives specific to resource and recreation management)

- To provide a balance between resource preservation and recreational use.
- To provide park development in concentrated areas, preserving the remaining portions of the park.
- To provide effective and efficient public services through cooperation between the Department of Natural Resources and the Minnesota Historical Society.

Park Description and Law

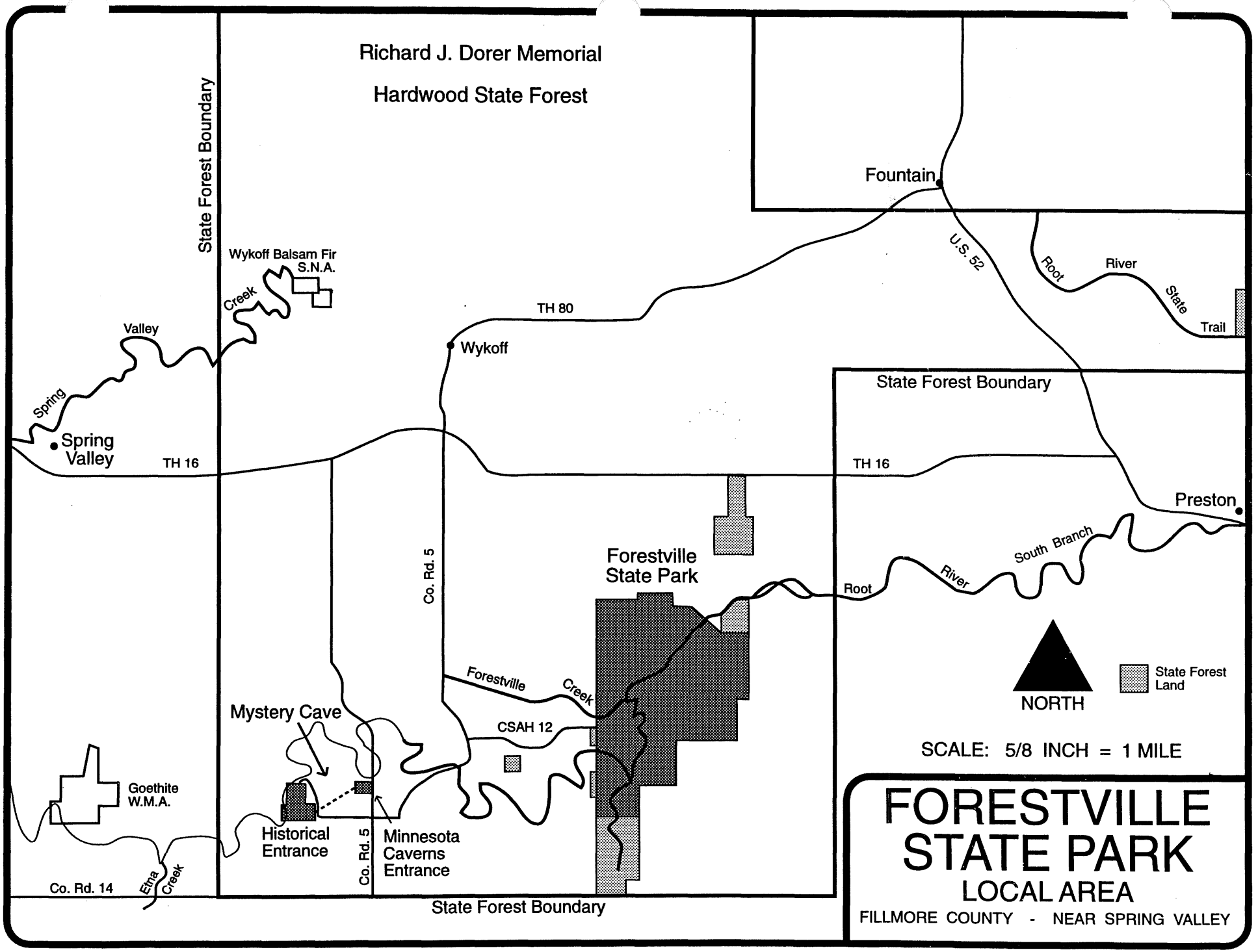
Forestville State Park is located in Fillmore County in southern Minnesota south of Wykoff, approximately halfway between Spring Valley and Preston. The park entrance is four miles south of State Highway 16 on Co. Rd. 5, and two miles east on Co. Rd. 12 (see Local Area map, page 3).

The park boundary includes approximately 2,691 acres. Approximately 286 acres are privately owned, and approximately 18 acres are included in the Forestville State Historic Site, administered by the Minnesota Historical Society (MHS).

The natural and cultural resources at Forestville State Park offer park visitors an exceptionally diverse and high quality outdoor recreation experience. The park includes:

- Historic Forestville, a MHS state historic site which includes the 19th century Meighen Store and a living history program with costumed guides;
- Mystery Cave, Minnesota's longest known cave (over twelve miles of passageway) and other karst topography features (e.g. sinkholes, springs);
- Scenic Bluffland Topography, characterized by rolling uplands, steep and wooded valleys with exposed rock bluffs, and flat valley floor floodplains;
- A Rich Diversity of Natural Resources, including hardwood forests, boreal remnants, prairie, bats, rattlesnakes, and wild turkeys;
- Some of the Best Trout-Fishing Streams in the state of Minnesota; and;
- One of the Best and Most Popular Horseback Trail systems in the State of Minnesota.

Forestville State Park was established in 1963 and the park boundaries were expanded in 1969 (see Park History, page 21). The administrative control of the state Historic Site was transferred to the MHS in 1977. Mystery Cave was added to Forestville State Park in 1987. Minnesota Laws for 1987 (Chapter 400, sec. 32, 85.012, subd. 19) includes provisions for 1) tour fees shall be deposited in the state park working capital fund (as necessary to the operation of Mystery Cave); 2) the DNR commissioner may enter into agreements with local road authorities for the maintenance or improvement of road necessary to provide access to the cave; and, 3) the DNR commissioner may acquire, in addition to the specific legal statutory boundary, subsurface estates and related rights and interests in lands needed for the permanent preservations of the cave and permanent development of those parts that will be open to the public.


Richard J. Dorer Memorial
Hardwood State Forest
State Forest Boundary
Wykoff Balsam Fir S.N.A.
Creek
Valley
Spring
Spring Valley
TH 16
TH 80
Wykoff
Fountain
U.S. 52
Root River State Trail
State Forest Boundary
TH 16
Preston
South Branch
Root River
Forestville State Park
Co. Rd. 5
Forestville Creek
CSAH 12
Mystery Cave
Goethite W.M.A.
Historical Entrance
Minnesota Caverns Entrance
Co. Rd. 5
Co. Rd. 14
Etna Creek
State Forest Boundary
NORTH
State Forest Land
SCALE: 5/8 INCH = 1 MILE
FORESTVILLE STATE PARK
LOCAL AREA
FILLMORE COUNTY - NEAR SPRING VALLEY

Park Advisory Committee and Planning Process

Because of the diversity of resources at Forestville, several advisory committees and park advocacy groups existed when the planning process was initiated in early 1994. These groups included the Friends of Forestville and the Mystery Cave Advisory Committee.

On January 27, 1994, a public information and planning organization meeting was held in Wykoff, Minnesota. Several meeting attendees suggested additions and changes to a preliminary Park Planning Advisory Committee. The committee structure included representation from the following organizations or areas:

1. Fillmore County Board
2. Forestville Township Board
3. Friends of Forestville
4. Spring Valley Chamber of Commerce
5. Preston Area Tourism Association
6. Southeast Minnesota Historic Bluff Country
7. Wykoff City Council
8. Zumbro Valley Audubon Society
9. Prairie Smoke
10. Youth Representative (appointed by local legislator)
11. Mystery Cave Advisory Committee

The Carimona Township Board and Kingsland School Board were invited to appoint a representative to the advisory committee, but both chose not to send formal representatives. The Forestville State Park Planning Advisory Committee held meetings to discuss major planning issues on the following dates (advertised and open to the public).

March 17, 1994
April 21, 1994
June 23, 1994
July 14, 1994
July 28, 1994
October 5, 1994
October 25, 1994
March 2, 1995

In addition, public "open houses" were held on October 12, 1994 and April 27, 1995.

The Department of Natural Resources formed an Integrated Resources Management (IRM) team to assist in developing this park plan. This technical team included area representatives from the Trails and Waterways Unit and Divisions of Forestry, Parks and Recreation, Fisheries and Wildlife, Waters, Minerals, and Enforcement. The team also included representatives from the Minnesota Historical Society and the DNR Region 5 Planner, Watershed Coordinator and Blufflands Initiative Coordinator. The IRM team met formally on November 16, 1993, March 18, 1994, and February 2, 1995. There were also several informal meetings with individuals on the team throughout the process.

The recommendations in this plan are the result of this partnership-based planning process. This plan provides a basic management direction for the park and is not intended to provide specific management or development details.

It should be noted that this is the second comprehensive management plan for Forestville State Park. The first plan was initiated during 1977, and completed in September, 1978. This plan replaces the plan completed in 1978.

A completed park plan and "planning process file" documenting the 1994-95 planning process and pertinent background information will be distributed to the following locations: Forestville State Park, Rochester Regional State Parks Manager, state park planning section (St. Paul), and DNR, Engineering (St. Paul).

BEYOND PARK BOUNDARIES

Regional Landscape and Watershed Description

The Blufflands Landscape

Much of southeastern Minnesota escaped the leveling powers of the last period of glaciation 10,000 years ago. Because of this lack of glacial activity, the major influence on the topography of the area has been the Mississippi River and its tributaries. The result of rivers flowing into the Mississippi has been a deep dissection of the landscape and a deeply entrenched stream system accompanied by a dramatic array of flat-floored valleys and intervening ridges. The steep, wooded valley walls and ridge crests of the Blufflands landscape stand in sharp contrast to the cultivated valley floor above and below. Blufftops and valleys can reach elevation differences of 500-600 feet. Rivers meander through the valleys, constantly changing their channels on their way to the Mississippi. Many of the valleys contain terraces, evidence of past stream channels left behind by the downcutting streams. Bedrock exposures are numerous, an indication of both the severity of stream erosion and also the thinness of the glacial cover (Matsch and Ojakangas, 1982).

Ecological Classification System

Minnesota's Ecological Classification System (ECS) stresses the interrelationships among components of the ecosystem. These components include climate, geology, geomorphology, parent material, soil, vegetation, hydrology, and land history. The ECS approach handles each component in relation to the others, rather than each one separately (Hargrave, 1992).

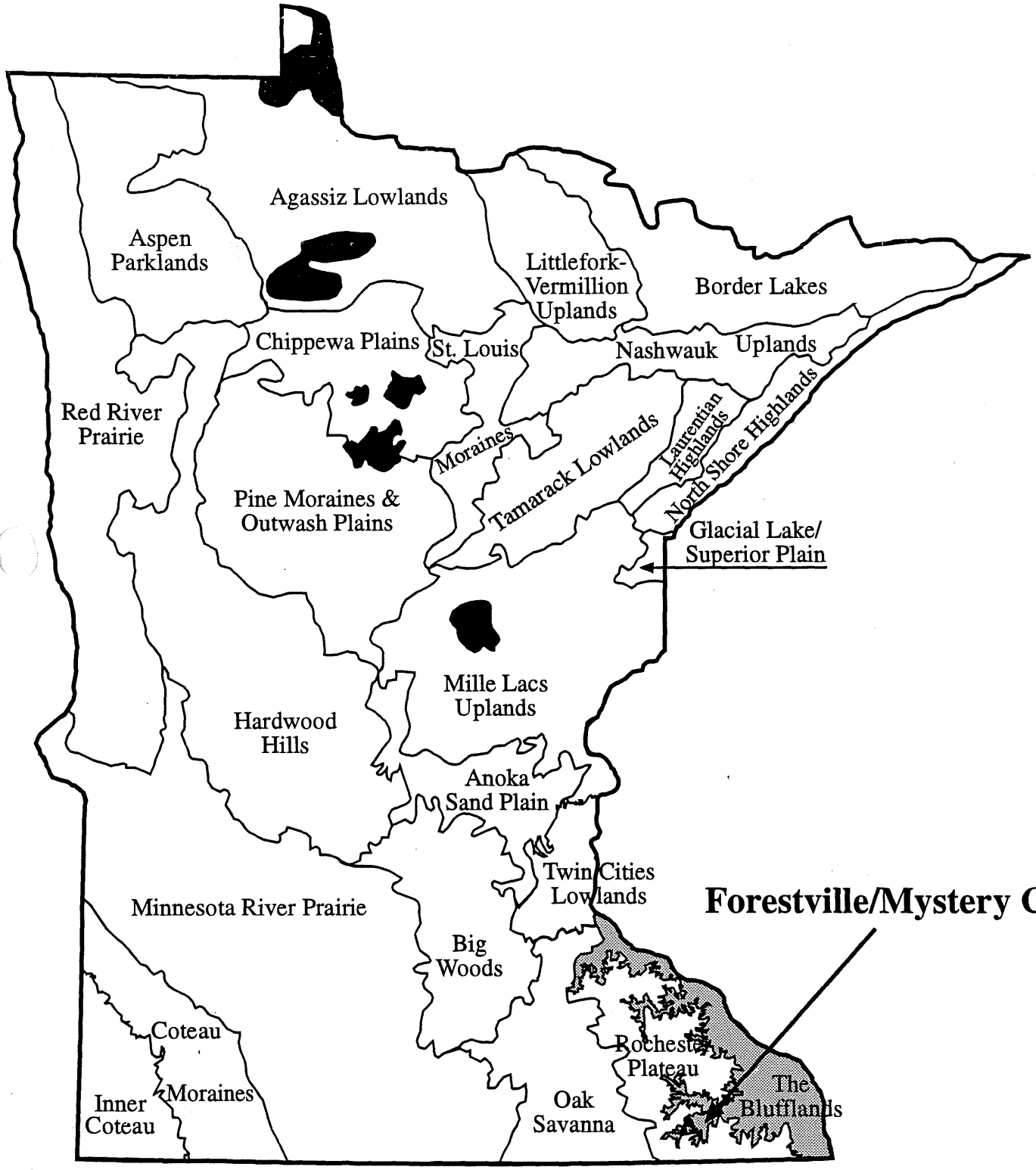
The ECS divides Minnesota into 23 subsections (see ECS map page 7). Forestville State Park is located in the "Blufflands" subsection. This subsection is essentially the "Blufflands" landscape described above, and includes areas covered by windblown silt (loess) and extensively eroded areas along rivers and streams. The Regional Context map, page 8, identifies major towns and roads in relation to the ECS subsections.

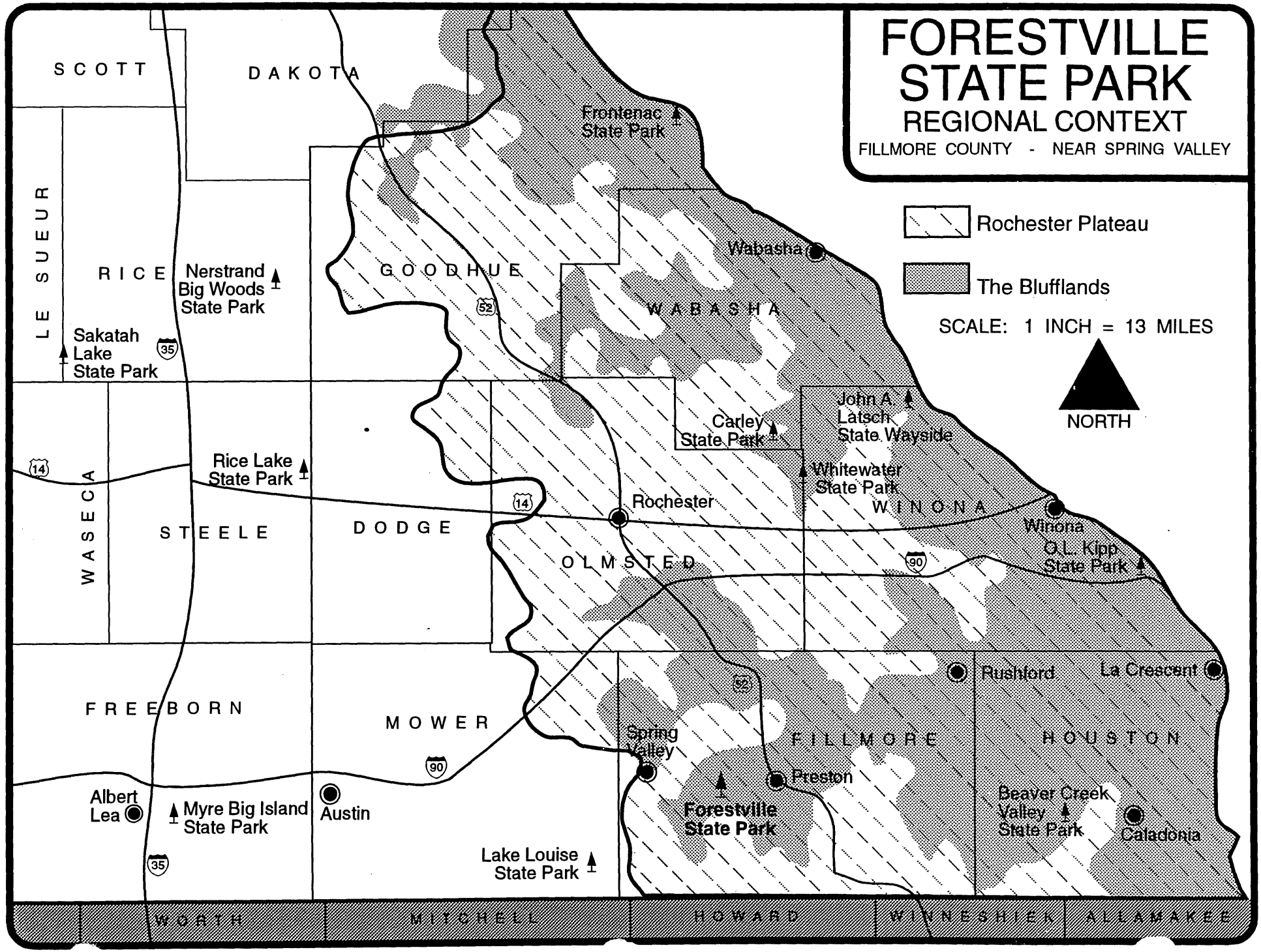
Watershed Description

Forestville State Park/Mystery Cave lies at the confluence of three significant drainages. These drainages are highly complex due to the karst (dissolved limestone) characteristics of the area. Surface waters flow easterly until encountering crevices and cave systems, at which point they become subsurface streams. These streams reemerge near the park producing three of the most important trout streams in Minnesota: Canfield Creek, Forestville Creek, and the South Branch of the Root River.

ECOLOGICAL CLASSIFICATION SYSTEM (ECS)

(Draft) Subsection Map of Minnesota




FORESTVILLE STATE PARK
REGIONAL CONTEXT
FILLMORE COUNTY - NEAR SPRING VALLEY
Rochester Plateau
The Blufflands
SCALE: 1 INCH = 13 MILES
NORTH
SCOTT
DAKOTA
LE SUEUR
RICE
GOODHUE
WABASHA
WINONA
WASECA
STEELE
DODGE
OLMSTED
FREEBORN
MOWER
FILLMORE
HOUSTON
WORTH
MITCHELL
HOWARD
WINNESHIEK
ALLAMAKEE
Frontenac State Park
Wabasha
Nerstrand Big Woods State Park
Sakatah Lake State Park
John A. Latsch State Wayside
Carley State Park
Whitewater State Park
Rice Lake State Park
Rochester
Winona
O.L. Kipp State Park
Rushford
La Crescent
Spring Valley
Preston
Forestville State Park
Beaver Creek Valley State Park
Caladonia
Albert Lea
Myre Big Island State Park
Austin
Lake Louise State Park
35
52
14
90

The quality of these unique aquatic resources within the park is directly dependent on the condition of the watershed. This water supports a healthy trout population, and a host of other organisms and systems, including the Mystery Cave stream environments. Several cave systems exist within this watershed, and exemplify the unique and fragile hydrologic-based ecosystem in this area.

Upstream of the park Canfield Creek drains roughly 35 square miles, Forestville Creek drains roughly 25 square miles, and the South Branch Root River drains close to 100 square miles. Much of the upland drainage is in agriculture. The wetland areas which remain significantly improve water quality within the immediate watershed. The larger Root River watershed drains 1,670 square miles and covers most of Fillmore and Houston Counties (as well as parts of Mower, Olmsted, and Winona Counties). Please refer to the Waters section of this plan for further watershed information.

The most fragile resources in the vicinity of the park exist in the bluffland features immediately upstream of the park. Here bluffs and steeply wooded hillsides provide diverse and unusual habitats supporting species characteristic of boreal forests such as balsam fir, white pine and Canada yew. The Wykoff Balsam Fir Scientific and Natural Area was established about 5 miles northwest of the park. Small bluff prairies and unique algific-talus slopes (see page 45) exist in this area. The Nature Conservancy purchased an area to protect an algific-talus slope between the main park unit and Mystery Cave ("Saxifrage Hollow"). The areas upstream of this park exhibit some of the highest quality resources, as well as the most serious habitat degradation, especially soil erosion. Development of steep bluffland areas and soil erosion are a serious concern.

According to Fillmore County Assessor and Zoning calculations for 1994, only 11% of the county is wooded, with 16% pasture and 64% tillable (remaining areas are; 6% wasteland and 3% roads/buildings). Forestville State Park is the largest contiguous, unfragmented block of closed-canopy forest in the county. It is the largest forest of this type in the entire watershed which is managed to perpetuate a relatively undisturbed condition.

Regional Issues

- Meeting the demand for recreational trails in a way that minimizes impacts to natural and cultural resources.
- Minimizing the fragmentation of natural resource areas and maximizing biological diversity.
- Protecting groundwater and surface water resources in a fragile karst geology environment.
- Minimizing the visual and resource impacts associated with blufftop development.
- Identifying and managing unique natural and cultural resources.
- Realizing "desired future conditions" where there is a balance between natural resources management and a strong local/regional economy (sustainable natural resources and development).

Regional Population

Forestville State Park is situated in western Fillmore county; the county population totaled 20,777 in 1990. The three largest cities in the county are Spring Valley (2,461), Preston (1,520), and Rushford (1,485). The population in counties and major cities surrounding the park are shown below and can be located on the Regional Context map, p. 8).

Counties	1990 Population	Major Cities	1990 Population
Fillmore	20,777	Spring Valley	2,461
Freeborn	33,060	Albert Lea	18,310
Houston	18,497	La Crescent	4,220
Mower	37,385	Austin	21,907
Olmsted	106,470	Rochester	70,745
Winona	47,828	Winona	25,399
Total	**264,017**	**Total**	**143,042**

Forestville State Park is located in the southeast corner of Minnesota. The park is situated 15 miles from Iowa and 50 miles from Wisconsin. Within a 50 mile radius of the park are the cities of LaCrosse, Wisconsin and Mason City, Iowa. The 1990 population of LaCrosse totaled 51,003, and Mason City totaled 29,040. Other large cities in Iowa within 80 miles of the park include Waterloo, (66,467), and Cedar Falls (34,298). Most park visitors from Iowa travel north on U.S. Highway 63 to access the park.

Tourism and Marketing

Forestville State Park is accessible from several principal highways, as well as interstate highways 35 and 90 (see Regional Context Map, p. 8). It is located 30 miles southeast of Rochester, Minnesota, 50 miles southwest of LaCrosse, Wisconsin, and 110 miles south of the Twin Cities.

Tourism in southeastern Minnesota has increased significantly over the past decade. Visitors are discovering the natural beauty of the blufflands, which offers unique scenery and a very different experience from the rest of Minnesota. The unique bluffland scenery is complemented by a variety of tourist attractions including many bed and breakfasts, resorts and campgrounds, Amish Community tours, bluff country eco-tours (provided by the Forest Resource Center in Lanesboro), winery/apple/berry farms, and Niagara Cave near Harmony, Minnesota.

One of the major new developments attracting visitors to southeastern Minnesota is the Root River State Trail, located between Fountain and Rushford, a 35 mile multi-use trail along the Root River developed on an abandoned railroad grade. The Root River State Trail provides outstanding scenery which includes the Root River Valley, rolling hills, and soaring limestone bluffs. Bicycling and hiking are the main summer uses, accounting for 91 percent of summer use (1990 DNR Summer Trail Survey), and cross-country skiing is the main winter use. The average Root River Trail user travels 82.2 miles from their home to use the trail, and they spend an average of $9.71 per day (Minnesota Office of Tourism Seasonal Survey of 1981-1991). There is currently an effort underway to connect the Root River State Trail to Preston and Forestville State Park. The planned "Blufflands Trail System" will connect most major communities in southeastern Minnesota.

The unique resources of Forestville State Park attract a diversity of visitor groups, including anglers, hikers, horseback riders, birders, skiers, snowmobiliers, and campers. Many visitors come to Forestville for interpretive tours of Mystery Cave, Historic Forestville, and other park features.

In 1993, the estimated impact of domestic travel in southeastern Minnesota generated 583 million dollars in total gross receipts, which represents about 9% of Minnesota's total tourism receipts. Fillmore county tourism provides 147 jobs bringing in 2.57 million dollars in gross wages. The bluffland forest products industry exceeds 65 million dollars a year in income and southeastern Minnesota land owners supply 60% of the commercial oak timber harvested in the state (Minnesota Office of Tourism).

Supply and Demand of Recreation Facilities

Supply

As a part of the Statewide Comprehensive Outdoor Recreation Planning (SCORP) process, the DNR has maintained a data base of recreational facilities since the early 1970's. While the data for most of the public facilities has been updated in recent years, some of the private facility data is out of date. Private facility information in this plan is supplemented by information from the Office of Tourism and local publications (1994). Information on regional interpretive opportunities is provided on page 88.

Table 1 shows an estimate of selected recreational facilities within a 50-mile radius of Forestville State Park (Minnesota only). Fifty miles was chosen for its convenience within one hour's drive of the park. The lack of many water-related recreation facilities is due to the fact that the park is located in an area of Minnesota with very few lakes. The lack of lakes and water recreation increases the need for land recreation, resulting in an abundance of hiking, horse, ski and snowmobile trails.

Facilities within a 50 mile radius of Forestville State Park

	Number of Facilities				Miles			
	Boat Accesses	Picnic Grounds	Campgrounds	Beach	Hiking Trails	Horse Trails	Ski Trails	Snowmobile Trails
US Fish & Wildlife	9	0	0	0	0	0	0	0
DNR Forestry	0	1	3	0	72	47.4	30.2	33.7
DNR Trails & Waterways	16	3	9	0	47.3	13	40.5	20.5
DNR Fish & Wildlife	7	0	0	0	0	0	0	0
DNR Parks & Recreation	0	7	7	2	58.9	23.7	25.9	18.3
MNDOT	4	3	0	0	0	0	0	0
County	5	4	3	1	11	0	8	1216
City	17	15	1	0	27.3	0	34.8	105
Public Subtotal	58	33	23	3	216.5	84.1	139.4	1394
Private	7	12	20	2	19	13	0	1
Total	65	45	43	5	235.5	97.1	139.4	1395

Boat Accesses - There are approximately 58 publicly owned boat accesses within 50 miles of the park; 23 of these are owned and operated by the Minnesota DNR, Trails and Waterways Unit and the Division of Fish and Wildlife.

Picnic Grounds/Beaches - There are 33 publicly owned picnic grounds and only 3 publicly owned swimming beaches within 50 miles of the park. This low count of beaches is due to the lack of lakes in the area.

Campgrounds - There are approximately 23 public campgrounds (or individually administered canoe campsites) within 50 miles of the park. There are 20 privately owned campgrounds within 50 miles of the park, including Maple Springs Campground, which is adjacent to the park along CSAH 12.

Within 50 miles, the following Minnesota State Parks provide camping:

Park	Drive-in Campsites	Horse Campsites
Beaver Creek Valley	42	-
Carley	20	-
Forestville	**73**	**80**
Lake Louise	22	6
O.L. Kipp	31	-
Whitewater	106	-

Hiking and Cross-Country Ski Trails - There are over 200 miles of publicly owned hiking trails and 140 miles of publicly owned skiing trails within 50 miles of the park.

Biking Trails - The major off-road bicycle trails in this region are the Root River State Trail (36 miles) and the Douglas State Trail (13 miles). Mountain biking opportunities are available at three State Forest units (Brightsdale, Isinours, and Gribben Valley) near Lanesboro, about fifteen miles from Forestville.

Horse Trails - There are approximately 80 miles of public and 13 miles of private horseback trails within 50 miles of the park. The majority of publicly owned horse trails include the Douglas State Trail and trails owned and operated by the Minnesota DNR, Division of Forestry. With 14 miles of horse trail, Forestville State Park offers the most extensive and highest quality horseback riding system in this region.

Snowmobile Trails - There are over 1,200 miles of County Grant-In-Aid (GIA) snowmobile trails within a 50 mile radius of the park. GIA trails are funded by snowmobile registrations and unrefunded gas taxes through the Minnesota DNR to local units of government who in turn distribute the funds to local snowmobile clubs for trail development and maintenance. Most of the snowmobile trails are operated by the individual counties the trails are located in. The two largest county operated trails are the Mower Trail in Mower County (182 miles) and the Gopherland Trail in Houston County (160 miles). Forestville State Park offers 9 miles of snowmobile trails and Lake Louise State Park offers an additional 9 miles. Approximately 75 miles of the snowmobile trails are owned and operated by the Minnesota DNR, Divisions of Forestry, Trails and Waterways, and Parks and Recreation.

Iowa Recreation Facilities- Within the state of Iowa there are two State Preserves within 50 miles of Forestville, and four State Parks, one State Recreation Area and one State Forest within 60 miles. Volga River State Recreation Area provides habitat for fish and wildlife with its rock formations, prairie areas and natural woodlands; it also provides 30 miles of hiking, cross-country skiing, snowmobile and equestrian trails and primitive camping facilities. The Yellow River Forest provides a primitive form of outdoor recreation with hiking trails, trout fishing streams and camping opportunities. Waterloo and Cedar Falls, Iowa are located about an hour south of Forestville, accessible on State Highway 63. George Wyth Memorial State Park is located between these two cities and offers an expanse of woodland and wildlife. It also provides many water recreational activities, picnicking, camping and trails.

Name	Acreage	Miles from Forestville
Clear Lake State park	55	55
Fort Atkinson State Preserve	5	30
George Wyth Memorial State Park	494	60
McIntosh Woods State Park	62	55
Pikes Peak State Park	970	60
Pilot Knob State Park	700	55
Rice Lake State Park	47	55
Volga River Recreation Area	5422	50

Demand

There is considerable demand for the types of services provided at Forestville State Park. State Parks provide unique natural resource and recreational opportunities. These opportunities differ from most city, county and private recreational facilities due to the significant resources and the atmosphere associated with them.

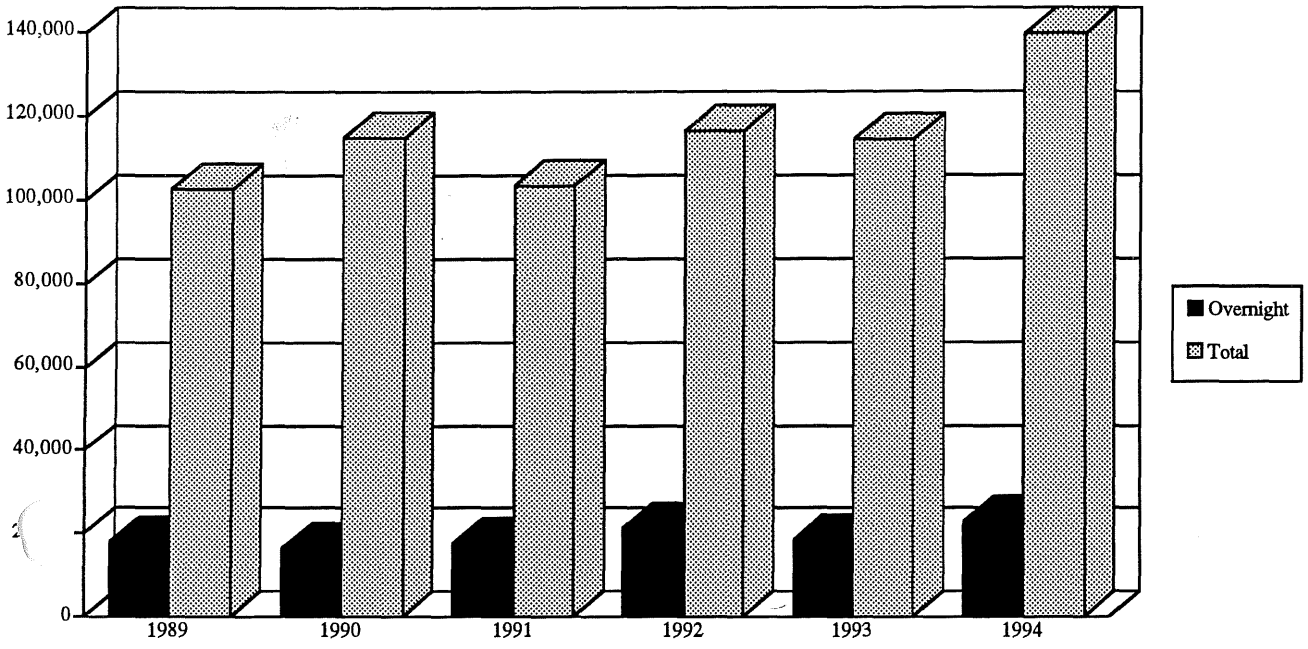
Forestville State Park is situated in an area which has experienced a dramatic increase in tourism in recent years. Visitors to the park often combine their park visit with other area attractions, including the Root River State Trail, canoeing on the Root River, and tours of Amish communities.

Even though the other State Parks located near Forestville State Park offer different combinations of recreational opportunities and experiences, they can be used as a measure of existing demand for state park services in the area.

1993 State Park Attendance in Southeast Minnesota

Park	Overnight Visitors	Total Visitors	% of Visitors that are campers
Beaver Creek Valley	6,277	23,966	26%
Carley	2,047	18,375	11%
Forestville	**18,623**	**114,400**	**16%**
Lake Louise	2,012	25,462	8%
O.L. Kipp	3,437	27,991	12%
Rice Lake	3,566	37,899	9%
Whitewater	36,827	259,398	14%

Forestville State Park Attendance



The attendance at Forestville State Park between 1989 and 1994 is shown above. Total attendance in 1994 was 140,400. Forestville is the second most heavily used State Park in southeastern Minnesota. Over the past five years, day use has increased significantly while overnight use is relatively stable (campsites at full capacity summer weekends and holidays). There has been a significant increase in day use at Mystery Cave (20,000 visits in 1994) and Historic Forestville (16,500 visits in 1994).

Park Visitor Analysis

Day Use

Day use accounts for approximately 82% of total park visitation. Day users typically visit Mystery Cave, Historic Forestville, go trout fishing, bird watching, horseback riding, hiking or skiing. Picnicking is very popular both at Mystery Cave and the main park. Please refer to the Interpretive Services chapter, page 79., for a discussion of day users related to the interpretive programs at the park.

In 1993, a study of park visitors was jointly conducted by the DNR, University of Minnesota, and the U.S. Forest Service. Forestville State Park was one of several parks included in the study. The study was designed to measure the value of experiences and benefits to users of the park. The most important experience and benefit to park users at Forestville was "enjoying the natural scenery," followed by "getting away from the usual demands of life," and "enjoying the smells and sounds of nature." At Mystery Cave, the second most important experience and benefit (following "enjoying the natural scenery") was "learning more about nature and natural history."

Overnight Use

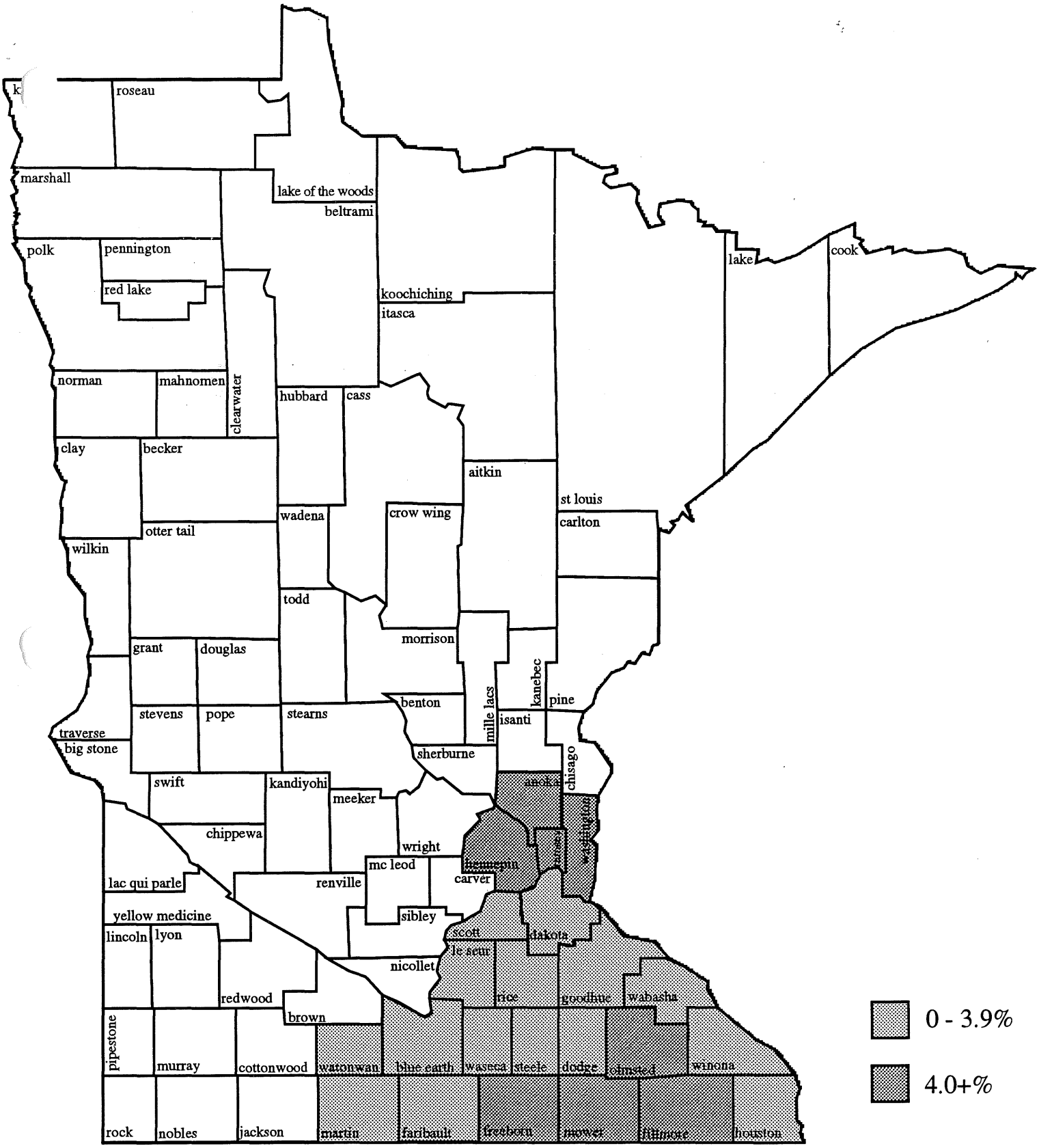
Visitors who camp at Forestville State Park must complete a registration card. In 1992, approximately 3,200 camper registration cards were completed. The chart below provides information based on a random sample of the 1992 cards (sample size = 321). These results are representative of a typical camping season at Forestville.

TABLE 4. 1992 Forestville State Park Camper Registration Card Survey Results

	% from state	average stay/days	average # in party	horse camp use by state (%)
MN	84	1.79	3.44	59.6
IA	10	1.87	2.97	33.3
WI	2	2	2.71	3.6
Canada	1	1	2.67	0
Other	3	1.5	5.3	3.5
Total non-MN	16	1.34	3.41	40.4

Eighty-four percent of Forestville State Park campers were from Minnesota. Of total campers, 37 percent were from the Twin Cities Metropolitan Area, 10 percent were from Iowa, and 6 percent from the city of Rochester. The primary camper service area is shown on the Camper Origin map, p. 17.

The horse camp represents 18 percent of total camping visitation. It is interesting to note that one-third of all horse campers are from Iowa.



Forestville State Park Camper Origin

Note: 76% of campers reside within the shaded area, plus an additional 10% reside in Iowa.
37% of campers reside within the Twin Cities Metropolitan Area.

NATURAL AND CULTURAL RESOURCES

Introduction and Climate

The Natural and Cultural Resources chapter begins with sections which inventory and describe the resources of the park. At the end of the chapter is a section which lists integrated resources management actions. The Resource Objectives and Integrated Management section will serve as the resource management plan for the park; this section can be revised periodically as described on page 95 of this plan.

As one of the southern most parks in Minnesota, Forestville/Mystery Cave has one of the longest warm weather seasons. Wildflowers begin blooming in early April and fall colors usually last through the third week of October. The longer warm season contributes to a longer visitor season and different natural communities than are found in northern Minnesota. The diverse microclimates created by blufflands and karst geologic features provide conditions suitable for several unusual natural communities.

Though the winter snow season usually lasts only about two months, the average annual snowfall is 39". This depth of snow is adequate for cross country skiing and snowmobiling.

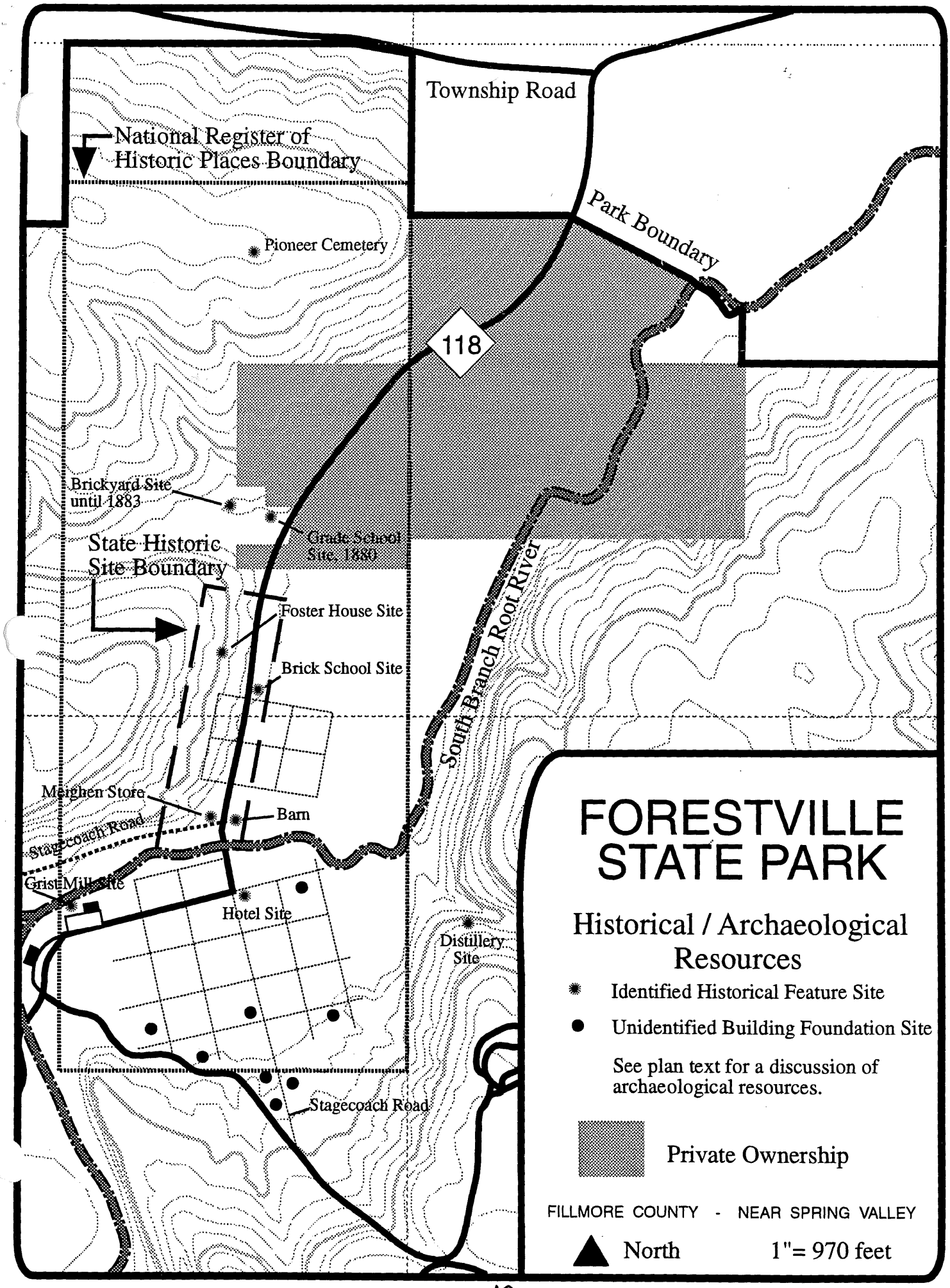
A very different climate exists within Mystery Cave where temperature is a fairly constant 48 degrees Fahrenheit. These mild temperature allow use of cave tour routes year round, but also provides ideal winter hibernating conditions for bats. The cave has a high relative humidity, high levels of radon and carbon dioxide. Short - term exposure to these conditions is not considered harmful.

Cultural Resources

The following cultural resource section is supplemented by additional information in the planning process file.

Archaeology

Lothson and Clouse (1985) summarized prehistoric and historic uses in the Forestville State Park area, documenting known archaeological sites and offering insights related to areas with the highest archaeological potential. Early American Indian cultures in the Forestville area were likely the Eastern Dakota and their linguistic relatives, the Otoe and Iowa. Withrow (1983, 1984) as cited by Lothson and Clouse, suggested settlement areas are more likely to be found adjacent to major tributary streams. Further, occupation sites occur more often on hilly terraces adjacent to the streams rather than on wide floodplains. Within the main park unit, prehistoric sites have been recorded within the Meighen Store area and northeast and southwest of Meighen Store. Sites have also been found in the group camp, adjacent to the campground area and near the Canfield Creek Big Spring location. Of particular interest is the recovery of a very early projectile point base from the Paleoindian Tradition (10,000 to 7,000 Before Present) that was found northeast of Meighen Store. Other sites in the park would appear to mostly date to the Woodland Tradition (3,000 to 1,000 Before Present). At Mystery Cave, a relatively extensive habitation site ("Prohaska site") exists due west of the park boundary; artifacts found in the existing parking area at Mystery Cave may have been deposited here from the Prohaska site floods. Artifacts have also been found during pre-construction testing when the vehicular and pedestrian bridges were built at Mystery Cave.


Township Road
National Register of Historic Places Boundary
Park Boundary
Pioneer Cemetery
118
Brickyard Site until 1883
Grade School Site, 1880
State Historic Site Boundary
Foster House Site
Brick School Site
South Branch Root River
Meighen Store
Barn
Stagecoach Road
Grist Mill Site
Hotel Site
Distillery Site
Stagecoach Road
FORESTVILLE STATE PARK
Historical / Archaeological Resources
Identified Historical Feature Site
Unidentified Building Foundation Site
See plan text for a discussion of archaeological resources.
Private Ownership
FILLMORE COUNTY - NEAR SPRING VALLEY
North
1"= 970 feet

Area History

Prior to the 1850's, American Indians were probably attracted to the Forestville area because the river valleys offered protection from severe weather, the forests and streams provided plentiful trout to catch and wildlife to hunt, and the limestone bluffs provided scenic beauty. Siouan-speaking American Indians controlled the Root River area during the early nineteenth century (Lothson and Clouse, 1985).

In 1851, the treaties of Traverse des Sioux and Mendota formally opened up the Forestville area for European settlement. The first European settlers were welcomed by a wealth of resources which promised to soften some of the hardships of life in a new unknown land. A heavy growth of hardwood timber along the South Branch Root River and its tributaries, extending well back from the streams, provided building materials, fence rails, and fuel. The river afforded potential mill sites, both for sawmills to utilize the lumber resources and for gristmills to grind the wheat that would soon be growing on the rich prairie land that spread over much of western Fillmore County. Although not among the first arrivals, the people most closely associated with Forestville in its early years were Robert M. Foster, who came in the spring of 1853, Forest Henry, for whom the town was named, and Felix and William Meighen, boyhood friends of Foster.

Felix Meighen probably accompanied Foster on his first visit to the area, but returned home to Galena, Illinois. Foster remained, and his letters to Felix provide a fascinating account of life in Minnesota in the 1850's. Late in the summer of 1853, having bought out an earlier settler, Foster, in partnership with the Meighen brothers, opened a store in a double log building under the name of Foster and Meighen. Business was good the following winter with customers coming from as far away as the Zumbro River, fifty miles to the north. They traded with American Indians for venison and furs until a competitor in the nearby settlement of Carimona threatened to have him arrested for trading without a license. Meanwhile Forest Henry, in partnership with his brother-in-law, William Renslow, purchased and completed a sawmill, to which a gristmill was soon added. By the end of 1854 two more stores opened and a tavern was thriving. Foster's letters to Meighen urged him to move west because the country was filling up, and the claims he had made for the Meighen brothers were being threatened. Also, William's services as a surveyor were needed for laying out the town site. Meighen and his wife followed this advice and left Galena on May 8, 1855. The town of Forestville was laid the same year, with the acquisition of a post office on October 16.

Forestville reached the peak of its prosperity in the last half of the 1850's, when it boasted at least two stores, two hotels, two sawmills, a gristmill (with its necessary adjunct, a copper shop), a distillery, a tavern (perhaps run in connection with one of the hotels), a chair factory, and a wagon shop. In 1857, Foster and the Meighens replaced the original log store with the brick building which is today a principal attraction of the park. In the same year a brick schoolhouse was built. The village was important enough to be a contender, along with Carimona and Preston, for the county seat in 1856. A remote, isolated frontier settlement in its first years, Forestville was designated as a way station on the Burbank stage line from Brownsville to Mankato and an alternate on the St. Paul to Dubuque line.

Forestville undoubtedly enjoyed a certain amount of economic importance in the pre-Civil War years. This prosperity lasted for a time after the war, but failure to obtain the county seat and changes in transportation routes-especially being bypassed by the railroads-brought the same decline in fortune that was suffered by so many other frontier towns in the early, speculative days of settlement. By 1878, the only businesses remaining in Forestville were the Meighen store, from which Foster had withdrawn a decade earlier, Forest Henry's gristmill, and probably the blacksmith and wagon repair shop. Two years later the mill ceased operation, and although several proposals to reopen it were considered in subsequent years, the evidence indicates that it remained silent thereafter. It had fallen into ruin by 1900 and was destroyed by a flood in 1917.

Robert Foster sold his share of the store in 1868. Even though it was said to be barely operating at a profit in 1878, the old brick store kept its doors open in spite of the discontinuance of the post office in 1902. Thomas Meighen, a banker, lived in Preston and operated the store in his spare time until 1910 when he decided he no longer had time for the declining rural mercantile store. One May evening he closed the store with the inventory intact.

Park History

Main Park Area

As early as 1903, people were aware of the value of the woods that the Meighen family had so carefully managed. But it wasn't until 31 years later that serious talk about the establishment of a park at Forestville began. Thomas Meighen contacted both Frank Yetka, secretary of the Minnesota Conservation Commission, and the Division of Forestry, but received little support for his idea, largely due to lack of funds. Meighen fully recognized that the state was in no position to pay what the land was worth, but he was anxious to have a park created and would have been satisfied with only partial reimbursement for the value of the land and timber.

In 1935, an attempt was made to purchase the land with State Relief Agency Funds. It was thought that development in the park could be done by the agency's work programs. Unfortunately, before the proposal was finalized, Thomas Meighen died and his heirs asked more for the land than the state was prepared to pay.

In 1938, the Conservation Department recommended purchase of 600 acres of land on the Root River near Spring Valley for a park, however an economy program endorsed by the 1939 Legislature made acquisition of the land an impossibility.

In the early 1940's, prohibitive taxes forced Joseph F. Meighen to log an 80 acre tract. Local citizens, concerned about the fate of the woods, tried to interest the University of Minnesota in buying the land for use as an outdoor biological laboratory. They were informed that the university had no money for such a sizable purchase. Inquiries addressed to the Division of Forestry brought the same response. The United States' entry into World War II in 1941 put a halt to any further action for the next several years.

In 1947, interest in a park was renewed and an agreement was formulated with the U.S. Forest Service whereby the Forest Service would purchase the land and then trade it for state-owned land in the Superior National Forest. For the next two years negotiations proceeded. In 1949, State Senators John A. Johnson, Werner E. Wuertz, and Helmer C. Myre introduced a bill in the legislature which mandated "the establishment, maintenance, and control of a state park in Fillmore County" not to exceed 850 acres, to be acquired through exchange with the federal government. This exchange of land fell through and all attempts for an appropriation to purchase the land failed. The situation was further complicated by the outbreak of the Korean War in the summer of 1950.

It was not until the Natural Resources Act of 1963 was passed that funds were provided "to establish a new state park located in Fillmore County to be known as Forestville State Park," giving the Commissioner of Conservation power to acquire said lands by gift, purchase, or eminent domain (this right has since been rescinded). The sum of $122,000 was set aside for the purchase of lands at Forestville with an additional $20,865 for capital improvements. Unfortunately this amount would buy only half the acreage originally envisioned for the park, which had been given statutory boundaries enclosing an area of 2,400 acres.

Because of the large number of parks established by the Natural Resources Act and the limited staff available to carry out appraisal work, land acquisition proceeded slowly for the next two years. In 1969, the legislature expanded the statutory boundary to include a total of 2,643 acres. As of 1994, approximately 2,405 acres were in state ownership.

The administrative control of the State Historic Site was transferred to the Minnesota Historical Society in 1977. The state site is surrounded by a National Register of Historic Places boundary (see History/Archaeology resources map, page 19).

Mystery Cave

About a mile east of where the South Branch of the Root River enters Forestville Township is the beginning of a section of river valley that has occasional cave openings in the valley walls and crevices in the stream bed. Apparently, many of these sites have been known since the time of settlement. Two caves, Old Still and Old Mystery Cave are the furthest upstream and located near the Historic Entrance to Mystery Cave. Both of these caves were known and used prior to the discovery of the Historic Entrance. Old Still Cave, as it's name implies, was reportedly used to harbor an illegal still during the 1920's prohibition era. Local legend has it that Old Mystery Cave was used as a hide-out for farmer's horses to avoid conscription by the U.S. Army during the Civil War.

A short distance downstream from the caves is a spot where water flowed into a hole at the base of a rock face. Called the "Disappearing River", it is uncertain when the name was coined. People knew a cave was there, but had no way to enter it.

As early as the turn of the century, the section of floodplain in the vicinity of the caves was used by local residents as a place to rest and relax. Threshing crews camped

adjacent to the stream, taking advantage of the cooler conditions afforded by the water and shade trees. Roy Blakeslee, a farmer and owner of the property just downstream from the caves and across from the Disappearing River, promoted the site as a pleasuring ground. He eventually put out a cook stove, picnic tables and kept an area mowed. Everyone was welcome to use the picnic grounds and many did.

Many years subsequent, in 1935, Frank and Henry Kummer of Spring Valley, secured a lease from Lynn Sheldon, the Old Mystery Cave owner, to develop the cave as a tourist attraction. A crew was hired to dig out the cave floor and level it.

Although it was known of as far back as anyone could remember, the cave did not have a name. One of the young workers, Clarence Prohaska, once made a comment while working that it should be called Mystery Cave because it was a "Mystery anybody [would] work in a hole like this". The new attraction was named Mystery Cave.

Lights were strung down the passage and an entrance building constructed. Joe Pettey worked as general manager. A tour operation was run out of Old Mystery for a couple years.

On February 3, 1937, another cave was discovered. Across from the picnic grounds and adjacent to the Disappearing River, Joe Pettey had observed an area on the talus slope of the valley wall where the snow had melted and left a muddy spot. By prying away rocks and debris he opened up a hole large enough to enter. Subsequent efforts resulted in the discovery of a network of passageways, including the present day commercial tour route.

Three men from Decorah, Iowa, Al Cremer, Leo TeKippe, and Joe Flynn leased the new cave from Roy Blakeslee. The three were businessmen and familiar with cave tour operations; they had a lease on Niagara Cave and were operating it.

Joe Pettey did much of the initial tour route development, assisted by two other workers and a mule. It was ready for visitors July 4th, 1937. This bigger new cave was also named Mystery Cave and Old Mystery Cave was the designation given the cave developed two years earlier. The site was advertised as Mystery Caves. For the price of a cave ticket, visitors received a guided tour of the new Mystery Cave and could stroll through Old Mystery Cave on their own.

The picnic grounds and caves became a very popular place for picnickers, family reunions, ball games, and church and school activities. Commenting on the abundance of picnickers, Joe Pettey once said, "If half the people that came for picnics... went in the cave, the cave would have made a pretty good go of it."

In June of 1942, two devastating floods a week apart destroyed the entrance doors, left quantities of flood debris in the cave, and washed away a footbridge and souvenir building, bringing a halt to tour operations. The cave lease was broken amiably and the cave sat idle for the next five years.

In 1947, three area men — Clarence Prohaska, his brother Donald, and Cardinal Bacon — leased the cave from Roy Blakeslee and launched an impressive clean-up and development campaign to once again make Mystery Cave suitable for commercial tours. Their efforts resulted in the re-opening of Mystery Cave in June of 1948. The cave and adjacent land was purchased from Roy Blakeslee. In later years Clarence Prohaska became the sole owner.

In the mid-1950's Mike McDonald, one of the Mystery Cave tour guides, and his brother began occasional cave exploring beyond the tour routes. They eventually reached the vicinity of the present day Minnesota Caverns tour routes.

By 1958 the Prohaskas knew where the cave extended underground from cave survey work. Clarence orchestrated an expedition of five explorers to enter the cave and find or dig an entrance in the remote new section of Mystery. The explorers, including Sam Blakeslee, grandson of Roy, hauled in considerable and awkward gear for the task at hand. This event received press coverage which was picked up by the wire service. Besides getting an entrance to the cave, Clarence received more advertisement than he ever dreamed.

The new section was called Minnesota Caverns and it became the focus of activity over the next two years with Clarence accomplishing extensive development work that culminated in the opening of the first tour in 1960.

The same year, at Prohaska's encouragement, the first organized caving group in Minnesota, the Minnesota Speleological Survey, was formed. The cavers explored Mystery Cave extensively. In 1967, the passageway to what is now called "Mystery III" was discovered. The next two years saw a series of passageway discoveries. The last major find occurred in July of 1969, though since that time, minor sections of the cave have been discovered or dug open, explored, and surveyed by the cavers.

Mystery Cave was the livelihood of the industrious Prohaska family. Numerous underground improvements were made and the picnic grounds were well-maintained as a park. Signs directing travelers to the cave were placed on several roads and highways. Road maps were labeled with both, the Mystery Cave and Minnesota Caverns entrances. Visitors were welcome to camp at the grounds if they liked. Thousands of school children made class visits to the cave and thousands more vacationing families visited the cave during the summer. At the height of the business, Clarence estimated 30,000 to 50,000 people were visiting the cave annually.

In 1975, Prohaska leased the cave to Neil Saylor with an option to buy. Saylor was unable to keep up payments and Prohaska resumed operations until 1977, at which time Prohaska sold the cave and it's operations to Neil Davie.

After acquiring the cave in 1977, Neil Davie ran commercial operations through both the Historic Entrance and Minnesota Caverns Entrance as a part-time business venture. Capital improvements were made to the house and a garage was built, however, the cave facilities, though repaired, gradually deteriorated.

Although Davie purchased the cave entrances and virtually all of the property above the tour routes, the bulk of the cave was owned by George and Loretta Tart. Davie secured a 50 year lease from Tarts in 1977 for exclusive underground development rights.

In 1985, Mystery Cave was put up for sale. It was at this time that the Minnesota Department of Natural Resources (DNR) became interested in acquiring Mystery Cave as a unique resource to be preserved for public use. For two years, interested persons within DNR , and outside of the Department worked to acquire public and legislative support, as well as the necessary funding to purchase the cave. These efforts came to fruition in 1987, when a bill authorizing the acquisition of Mystery Cave was passed by the Minnesota Legislature. Mystery Cave was purchased in February 1988 and officially dedicated as a part of the state park system on August 14, 1988.

DNR officials began planning improvements for the tour routes the same year. In 1989, the initial excavation efforts were launched for what became one of the largest cave restoration and redevelopment projects of its kind. The majority of this project was completed by August 1992 and resulted in a modern state-of-the-art tour route which can also accommodate visitors using mobility aids.

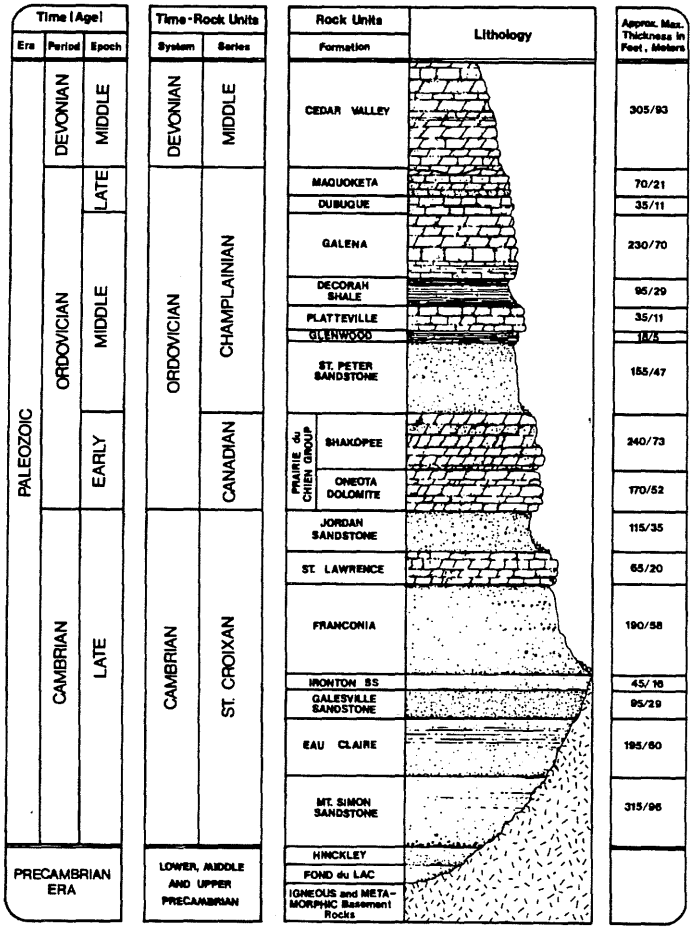
Natural Resources

Geology and Soils

Southeastern Minnesota is geologically different from most areas of Minnesota, largely due to the fact that the leveling powers of the last glaciation 10,000 years ago did not reach this part of the state. This fact is represented in the landscape: it is a lake-free terrain with a well-integrated, deeply entrenched stream system.

The area did not totally escape the influence of past glaciation, however. Much of the area is covered by a blanket of fine, wind blown silt, or loess. Glacial meltwater deposited large amounts of sand and gravel. Such sediment deposits cover an estimated 99% of the bedrock in the state. Thus, bedrock exposures are relatively rare in Minnesota. The Blufflands counties are exceptions (as are other areas, mainly in the Arrowhead region and along the Minnesota River).

Only the southeast and extreme northwest counties of Minnesota are covered with Ordovician Rocks. These are the layers of limestone, dolomite, sandstone and siltstone which underlay Forestville State Park (see Rock Column Figure, below). Those in the northwest counties of the state are buried under thick glacial deposits, but those in southeastern counties are exposed in many places.



Minnesota's Sedimentary Rock Column (after Weber and Austin, 1972, as reported in Ojakangas and Matsch, 1982).

The bedrock in Forestville State Park ranges from the Cedar Valley to the Galena. Almost all of Mystery Cave is in the Dubuque and upper Galena.

Karst Topography

Unlike other rocks, limestone and dolomite (carbonate rocks) are readily dissolved along zones of structural weaknesses over long periods of time. The result is that rather than rain or river water simply running downhill and off the land, the many minute cracks found in the bedrock (typical for most masses of rock) are dissolved even wider. Once this occurs, the fractures which previously were so small that only tiny amounts of water could go through, are now enlarged enough to allow a lot of water to enter. When this occurs on a large scale, such as a landscape, the effects are pronounced; the land takes on a different appearance, and in this case 'karst' is developed. Karst is a landform well expressed in Southeast Minnesota, and particularly well in Fillmore county. Although there are a variety of types of karst around the world, the karst of the midwest and Minnesota is characterized by features such as sinkholes, underground drainage basins, disappearing rivers, springs, caves, and blind valleys. Although surface drainage occurs in stream and river networks, the underground drainage pattern may run contrary to the surface.

Sinkholes are one of the most prominent surface expressions of the soluble bedrock below the surface. Over 10,000 sinkholes are in Fillmore County, the highest concentration in the state. Sinkholes are distributed at several areas in the main park and the vicinity of both cave entrances with the best examples at the main park. Although sinkholes are often important water "recharge points" for caves and relate to their genesis, in the case of Mystery Cave their effect is small.

Water entering the ground in karst areas often receives little natural filtration before reaching the bedrock and traveling to the aquifer. Thus an enormous potential exists for direct contamination of underground water resources. A karst landscape is like an enormous sieve, and because of landfills, sewage treatment, pesticide and fertilizer use in the area, harmful chemicals or bacteria can and do enter the groundwater supply.

Mystery Cave

Mystery Cave is perhaps the finest example of a floodwater maze cave in the United States (Palmer and Palmer 1993). Such cave systems are a network of interconnecting passages largely developed by repeated flooding. Mystery cave functions as a meander cut-off for the South Branch Root River (see map, page 57). A series of bedrock fractures (joints) extending under the river in the vicinity of the Historic Entrance captures water that takes a one and a half mile short cut through the cave and eventually returns to the surface five river miles downstream. The joints are partly occluded by silt, rock and debris, but have a collective capacity to accept surface water. On occasion, the river flow is less than the joint capacity and the entire flow of the South Branch is captured underground, making it the largest disappearing karst stream in the state. The lower level passages flood at least annually, however the openings through which the water normally enters the cave are narrow enough that debris larger than about a centimeter in diameter is filtered out and does not enter the cave. The known extent of cave is under about one half square mile of land and typically at depths of 40 to 150 feet below the surface.

The dip of the bedrock (direction of tilt) is about half a degree to the northwest. In profile, the cave largely cuts across or opposes the dip. This is rather unusual in caves and is accounted for by the steep hydraulic gradient across the meander (steepest on the entire South Branch) coupled with the highly fractured bedrock.

Besides the typical features peculiar to underground cave environments, Mystery Cave has representative characteristics of many caves in the area. As with other lengthy Minnesota caves, virtually all of Mystery Cave is in two geologic formations, the Dubuque and Stewartville.

Passage cross sections are markedly distinct depending upon which formation the passage is in: square or rectangular in the Dubuque Formation, vertical fissure shaped in the Stewartville, and often keyhole shaped if in both. The passage ceilings in the Dubuque are noteworthy for their flatness. The rough wall texture caused by fossil worm burrows in rock are common in Mystery Cave, though unusual in the degree of weathering for any cave. Breakdown (rocks from the walls or ceiling) is common in the Dubuque corridors. Silt, sand, or gravel deposits are ubiquitous on the cave floors and some passages are entirely filled. In some areas the natural depressions in the floor are sealed well enough to hold water and form pools or lakes. Lily Pad Lake is the largest at 600 feet long and 10 feet wide.

The cave has two distinct levels with independent networks of passages. Connections exist between the upper and lower levels in some areas where they cross or run concurrently. All passages are controlled by three joint trends. Long straight passages are frequent with one of the longest being nearly one half mile. By length alone, Mystery Cave is one of the one hundred longest caves known on earth and ranks as 34th longest in the nation. It represents the longest contiguous exposure of the fossil laden Dubuque Formation in the state.

Other features are so unusual as to be of regional or even national significance. The speleothems (secondary mineral deposits) in Mystery Cave range from the expected calcite deposits of stalactites, stalagmites, and flowstone to features unique to a few caves in the Americas.

The cave has examples of: small aragonite needles, gypsum crystals, calcite rafts, and a variety of helictites. Some of these are probably the best examples in a Minnesota cave and although found in many caves, most in the Eastern U.S. do not contain them. Mystery is the only cave in the nation in which the touring public can see calcite rafts and raft cones. Chenille spar, a deposit lining pools, is unusual and found at several sites in the cave.

Other speleothems are exceptional deposits in a broader context. They are some of the best examples in the U.S. and of world class merit. Folia, a shelfstone, is found in Cuba, Italy, the western United States (Arizona, New Mexico, Nevada, Colorado) and Mystery Cave. The several dozen raft cones (at pool locations) are apparently the only ones within 900 miles (none east of the Mississippi). A limited exposure of boxwork is rare as are features called calcite shrubs. The boxwork is of different origin than the well known examples of the Black Hills caves. Extremely rare features are organic fillaments, pool fingers and several types of iron-cored speleothems. Aside from Mystery Cave, these are only known from a few other caves in the world (Guadalupe Mountains, New Mexico).

Mystery Cave takes its place as one of the most important caves in the country in terms of what it can explain about glacial and erosional history and the growth of speleothems. It is especially significant because nearly all of the processes that formed the cave and speleothems are still active today.

Minerals

Deposits of iron have been identified in the park area. Even though iron content is only between 1 and 20%, mining operations between 1941 and 1969, produced more than eight million tons of iron ore. The area near Forestville has been given a high rating for its metallic mineral potential. Also, a fair potential exists for deposits of lead, zinc and uranium. These deposits are not necessarily within park boundaries. The largest concentration of potential iron ore is in the Etna area, west of the park.

Soils

The soils in Forestville State Park developed under prairie, hardwood forest, and transitional areas between these two vegetation types. The soils formed over glacial till, loess deposits and/or colluvium, with limestone bedrock below. The following Soil Limitations chart and Soils Maps were derived from a report by the U.S.D.A. Soil Conservation Service (1948). Detailed soil descriptions are included in the Forestville State Park Management Plan-Planning Process File.

Soil Limitations Chart

Forestville State Park

(see Soils map for soils location and text for descriptions)

Map Unit	Description	Slope	Original Vegetation	Permeability*	Water Table	Septic Tank Absorbtion Fields	Sewage Lagoon Areas	Buildings**	Local Roads & Streets	Intensive Camp Areas	Picnic Areas	Playgrounds	Paths & Trails	Lawns & Landscaping	Overall Suitability
Ab	Alluvial Lands	-	NA	0-60"/0.6-2.0	>6 Feet	S	S	S	S	S	L	L	L	M	S
Ca	Chaseburg and Judson Silt Loams	0 to 1%	NA	0-60"/0.6-2.0	>6 Feet	S	S	S	S	S	L	L	L	M	S
Cb	Chaseburg and Judson Silt Loams	2 to 6%	NA	0-72"/0.6-2.0	>6 Feet	S	S	S	S	S	L	M	L	M	S
Df	Dakota Loam	2 to 6%	Prairie	0-27"/0.6-2.0	>6 Feet	S	S	L	M	L	L	M	L	L	L
Ds	Dubuque and Whalan Silt Loam	2 to 6%	Forest	0-27"/0.6-2.0	>6 Feet	S	S	S	S	S	S	S	S	M	S
Du	Dubuque and Whalan Silt Loam, Eroded	2 to 6%	Forest	0-27"/0.6-2.0	>6 Feet	S	S	S	S	S	S	S	S	M	S
Dv	Dubuque and Whalan Silt Loam	12 to 17%	Forest	0-27"/0.6-2.0	>6 Feet	S	S	S	S	S	S	S	S	M	S
Dx	Dubuque and Whalan Silt Loam	18 to 45%	Forest	0-27"/0.6-2.0	>6 Feet	S	S	S	S	S	S	S	S	S	S
Fb	Fayette Silt Loam	2 to 6%	Forest	0-60"/0.6-2.0	>6 Feet	M	M	M	S	L	L	M	L	L	M
Fc	Fayette Silt Loam, Eroded	2 to 6%	Forest	0-60"/0.6-2.0	>6 Feet	M	M	M	S	L	L	M	L	L	M
Fd	Fayette Silt Loam, Eroded	7 to 11%	Forest	0-60"/0.6-2.0	>6 Feet	M	S	M	S	M	M	S	S	M	M
Ff	Fayette Silt Loam, Eroded	12 to 17%	Forest	0-60"/0.6-2.0	>6 Feet	M	S	M	S	M	M	S	S	M	M
Fh	Fayette Silt Loam, Eroded	18 to 45%	Forest	0-60"/0.6-2.0	>6 Feet	S	S	S	S	S	S	S	S	S	S
Fk	Fayette Silt Loam, Terraced	2 to 6%	Forest	0-60"/0.6-2.0	>6 Feet	M	M	M	S	L	L	M	L	L	M
Ka	Kasson Silt Loam	0 to 1%	Oak/Brush	0-24"/0.6-2.0	2-3 Feet	S	S	S	S	M	M	M	L	L	M
Md	Mixed Alluvial Land	0 to 6%	NA	-	-	S	S	S	S	S	S	S	M	S	S
Rd	Racine & Ostrander Silt Loams, Eroded	7 to 11%	Prairie	0-60"/0.6-2.0	>6 Feet	M	S	M	M	M	M	S	L	M	M
Rf	Renova Silt Loam and Loam	0 to 1%	Forest	0-60"/0.6-2.0	>6 Feet	M	M	L	M	L	L	L	S	L	L
Rg	Renova Silt Loam and Loam	2 to 6%	Forest	0-60"/0.6-2.0	>6 Feet	M	M	L	M	L	L	M	S	L	M
Rh	Renova Silt Loam and Loam, Eroded	2 to 6%	Forest	0-60"/0.6-2.0	>6 Feet	M	M	L	M	L	L	M	S	L	M
Rk	Renova Silt Loam and Loam, Eroded	7 to 11%	Forest	0-60"/0.6-2.0	>6 Feet	M	S	M	M	M	M	S	S	M	M
Rl	Renova Silt Loam and Loam, Eroded	12 to 17%	Forest	0-60"/0.6-2.0	>6 Feet	M	S	M	M	M	M	S	S	M	M
Rn	Rockton and Dodgeville Silt Loams, Erod	2 to 6%	Prairie	0-16"/0.6-2.0	>6 Feet	M	S	M	M	L	L	M	L	M	M
Rr	Rockton and Dodgeville Silt Loams, Erod	18 to 35%	Prairie	0-16"/0.6-2.0	>6 Feet	S	S	S	S	S	S	S	S	S	S
Sa	Schapville Silt Loam and Silty Clay Loam	2 to 6%	Oak/Brush	0-17"/0.6-2.0	1-3 Feet	S	S	S	S	S	M	S	M	M	S
Sb	Schapville Silt Loam and Silty Clay Loam	7 to 11%	Oak/Brush	0-22"/0.6-2.0	>6 Feet	S	S	M	S	M	M	S	L	M	M
Se	Seaton and Port Byron Silt Loams, Eroded	7 to 11%	Oak/Brush	0-60"/0.6-2.0	>6 Feet	M	S	M	S	M	M	S	S	M	M
Sl	Steep Rocky Land	-	NA	0-6"/0.6-2.0	>6 Feet	S	S	S	S	S	S	S	S	S	S
Tc	Tama and Downs Silt Loam, Eroded	2 to 6%	Oak/Brush	0-60"/0.6-2.0	>6 Feet	L	M	M	S	L	L	M	L	L	L
Tf	Tama and Downs Silt Loam	12 to 17%	Oak/Brush	0-60"/0.6-2.0	>6 Feet	M	S	M	S	M	M	S	L	M	M
Tm	Thurston and Wykoff Loams, Eroded	2 to 6%	Oak/Brush	0-60"/0.6-2.0	>6 Feet	S	S	L	M	L	L	M	L	L	L
Wa	Waukegon Silt Loam	0 to 1%	Prairie	0-40"/0.6-2.0	>6 Feet	S	S	L	S	L	L	L	L	L	L

Chart Legend-Soils Suitability/Characteristics

L - (Low) Limitations for a stated use are minor and can be overcome easily.

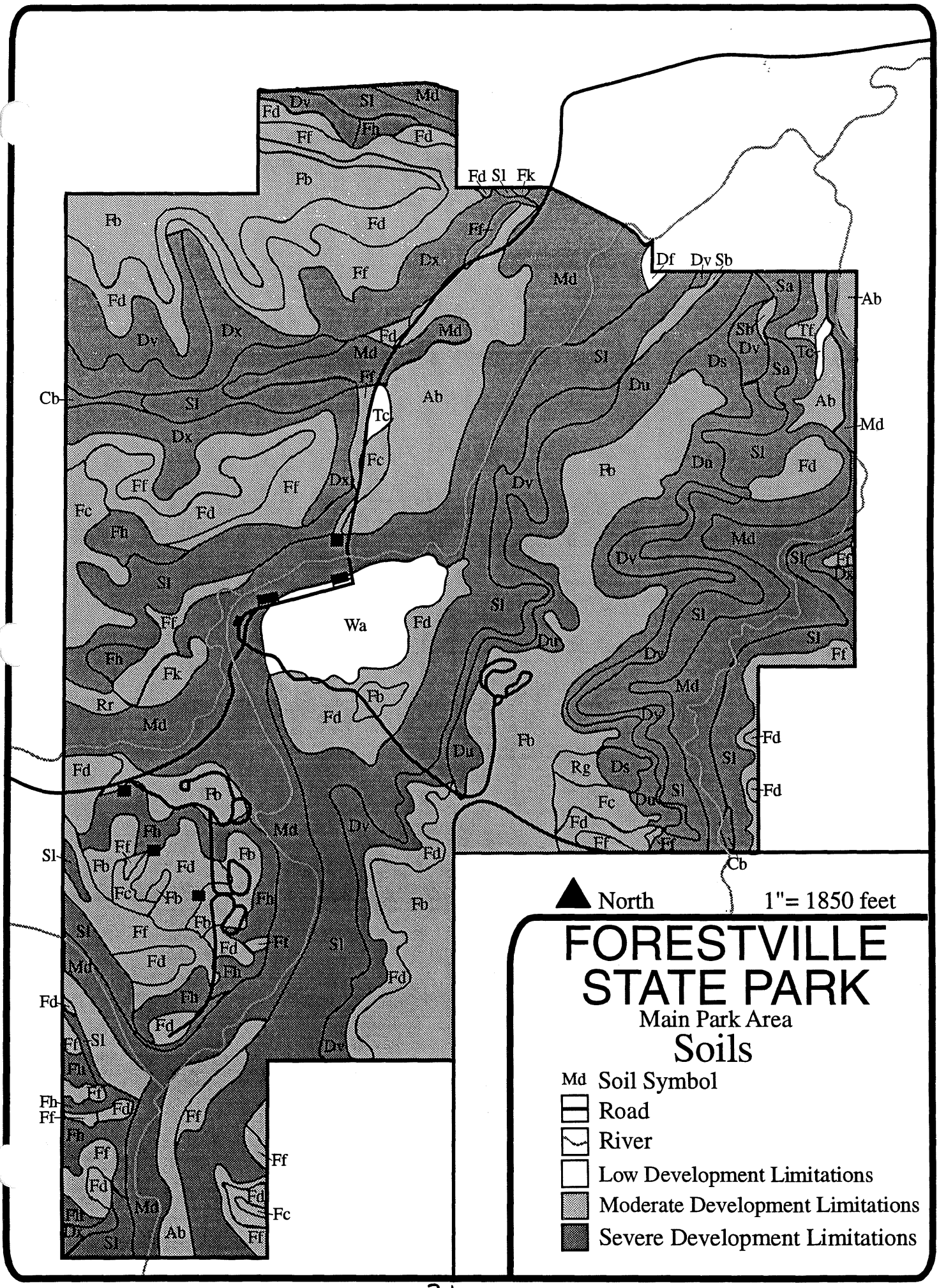
M - (Moderate) Limitations for a stated use can be overcome by special planning, design, or intensive maintenance.

S - (Severe) Limitations for a stated use generally require a major soil reclamation, special design, or intensive maintenance.

*Depth and permeability (inches per hour) ie. Ab soil= top 0-60" of soil depth have a permeability of 0.6-2.0 inches per hour.

**Based on buildings with a basement or foundation.

NA - Not Available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1"= 1850 feet
FORESTVILLE
STATE PARK
Main Park Area
Soils
Md Soil Symbol
Road
River
Low Development Limitations
Moderate Development Limitations
Severe Development Limitations

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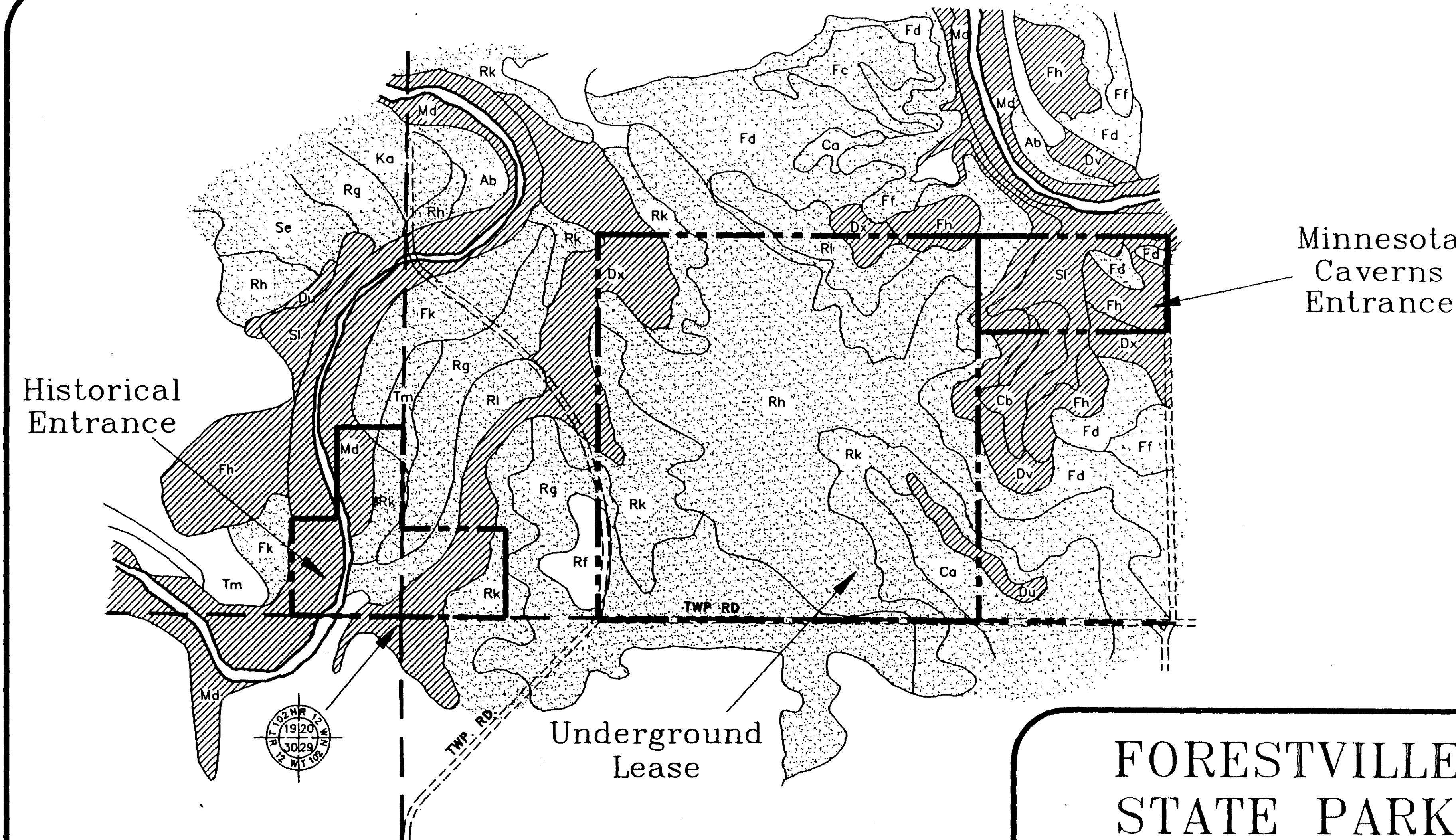

FORESTVILLE STATE PARK

MYSTERY CAVE: SOILS

- RIVER
- ROAD
- SEVERE LIMITATIONS
- MODERATE LIMITATIONS
- LOW LIMITATIONS

FILLMORE COUNTY - NEAR SPRING VALLEY

NORTH

APPROXIMATE SCALE: 1 inch = 1000 ft.
SEE TEXT FOR SOIL DESCRIPTIONS

The information shown on this map was digitized from 1947 U.S. Department of -riculture, Soil Conservation Service Information. This map may not comply with -onal Map Accuracy Standards. Questions concerning map accuracy should be -essed to the MN Dept. of Natural Resources, Bureau of Engineering, Survey Sectic

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Water Resources

Groundwater

The groundwater process in karst areas is previously described under Geology (p. 26-27). Forestville's streams are significant in that they each begin as warm water streams, sink into crevices or blind valleys, travel through extensive cave systems, then reemerge at major springs. Vertical infiltration and perched water tables of the upper carbonate aquifer are also important characteristics of groundwater in this area. Both are evident within Mystery Cave. The cave provides a unique opportunity not only to study hydrologic drainage patterns, but to educate the public about the fragile nature of karst areas. All wells and sewage disposal facilities must be carefully designed in karst areas.

Surface Water

The South Branch Root River is the primary water body in the park. It begins in eastern Mower County, sinks into crevices near Mystery Cave, travels through the cave, reemerges at Seven Springs, and flows through the main park area on it's way to Preston and Lanesboro. It changes drastically from a slow moving warm water stream above the cave to a high gradient coldwater stream below Seven Springs and through the main park. Within the main park (mile 25.4 to mile 30.0 of the river), the river's average width is 47 feet and average depth is 1.25 feet (maximum depth 9 feet). The South Branch is a tributary to the Root River and Mississippi River. Forestville Creek and Canfield Creek are smaller tributaries which flow into the South Branch of the Root River within the main park. Both dramatically emerge from springs just upstream of the main park. The Big Spring is the headwater spring of Canfield Creek. Moth and Grabau Springs feed Forestville Creek. Forestville Creek is 2.6 miles long with an average width of 18.3 feet and average depth of 0.89 feet. Canfield Creek is 16.9 miles long. Moth and Grabau Springs are fed by a large watershed that has two blind valleys and hundreds of sinkholes. The upper portion of Canfield Creek sinks in the blind valley at York, Minnesota. This water flows underground to the Odessa Spring on the Upper Iowa River at Granger, Minnesota. This blind valley captures all surface flow except flood events. Downstream from York there are a series of sinkholes that carry water to the Big Spring. From the Big Spring, the creek flows 1.57 miles to join the South Branch Root River. The creek has an average depth of 0.95 feet and an average width of 24.8 feet. All three of these karst streams maintain relatively stable temperatures below the major springs which favors a coldwater fishery (see p. 41-42). The watershed for all three surface water streams is intensively used for agriculture. Silt, fertilizer, and pesticides enter these stream systems, causing degradation of water resources. The U.S. Department of Agriculture Natural Resources Conservation Service, encourages the use of conservation practices in this area. Other small surface streams exist in the park. At least one of these provides habitat for a variety of non-game fishes.

Natural Communities

A natural community includes the complex assemblage of climate, soils, hydrology, plants and animals that support one another and occupy the same habitat. For the purposes of discussion in this plan the natural communities in the park are described in terms of plant communities, wildlife, and endangered, threatened and special concern species.

Plant Communities

Pre-European Settlement Vegetation

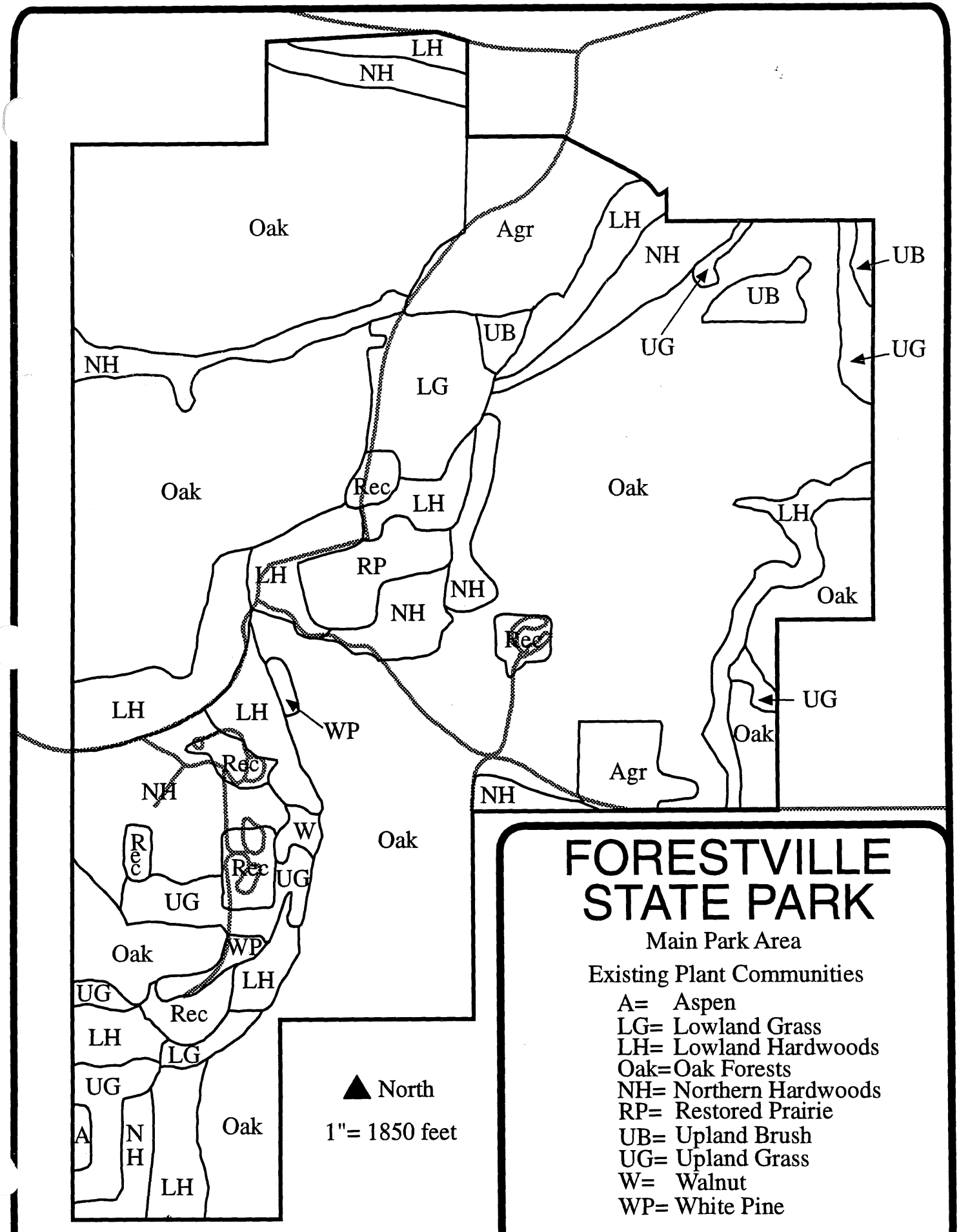
Public lands were surveyed to describe township and range lines and establish counties in most states. Surveyors described vegetation characteristics in their survey notes and used trees to make compass bearings at section corners. Interpretation of these survey records is one of the best sources of information in understanding what vegetation, (i.e., natural communities) existed prior to European settlement.

Public Land Survey Records indicate that the Forestville area was surveyed in 1853. These records indicate that red, white and bur oak were the dominant tree species throughout the park, but that elm, hickory, basswood, sugar maple, walnut and ash were also to be found, specifically in the southwest and eastern parts of the park. Survey records indicate that there were areas of open oak (oak savanna) in the park. These areas were in the northeastern portion of the park, east of the Root River. Survey records indicate the landscape was "varied between level or gently rolling" (with first rate agricultural soil) to "rolling and hilly" (with second rate agricultural soil). In many other areas, records indicate the land was quite brushy, with scrub oak, hazel, aspen, and prairie willow.

Existing Plant Communities

A diversity of land uses including grazing, logging, farming and recreational development, the introduction of non-native species such as European buckthorn and brome grass, and the decreased frequency of fire have all changed the character of the "original" natural communities of the park. Through natural succession, the oak forest community has displaced the oak savannas, due primarily to the absence of fire since settlement. The existing natural communities in the park are predominately deciduous forests. Within this forest expanse is a diversity of other plant communities, including bluff prairies, wetlands, small areas of white pine, old fields, pine plantations, and planted prairies.

Forestville State Park and the mosaic of natural communities surrounding it provide habitat for many rare species (see Endangered, Threatened, and Special Concern Species, page 43; all rare elements are listed by their "state" status in this plan). Forestville also includes areas which are considered to be "old growth" forests. Characteristics of old growth forests are occasional gaps in the canopy resulting from naturally downed trees and standing snags (dead standing trees). Decayed moss covered trunks and broken limbs are common on the forest floor. These add to the biological diversity by creating habitat for reptiles / amphibians, birds and small mammals. Two specific



FORESTVILLE STATE PARK

Main Park Area

Existing Plant Communities

A= Aspen
LG= Lowland Grass
LH= Lowland Hardwoods
Oak= Oak Forests
NH= Northern Hardwoods
RP= Restored Prairie
UB= Upland Brush
UG= Upland Grass
W= Walnut
WP= White Pine

Rec= Recreation
Agr= Agriculture

areas are likely to be categorized as old growth; one area is situated between the park contact station and the western park boundary, the other area is within the Canfield Creek (DNR Forestry) area, just south of the current park boundary.

The plant community descriptions below correspond to the "Existing Plant Communities" map on page 35. The descriptions and map community boundaries were compiled from several sources, including the Region 5 Resource Specialist, Minnesota County Biological Survey staff, and a review of DNR Forestry's Cooperative Stand Assessment information. Ecological information about these communities was obtained from the DNR Biological Report: Minnesota's Native Vegetation: A Key to Natural Communities.

Oak Forests (Oak)

Several oak community types occur in Southeastern Minnesota. Dry oak forests are determined by aspect and soil, and occur most commonly on south facing bluffs and over rocky soil areas. These forests provide excellent habitat for a number of rare reptiles. Mesic oak forests are more typically dominated by red oak with a high number of maples, basswood, green ash and butternut. The branching pattern of oaks in the absence of fires shrub layers can become dense. Ashes, hickories, black cherry, paper birch and aspen are also common in oak forests. These species establish in shade but require open sun to mature.

Oak forests dominate the landscape in Forestville State Park today. The oak forests of the park are most often dry-mesic to mesic forests dominated by red and white oak, with lesser amounts of black cherry, basswood and sugar maple. Large tooth aspen, butternut, red elm and black ash are also components of the park's oak communities. Shrubs typical of oak forests found here include hazelnut, raspberry and gray dogwood. Canadian Black Snakeroot (Sanicula canadensis), a species of special concern, is documented from the oak communities in this park.

Unlike the rest of Fillmore County, the oak forests in the park are largely contiguous and indicate a long term stable community. The presence of large black cherry, big tooth aspen and red elms and some white oaks approaching four feet in diameter may be evidence of minimal damage from grazing and logging. One of the two areas in the park and adjacent DNR Forestry land likely to be categorized as old-growth includes an oak forest. The diversity of wildflowers in the park includes yellow pimpernel, spikenard, wild sarsaparilla and Desmodium cuspidatum, a species of tick-trefoil.

The forests northeast of the horse area are different from other oak forest in the park in that the soils here are not as compacted, and are for the most part not eroded. Additionally, snags (dead standing trees) are more common and the trees are slightly older.

Northern Hardwoods (NH)

There are a number of different plant communities found within the Northern Hardwood vegetation type. These include the maple-basswood forests and black ash seeps. Maple-basswood forests are a shade tolerant late-successional plant community rich in

wildflowers. Forest wildflowers generally bloom in early spring before the forest canopy develops and shades the ground. Maple-basswood forests are dominated by basswood, sugar maple and American elm (Dutch Elm Disease has eliminated much of the elm component). Slippery elm, northern red oak, bur oak, white and green ash are locally common. Soils of maple-basswood communities are rich in humus and have high moisture retention capacity. These forests provide habitat for a variety of mammals and are important nesting habitat for neotropical migratory songbirds.

Small black ash seep areas can be found in some maple-basswood forest areas. Dominated by a relatively open black ash canopy skunk cabbage sometimes dominates the ground cover. Other species which are more characteristic of marsh communities, such as marsh marigold, are often found in these seep communities.

The northern hardwood areas in Forestville State Park are dominated by maple-basswood forests. These forests are found in the protected narrow valleys and ravines on the lower half of northerly facing slopes which receive indirect sunlight. These areas of Forestville contain a higher number of wild flowers, a consistently closed canopy comprised of a wide variety of tree species, consistently big and older trees and numerous seeps providing abundant moisture.

As defined by the Minnesota County Biological Survey, Forestville State Park includes some of the largest tracts of old growth maple-basswood forests in Fillmore County. There is a high variety of tree species in the canopy including sugar maple, red oak, basswood, white oak, red and American elm. Most trees in the canopy are greater than 15 inches diameter-breast-height (DBH) but many are greater than 24 " DBH and some have been aged at greater than 172 years old. The sparsely vegetated understory is dominated by shade tolerant shrubs and understory trees such as pagoda dogwood (Cornus alternifolia) and bladdernut (Staphylea trifolia).

Eight of the 17 currently listed plant species in the park are associated with maple-basswood forests including nodding wild onion (Allium cernuum-threatened), goldies's fern (Dryoperis goldiana-special concern), twin leaf (Jeffersonia diphylla-threatened), and a species of sedge (Carex jamesii-proposed threatened).

The black ash seep areas in Forestville State Park are found between the Galena Limestone and the Platteville Limestone rock formations. These plant communities range in size from about 35 feet square up to one or more acres. Tolerant of wet soils, black ash are frequently the only canopy species present. Black ash trees 171 and 176 years old have been found in these seeps. Carex woodii, is found along the edges of the black ash seeps. This species of special concern is found more frequently in Forestville and Fillmore County than anywhere else in the state. Species typical of marshes such as marsh marigold, buttercups, swamp saxifage, and cardamine bulbosa are common. Skunk cabbage is often the dominant ground cover.

Lowland Hardwoods (LH)

Lowland hardwood forests, as defined by the Minnesota Natural Heritage Program, usually occur in fire-protected areas on well-channeled alluvial floodplains. Lowland

hardwood forests are dominated by species tolerant of periodic flooding of short duration such as American and slippery elm, black and green ash, basswood, bur oak, aspen, hackberry, yellow birch and cottonwoods.

Forestville State Park contains large tracts of lowland hardwood forest. These communities in the park contain occasional large trees which are not commonly found in similar communities elsewhere in the county. Red and American elm, green ash, black walnut, hackberry, maples, comprise trees of these communities as well as scattered bur oak. Snags (mostly elm) and a ground floor lush with wildflowers in the spring are also common to the park's lowland hardwood forests.

The occasionally open canopy provides partial shade, and the medium size flood plains are conducive for glade mallow, Napea dioica (endangered). This species is found frequently in the park.

White Pine (WP)

The largest naturally - occurring white pine stand is located above a rock precipice on the east side of the Root River across from the main campground. This area shows little sign of disturbance and is dominated by white and red oak in the canopy. The pines tower over the oaks which show evidence of having been open grown and reach ages of 97 to 125 years. Carex pennsylvanica, wild geranium, coral-root orchid Corallorhiza sp., and rattlesnake plantain orchid occupy the dry ground layer. There is no evidence of logging (no stumps present) and there is little regeneration of the pines. Deer browse, lack of soil disturbance and a closed canopy may all contribute to the limited regeneration of white pine in the park. Sugar maple is starting to grow in the shrub and seedling layers. Three white pine plantations and several historic (old homesites) plantings of white pine also occur in the park.

Lowland Grass (LG)

This community is dominated by water tolerant grasses, wildflowers and scattered shrubs and is generally found in the floodplains along rivers. The lowland grass area south of the group camp is an old oxbow of the South Branch of the Root River. Surrounding this area is a zone completely dominated by wild rice (Zizania palustris var. interior). The sedge Carex trichocarpa is also found in this area.

The large lowland grass area north of the state historic site was almost entirely cultivated fields at one time. This area is in the floodplain and was mostly under water during a flood in 1993. This lowland grass area is dominated by brome, bluegrass, reed canary, timothy, goldenrods, and scattered pockets of shrubs.

Elsewhere in the park are populations of the rare sedge Carex laevivaginata, a proposed threatened species. Also, a population of white campion (Silene nivea), has been documented near the restored prairie.

Walnut (W)
Walnut comprises the main canopy tree of this community type. Other tree species include red elm, hackberry, and boxelder. Understory species include hazel and fireweed. Significant stands of walnut exist in flood plain areas of the park.

Aspen (A)
Aspen forest is an early-successional community and is dominated by trembling (quaking) aspen. In the absence of fire or other disturbances, aspen forests succeed to mid-successional forests composed of paper birch, bur oak, green ash or basswood.

There is one small area dominated by trembling aspen in the park (see plant communities map, page 35). Other tree species found in the trembling aspen community include walnut and boxelder. Pockets of big-tooth aspen and trembling aspen are scattered throughout much of the park in other community types.

Upland Grass (UG) and Upland Brush (UB)
The upland grass and upland brush areas in the park were old cultivated field areas, now dominated by planted grasses, boxelder trees, and infrequently, aspen.

Algific-talus Slopes, Moist Cliffs, and Maderate Cliffs

These community types are not shown on the Existing Vegetation map, but they are an extremely important component of the ecology of this area. Algific-talus slopes are described as a unique feature on page 45 of this plan.

Moist cliff communities occur on north to northeast facing vertical exposures of bedrock where most of the rock surface is kept moist by seepage or condensation. They often occur upslope from and grade into talus slope communities.

Maderate cliffs are found only in the southeastern part of Minnesota and are often associated with the algific-talus slopes. Maderate cliffs occur on rock faces with actively dripping cold water systems creating a cool microhabitat.

Restored Prairie (RP)
The soils of this area, the town site south of the Historic Forestville bridge, indicate the original vegetation was predominately grassland vegetation. Between 1978 and the early 1980's this area was planted with prairie grasses and wildflowers native to the park and Fillmore County. Seed was collected from within a thirty to thirty-five mile radius of the park to preserve local genotypes.

Agricultural (AGR)
Agricultural areas are privately owned and are currently used for crop production and grazing.

Recreation (REC)
Recreation areas are developed for intensive recreational uses which include campgrounds, the State Historic Site, and shop. Depending on how they are managed, recreation areas can have important natural resource values.

Wildlife

Introduction

Due to the diversity of habitats created by the area's geology and diverse vegetation, a variety of wildlife exists in the park. The Minnesota County Biological Survey (MCBS) will conduct animal surveys in the park area during the next few years. The list of known wildlife species will likely be expanded as a result of the survey.

Mammals

Dramatic changes have occurred to Forestville since European settlement with the extirpation of large grazing mammals (elk, bison) and predators (gray wolf, cougar, black bear). While likely common prior to European settlement, white-tailed deer have increased significantly into an approximate 40 per square mile winter population in the park area. This high deer population level negatively impacts the ability of forest communities to regenerate. Lack of large predators, an increase in agricultural areas and declining fur prices have also contributed to a large raccoon population in the park. Both species are controlled within the park through special hunting regulations. Other mammals that likely inhabited the area prior to European settlement are river otter and bobcat.

Mammals in the park today include red fox, gray fox, coyote, mink, weasels, badger, striped skunk, opossum, Eastern mole, shrews, Plains pocket gopher, Eastern chipmunk, red squirrel, gray squirrel, fox squirrel, woodchuck, Eastern cottontail, beaver, muskrat, voles, and several species of mice.

Mystery Cave is an important hibernaculum for four species of bats: big brown, little brown, Northern myotis (special concern), and Eastern pipistrelle (special concern). Roughly 1400 hibernating bats were counted in the cave during the 1992 winter bat count and over 1900 were counted during the 1995 winter bat count. Small numbers of other bats also hibernate in the cave system.

Birds

The current park bird list includes 172 species which have been identified in the park. The primary sources of this list are records from Dr. Samuel Haines, observations by members of the Minnesota Ornithological Union (MOU), and the Zumbro Valley Audubon Society.

Forestville has a very rich diversity of songbirds typical of closed canopy forests. This includes sightings of at least 25 species of warblers and 5 species of vireos.

To date, no birds on the current state list of endangered, threatened, and special concern species have been verified to nest in the park. Two listed species which may nest in or near the park are red-shouldered hawks (special concern) and loggerhead shrikes (threatened). Red-shouldered hawks prefer large, contiguous tracts of mature forest with smaller wetland inclusions. Loggerhead shrikes prefer more open field and upland areas.

There is debate over the extent of the natural range of wild turkeys. However, some persons believe the park area is within the natural range of wild turkeys prior to European settlement. A 1984 release of wild turkeys near the park resulted in a highly successful "reintroduction". These birds utilize the mature oak forest stands in the park.

Reptiles and Amphibians

Many excellent herpetological habitats exist in the park, but have not been surveyed. The following reptiles and amphibians are known to occur within the park. Please refer to the "Heritage Element" discussion on pages 43 for those listed with an official state status.

Blanding's turtle (threatened)	Northern water snake
Eastern milk snake (special concern)	American toad
Timber rattlesnake (special concern)	Eastern gray tree frog
Snapping turtle (special concern)	Northern leopard frog
Redbelly snake	Green frog
Spring peeper	Wood frog
Western painted turtle	Tiger salamander

Protected species which occur in Fillmore County but are not known to occur in the park at this time include the five-lined skink (endangered), pickeral frog and blanchard's cricket frog (special concern), and the gopher (or bull) snake (special concern).

Fish

Relatively good water quality and habitats provide an outstanding recreational fishery. South Branch Root River - The South Branch of the Root River is managed as a brown trout fishery although occasional plants of rainbow and brook trout yearlings occur. Both the brown and rainbow trout are introduced species to Minnesota, whereas the brook trout is native to the state. An experiment to establish a nonmigratory rainbow trout population in the early 1980's failed. Most stocking is done with fry. Some natural reproduction occurs. A 1990 survey in the main park identified the following species:

Brown trout	Common shiner
Rainbow trout	Johnny darter
Northern hog sucker	Fantail darter
White sucker	Slimy sculpin
Blacknose dace	Brook lamprey
Longnose dace	Creek chub

Surveys in the South Branch near Mystery Cave between 1984 and 1993 included the following species:

Brown trout	Bluntnose minnow
White sucker	Fathead minnow
Northern hog sucker	Blacknose dace
Green sunfish	Longnose dace
Central stoneroller	Creek chub
Common shiner	Brook stickleback
Hornyhead chub	Rainbow darter
Bigmouth shiner	Fantail darter
Southern redbelly dace	Johnny darter

Several species of fish common to surface waters have been documented in Mystery Cave. They have been washed in through crevices. There are several public fishing easements along the South Branch upstream of the main park area. A major bank stabilization project in 1985 near the campground's A-loop provides erosion control and good trout habitat. Another major project was completed in 1994 near the group camp. Lunker structures were installed along with large rocks for bank protection. A special regulation for catch and release was implemented in 1986 on a 1 1/2 mile stretch from Canfield Creek to CSAH 12. The experiment failed to achieve the desired goal of creating a trophy fishery. The regulation was discontinued in 1992. A discussion pertaining to native and non-native fish is on page 50.

Forestville Creek - Forestville Creek has been managed as a wild trout stream (no stocking) since 1977. The creek has a prolific brown trout population, and is known to provide excellent fishing. Habitat improvement projects have included bank stabilization, beaver control, and log jam tree removal. Brown trout, white sucker, and slimy sculpin were present in a 1990 survey of the creek. Brook lamprey were observed during the spring of 1994. The state maintains a fishing easement on most of the creek outside of the park (approximately 2 miles).

Canfield Creek - Canfield Creek has also been managed as a wild trout stream since 1977, with the exception of minimal stocking during the drought of 1987-88. Angling success is known to be very good in Canfield Creek. A 1990 survey of fish in the creek included brown trout, white sucker, creek chub, slimy sculpin, and green sunfish. Habitat improvement projects are the same as listed for Forestville Creek.

Butterflies and Moths

Although little sampling has been completed, the park is known to include several insect and other invertebrate species. Twenty species of butterflies have been identified in the park (see planning process file). Several large moths also inhabit the park including luna and polyphemus moths.

Aquatic Insects and Other Invertebrates

A significant number of aquatic insects exist in the diverse waters of Forestville. Mayflies, stoneflies, caddis flies, dobson flies, craneflies, midges, black flies, damsel flies, and dragon flies are well represented. Several species of some insect families are present. These insects contribute to a healthy fish population. In Mystery Cave, a number of insects have been documented including cave crickets and two species of springtails. Mystery Cave is the only known site in Minnesota for both of these species. Other aquatic insects common to surface environments are washed into the cave and survive there. Other known invertebrates include land snails (see page 46) and freshwater mussels.

Endangered, Threatened, and Special Concern Species

The Minnesota Natural Heritage (MNHP) and Nongame Programs identify and document occurrences of endangered, threatened, or special concern, plant and animal species, as well as geologic processes and natural communities. Each occurrence is termed an "element" and is included on an official register maintained by the MNHP. The listed species register is currently being revised.

Fourteen elements have been documented by the MNHP as existing in Forestville/ Mystery Cave State Park. An additional 28 elements have been identified in nearby park areas (See table p. 46). A survey for elements in Fillmore County is planned for 1994-1996 by the County Biological Survey. Many new plant elements discovered in the park during the 1994 survey are included in the descriptions below. The status reported in the text is the official current state status as listed by the State of Minnesota (there may also be a federal status for each species).

Known Elements Within Park Boundary

Plants:

Glade Mallow (*Napaea dioica*)-Status: Endangered - This large, distinctive species often grows to two meters in height with several flowering stems. Glade mallow was probably uncommon even in presettlement times, although it may have been locally abundant. Conversion of native prairie to agricultural use led to the species' rapid decline and eventual disappearance over much of its range. Glade mallow is associated with the moist, sunny alluvial meadows of the major tributaries of the Mississippi River in the Paleozoic Plateau. It may also occur in partial shade near adjacent woodlands. Several populations of the plant have been verified in the park.

Nodding Wild Onion (*Allium cernuum*)-Status: Threatened - This species is associated with northern hardwood and maple-basswood forests. It is often found on moist talus slopes, peripheral to seeps and other rocky moist areas.

Twinleaf (*Jeffersonia diphylla*)-Status: Threatened - This species is associated with rich maple-basswood forests.

Wood's Sedge (*Carex woodii*)-Status: Special Concern - This species is found peripheral to seepage areas on very moist loamy soils in maple-basswood forests.

Tick-trefoil (*Desmodium cuspidatum var. longifolium*)- Status: Special Concern - One of the tick - trefoils, this species inhabits openings in mature oak forests.

Goldie's Fern (*Dryopteris goldiana*)-Status: Special Concern - This fern inhabits rich, moist forests peripheral to upland seepage areas.

Canadian Black Snakeroot (*Sanicula canadensis*)-Status: Special concern - This species inhabits mature oak forest areas.

Sedges (*Carex laevivaginata and Carex jamesii*)-Status: Proposed Threatened - The first sedge listed inhabits wet meadows and the later inhabits rich maple-basswood forests.

Rattlesnake-master (*Eryngium yuccifolium*)-Status: Special Concern - This distinctive prairie species closely resembles the yucca plant, with its long leaves and spiny margins, from which it derives its scientific name. Once quite common in mesic prairie habitats throughout southeast Minnesota, agricultural conversion has since led to population declines, although substantial relict populations are found on prairie strips along railroad rights-of-way. Minnesota populations show no ability to adapt to human disturbance, and occur only in undisturbed native habitats. The species is particularly susceptible to herbicides and cattle grazing. A small population has been verified in the park adjacent to the Root River.

Animals:

Timber Rattlesnake (*Crotalus horridus*)-Status: Special Concern - One of only two venomous snakes in Minnesota, the timber rattlesnake is characterized by its distinctive banded body pattern and its tan-colored rattle at the base of its black tail. In Minnesota the rattler is restricted to eight southeastern counties. It is spotty in distribution but may be locally abundant. Summer habitat includes deciduous forests, croplands, and bottomlands along river valleys. In spring and fall the snake frequents steep, rugged bluffs, rock ledges, and outcrops near overwinter dens. The major cause of the snake's decline in the past has been the systematic and willful destruction by humans; until recently, the snake was bountied by four southeastern counties. These bounties have since been eliminated, and the status of the snake is proposed to be changed to threatened.

American Brook Lamprey (*Lampreta appendix*)-Status: Special Concern - The American brook lamprey is currently restricted to the Cannon, Zumbro, and Root Rivers and their tributaries. The lamprey has a sucker-like disk for a mouth and lacks jaws. It is usually less than 20 centimeters in length. Preferred habitat is small to medium-sized streams with good water quality and little erosion. The major part of the lamprey's life cycle is spent in the larval state, in mud-sand-silt sediments in pools. Adults live only six to seven months, spawn, and die. Spawning occurs in gravel riffles.

Northern Myotis (*Myotis septentrionalis*)-Status: Special Concern - Once thought to be relatively uncommon, this medium sized bat is now known to occur throughout most of Minnesota. Winter habitat includes natural caves, sand mines and deep iron mines. Summer habitat is usually forested areas, where the bat forages for insects over trees, ponds, and streams. The bat spends its summer days under tree bark, in buildings, and behind signs and shutters of buildings. Mystery Cave is an important winter habitat for this and other species of bats.

Eastern Pipistrelle (*Pipistrellus subflavus*)-Status: Special Concern - The smallest of Minnesota's seven bat species, the eastern pipistrelle is known to be a regular resident of Southeastern Minnesota. Like the northern myotis, this bat's winter habitat includes natural caves and sand mines. Winter habitat requirements are sites high in humidity, of constant temperature a few degrees above freezing, and free from human disturbance. Mystery Cave is an important winter hibernacula for this species of bat.

Blanding's Turtle (*Emydoidea blandingii*)-Status: Threatened - Minnesota lies on the northwest periphery of the Blanding's turtle range. Preferred habitat for the turtle is calm, shallow water, rich aquatic vegetation, and sandy uplands for nesting. Draining of wetlands, river channelization, and water impoundment have significantly decreased available habitat, especially in the agricultural areas of southeast Minnesota. The species is also vulnerable to collecting as a pet species.

Milk Snake (*Lampropeltus triangulum*)-Status: Special Concern - This medium-sized snake is locally abundant in southeast Minnesota. Easily recognized by its distinctive body pattern and smooth scales, the Milk Snake's primary threat is collection as a pet species. As is the case for other large snakes, overcollecting or destruction at the den sites can result in local extirpation of the species. Milk snakes occur in a variety of habitats including woodlands and rocky areas and associated forests, although it is known to be abundant in old woodlots and pastures adjacent to small streams and marshes.

Other Unique Features:

Bat Concentrations-No Legal Status - The main park unit of Forestville and especially Mystery Cave provide very important habitat for a number of bat species. There are several concentrations in both the main unit and Mystery Cave. The main park unit is a seasonally important site for the little brown bat (Myotis lucifugus) and the red bat (Lasiurus borealis). Mystery Cave itself is a major winter bat hibernaculum because of its constant year round temperature and high humidity. Species present include the little brown bat, Northern myotis (Myotis septentrioualis), the eastern pipistrelle (Pipistrellus subflavus), and the big brown bat (Eptesicus fuscus). Monitoring of bat populations in the cave should be a priority because of potential impacts from cave tours.

Algific-Talus Slopes-No Legal Status - Talus slope communities occur in northeast and southeast Minnesota in the deciduous forest-woodland and conifer-hardwood forest zones. They are accumulations of coarse rock and soils at the bases of cliffs and steep slopes. They range from shady and moist to exposed and dry, and can range from as small as one square meter to linear corridors up to 1.5 km in length. Algific-talus slopes are unique to the Paleozoic Plateau of southeast Minnesota at bases of steep, north facing slopes. Continuous cold air drainage from fissures and ice caves create a cool, moist microclimate year-around (even during summer). This unique microclimate supports a wealth of disjunct northern species, including miterwort, Canada mayflower, bunchberry, smaller enchanter's night shade, tall lungwort, alderleaved buckthorn, balsam fir and American Yew. The rare boreal golden saxifrage and several species of snail occur in Minnesota only in the algific-talus slope community. Adoxa moschatelliana, a plant of special concern, is also associated with these areas. There has been substantial documentation of algific-talus slopes in and around Forestville/Mystery Cave State Park. Continued monitoring and protection is warranted for this unique feature.

Groundwater Composite - No Legal Status - The Mystery Cave area, with two entrances, is separated by a meander spur ridge of South Branch Root River. This is formed in lower part of Maquoketa formation and in the upper part of Galena formation.

Groundwater Process (Holocene) - No Legal Status - Mystery Cave area. Some water from the South Branch Root River normally sinks in at the western Cave entrance.

Additional Known Elements In The Vicinity Of The Park

The following species occur in the Forestville area, but are not yet known to occur in the park. The existence of these species in the nearby vicinity suggest that these species may also occur in similar habitats in the park. Their occurrence is also an indicator of the rich diversity of natural communities within the watershed.

Plants:
Golden saxifrage (Chrysosplenium iowense)
Leedy's roseroot (Sedum integrifolium)
Wood's sedge (Carex woodii)
One-flowered broom-rape (Orobanche uniflora)
Narrow-leaved spleenwort (Athyrium pycnocarpon)
Silvery spleenwort (Athyrium thelypterioides)
Sullivant's milkweed (Asclepias sullivantii)
Moschatel (Adoxa moschatellina)
A species of Whitlow Grass (Draba arabisans)
Squirrel corn (Dicentra canadensis)
Wolf's junegrass (Poa wolfii)
Purple rocket (Iodanthus pinnatifidus)
Wild quinine (Parthenium integrifolium)
Yellow pimpernel (Taenidia integerrima)
Smooth rock cress (Arabis laevigata)
Valerian (Valeriana edulis)
Tuberous indian plantain (Cacalia plantaginea)
Cowbane (Oxypolis rigidior)
Ginseng (Panax quinquefolius)

Animals:
Loggerhead shrike (Lanius ludovicianus)
Prairie vole (Microtus ochrogaster)
Black redhorse (Moxostoma dugnesuei)
Pickerel frog (Rana palustris)
Keen's myotis (Myotis septentrioualis)
Northern cricket frog (Acris crepitans blanchardi)
A species of land snail (Discus catskillensis)
Hubricht's vertigo (Vertigo hubrichti-a snail)
Minnesota pleistocene succineid (Succinea sp.-a snail)

Other Unique Features:
Moist cliff
Northern-hardwood-conifer forest, bluff subtype
Talus slope

Resource Objectives and Integrated Management

Introduction

There is a delicate balance in bringing people and nature together. People need access to open space and natural areas for recreation and renewal in an ever increasingly complex world. County biological surveys indicate only four to eight percent of most Minnesota counties remain in natural communities. The pressure to use these remaining natural areas needs to be balanced with the requirements of other forms of life that depend on these areas for survival. It is imperative that we manage our natural, historic, and cultural resources wisely, because if they are lost, the integrity of the resources are lost forever.

Plan Modifications related to the Forestville State Park Resource Inventory

The Minnesota Natural Heritage Program is completing the County Biological Survey (CBS) in Fillmore County over the next three years. Forestville State Park will be surveyed more intensively than most other areas in the county. Ideally, this level of resource information would have been available prior to the onset of the park planning process. As this information becomes available it should be carefully considered related to the management recommendations in this plan. Appropriate plan revisions and amendments (see pages 95-96) should be made to this plan if warranted when the Fillmore County Biological Survey is completed. The Regional Resource Specialist, Regional Manager, Park Manager and a member of the Park Planning staff should jointly review the results of the CBS and recommend appropriate plan modifications.

Natural Community and Historic/Cultural Resource Objectives:

- Sustain functional ecological systems and the integrity of biological diversity at all levels: landscape, habitat, species, and genetic.
- Maintain habitats essential for declining species and identified heritage elements.
- Restore degraded natural communities and ecological systems.
- Identify, monitor, and manage historical and cultural resources in cooperation with the Minnesota Historical Society.

Integrated Resources Management:

Topic 1. Ecosystem-Based Management

Discussion: Although Forestville State Park and its immediate vicinity represents an extremely resource-rich area, it is only one part of a much larger functioning ecosystem. In order to perpetuate a sustained quality ecosystem in this area, we must work with a variety of public and private partners. Many of these potential partners are listed in the boundaries section of this plan (see page 74), where an "ecological boundary" is defined for the immediate Forestville area.

Sustainability requires that natural systems be managed to allow their use by present generations without jeopardizing their use by future generations. We must recognize that there are legitimate human needs for natural resources. At the same time, we must recognize that human needs must be balanced with the long-term needs of the ecosystems. Ecosystems do not have an infinite capacity to meet human needs. Human demands continue to increase with increasing population trends.

The demand for recreational development/opportunities and residential housing within natural areas continues to increase. The blufflands have been under these pressures for several decades. The challenge is to provide for a strong local and regional economy, while at the same time perpetuating the scenic and biologically rich blufflands area for future generations. Businesses and housing developments should be encouraged within established communities. Major housing developments that are sited along steep valley walls should be discouraged (for visual impacts, soil erosion concerns, and impacts to adjacent fragile resources).

ACTIONS

Action 1: Participate in local and regional planning efforts to sustain healthy ecosystems, including the Blufflands Initiative and a local watershed partnership (see page 73).
Action 2: Support projects and programs that will encourage a strong local / regional economy while at the same time sustain a healthy natural resource base for future generations.
Action 3: Incorporate concepts of biodiversity, ecosystem management, and watersheds/landscape management into park interpretive programs.

Topic 2. Biological Diversity

Discussion: Each species within a given community fills a niche that is interconnected to all other species. As individual species are lost, ecosystems deteriorate, providing habitat for fewer and fewer species. Prior to 1900, it is estimated that one species was lost every four years; today, estimates indicate one species is lost every hour. Although these figures represent our global situation, we must do our part locally to preserve the diversity of biological species.

More than 30 natural plant communities in the blufflands harbor more than 100 rare plants and animals - a higher diversity than anywhere else in Minnesota. Forestville State Park includes a very rich diversity of rare and unique features (see Endangered, Threatened, and Special Concern Species, page 43).

ACTIONS

Action 1: Protect Federal and State listed species and manage habitats which encourage their proliferation.
Action 2: Continue biological surveys to document element occurrences which may exist but are unknown at this time.
Action 3: Implement management strategies that mimic natural disturbance patterns to maintain and restore the ecological integrity of the natural communities in the park.
Action 4: Delineate and protect old growth forest areas.
Action 5: Monitor species and natural communities for indications that reflect changes in populations and biological health.
Action 6: Identify educational activities and public outreach opportunities to increase the awareness and understanding of rare resources and biological diversity issues.

Topic 3 Fragmentation of Closed-Canopy Forest Environments

Discussion: Forests are fragmented when adjacent land uses result in smaller tracts of forest and more forest "edge". Aerial photos of southern Minnesota reveal that there are very few large blocks of contiguous, closed-canopy forests remaining. Animals that depend on larger blocks of quality forest environments include neotropical migrant songbirds, several small mammal species, and a diversity of reptiles and amphibians. Forestville State Park is the largest contiguous block of relatively undisturbed oak forest being managed to perpetuate this condition in the Root River watershed. The average age of this forest is 80 to 90 years old, and its resource value will only improve with time.

ACTIONS

Action 1: Minimize forest fragmentation to protect interior forest species habitat.
Action 2: Protect old growth forest areas as identified by the Minnesota Natural Heritage Program and DNR Old Growth Forest Guidelines.
Action 3: Conduct breeding bird and other biological surveys to help guide park development and use.
Action 4: Restore forest canopy to old fields, recreational areas and other areas where necessary to reduce "edge effect."

Topic 4. Natural Community Management and Restoration

Discussion: Forestville State Park represents one of the most important natural components within the Root River watershed. As such, the natural resources within the park should be managed to perpetuate a healthy, natural condition. The Outdoor Recreation Act specifies that state parks be managed to exemplify natural characteristics in an essentially unspoiled or restored condition, and that they be administered in a manner which preserves and perpetuates the natural features that existed prior to settlement. Presettlement vegetation, as described on page 34 of this plan, is a good starting point for managing the natural resources of this park. However, drastic changes to our landscape and entire ecosystem have taken place since settlement in the mid - 1800's. The ecosystem and watersheds surrounding the park have been so altered that it is impossible to re-create pre-settlement conditions. However, within the context of maintaining the healthiest systems we possibly can, we need to evaluate not only pre-settlement conditions, but the remaining natural systems that exist today. For example, it may be more important today to manage most of Forestville as a closed canopy oak forest because so few areas like this remain. Its value for interior forest species, including neotropical migrants, may be greater than attempting to re-create a pre-settlement condition that included larger tracts of oak savanna.

ACTIONS

Action 1: Determine pre-settlement vegetation conditions.
Action 2: Restore degraded natural communities areas, such as old cultivated fields and extirpated plant and animal species.
Action 3: Remove undesirable non-native species where it is ecologically necessary to do so. Some exotic species, such as European buckthorn, are aggressive, invading larger and larger natural areas. These aggressive exotics change the character of the natural community and threaten the biological diversity of the ecosystem.

Brown and rainbow trout are stocked in the South Branch of the Root River (both non-natives). Natural reproduction also takes place. The native brook trout was stocked in the early 1980's but brown trout are typically more successful, and brook trout are rare in this area. Brown trout appear to be compatible with the cold water stream systems of southeastern Minnesota, have become a very important recreational resource, and should be considered a desirable non-native species. Management which benefits native species such as the brook trout should be implemented where feasible.

Action 4: Maintain the existing native plant nursery in the park. Plant materials and seeds collected from the park will help preserve the genetic integrity of this area.
Action 5: Manage deer, raccoon, and other wildlife populations to meet balanced ecosystem goals.
Action 6: Monitor natural communities for occurrence of problem species, trends in populations of indicator species and changes in species composition to evaluate need to revise management strategies.

Topic 5. Water Quality and Cave Management

Discussion: Visitors to Mystery Cave experience first-hand that surface water filters into groundwater aquifers. Water droplets falling throughout the cave remind us of the enormous potential for groundwater contamination in karst landscape areas. Water quality protection and monitoring is an important component of resource management and interpretation at Mystery Cave.

Mystery Cave is perhaps the most unique natural resource feature in the park. Many of its features are non-renewable from a human perspective. Underground resource protection and cave conservation must be emphasized in all phases of park management.

ACTIONS

Action 1: Delineate groundwater basins that feed the major springs in the park area. Work with DNR, Division of Waters, University of Minnesota Geology Department, and organized caving groups to conduct water tracing work necessary to achieve this action.
Action 2: Continue existing and develop new cave conservation practices including speleothem / passage restoration and controlling effects from tour operations such as dust, algae and lint. Continue efforts to maintain or restore the cave to conditions to what existed at the time of discovery and still provide access to visitors. Major progress in this direction was completed during 1989-92 when many of the 1937 floors were uncovered after being buried in fill material for many years. Identify and apply methods for measuring impacts of visitation to the cave resources such as establishing a photo monitoring program with emphasis on tour areas and caving routes. Develop materials to promote low impact caving techniques in Mystery Cave. Identify and monitor any threat to the geologic or biologic cave resources and make efforts to eliminate or lessen the impacts.
Action 3: Support efforts to map and inventory caves within the park. Participate with organized caving groups to bring survey efforts to culmination in usable documents for management, interpretive or research purposes.
Action 4: Continue cave research efforts such as studies on water quality, water-table levels in the cave as compared to non-cavernous parts of the limestone bedrock, rates of cave enlargement, long term geophysics and rock mechanics, bat populations, and terrestrial and aquatic invertebrates. A number of suggestions on future cave related research is found in the management reports of the 1991 Mystery Cave Resource Evaluation Project.

Topic 6. Historical and Cultural Resources

Discussion: Forestville State Park includes Historic Forestville State Historic Site which is surrounded by a National Register of Historic Places boundary. The park also includes many important archaeological sites, as described in the Archaeology Section (see History/Archaeology, page 18).

ACTIONS

Action 1: Survey all proposed development areas for the presence of cultural resources. If significant cultural resources are discovered during the surveys, facility siting, public use, and possible archaeological mitigation will need to be reviewed to avoid or minimize impacts.
Action 2: Work with the Minnesota Historical Society, State Historic Sites and Historic Preservation Office, to manage historical and cultural resources within the park (e.g. Zumbro Hill Cemetery, school and house foundations, etc., see planning process file).
Action 3: The MHS, State Historic Preservation Office should review all major proposed developments within the National Register of Historic Places boundary (to maintain historical integrity in this area).

Topic 7. Research, Inventory, and Monitor Natural and Cultural Resources

Discussion: Wise management decisions and effective education programs require accurate, sufficient information and knowledge. Natural systems are dynamic and continually changing through natural succession, with fluctuations in climate, pest cycles and other factors. In the past, research has focused on populations and patterns of individual species. Scientific information on ecological systems is limited. Research and monitoring must be ongoing to evaluate effectiveness of management activities, impacts of recreational use, and other factors affecting the resources.

ACTIONS

Action 1: Incorporate new management techniques as recommended by research and evaluation.
Action 2: Complete a baseline level of biological information of park and ecological boundary resources.
Action 3: Maintain a database and geographic information system of natural and cultural resources information to guide planning and monitoring activities.
Action 4: Collaborate with other agencies and organizations to identify and conduct research to further understanding of natural and cultural resource systems.
Action 5: Monitor and evaluate resource management activities to determine effectiveness for desired goals and objectives.
Action 6: Monitor recreational use to determine needed changes in management strategies.
Action 7: Provide training and educational opportunities to keep park staff informed of trends in current management techniques.

RECREATION RESOURCES

Recreation Management Objectives

- Preserve the park's natural scenic beauty, non-commercial atmosphere, and historic character.
- Minimize and concentrate park developments in order to preserve the remaining portions of the park.
- Encourage park use, but manage and control all use so that it does not detract from the resources people have come to enjoy.
- Provide the highest level of access practicable for persons with disabilities.
- Offer and market a package of opportunities which includes:

    - Camping
    - Historic Forestville
    - Mystery Cave
    - Trout fishing
    - A variety of trail opportunities including hiking, horseback riding, skiing and snowmobiling
    - Scenic bluffland and karst landscape
    - One of the highest quality, closed-canopy oak forests in Minnesota, and,
    - A diversity of unique wildlife including bats, rattlesnakes, and wild turkeys.

Existing Development

Camping

- Semi-modern campground: 73 drive-in sites, 23 with electricity
  Modern sanitation building with showers
- Equestrian campground: 80 unit capacity, non-structured sites
- Primitive Group camp: 160 person capacity

Trails

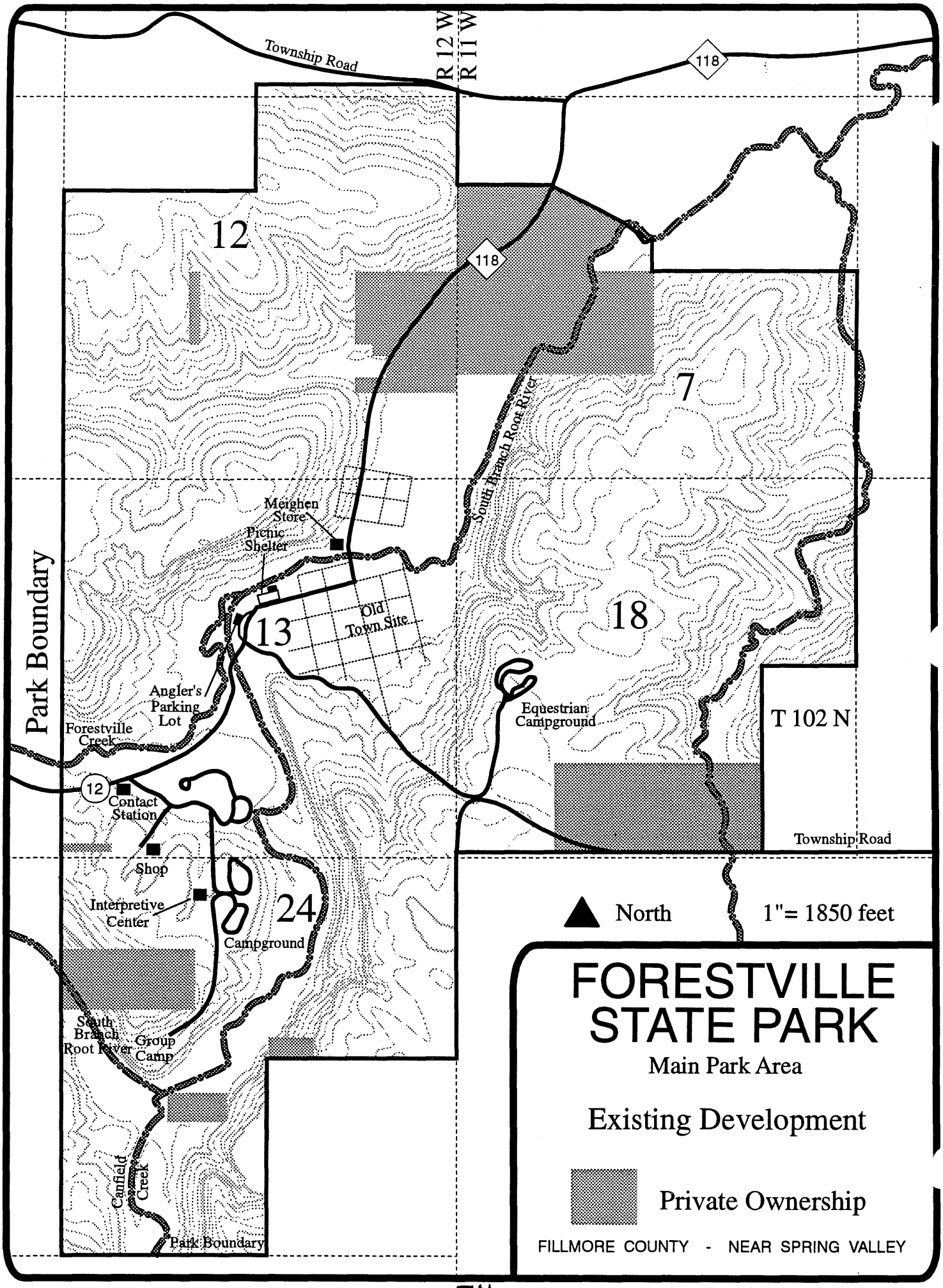
- Horseback: 14 miles (designated and authorized)
- Hiking: 16 miles (14 are also horseback; 2 miles hiking only)
- Cross-country ski: 6.5 miles
- Snowmobile: 9 miles

Day-Use

- Picnic Shelter/Winter Trail Center (partially enclosed with flush toilets, built in 1980)
- State Historic Site (includes Meighen Store, Barn and several other amenities)
- Mystery Cave: Commercial tour route and Minnesota Caverns tour route
- Interpretive Center and Amphitheater (near campground)
- Picnic Areas: Main park near shelter and at Mystery Cave (60 tables total)
- Angler's Parking Areas

Park Administration

- Contact Station (built in 1982)
- Mystery Cave: Manager's residence, offices (trailer), ticket building and service garage
- Main Park service garage and shop
- Trailer Dump Station
- Septic Tanks: 5
- Active Wells: 6
- Roads: 3.7 miles gravel, 1.6 miles paved


Township Road
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R 11 W
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12
118
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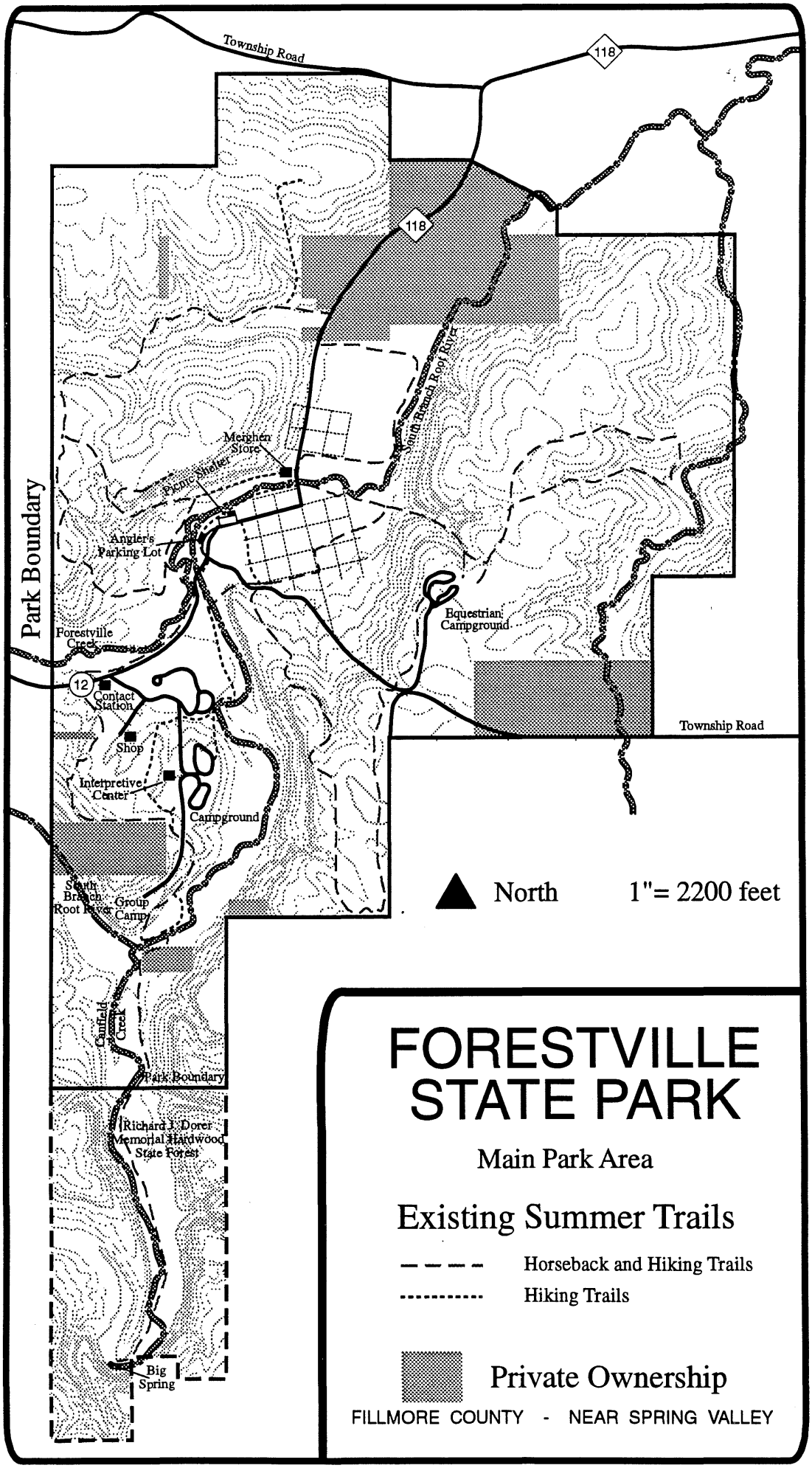
South Branch Root River
Merghen Store
Picnic Shelter
Old Town Site
13
18
Park Boundary
Angler's Parking Lot
Forestville Creek
Equestrian Campground
T 102 N
12
Contact Station
Township Road
Shop
Interpretive Center
24
Campground
South Branch Root River
Group Camp
Canfield Creek
Park Boundary
North
1"= 1850 feet
FORESTVILLE STATE PARK
Main Park Area
Existing Development
Private Ownership
FILLMORE COUNTY - NEAR SPRING VALLEY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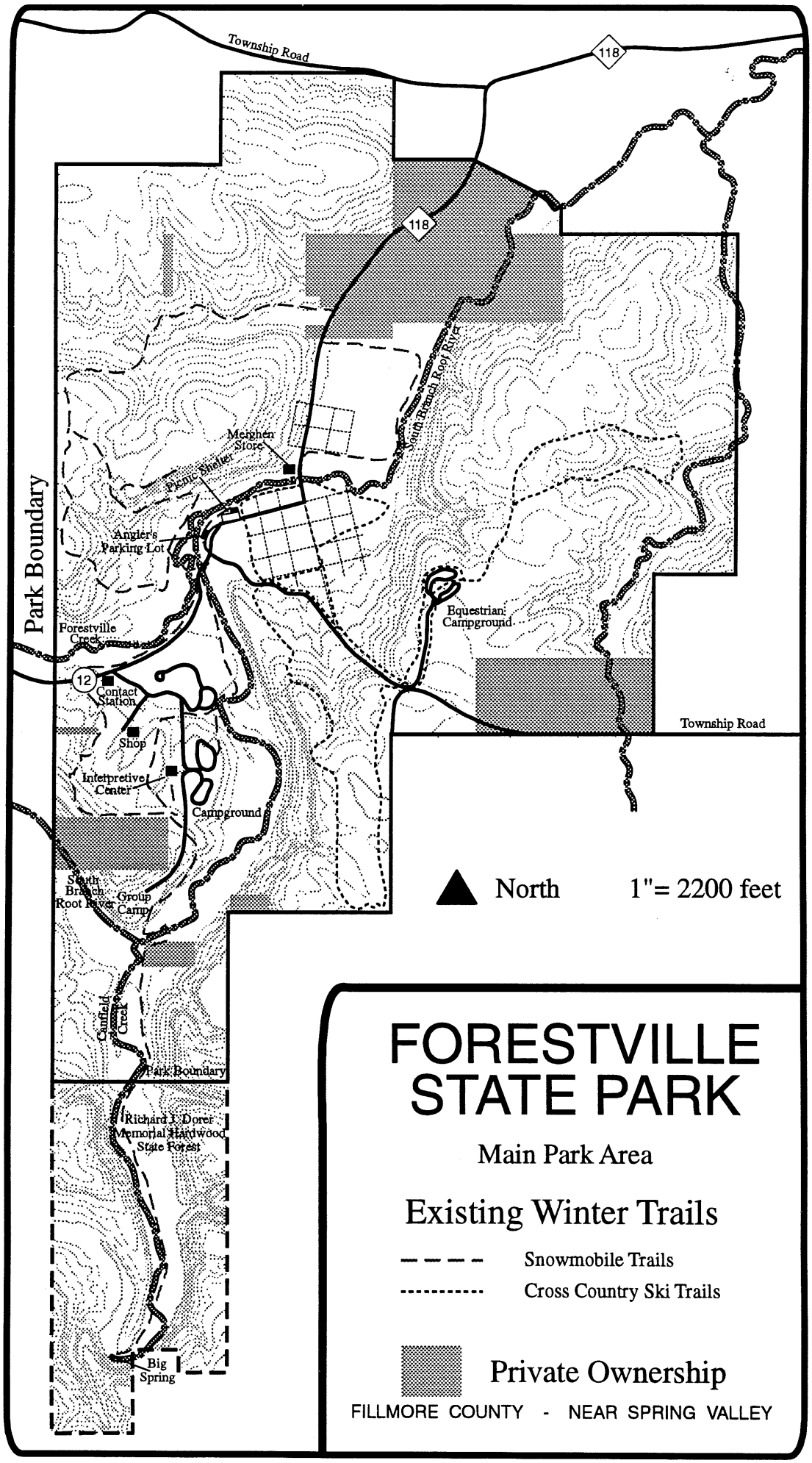
Park Boundary
Meighen Store
Picnic Shelter
South Branch Root River
Angler's Parking Lot
Equestrian Campground
Forestville Creek
12
Contact Station
Township Road
Shop
Interpretive Center
Campground
South Branch Root River
Group Camp
Canfield Creek
Park Boundary
Richard J. Dorer Memorial Hardwood State Forest
Big Spring
North
1"= 2200 feet
FORESTVILLE STATE PARK
Main Park Area
Existing Summer Trails
Horseback and Hiking Trails
Hiking Trails
Private Ownership
FILLMORE COUNTY - NEAR SPRING VALLEY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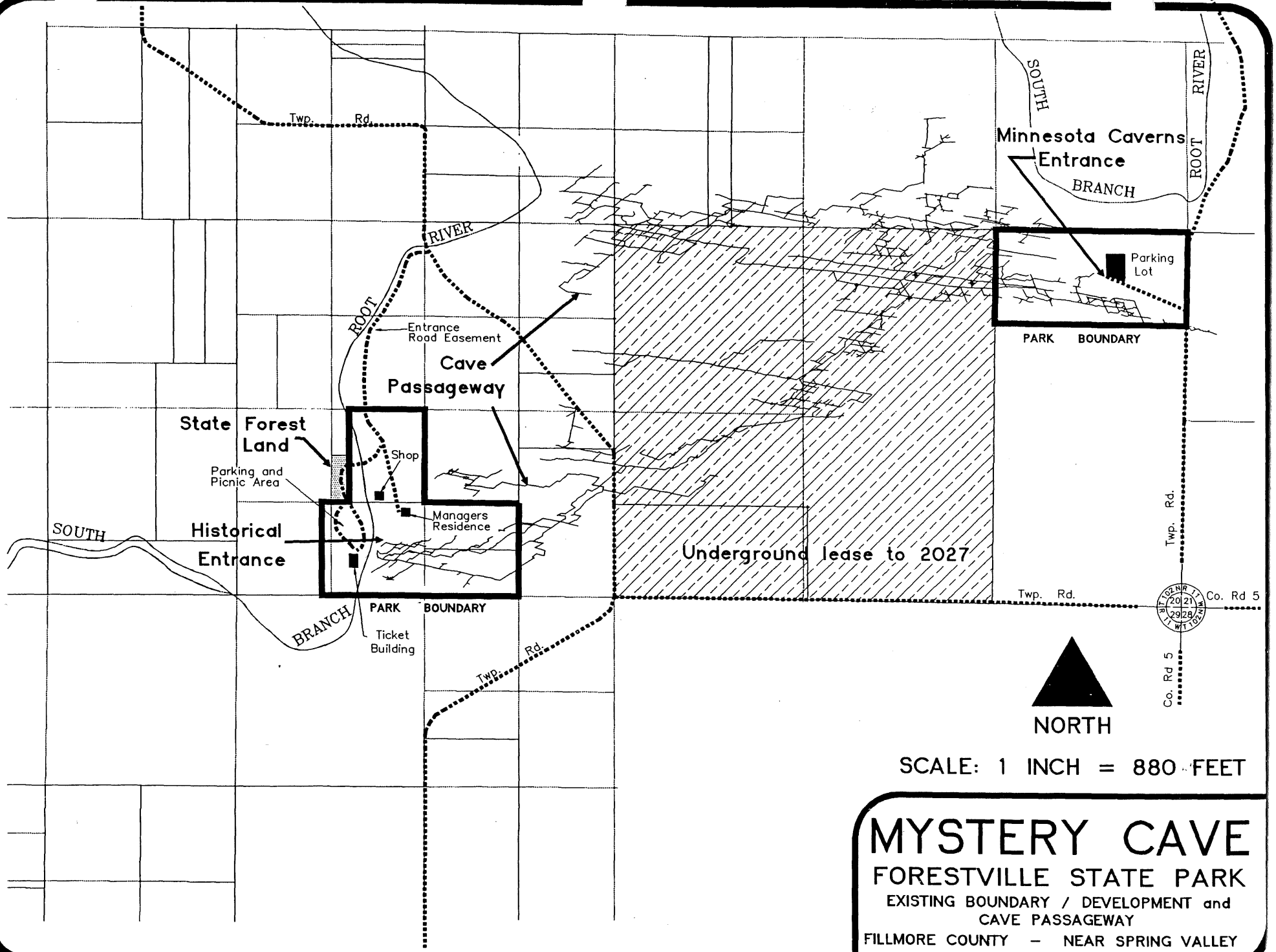
Big Spring
North
1"= 2200 feet
FORESTVILLE STATE PARK
Main Park Area
Existing Winter Trails
Snowmobile Trails
Cross Country Ski Trails
Private Ownership
FILLMORE COUNTY - NEAR SPRING VALLEY


Twp. Rd.
SOUTH
ROOT RIVER
Minnesota Caverns
Entrance
BRANCH
ROOT RIVER
Parking
Lot
PARK BOUNDARY
Entrance
Road Easement
Cave
Passageway
State Forest
Land
Shop
Parking and
Picnic Area
Managers
Residence
SOUTH
Historical
Entrance
Underground lease to 2027
Twp. Rd.
Co. Rd 5
PARK BOUNDARY
BRANCH
Ticket
Building
Twp. Rd.
Co. Rd 5
NORTH
SCALE: 1 INCH = 880 FEET
MYSTERY CAVE
FORESTVILLE STATE PARK
EXISTING BOUNDARY / DEVELOPMENT and
CAVE PASSAGEWAY
FILLMORE COUNTY – NEAR SPRING VALLEY

57

Proposed Development

The proposed development in this plan is generally conceptual. Site-specific, detailed development plans will be completed based on the concepts outlined in this plan. The proposed development map on page 70 shows the location of major proposed developments. Also, refer to the proposed summer and winter trail maps on pages 71-72 and the Interpretive Services Chapter, page 79.

Proposed developments outlined in this plan were generated after reviewing available information on park resources. Development recommendations are made after careful consideration of the, natural / cultural resources and the resource / recreation management objectives outlined in this plan.

All recommended development proposals (e.g. buildings, trails) will be contingent on a detailed site analysis prior to implementation. Development will only take place after a detailed physical analysis (e.g. soils) and resource assessment (e.g. rare plants or archaeological sites) have been conducted and considered.

Topic 1. Summer Trails (Bike, Horse, Hike)

Discussion: Bicycle Trail - An extension of the Root River State Trail is proposed to connect to Forestville State Park. Several alternative alignments have been discussed, given the major considerations of steep topography, trail safety, floodplains, natural and cultural resource impacts, cost efficiency, providing a quality recreation experience, and conflicts with other trail uses. The direction of these discussions suggests that a trail that passes through the park at the "valley elevation" makes the most sense. The major limiting factor preventing approaches from other directions is steep topography. Because the valley elevation includes significant floodplain and wetland areas, one of the best alternatives is for the proposed trail route to follow County Road 118 and County State Aid Highway 12 through the park. The trail would be on a widened shoulder or in the vicinity of the road right-of-way. This alignment would bring bicycle riders to many of the park's major amenities, including Historic Forestville, the picnic shelter and picnic area, angling areas along the South Branch Root River, and the park contact station. It would also be accessible from the main campground. The bicycle trail may also connect to Mystery Cave, depending on the alignment chosen between the main park and Spring Valley.

The trail through the park will be developed as part of the trail system, so its construction would take place as the bike trail reaches the park boundary. The trail outside of the park may also accommodate horses, in which case the horse treadway would connect to the park's horse trail system (see proposed summer trails map, page 71). Horses and bicycles are generally not compatible on the same treadway.

Horse Trails - The park includes 14 miles of trail designated for horseback and hiking. Although the trail system has seen many improvements over the past 12 years, there are still many areas of severely damaged treadway from horse use. This is a

safety concern for riders, and a major resource impact concern related to the water quality in this area. Most planning process participants, including many horseback riders, felt improvements to the trails were a much higher priority than improvements to the horse camp area (see topic # 4). The horse trail system is the main attraction for horseback riders. Improving the horse trails will provide a better quality horseback riding experience, better hiking trails, improved winter trails, and reduce the natural resource impacts to the park and watershed.

New horseback trails are proposed in the northeast corner of the park and outside of the current park boundary to complete a Big Spring loop trail. The Big Spring loop would require park boundary adjustments (or DNR, Trails & Waterways acquisition) adjacent to the Canfield Creek area. Throughout the trail system, some designated horse trails will have to be rerouted when they are repaired and some trails may have to be closed as new alignments are developed. There will be no reduction in the designated horse trail mileage (14 miles), but trail routes may change to more appropriate locations. If proposed alignments (e.g. Big Spring loop) can be added, the designated horse trail system would experience a net increase.

Several meeting participants, including horseback riders, supported the idea of creating an "Equestrian Improvement Donation Account", with funds exclusively dedicated to horse camp and trail improvements at the park. Donations would be tax deductible.

Wagons, carriages, and buggies will continue to be allowed at the park on a special use permit basis. The park manager will determine when and where this type of use will be allowed (essentially during low use periods and on flat trails only). Use and demand will be monitored.

Hiking Trails - The park has two miles of designated hiking only trail, 14 miles of horse/hike trail, and several miles of informal footpaths along the river and streams. Because many of the horse/hike trails are damaged from horses, hiking can be a wet, muddy, and unpleasant experience for hikers. When the horse trails are improved, the park will be much more accessible to hikers.

ACTIONS

Action 1: Work with Fillmore County and the Bluffland Trail Joint Powers Board to provide a bicycle trail through the park on a widened shoulder or in the vicinity of the road right-of-way on Co. Rd. 118 and CSAH 12. Where it is possible, consideration will be given to separating the trail from the road for safety. If the through-park motor vehicle traffic is rerouted seasonally (see topic #2), there would be less need to separate the treadway from the road.

Action 2: Within the State Historic Site Boundary, work with the State Historical Society to determine bicycle trail alignment and treadway surfacing (e.g. limestone as an alternative to asphalt).

Action 3: Work with the Blufflands Trail Joint Powers Board and the DNR, Trails and Waterways Unit to determine bicycle trail alignments between the main park and Mystery Cave. The DNR, cave specialist should be involved in determining bike trail alignments in the vicinity of the cave in order to avoid negative impacts to the cave.

Action 4: Realign and reconstruct the existing designated horse trails; close inappropriate alignments as new alignments are constructed. These improvements will protect important resources and provide better quality hiking, ski, and snowmobile trails. **Add new trails in the north east corner of the park and a new loop trail from the big spring (see proposed summer trails map, page 71).**

Considerations:

1. The first priority is to repair and reroute where necessary the existing, designated (on park map and signed in park) horse trails. The second priority (new) trails would not be started until the existing trails are repaired.

2. During construction of the trails outlined above, all other "unofficial" horse trails will be closed. Horse trails and riding will only be permitted on the existing designated trails and the proposed trails as shown on the proposed summer trails map (see page 71).

3. Produce an educational pamphlet and provide a kiosk in the horse area pertaining to the importance of staying on the horse trails, trail conservation, and etiquette (see interpretive chapter, page 89).

4. Consider adding staff and volunteers to work with horseback riders (see staffing, page 92).

Action 5: Establish a dedicated equestrian improvement donation account for the park.
Action 6: Repair the hiking trail that leads to the pioneer cemetery.
Action 7: Provide a hiking trail down to a fishing access area on the South Branch of the Root River between campground loops A and B.
Action 8: Monitor all horse and hike trails for erosion and impacts to natural communities.

Topic 2. Forestville Bridge / County Road 118

Discussion: Forestville bridge is used as a crossing for automobiles, trucks, campers, horses, pedestrians, bicycles, and occasionally carriages. Motor vehicle traffic is disruptive to the "living history" program which is being conducted to create an 1899 atmosphere (see topic # 6). When a bicycle trail connection is made to the park, the "bottleneck" at the historic bridge will be intensified. Alternative new bridge crossings are very expensive, impact other historic and natural resources, and it is believed that most users would still prefer the most direct route across the river (the historic bridge).

Most discussions on this issue eventually lead to the idea of rerouting motor vehicle traffic to the Township road north of the park, and not allowing motor vehicle traffic across the bridge or through the historic site. All participants recognize this idea surfaced decades ago, and that there are benefits to retaining motor vehicle traffic through the park. At their meeting on April 21, 1994, the advisory committee compiled the following list of major advantages and disadvantages on this issue (below).

Advantages of Rerouting Motor Vehicles

1. Improved safety and reduced liability at the bridge site
2. Extended bridge life
3. Ease of understandable access to the park for park visitors
4. Improved historic site program and tourist attraction
5. Improved control for park management (visitor orientation, permit and fee collection, reduced littering and enforcement costs)
6. Better security provided for historic artifacts

Disadvantages of Rerouting Motor Vehicles

1. Inconvenience for local traffic
2. Scenic drive "through" park is lost
3. Negative public relations because people do not like change
4. Cost to improve/maintain township road (to extent needed)
5. Loss of "back road" if township road is improved
6. Emergency access concerns, although access could be gated

Recognizing both the advantages and disadvantages of this idea, planning process participants discussed many options. There are proportionally more local traffic connection needs on weekdays and over the winter months. The majority of heavy park visitor traffic occurs during the summer months and especially on weekends/holidays.

During the planning process, and especially at the October 5, 1994, Advisory Committee meeting and the October 12, 1994 Open House, the Preston Area Tourism Association and business community members suggested an alternative to the "seasonal rerouting" option. The concept would be to pave six miles of County Roads 12 and 118 from Preston through Carimona, establishing a second major entrance to the park. To alleviate congestion at the historic bridge, a new motor vehicle bridge would need to be constructed downstream of the historic bridge. The historic bridge would be open to trail traffic only. Although this alternative may solve the issue of congestion at the bridge, it would create other major issues and concerns, including:

- Environmental Impacts - river channelization and major road construction within a floodplain;
- Historic Impacts - visual and direct within townsite on both sides of the river;
- Financial Impacts - multi-million dollar project;
- Park Circulation - second major entrance would need to be controlled and park would be bisected into two zones;
- Park Character - would change from quiet, managed site to a much busier atmosphere; and ,
- Visitor Safety - Visitors on bicycles and any trail crossings (horses, snowmobiles, etc.).

Because of these concerns, and especially because the park mission, vision, and goals (see page 11) emphasize retaining the quiet, non-commercial atmosphere that exists

at Forestville today, this plan cannot recommend this option. This management plan should consider economic interests, but overall, it must be a plan for the park and its goal should be to improve on its existing attractiveness. In the long-term, it may be in everyone's best interest, including the local economy, to preserve the current character and atmosphere of the park. This is why visitors come here, because it is relatively undeveloped (see Park Visitor Analysis, page 16). More development will only detract from the park's uniqueness.

This issue will continue to evolve, and its outcome will be impacted by future bike trail and traffic conditions.

*** Since this is a County-owned road and involves a Township road, the decision whether to alter traffic patterns rests with Fillmore County and Forestville Township. The Forestville State Park Management Plan can only make a recommendation, given the considerations outlined during the planning process.**

ACTIONS

Action 1. Support maintaining an open road for local traffic through the main park from October to the end of May each year.

Action 2. If mutually agreed to by Fillmore County, Forestville Township, DNR, and MHS, reroute motor vehicles between Memorial Day Weekend and the end of September (or until the site closes for the season) on weekends (Saturdays and Sundays) and holidays. (Memorial Day, July 4, and Labor Day) during historic site hours.

Considerations:

1. Township Road: This level of rerouting would not likely justify the high cost of improving the township road. It may warrant considering some maintenance funding (e.g. dust control) to the township, however, this would have to be mutually agreed to. Traffic counts would help determine how much additional traffic is actually rerouted onto the township road.

2. Parking Lot: From a state park/historic site operations perspective, it would be best to route all visitor traffic past the contact station, and not provide a parking lot at this location. This would be especially true if the historical society decides to charge a site fee in the future. For now, any visitors parking in a lot, if on state-owned property, would need a vehicle permit. If a gate is ever constructed, a turn-around area would need to be developed.

3. If Action 2 cannot be mutually agreed to, work to implement more traffic control measures in the historic bridge area. This includes motor vehicles and all trail traffic - pedestrians, horseback riders, bicyclists, etc.

Action 3. IF NEEDED (especially after the bicycle trail is routed through the park), as mutually agreed to by the parties in action two: Reroute motor vehicles seasonally between Memorial Day weekend and the end of September (or until the site closes for the season).

Considerations:

1. This level of rerouting may justify the cost of improving the township road, however, this depends on the cost of improvement. The cost of improvement (and maintenance) would have to be weighed against the benefit of seasonal rerouting.

Action 4. Determine if state funds can or should be used for township road maintenance or improvement. State park road account funds are designated for access to specific units of the State Outdoor Recreation System, including state parks. These funds were used for improving the park's entrance along County State Aid Highway 12 from County Road 5 in 1993.

Action 5. Work with the Preston Area Tourism Association and business community to direct park visitors to the park from Preston. This includes directing most park visitors as follows:

- State Highway 16, County Road 5, and CSAH 12, past the contact station; or,
- County Road 14 (Greenleafton Road), Co. Rd. 5, and CSAH 12 (as a scenic alternative).

Action 6. Work with the Minnesota Department of Transportation to provide park and historic site signs at the intersection of State Highway 16 and U.S. Highway 52 in Preston. All highway signage should reference both Mystery Cave and Historic Forestville.

Topic 3. Winter Trails

Discussion: The park's winter trail system provides both snowmobile (9 miles) and cross-country ski (6.5 miles) trails. Skiing use has increased at the park in recent years, but many skiers comment that 6.5 miles of trail is not enough to make this park a repeat destination. Therefore, it would be beneficial to increase ski trail mileage if possible.

Snowmobile clubs have developed an extensive system of Grant-in-Aid (GIA) trails in southeastern Minnesota. There are many opportunities to travel cross-country, but a connection between Wykoff and Harmony, Minnesota has not been accomplished. Clubs from both communities attended planning meetings, and supported the concept of a snowmobile trail that would pass-through the park, with access to the winter trail center (summer picnic shelter building).

The snowmobile trail opportunities outside of the park indicate a need only for the pass-through alignment shown on the proposed winter trails map, page 72. Skiing trails are limited, however, and should be increased as shown on the map. For safety and noise concerns, the snowmobile and ski trails are separated as much as possible.

ACTIONS

Action 1: Provide a north-south snowmobile GIA trail connection with access to the winter trail shelter. Horse trails north of the contact station and in the Canfield Creek area must be constructed/improved prior to this connection.
Action 2: Increase the ski trails in the park from 6.5 to approximately 10 miles.

Topic 4. Camping

Main Campground - The semi-modern campground has 73 campsites, 23 with electricity. Camper comment cards, long lines at the shower building, and verbal comments indicate the need for additional showers at the park. Some campers from the horse camp and group camp drive to the semi-modern campground to use the shower, putting additional pressure on this facility. Considering limited development space, limited physical development and resource capacity, impacts to operating budget, and many private campground partners, significant campground expansion is not recommended at this park at this time.

Horse Campground - The horse campground can accommodate a maximum of 80 camping parties. A 1978 development plan for the horse camp has been partially implemented. One portion that was not implemented was individual campsites. This is primarily an administrative and enforcement concern; it takes many additional staff hours to check for camp registration compliance and often invades campers' privacy. Horse campers generally favor a more open setting for camping. Many horse campers have requested showers and electric sites in the horse campground, but most who have participated in the planning process so far have stated the highest priority is to improve the horse trails before these other amenities are provided. It also stands to reason that improved campground amenities will only put additional pressure on the already damaged trail system.

Most process participants have agreed that showers should eventually be provided in the horse camp area. This will take the pressure off of the semi-modern shower building and eliminate the additional park traffic and parking problems caused by horse campers using the semi-modern campground shower.

Group Campground - The water system in the group camp will need repair and improvements over the next five years. There is also a need to provide additional shade trees in this area.

Bicycle/Walk-in Camping - When the bike trail connects to the park, there will likely be demand for *transient* bicyclist camping. Development space and physical amenity/ resource capacity is limited at this park (see main campground, above). The best spot to locate this type of camping would be in the old field area southwest of the semi-modern campground C-loop. Up to seven sites will bring the total campsites in this area to 80, the maximum we can provide with existing shower building capacity. To avoid exclusive use by any group, these sites would also be available as "walk-in" campsites (campers would park near the existing angler's parking lot). If Canfield Creek is added to the park (see topic #4), backpacking sites in the Big Spring area will be considered.

ACTIONS

Action 1: Horse Campground - After all horse trails are improved implement the following improvements. Provide a shower building in the horse camp area. Designate up to one-third of the horse camp as individual sites (these would be the sites where electricity could eventually be provided). In the open area, try new methods of identifying campers such as rear-view mirror "hang-tags." Provide improved landscaping, an information kiosk, and small horse trail loop for younger riders adjacent to the horse camp.

Action 2: Group Camp - Improve the water system and provide additional shade trees.

Action 3: Walk-in/Bicycle Campsites - When the bicycle trail connects to the park, determine if there is enough demand to warrant adding transient bicycle campsites at the park. If so, provide up to 7 walk-in/bicycle campsites in the old field area southwest of C-loop. These sites would be equally available to both walk-in and transient bicycle campers. Also, consider backpacking campsites in the Big Spring area if Canfield Creek is added to the park.

Action 4: Upgrade the main campground shower building. - The main campground shower building and drainfield was designed to accommodate 44 campsites. It currently provides service for 73 sites, plus use from the group camp and horse camp. Although this plan recommends a new shower building in the horse camp, the main campground shower building should be upgraded by adding two shower stalls which meet accessibility standards, and all related drainfield and physical plant improvements.

Topic 5. Mystery Cave

Discussion: Historic Entrance - Most of the underground development at the historic entrance has been completed, but surface facilities need major improvements. The existing ticket building is in poor condition and is situated in the flood plain; satellite toilets provide sanitation facilities; and, the cave manager and seven seasonal naturalist share a rented trailer for offices, meeting rooms, and storage. The ticket building, toilets, and trailer are all in different locations.

Cave visitors often have to wait one to three hours for their cave tour to begin. These visitors represent an unfulfilled interpretive opportunity.

Minnesota Caverns Entrance - The Minnesota Caverns tour is more of a rustic experience using hand-held lights. The existing entrance building is in poor condition and needs replacement.

ACTIONS

Action 1: Historic Entrance: Construct a new office/public contact building on the slope between the pedestrian bridge and the garage (in the vicinity of the existing staff

parking lot). This building should meet the essential needs outlined above (ticket sales, toilets, and office/work space). It should also accommodate karst interpretive displays and gift shop sales. Because of the karst landscape and interpretive potential, a composting toilet system should be considered. Construct a self-guided interpretive trail which includes sinkholes, stream sinks, and the Prohaska archaeological site. Underground improvements are proposed for the Devils Kitchen, Geyser Pass, and the Cathedral Room areas (see Interpretive Services chapter, page 91).

Action 2: Minnesota Caverns Entrance: Construct a new cave entrance building that includes the following: airlock, security system, bat access, storage area for hand-held lights, interpretive panels, area for ticket sales when the historic entrance is closed and an outdoor "overhang" roof for groups to wait in rainy weather. Provide a vault toilet near the parking lot. Provide landscaping in the parking lot as needed. Underground improvements are proposed in the Garden of the Gods and Blue Lake areas (see Interpretive Services chapter, page 91).

Action 3: Restore Old Mystery Cave entrance. The proposed park boundary includes the Old Mystery Cave entrance (see page 76): If this is acquired, cave entrance shoring, an access gate, and minor restoration work would be needed to make this area accessible to the public.

Action 4: Restore / Improve Wild Cave Areas. Some degraded wild cave areas should be restored. Volunteer cavers can do much of this work. For example, some preferred trail routes and fragile features should be marked with flagging. Hardening of some caving routes should be considered, especially at Dragon's Jaw Lake and Fireball Flow. (Existing wood planks should be replaced with an inert material. A different system to cross the lake and flowstone should be considered).

Topic 6. DNR / Minnesota Historical Society Coordination

Discussion: Historic Forestville is a state historic site surrounded by a state park; the historic site functions as an integral component of the park. The visiting public does not differentiate between the two operating entities - they expect and deserve an efficient operation by "the state." Within this context, it makes sense for the Minnesota Historical Society and the Department of Natural Resources to combine operations wherever efficiency and better public service can be attained. Ideas generated prior to and during the planning process included: 1) coordinating grounds maintenance, garbage pickup, snowplowing, etc.; 2) coordinating tour reservations between the Historic Site and Mystery Cave; 3) coordinating a fee collection system if fees are collected for the Historic Site; 4) rotating interpretive staff to address repetitive tour "burnout;" and, 5) providing a joint DNR/MHS contact station.

The legislation which created Historic Forestville requires that "The commissioner of Natural Resources and the Minnesota Historical Society shall jointly prepare and enter into an agreement which delineates the responsibilities of each party in the management of the Forestville State Historic Site." The current agreement is dated December 30, 1977, and should be updated.

At the Historic Forestville State Historic Site, the MHS is providing an 1899 "living history" program. In the midst of an 1899 atmosphere, MHS must conduct 1995 opera-

tions. There is no separate administrative space, staff changing area, modern equipment storage area, or office/work space. In addition to these concerns, MHS has display needs if artifacts and the theme of an 1850's trade center is to be offered. The 1899 Meighen Store, garden area, and home can only accommodate small groups at any given time. Staff toilets are in an inaccessible location (upstairs), and public toilets are rented satellites.

During the planning process, several discussions took place pertaining to the need for a visitor center. Visitor center discussions included a review of the existing and potential visitor needs related to Historic Forestville, the park (including Mystery Cave), and proposed bicycle trail, as well as the administrative building needs of both MHS and DNR. Both MHS and DNR are concerned that a major new facility will include major additional operation costs. The larger and more elaborate the structure, the more it will likely cost to operate and maintain (and this can actually detract from existing programs). Many alternative locations for a visitor center facility were discussed, including on the State Historic Site, south of the Historic Site near the curve in CSAH 12, just west of the existing park boundary along CSAH 12, at Mystery Cave, and as an expansion to the existing park contact station.

If possible, it would be beneficial to the public, MHS, and DNR to have a central administrative/contact building. The existing contact station could be expanded to provide combined administrative space and limited exhibit space. The contact station is in a good location to provide combined operations and public contact for the entire park. The major limiting factor is a lack of potential parking space; the station was designed for relatively quick visitor contact (visitor orientation and camper registration). Exhibit and display space would be somewhat limited at this location. The MHS will be completing a unit plan for Historic Forestville in the near future and will address its overall site needs at that time, however, some of the identified major needs at the site will be toilets, staff changing facilities and a drinking fountain.

An expanded contact station would include space for the existing park staff now in the office (park manager, assistant park manager, and two clerk positions), plus new space for the historic site manager. It should also include space for park interpretive staff. In addition, new combined space would include:

- combined gift shop and merchandise storage (some sales would still occur at Mystery Cave);
- combined general storage area (DNR storage space is very limited in existing buildings);
- combined meeting room for staff and other meetings; and,
- combined interpretive display and historic exhibit area.

ACTIONS

Action 1: Update the management agreement between MHS and DNR. This includes coordinating operations to the extent that it improves efficiency and public service.

Action 2: Expand the existing park contact station to include new office space, combined administrative area, limited exhibit space, and gift shop sales.

This combined administration / visitor contact building would:

- provide one orientation contact point to all park visitors;
- increase efficiency and facilitate cooperation between state agencies;
- increase efficiency in overall park operations;
- cost less to staff and maintain than two separate buildings;
- provide a centralized display area on all park themes;
- be very accessible to campers and bicyclists on the new trail; and,
- preserve the "non-developed" nature of the historic townsite areas.

Considerations:

1. Although it is feasible to expand the contact station in its present location, there is a limited amount of room for expansion. To the extent possible, site designers should work within the existing canopy opening in this area. A candidate old-growth area exists between the contact station and the western park boundary (see plant communities section, page 36).

2. In general terms, our discussions during the planning process included an expansion that would triple the size of the existing building. The furnace, electrical system, toilet and drainfield would all have to be upgraded. To maximize space near the contact station, the drainfield may have to be moved east of the campground road (if possible).

3. Parking space will be limited; the public space in the building will help determine how many parking spots should be provided. A preliminary review indicates there is room for up to 15 cars behind the contact station and up to 6 cars on a pull-off lane along CSAH 12 directly across from the contact station (for west-bound traffic).

4. With the interpretive / display area in the contact station, interpretive staff would not have to be present and displays would be available whenever the contact station is open. Interpreters could use the facility as needed for programs, and campers could easily walk or bike to the station. The proposed bike trail passes this location, and a bicycle parking area would be needed.

5. If the expanded contact station, including parking and drainfield, cannot be accommodated at this location, an alternative site exists along CSAH 12 just west of the park boundary. This is the old park manager's residence site, currently administered by DNR, Forestry. The existing contact station site is preferred because it is closer to the campground and provides security for the campground / group camp road.

Topic 7. Accessible Facilities / Shore Fishing

Discussion: All new construction and building remodeling will be accessible to persons with disabilities. All outdoor and underground development will be accessible where it is possible/practicable. The Historic Entrance at Mystery Cave is an example of an accessible development that has received considerable use by persons with disabilities. Persons with disabilities who reside in the Forestville area or visiting the Mayo clinic represent an important segment of the park's clientele.

The DNR would like to consider providing an accessible shore fishing structure on the banks of the South Branch Root River within the park. The structure would have to be

constructed to withstand flash flooding, and it should be located in an area that provides good fishing. One of the concerns raised is that good fishing spots can change as the river changes. Also, participants suggested minimizing the visual impact of the structure and providing an accessible trail to the structure. It may also be possible to build onto this trail connection to expand accessible trail opportunities at the park.

One location that should be considered for the accessible shore fishing structure is the "big hole" where Forestville Creek joins The South Branch of the Root River. Sited at this location, the structure would have to be designed to go under water during a flood.

ACTIONS

Action 1: Expand accessible trails and other facilities where it is possible and practical to do so.
Action 2: Work with DNR, Fisheries to site an accessible shore fishing structure that can withstand floods and is adjacent to a stable, high quality fishing spot. Minimize visual impacts and provide an accessible trail to the structure.

Topic 8. Anglers Parking Lot Improvements

Discussion: The angler's parking lot just north of the new CSAH 12 motor vehicle bridge over the South Branch of the Root River needs to be improved. One of the entrance / exit roads to this parking lot is at an angle that should be corrected to a ninety-degree turn. This recommendation was included on page 104 of the 1978 plan, but was never implemented. When this parking lot is improved, it should be designed to accommodate large vehicles and trailers (for "turn-arounds" from the contact station).

ACTION

Action 1: Improve and surface the angler parking lot along CSAH 12 between the South Branch of the Root River and the picnic shelter parking lot.

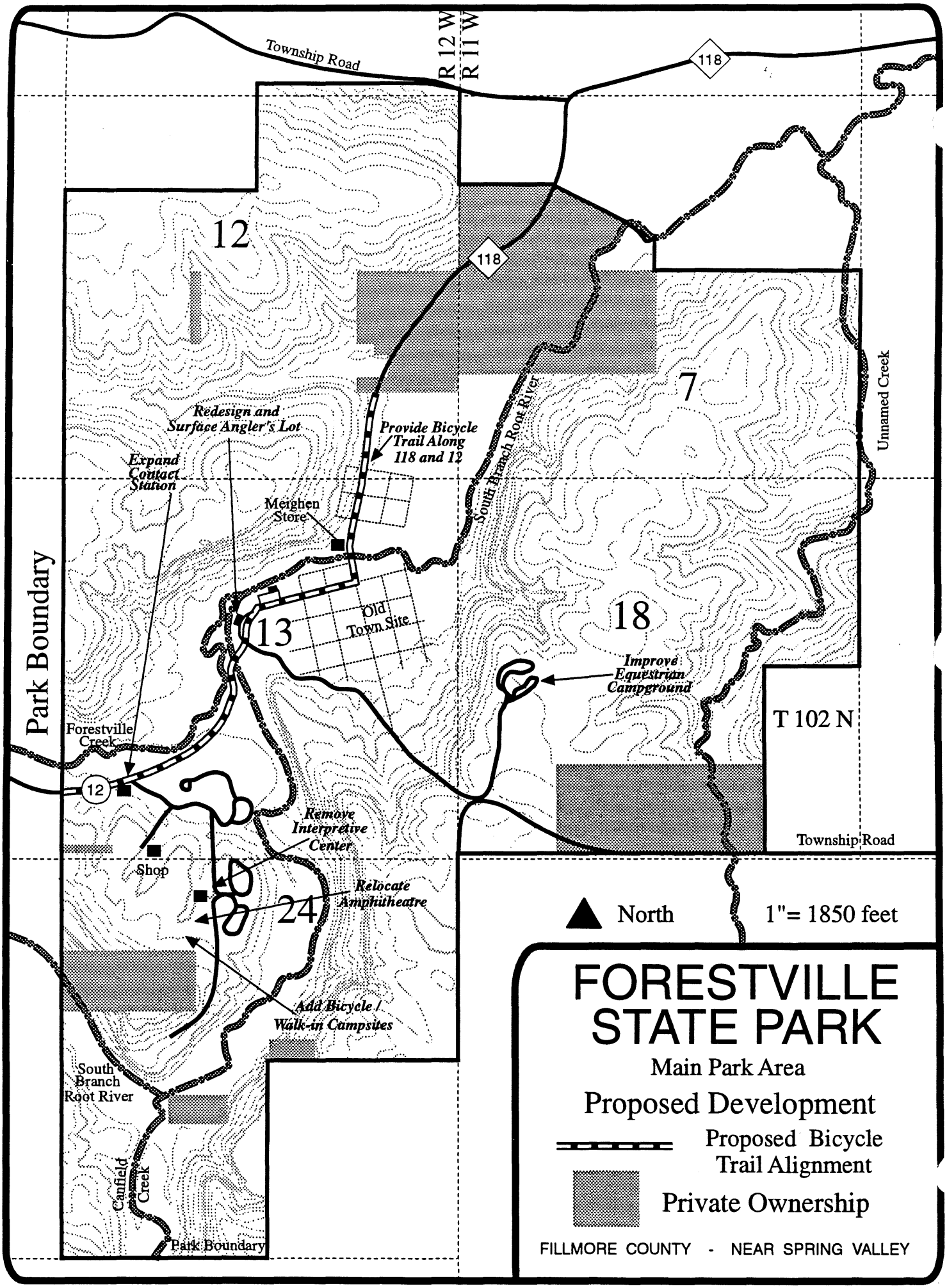
Topic 9. Park Identification

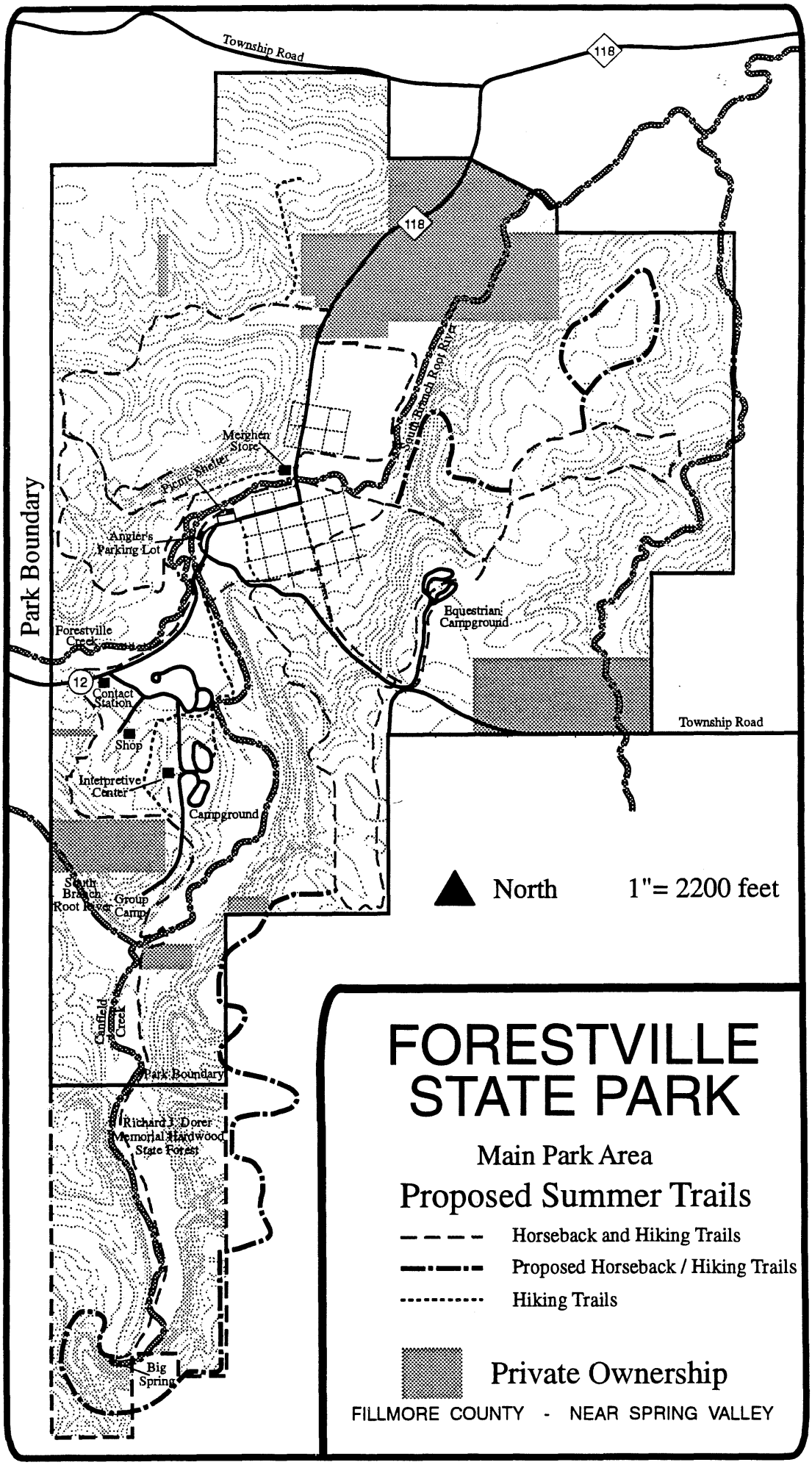
Discussion: Since Mystery Cave was added to the park in 1987, there has been some confusion by the public related to how Mystery Cave relates to the main park. In order to clarify that Mystery Cave is part of Forestville State Park, the name of the park could be officially changed to Forestville / Mystery Cave State Park.

With the addition of Mystery Cave, the re-opening of Historic Forestville, and the overall increase in recreational use in the Forestville area, Forestville State Park has become one of the top 12 parks in the state park system (as classified according to operational levels and resource importance). The existing standard brown and yellow routed entrance signs should be replaced to reflect the relative importance of this unit. The placement of the new signs may be along the park's western boundary (on CSAH 12), and at the entrance to Mystery Cave.

ACTIONS

Action 1: Consider changing the official name of the park to Forestville / Mystery Cave State Park.
Action 2: Replace the existing park entrance sign. Consider any necessary improvements to the park's "entrance portal" area.


Township Road
R 12 W
R 11 W
118
12
118
7
Unnamed Creek
South Branch Root River
Redesign and Surface Angler's Lot
Provide Bicycle Trail Along 118 and 12
Expand Contact Station
Meighen Store
Old Town Site
13
18
Improve Equestrian Campground
T 102 N
Park Boundary
Forestville Creek
12
Shop
Remove Interpretive Center
Relocate Amphitheatre
24
Township Road
North
1"= 1850 feet
Add Bicycle / Walk-in Campsites
South Branch Root River
Canfield Creek
Park Boundary
FORESTVILLE STATE PARK
Main Park Area
Proposed Development
Proposed Bicycle Trail Alignment
Private Ownership
FILLMORE COUNTY - NEAR SPRING VALLEY


Township Road
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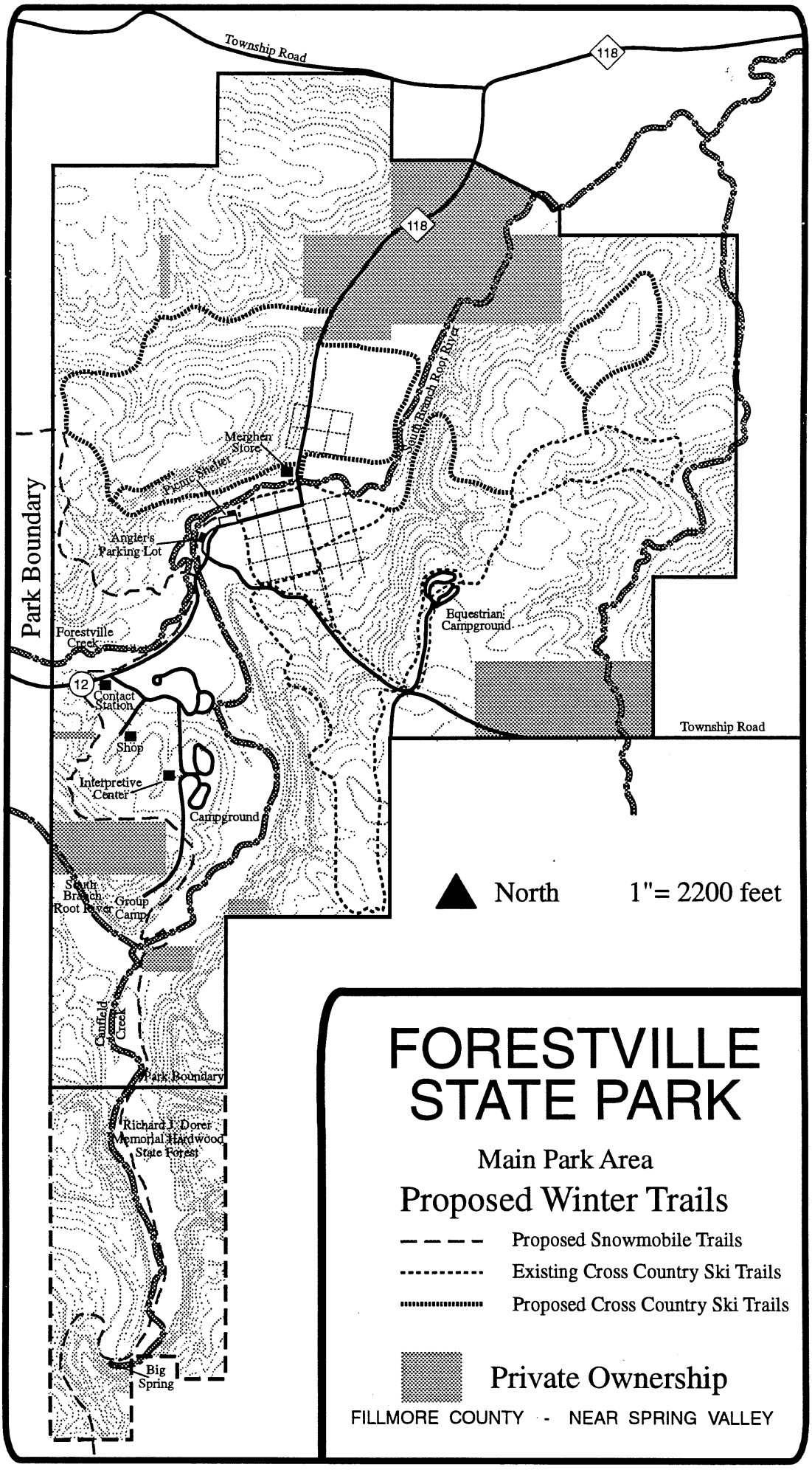
Park Boundary
Meighen Store
Picnic Shelter
Angler's Parking Lot
South Branch Root River
Equestrian Campground
Township Road
Forestville Creek
12
Contact Station
Shop
Interpretive Center
Campground
South Branch Root River Group Camp
Canfield Creek
Park Boundary
Richard J. Dorer Memorial Hardwood State Forest
Big Spring
North
1"= 2200 feet
FORESTVILLE STATE PARK
Main Park Area
Proposed Summer Trails
Horseback and Hiking Trails
Proposed Horseback / Hiking Trails
Hiking Trails
Private Ownership
FILLMORE COUNTY - NEAR SPRING VALLEY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Campground
South Branch Root River
Group Camp
Canfield Creek
Park Boundary
Richard J. Dorer Memorial Hardwood State Forest
Big Spring
Township Road
North
1"= 2200 feet
FORESTVILLE STATE PARK
Main Park Area
Proposed Winter Trails
Proposed Snowmobile Trails
Existing Cross Country Ski Trails
Proposed Cross Country Ski Trails
Private Ownership
FILLMORE COUNTY - NEAR SPRING VALLEY

PARK BOUNDARY

Introduction

The existing statutory boundary of Forestville State Park includes approximately 2,691 acres. Included within the boundary are 2,387 acres of state-owned property administered by the DNR, Division of Parks and Recreation, 286 acres of privately owned land, and 18 acres of state-owned property administered by the Minnesota Historical Society, Department of Historic Sites.

When private land is included in a state park boundary, it only means that the state can negotiate for purchase of that land from a willing seller. Outside of the boundary, state parks cannot purchase land. Purchases can only take place when funds are available, and landowners can sell to whomever they choose.

Boundary modifications are considered during all state park management planning processes. Although this plan can recommend boundary changes, only the legislature can change park boundaries. All boundaries are legally described in Minnesota Statutes. When an addition to a park is considered, the DNR, Division of Parks and Recreation will contact private landowners that would be within a proposed boundary and ask for their documented support. Appropriate local units of government will also be contacted for their support; without the support of the community, the Division of Parks and Recreation will not request boundary changes from the Minnesota Legislature.

Topic 1. Ecological Boundary

Discussion: From an ecosystem perspective, the areas inside the park statutory boundary are inseparable from the wooded watershed corridors between the main park and Mystery Cave, as well as those area upstream of Mystery Cave. Some of the highest quality resources in the ecosystem are outside of the park boundary, including rare plant and animal elements, spectacular scenery, and unique geologic features. Many wildlife species, such as wild turkey, deer, and several non-game species, rely on all of the forested portions of the watershed. Forest fragmentation and water quality are the paramount resource issues in this area. The karst landscape (see Geology section, page 27) is especially vulnerable to aquifer contamination and overall water quality degradation. The current water quality supports some of the best trout streams in the state.

While forested corridors provide some of the most critical stream habitat, water quality depends a great deal on management of agricultural uplands, especially the remaining wetland areas. Farming practices, policies, and programs are critical to the health of the natural resources in Forestville State Park. Farmers are among the most important land management partners in this watershed.

While it is recognized the ecosystem and watershed extends well beyond the South Branch of the Root River corridor between the main park and Mystery Cave, this area represents an extremely important component of the natural resources in the region. During the park planning process, an "ecological boundary" was delineated

between the main park and Mystery Cave (see Proposed Main Park Boundary and Ecological Boundary map, page 77). Because this will not be a park statutory boundary, state parks cannot purchase land in this area. However, many partners are already working together to maximize quality natural resources in this area, including the DNR, Division of Forestry. DNR Forestry identified much of this area as the "Cherry Grove Acquisition Compartment" in 1979. DNR Fisheries manages several public fishing easements in this area, and the DNR Trails and Waterways Unit is working with local trail advocacy groups to locate a bicycle trail corridor through this area. Beyond DNR, there are a variety of potential private and public partners in this area, including:

- all private landowners;
- The Nature Conservancy;
- County and Township Boards;
- Trout Advocacy Groups;
- Forestville State Park Advisory committees;
- USDA Soil Conservation Service;
- U.S. Fish and Wildlife Service (Driftless Area National Wildlife Refuge);
- Minnesota Land Trust; and,
- Minnesota Parks and Trails Council.

ACTIONS

Action 1: Work with a variety of partners to manage the natural resources within the "ecological boundary area" and greater South Branch of the Root River Watershed.

Action 2: Support the appropriation of funds to the DNR, Division of Forestry specific to acquisition of land or conservation easements within the Cherry Grove acquisition compartment. Protection of stream corridors is of clear benefit to the park and exemplifies the principles of integrated resource management.

Action 3: Support actions by the Fillmore County, Forestville Township, and Carimona Township boards that favor zoning which limits housing development along steep valley walls (for visual impacts, soil erosion concerns, and negative impacts to fragile resources).

Action 4: Support the position paper developed by the DNR Farm Bill Working Group (1994-1995). Support national and state agricultural policies which encourage farmers to manage their land in an environmentally-sound manner (see planning process file).

Topic 2. Main Park Boundary Modifications

Discussion: The main park boundary includes approximately 2642 acres (2,338 acres state park, 286 acres private, 18 acres state historic site). This plan recommends boundary modifications adjacent to the current southern and northeastern park boundary (see Proposed Main Park Boundary map, page 77). These modifications are summarized below, and generally fall into four categories. In addition to the reasons cited, these modifications will protect important resources and help preserve a larger block of closed-canopy forested area.

ACTIONS

Action 1: Include lands visible from the group camp - There are two privately-owned parcels south of the group camp that would pose visual impacts from the group camp and park trails if developed or clear-cut. A seasonal cabin is being constructed on one of these parcels at this time.

Action 2: Include lands needed to complete a Big Spring loop trail - The proposed Big Spring loop trail (see proposed Summer Trails, page 71) would require park boundary additions adjacent to the current Canfield Creek Forestry Unit. There is also one area adjacent to the current southeast park boundary that would be needed for trail routing. Boundary modification and fee-title acquisition is preferred and more likely to be implemented, but acquisition of trail easements (purchased through authority of the DNR Trails and Waterways Unit) may be considered if boundary changes are not approved. Trail easements would not necessarily contribute to preserving a contiguous "block" of closed-canopy forested area.

Action 3: Include lands managed by DNR, Forestry - During the park planning process, DNR Forestry indicated an interest in transferring administrative control of two Forestry areas adjacent to Forestville to the Division of Parks and Recreation. These areas are situated on the northeast park boundary (about 80 acres) and along the southern park boundary (Canfield Creek, about 270 acres). These lands, especially Canfield Creek, have outstanding scenic and recreational value that may be more appropriately managed by the Division of Parks and Recreation. Canfield Creek also has one of the premier algific-talus slopes in southeastern Minnesota (at the Big Spring), and several rare plant element occurrences. Canfield Creek is an important trout stream, and the DNR, Division of Parks and Recreation will work in cooperation with the DNR, Section of Fisheries on trout stream management projects. Planning process participants supported this proposed transfer of administrative control, if these areas remain open to general public hunting. If arrangements can be made internally within DNR and the legislature approves, this proposed change may be implemented in 1995. Approximately 15 acres of the 80 acre Forestry parcel are currently under an agricultural lease that would be phased-out under State Park management. That portion of the 15 acres which is in the flood plain should be planted in native grasses. If trees are allowed to grow in this area, adjacent private cropland could be impacted by floods.

Action 4: Amend the boundary to follow an unnamed tributary to the South Branch of the Root River on the park's northeast corner. - When the 80 acre DNR Forestry tract is added to the park boundary, it will follow an unnamed intermittent stream in the Southeast quarter of Section 7, T. 102 North, R. 11 West. Following this streambed will create a recognizable park boundary in this area. It will involve the deletion of approximately 5 acres of former cropland and the addition of approximately 2 acres of lower streambed.

Topic 3. Mystery Cave Boundary Modification

Discussion: The Historic Entrance area includes 30 surface acres and the Minnesota Caverns area includes 20 surface acres. The state holds an easement along the entrance road to the Historic Entrance. The state also has a 160 acre underground lease between the two areas which expires in 2027 (see Mystery Cave Existing Boundary map, page 57). This limited land base does not adequately protect the surface and underground resources at Mystery Cave.

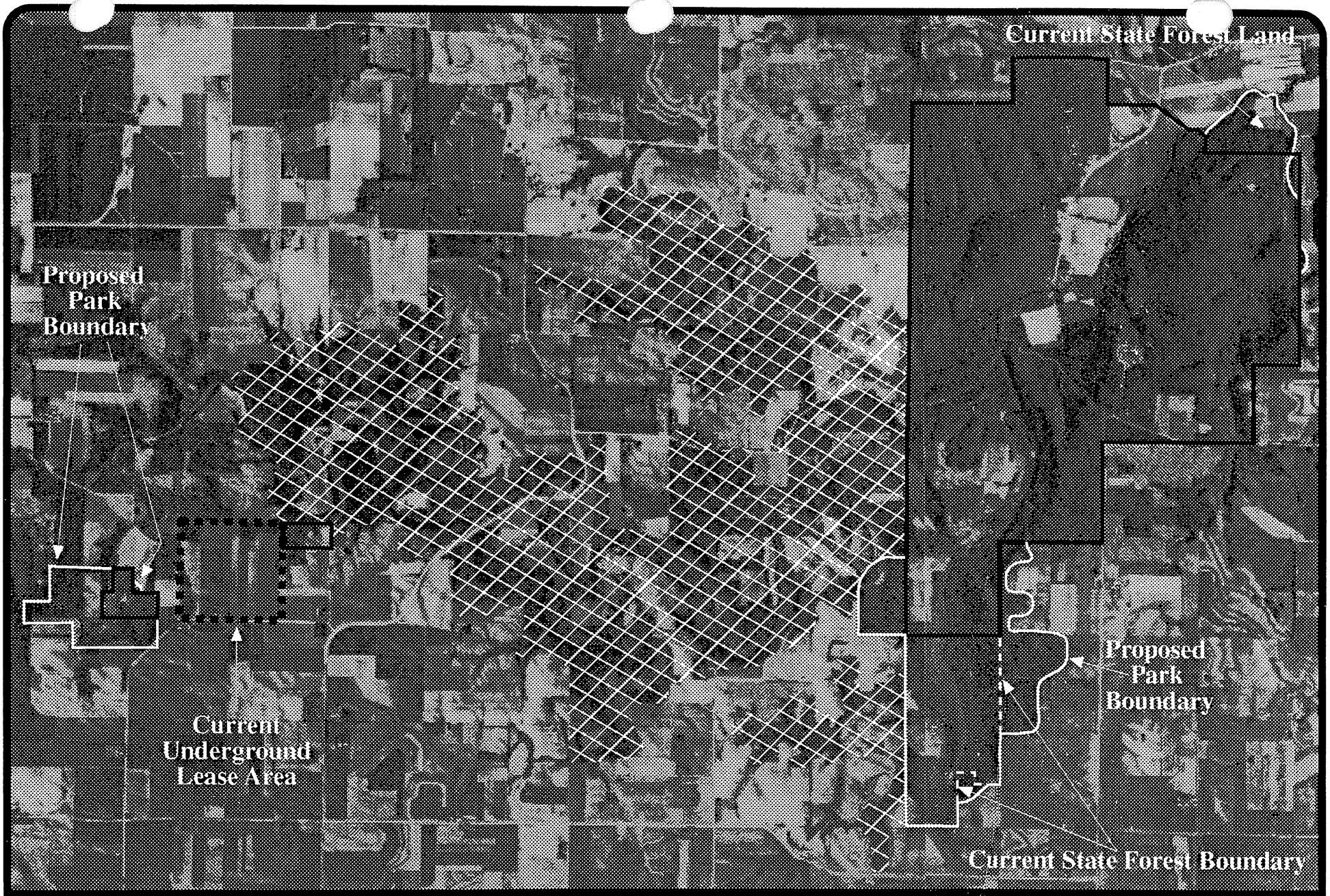
ACTIONS

Action 1: Acquire perpetual underground easements above all cave passageways that are not in the park boundary. (see map, Page 78).

Action 2: Modify the Historic Entrance boundary to include approximately 75 additional acres. (See map on page 78). This land is needed to:

- preserve and interpret the Old Still and Old Mystery Cave entrances;
- provide visual buffers to the west of the Historic Entrance and picnic grounds;
- preserve and interpret the sinkhole behind the manager's residence;
- preserve and interpret the "Prohaska" archaeological site (see Archaeology, page 18); and,
- provide area for an interpretive trail which can be used by visitors waiting for their cave tours. The proposed boundary would include one acre of land acquired by the DNR, Division of Forestry in 1992.

Action 3: Relinquish unneeded cartway north of the proposed Historic Entrance boundary. When DNR Forestry acquired a one acre parcel at the Historic Entrance motor vehicle bridge crossing in 1992, an "exhibit" attached to the option indicated cartway easements in this area were to be relinquished. The new proposed boundary in this plan includes most of these cartway areas, which will eventually be acquired by the state on a willing seller basis. There is one portion of these cartways which runs about 600 feet north of the proposed Historic Entrance boundary. This cartway should be relinquished (if the current land owner still wants it to be). This action must not affect the portion of the cartway which constitutes the main access road to the Historic Entrance area.



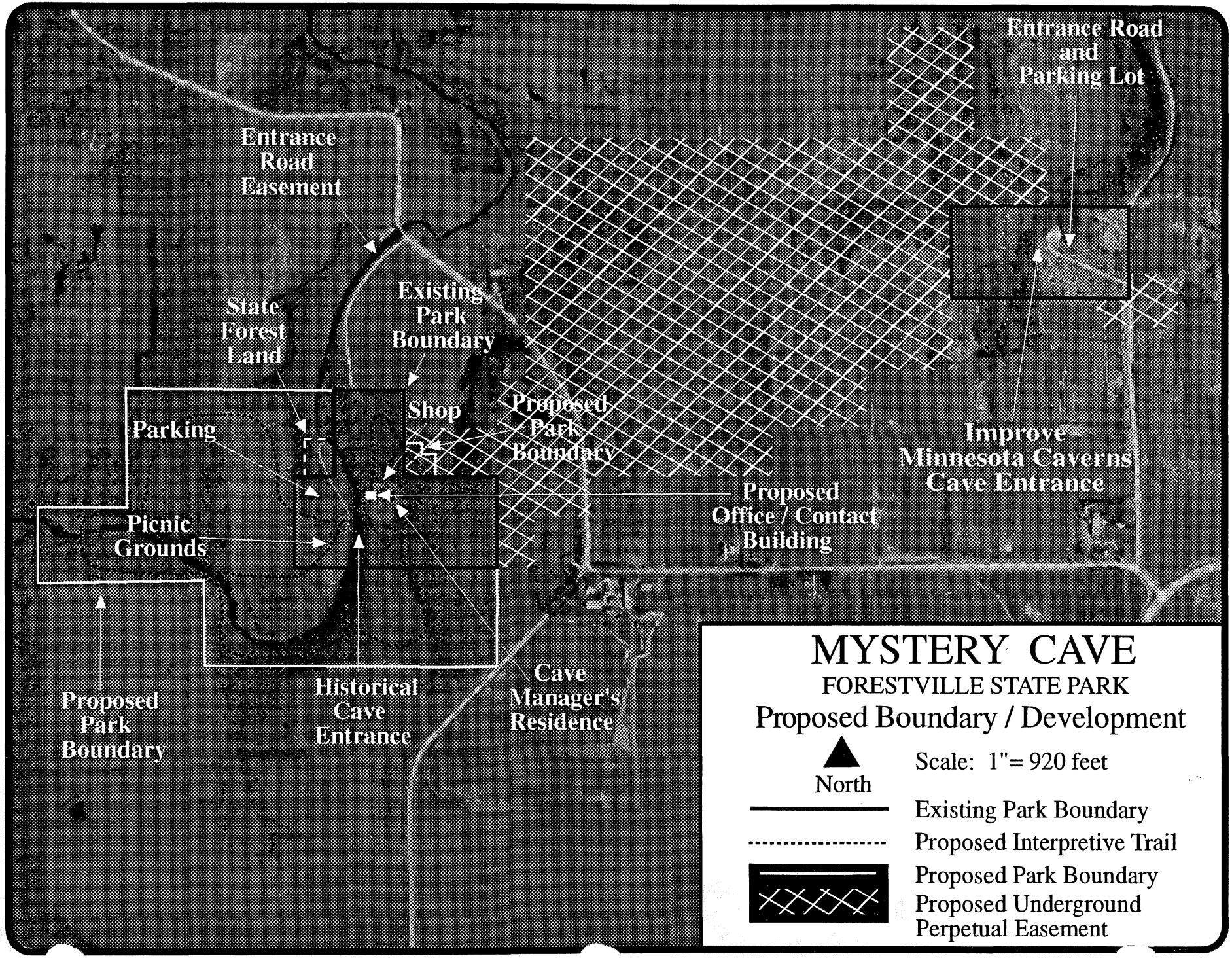
PROPOSED MAIN PARK BOUNDARY AND ECOLOGICAL BOUNDARY

FORESTVILLE STATE PARK

North

Scale: 1"= 3520 feet

Existing Park Boundary
Proposed Park Boundary
Proposed Ecological Boundary


Entrance Road and Parking Lot
Entrance Road Easement
State Forest Land
Existing Park Boundary
Shop
Proposed Park Boundary
Parking
Improve Minnesota Caverns Cave Entrance
Picnic Grounds
Proposed Office / Contact Building
Proposed Park Boundary
Historical Cave Entrance
Cave Manager's Residence
MYSTERY CAVE
FORESTVILLE STATE PARK
Proposed Boundary / Development
North
Scale: 1"= 920 feet
Existing Park Boundary
Proposed Interpretive Trail
Proposed Park Boundary
Proposed Underground Perpetual Easement

INTERPRETIVE SERVICES

With the addition of Mystery Cave and the Historic Forestville living history program, Forestville State Park has one of the largest interpretive programs in the state park system. During the 1994 season, Forestville DNR interpretive attendance reached 22,700 visitors. To put this figure in context, Soudan Underground Mine State Park had approximately 33,000 tour visits in 1994, and Itasca State Park reported 20,000 interpretive visits in 1994.

In addition to 20,000 visits recorded at Mystery Cave in 1994, there were approximately 2,700 visits at main park camp fire/hike programs, and approximately 16,500 visitors at Historic Forestville. Although many individual visitors attend several programs, "visitor contact" through personal interpretive programming for both DNR and MHS programs at Forestville reached 39,200 in 1994. This level of interpretive program attendance demonstrates the importance of interpretation at Forestville State Park and within the state park system.

The following interpretive services chapter is organized into four main sections. These sections basically follow a format for interpretive unit plans that was developed by the Division of Parks and Recreation Statewide Interpretive Services Program in 1992-1993. This chapter emphasizes the interpretive programming administered by the DNR, Division of Parks and Recreation (Mystery Cave and main park). The Minnesota Historical Society (MHS), which administers Historic Forestville, will be completing a unit plan for Historic Forestville separate from this plan. However, this park plan was developed in cooperation with the MHS, and discussions pertaining to Historic Forestville were integrated into the following text where appropriate.

Interpretive Clientele

Main Park

The majority of participants in interpretive programs at the main park are people using the park's general campground. There is some participation from the group camp and day users. Although visitors using the horse campground visit Historic Forestville, they rarely attend other interpretive programs. Local resident attendance for evening programs has varied over the years and is related to subject material. Requests for off-site interpretive services by schools, youth organizations and civic groups have had to be discouraged because of staffing limitations.

Mystery Cave

The following 1993 visitor age profile, derived from ticket sales, is generally representative of the past seven seasons of visitation at Mystery Cave.

Cave Visitor Age	% of total
Adults (13 years and older)	56
5 yrs. through 12 yrs.	26
4 yrs. and under	7
school groups	11

Individual Visitors

People who visit the cave that are not associated with groups can be characterized as follows:

1. People that come specifically to see the cave. These visitors may see other attractions on their trip, but would not have come to this area unless the cave is open for tours. These people will often call to request a tour reservation.
2. People in the area to visit the attractions of the Blufflands in general. Some persons in this group are here because of Mayo Clinic appointments, a group that has been an important business clientele to Mystery Cave for forty years. Observations of the interpretive staff are that the Mayo Clinic visitors have increased in numbers in the last few years. This group represents a potential year-round clientele.
3. People using the main park. Visitors coming primarily to use the other facilities of the park such as the campgrounds or picnic area.

The current DNR cave specialist estimates that about half of all visitors to Mystery Cave visit the main park as well.

Groups

Organized groups provide a significant amount of visitation to Mystery cave. These groups include:

- classes from kindergarten through college,
- community education classes,
- school youth programs,
- governmental agencies,
- day care facilities,
- mental health entities,
- churches,
- civic organizations, and,
- special interest groups.

The largest number of group visits to Mystery cave are by educational groups. During the past seven years, most school groups have come for cave tours during May and June. A survey conducted in the fall of 1994 coupled with records collected since 1988, indicate that groups using the cave can be characterized as being from Minnesota schools within a sixty mile radius of the park - and those located along the U.S. Highway 52 corridor as far away as the Twin Cities. Survey results show the greatest interest in visiting the cave is by grades 3 through 6. Grades K through 2 and 7 through 11 demonstrated a secondary level of interest.

College level classes, usually geology field trips, visit Mystery Cave annually. St. Cloud State University, the University of Minnesota, Rochester Community College, and Winona State University are the primary users.

In 1989, visitation by school groups was 18% of the total for the year; in 1993, budgetary restrictions resulting in a shorter season resulted in reducing this to 11%.

Interpretive Themes

Connecting Themes

Connecting themes are the common elements that tie the entire park together. Two connecting themes have been identified for Forestville/Mystery Cave:

1) The South Branch of the Root River watershed has a major influence on the resources of Forestville State Park.

The South Branch of the Root River is the focal point of the entire park. The town of Forestville was founded in its location because of the river and valley bottom. Similarly, the rare plants and unusual habitats in the park exist because of the stream cut valleys. Some of the wildlife is found here because the land is too rugged to farm. The recreational potential of the park and the cave are a function of the formative powers of the Root River; they would not exist if it had not been for the river.

2) Forestville State Park exists as it is today because of efforts to conserve the resources.

Past efforts taken by the Meighen family effectively preserved the natural and cultural resources of another era. The end result has been conservation of what has become an important historic site and natural preserve. As the cave was discovered and developed, it provided individuals with a means to generate revenue; however, even in the very early years of operation, the owners understood the importance of protecting the speleothems. This conservation ethic was driven at least in part by economic interests and certainly by appreciation of the resource.

Primary and Secondary Themes

The primary themes are the "big stories" of the park. Secondary themes can be developed around the primary themes and used in programs about specific resources or species found in the park. Examples of primary themes are outlined below.

Cultural

1. The railroad bypass of Forestville demonstrates the growth and decline of rural towns across the Midwest.

2. Historic Forestville chronicles the change from subsistence wheat farming to diversified dairy farming.

3. Settlement at the Forestville townsite occurred due to land and natural resources availability proximal to the South Branch Root River.

4. The Meighen general store business records help explain the way of life for rural Midwest Americans from the 1850's to 1910. The buildings and collection demonstrate the relationship between commerce and domestic life during this period (1850's - 1910).

Geologic

1. Karst has a profound affect on biotic communities here.

2. Karst watersheds are complex and intimately associated with groundwater as seen in Forestville's watersheds.

3. Unique combinations of geologic forces have resulted in unusual habitats at Forestville.

4. What are the characteristics of the SE Minnesota karst?

5. Mystery Cave is a geomorphic feature which reflects a unique combination of site specific influences.

6. Mystery Cave is a conduit for water flow.

7. The speleothems of Mystery Cave are unusual, fragile and collectively unique to caves of the region.

8. Caves are fragile environments that contain features unique to the underground.

9. Past environments and natural events are chronicled in the geology of Forestville State Park.

Biologic

1. The Blufflands landscape has unusual diversity for Minnesota, and this theme is demonstrated in Forestville State Park.

2. Forestville State Park is functioning as an island as a result of habitat fragmentation.

3. Factors beyond the park boundaries affect the conservation efforts within the park.

4. Forestville State Park provides habitat for rare plants and animals.

5. A diversity of specialized aquatic life exists in the high quality park streams.

6. Bats are highly developed mammals that have particular habitat needs found in Forestville.

7. Land use practices and introduction of exotic species have resulted in vegetation changes. Human impacts have influenced the landscape at Forestville.

8. Park wildlife species and populations have changed and fluctuated since presettlement times.

9. Wildlife management practices have a major influence on the survival of some species.

10. Forestville is a living repository of genetic codes.

11. Rattlesnakes are top predators that may not survive in relatively small, preserves such as Forestville.

12. Contiguous tracts of native vegetation, as in Forestville, are important and limited in maintaining viable populations.

13. Wild turkeys are a wildlife management success story for Forestville.

14. Deer populations within Forestville State Park have changed dramatically since presettlement times.

15. Trout complete their life cycles in the park streams due to the proper conditions available enhanced by management practices.

16. The Forestville prairie areas are small remnants of former vast expanses of native vegetation.

Management

1. Mystery Cave tour route restoration and development is an attempt to preserve the values visitors come to experience.

2. Recreation demands in Forestville State Park are tempered by competing interests and the preservation of natural resources.

3. Forestville has a rich diversity of natural and historical resources.

4. Trail Management benefits users and natural resources.

Summary of Existing Interpretive Services

Personal Programming

Mystery Cave

Scheduling for cave tours is designed to maximize services on Saturday and Sunday when the park is busiest. At the present time cave tours are the only interpretive activities in the park for which a fee is charged. Due to the sensitive nature of cave resources, it is necessary that tour groups be accompanied by an interpreter to oversee the activity.

Historic entrance tours incorporate a modern lighting system and concrete walkways. Tours last approximately one hour and are available seven days each week during the summer. The tour is exceptional in that it is wheelchair accessible; something rare in show caves.

On weekends and holidays, tours at the Minnesota Caverns entrance are also given. This is a rustic tour in which the visitor carries an electric lantern to illuminate their way along gravel pathways with stone steps and few handrails.

Demand for cave tours has often exceeded tour availability during the past six seasons. The limiting factor for tours is the number of naturalists available to give them. Tour buses during the summer season have been discouraged from stopping at the site because present staff cannot accommodate tours. Reservations for group tours are presently restricted to school groups. Efforts to accommodate school groups have been restricted to a few weeks during May and June while schools are still in session, and staff is being recalled in preparation of the summer season.

Presently no more than twenty people are allowed per tour. This allows for a better quality experience for members of the tour, enabling them to see and hear much better than would be possible with larger groups. With this group size standard in place, and the present staff available, the maximum rate visitors can be accommodated is 50/hour. If it were possible to adequately staff the two existing types of tours presently available; two tours of twenty each could depart every twenty minutes - a rate of 120 visitors/hour. However, there are also resource and logistical constraints to be considered.

Main Park

Personal programming at the main park includes evening campfire programs and hikes / activities on Fridays and Saturdays. The majority of these programs involve natural history topics. A representative weekend program might include a 10 o'clock plant hike, followed by a walk through the prairie at 1 PM, and a 9 PM slide show on park birds. A few of the interpretive programs have been held away from the park. Impromptu talks or walks are used at Mystery Cave when staff are available.

Historic Forestville

Historic Forestville presents the history of the village to the public through living history. Visitors "experience the past" by interacting with costumed interpreters that represent people who lived in Forestville in the summer of 1899. During their tour, visitors explore the Forestville store and post office, Thomas and Mary Meighen's home and garden, and the Meighen's diversified farming operations. Tours are available Memorial Day weekend through Labor Day, Tuesdays through Sundays, and on weekends September-mid October. School tours are also available. Historic Forestville also presents history through special programs that include walking tours of greater Forestville, lectures, and special events (such as 4th of July).

Non-Personal Programming

Two exhibits are located in the Mystery Cave ticket building: one on limestone development, the other on spatial relationships of cave to surface features. The interpretive building in the main park contains two exhibits, one on karst, the other on caving equipment and exploration.

Other displays include a kiosk with panels at the historic site parking lot, and seven metalphoto signs distributed at former building/cultural sites.

Signs discussing stream life are located on the Mystery Cave footbridge.

Staff

The Forestville State Park interpretive staff consists of one full-time, year around cave specialist and seven full-time seasonal interpreters. A parks worker position is assigned to the cave operation. In addition to the primary function of ticket sales, the parks worker handles interpretive questions from visitors at the ticket counter.

Rotation to programming in the main park is the key factor in diversifying the job duties to combat boredom from repetitive tours. This is a calculated effort that results in enhancing and maintaining tour quality, and limits the level of radon exposure to interpreters.

Historic Forestville maintains a seasonal staff of 11 part-time interpreters supervised by a full-time year around site manager. The seasonal staff provides the living history tours of the site.

Evaluation

The cave specialist regularly evaluates interpretive presentations of the seasonal interpretive staff. This is a focused, active effort to enhance and/or maintain the quality of the interpreter's presentation. The regional naturalist and park manager also review presentations and consult with the presenter and the cave specialist on their findings. Seasonal naturalists are occasionally assigned to do peer critiques.

Facilities

Main Park

The amphitheater, where campfire programs are held, is located immediately west of the campground, providing ready access to campers. It is often plagued by noise and light disturbances from vehicles passing on an adjacent road. The facility was built on top of an area of seep springs making for soggy ground in the performance area. This facility is in poor condition.

Immediately adjacent to the amphitheater is a 25 by 30 foot, one and a half story, timber framed, wooden structure with a concrete floor that is used as an interpretive center. Programming occasionally occurs in this building; however, no seating is available inside. Exhibit materials and A-V equipment are housed inside during the summer. This building is in poor condition and does not represent the high quality of resources at this park.

The picnic shelter building serves as an alternative program space during times of inclement weather.

Mystery Cave

A ticket building constructed during the 1950's by the former owner of the cave continues to function as a ticket sales area, and houses some exhibits. This building is located in the floodplain and needs to be replaced.

The administrative office at the cave is a rented 12 by 60 foot trailer which also serves as the only meeting room facility in the park. The naturalist staff has limited office space at this facility, and interpretive files, books, supplies, and equipment are stored here. Contracted portable toilets serve as sanitary facilities for the cave office, ticket building and picnic grounds. Running water is available at a fountain/spigot located in the picnic area, and in the trailer during the summer season.

A two-car garage next to the cave office serves as a workshop area. Tools, cave maintenance items, and interpretive supplies are stored here.

The cave specialist is housed on site in order to provide security for cave resources and prevent vandalism or destruction of irreplaceable formations. It is important to note that

illegal entry by vandals has occurred in the past (prior to state management) with some damage occurring to cave formations.

There are two entrances to Mystery Cave; both developed to accommodate visitors. The historic entrance, located at the cave picnic grounds, provides access to 1400 feet of cave passage. This portion of the cave has recently been restored and developed with new concrete pathways, lighting system, handrails, bridges, and wheelchair assisted grades.

The Minnesota Caverns entrance leads to 4,000 feet of unlit, rustic gravel pathways, and rock steps. Tours are given in this portion of the cave with handheld electric lanterns, and have become a favorite of many visitors.

Integrated Resource Management

The interpretive program is a natural forum for promoting the concepts of integrated resource management. Virtually all of the primary themes identified for this park reach beyond its statutory and administrative boundaries. Interpretation and management of park resources involves a multi-disciplinary approach.

Cave staff have worked within all DNR disciplines and many other agencies. Issues of cave management frequently entail considerations of a wide range of disciplines. With a goal of interpreting the many aspects and interdependencies involved in the resources of the karst region of southeastern Minnesota it is logical that the approach would involve a great number of sciences and technologies. Assistance and advice is sought from a number of experts from within and outside the agency.

Training

The interpretive operation at Mystery Cave is unusual in Minnesota State Parks. During the summer season, it is a seven day a week operation that has been widely advertised for over fifty years in brochures, books, and billboards. As in most businesses, visitors expect to be accommodated shortly upon arrival.
To meet these visitor expectations, the interpretive staff is trained to know how the operation works, their routine tasks, and how to handle unexpected/difficult situations. Training sessions usually begin in mid-May, and vary from three to six days in length. The training is heavily weighted toward cave operations and resources; however, aspects of "above ground" park interpretive program, common in state parks, is integrated into the training and subsequent interpretive operations of the park.

Fees

In order for the public to take a tour of Mystery Cave they have to be accompanied by a member of the interpretive staff. The reason for this is to: 1) provide visitor safety, 2) protect cave resources, and 3) provide interpretation. Fees are charged for this service partly to recoup operating costs and to maintain a cost factor so as to not adversely

affect competing private show cave operations. Ticket costs are an activity fee and separate from the state park vehicle fee which is mandated by statute. The fee structure at Mystery Cave was established with consideration for providing consistency with the tour fees at Soudan Underground Mine and the current fees at nearby private show caves. Revenue generated from ticket sales is deposited in the state park working capital fund as per Mystery Cave enabling legislation.

Volunteers

Volunteer efforts have been a part of the interpretive program at both the cave and main park. Volunteer guest speakers occasionally present talks at campfire programs and those with special expertise have provided assistance at training sessions. Other related efforts by volunteers, although not directly associated with interpretive programming, have provided information that has had a profound effect on interpretive programs and information provided to the public. For example, cave mapping, radon monitoring, research equipment downloading, plant surveys, and speleothem restoration are all areas of substantial voluntary contributions that have benefited the park interpretive program.

Presenting cave tours is not a suitable use of most volunteers. The complex logistics of daily operations, handling difficult public relations problems, dealing with the responsibilities of visitor safety, and protecting the cave resources necessitates attendance at training sessions and regular staff meetings. It is preferable to employ professional staff for this function.

Regional Interpretive Opportunities

The following discussion supplements the information provided on other state parks and other facilities described previously under "Supply and Demand of Recreation Facilities," page 12.

Entities within the region that offer environmental education programs, largely directed towards elementary schools, include: River Bend Nature Center (Faribault), the Hormel Nature Center (Austin), Quarry Hill Nature Center (Rochester), Oxbow County Park (Byron), and the Forest Resource Center (Lanesboro). The Forest Resource Center provides eco-tours of the area, and Michael's Amish Tours (Harmony) provides family oriented tours which illustrate the life style of the Amish people living in southeastern Minnesota.

Several neighboring towns offer brochures for walking or driving tours that highlight the history and development of their communities. In turn, most of these towns feature festivals which accent some noteworthy characteristic or event. Some of these annual events are: Spring Valley's Ag Days; Wykoff's Fall Festival; Preston's Trout Festival and Lanesboro's Buffalo Bill Days.

The Fillmore County History Center in Fountain serves as the county archives and is developing an impressive collection of exhibits. The Spring Valley Community Historical Society operates two museums seasonally which largely focus on artifacts and a way of life from settlement days and later. The Wykoff Historical Society operates Ed's Museum seasonally. A former grocery store, the proprietor collected a unique potpourri of such items as old grocery and retail articles, antiques, movie memorabilia and other items reflecting Wykoff's past.

Good Earth Village is located Northeast of Spring Valley. This Lutheran camp operates seasonally. The camp location is somewhat similar to Forestville in having a trout stream, a small cave and naturalists.

Two other show caves in the region draw from the same pool of visitors as Mystery Cave: Crystal Cave in Spring Valley, WI, and Niagara Cave near Harmony, MN (only 19 miles from Forestville). Niagara employees are mostly high school students from the local area. Tours at Niagara Cave may involve discussions of the natural features and homespun humor with fanciful stories. Visitor referrals to Niagara are a frequent occurrence at Mystery Cave. Niagara maintains longer seasons than Mystery Cave.

Within the context of all of these regional interpretive opportunities and programs, Forestville State Park in the only provider that offers such a broad range of interpretive programming in one setting.

Interpretive Services Recommendations

There are many opportunities for the MHS and DNR to develop cooperative interpretive programs at Forestville, both in non-personal and personal programming. One example is the interpretation of the Meighen-Lutke saw/roller mill site, which demonstrates the relationship between history and the utilization of park forest resources. Other examples are included in topics 1 and 2, below.

Topic 1. Non-personal Programming Recommendations

Discussion: Brochures, self guided trails, and exhibits are a mainstay of interpretive programs. They are available to visitors year round, 24 hours a day, and they do not necessarily require building facilities. A mix of printed, self guided, and exhibit materials are proposed for Forestville/Mystery Cave.

ACTIONS

Action 1. Develop the following self-guided interpretive trails.

- Mystery Cave Geology Loop
- Historic Forestville Townsites - North and South
- Big Spring Area

Action 2. Develop the following brochures and materials.

- Cave brochure and map
- Forestville Natural History : Plants, Animals, Oak Forests, Fungus, and Fossils (separate brochures or combined)
- Horseback Riding at Forestville (include information on resource management, rider responsibilities, and the equestrian donation account)
- Book or booklet on Mystery Cave (for resale)
- Environmental education materials for school groups (e.g., slide program)

Action 3. Develop the following exhibits and kiosks.

- Mystery Cave Public Contact Building Exhibit (e.g., cave history and development, bat biology, cave formation, karst)
- Main Park Expanded Contact Station Exhibit (e.g., Historic Forestville artifacts with MHS, old growth forest and fragmentation, karst geology)
- Picnic Shelter Exhibit (Also, personal programs can be held at this location in bad weather conditions)
- Main Picnic Area Kiosk (e.g. early milling, prairie restoration, black walnut trees)
- Big Spring Area Kiosk or panel (e.g. algific-talus slopes, boreal remnants, fragility of area and need to stay on trails)

ACTIONS

Topic 2. Personal Program Recommendations

Action 1. Relocate the main park amphitheater and continue campfire programs / hikes at the main park. Campfire programs and hikes have been very popular at the park since the 1970's. The amphitheater should be relocated to the area shown on the proposed development map, page 70. Provide a new storage structure for interpretive equipment. Consider placing interpretive panels on the storage structure exterior. Remove the old interpretive center building.

Action 2. Continue efforts to rotate naturalist staff to interpret surface resources. Staff rotation is essential to prevent cave tour "burnout," and to limit radon exposure within Mystery Cave. Rotation with historic site positions may be possible in the future.

Action 3. Expand the cave tour season into the fall and spring as funding and resources allow. High demand exists for cave tours during the spring and fall, especially on the weekends. There is potential for year around tours at the historic entrance.

Action 4. Explore new personal program themes. Programming should expand to include a variety of cave tours (e.g. spelunking, photo, candlelight /historic). Other seasonal surface programming should be considered such as spring trout fishing clinics, maple syruping, spring and fall mushroom hunting, black walnut harvesting, spring wildflower walks, and others. A working relationship with the Forest Resources Center in Lanesboro may also be possible.

Action 5. Provide personal programs for horseback riders. Horse camp visitors visit Historic Forestville, but very infrequently attend campfire programs or hikes. Consider providing personal programming which targets riders.

In addition, the serious nature of resource impacts from inappropriate horse use may warrant considering additional staff or to re-prioritize existing staff to work with horseback riders, especially on horse trails.

Topic 3. Cave Restoration and Interpretive Research Needs.

ACTIONS

Action 1. Restore Historic Entrance passageways.
The original floor in the Devil's Kitchen area need to be excavated. In addition, the passage to the Cathedral Room needs total renovation. Early cave developers indicated the Cathedral room, the largest known room in the cave, contains features unique in the Mystery Cave system. Provide grating over a 50 - foot long crevice in the Geyser Pass area of the formation passage.

Action 2. Restore and develop Minnesota Caverns passageways. Restore the floor area, expose crevices, and replace the existing bridge in the Blue Lake area. Also, consider installing a lighting system to the Garden of the Gods area. (This room contains the most spectacular formations on the public tour sections of the cave, but the height and configuration do not allow optimal illumination with hand - held lanterns).

Action 3. Interpretive Research Needs. In addition to the research needs identified in the park resource management chapter (see page 47-51), there are interpretive research needs at Forestville State Park. These needs include visitor surveys to identify user interests and research to gauge program effectiveness.

OPERATIONS, STAFFING, AND COSTS

Operations and Staffing

Forestville State Park operations are effectively implemented with present staff levels. However, several actions outlined in this plan would require additional staffing, mainly in the area of interpretation. The 1994 Division of Parks and Recreation Statewide Interpretation Plan staffing recommendations are generally consistent with the needs identified in the Forestville State Park Management Planning process. However, additional work will be needed to determine the best staffing arrangements at the cave.

In addition to these recommendations this plan recommends adding staff or utilizing volunteers to work with horseback riders in the horse camp and on horse trails. The purpose of this effort would be to alleviate - - and to the extent possible, eliminate - resource impacts related to horse use in the park. Most resource damage related to horses occurs when horseback riders leave the designated trail system. Tickets are issued to riders on unauthorized trails, but park staff cannot effectively deal with this issue given current staffing limitations. Enforcement efforts should be focused on heavy use weekends, and interpretive efforts (personal and non-personal) should emphasize the need to stay on designated trails in order to reduce resource impacts. Ideas for implementing this effort have included:

- horseback club volunteers;
- any other volunteers;
- parks workers;
- work experience persons;
- help from the local DNR conservation officer or trainees; and
- consider using "working capital" funds for non-staffing resource/interpretive related efforts.

Additional staff may also be needed as a result of the expanded contact station. However, this will depend on the extent of expansion and the agreement reached by MHS and DNR.

The DNR, Division of Parks and Recreation will experience increased staffing needs and workloads as a result of plan implementation. Other DNR disciplines may also experience some increased workload. For example, the Division of Enforcement can experience increased workloads as a result of increased recreational participation; other enforcement examples might include horse trail violations.

Costs

Operational Costs

If all of the actions and recommendations in this park plan were implemented, the park's annual operational costs would increase. The level or amount of this increase is difficult to estimate because many of the recommendations are too general to base estimates on at this time. However, the increase in staffing outlined in the previous section combined with a review of the development projects outlined below, suggests the parks annual operating budget would increase by 15 to 25%.

Development Costs

The following list represents those actions which have development cost implications. The total cost to implement these actions (as noted) is estimated at $ 1.9 million, (in 1995 dollars). This estimate was generated as part of the planning process and has a significant margin of error because a variety of assumptions were made related to unknown variables (e.g. use of existing well vs. new wells, site specific soil conditions, decisions related to site design, septic system selection, distance to electrical service).

1. Conduct biological surveys and cave research
2. Restore degraded communities and remove undesirable exotic species
3. Delineate groundwater basins in the Forestville area
4. Conduct cultural resource surveys, especially in proposed development areas
5. Existing horse trail improvements
6. New horse trail construction
7. Improve hiking trail to pioneer cemetery
8. Provide hiking trail and fishing access on the South Branch of the Root River between A and B loops.
9. Horse camp - shower building, some individual sites with electricity
10. Group camp - water system and shade trees
11. Upgrade shower building in the main campground.
12. Walk-in and bicycle campsites
13. Mystery Cave - office / public contact building
14. Mystery Cave - Historical tour route improvements
15. Mystery Cave - Minnesota Caverns entrance building
16. Mystery Cave - Minnesota Caverns vault toilet
17. Mystery Cave - Minnesota Caverns tour route improvements
18. Expand contact station (DNR share)
19. Angler parking lot improvements
20. New entrance sign and entrance portal improvements
21. Self-guided trails - Mystery Cave, Big Spring, Forestville townsite
22. Brochures - Mystery Cave, Natural History, Horseback Riding
23. Exhibits - expanded contact station, Mystery Cave office/public contact building, and picnic shelter
24. Kiosks - big spring and picnic area
25. Relocate amphitheater

This development project list does not include the following projects (reasons noted).

1. Bicycle Trail (Funding will be provided from a separate appropriation)
2. Co. Rd. 118 / Township Road Rerouting (estimate cannot be determined at this time because issue has not been resolved)
3. Land Acquisition Costs (cannot be determined at this time)
4. Snowmobile and Ski Trail Improvements (included in horse trail improvements cost estimate)

A breakdown of development cost estimates is available in the Planning Process File.

PLAN MODIFICATION PROCESS

State Park Management Plans document a partnership-based planning process and the recommended actions resulting from that process. These comprehensive plans recognize that all aspects of park management are interrelated, and that management recommendations should also be interrelated.

Over time, however, conditions change that affect some of the plan recommendations (or, in extreme cases, an entire plan). Plans need to recognize changing conditions and be flexible enough to allow for modifications as needed.

For the purpose of this plan we will differentiate between less controversial plan revisions and major plan amendments. Minor plan revisions can generally be made within the Division of Parks and Recreation. If a proposed change to a management plan meets any of the criteria below, it must follow the Plan Amendment Process. To maintain consistency among the plans and processes, all revisions and amendments should be coordinated through the Division of Parks and Recreation planning section. Requests for modifications should be directed to the Division of Parks and Recreation Planning Manager at the central office.

Major Plan Amendments

Proposed Plan Change Amendment Process Criteria

If a proposed change meets any of the following criteria, it must be approved through the amendment process below.

The proposed change:

1. alters the park mission, vision, goals, or specific management objectives outlined in the plan; or
2. is controversial among elected officials and boards, park user groups, the public, other DNR divisions or state agencies.

Management Plan Amendment Process

1. Division of Parks and Recreation Initial Step: Review plan amendment at park and regional level. Determine which stakeholders potentially have a major concern and how those concerns should be addressed. If the major concerns are within the Division of Parks and Recreation, the issue should be resolved within the division. Review proposed approach with central office managers.

2. If the proposed change issue is between DNR Divisions, the issue should be resolved by staff and approved by the Division Directors. This may require one or two area/ regional integrated resources management team meetings. The Division Directors will determine whether the proposed change should go through the departmental (CTECH/ Senior Manager) review process.

3. If the proposed change issue is between state agencies, the issue should be resolved by staff from both agencies and approved by the Division of Parks Director.

4. If the proposed change is potentially controversial among elected boards, park user groups, or the public, the park advisory committee should discuss the proposed change and attend an open house forum which is advertised in the local and regional area. Following the open house, the Division of Parks Director will determine whether the proposed change should be reviewed by the department.

5. All plan amendments should be coordinated, documented, and distributed by the Division of Parks planning staff.

Plan Revisions

If a plan change is recommended that does not meet the amendment criteria above and generally follows the intent of the park management plan (through mission, vision, goals, and objectives), the Division of Parks has the discretion to modify the plan without a major planning process.

Revisions related to Physical Development Constraints and Resource Protection

Detailed engineering and design work may not allow the development exactly as it is outlined in the plan. A relatively minor modification, such as moving a proposed building site to accommodate various physical concerns, is not uncommon. Plans should outline a general direction and document general "areas" for development rather than specific locations. For the most part, plans are conceptual, not detail-oriented. Prior to development, proposed development sites are examined for the presence of protected Minnesota Natural Heritage Program elements (see page 58) and historical/ archaeological artifacts. If any are found, the planned project may have to be revised to accommodate the protection of these resources.

Program Chapter Revisions

The resource management section (Resource Objectives and Integrated Management, page 18) and Interpretive Services chapter (page 79) should be updated periodically as needed. Division of Parks and Recreation Resource Management and Interpretive staff will determine when an update is needed and coordinate the revision with the park planning section. Program chapters should be rewritten in a format consistent with the plan as originally approved by the DNR. To retain consistency, park planning staff should be involved in chapter revision review, editing, and distribution.

BIBLIOGRAPHY

Alexander, Calvin. 1984. Springs of the Mystery Cave Area, in: Fetvedt, John E. (ed.), Mystery Cave Area: MSS Corn Feed, August 1984. Minnesota Speleological Survey, Spring Valley, MN, p. 68-69.

Fillmore County Assessor's Office, 1994. Zoning and Assessor Land Use Calculations.

Grow, Sheila Roseanne. 1986. Water Quality in the Forestville Creek Karst Basin of Southeastern Minnesota. M.S. Thesis, University of Minnesota, Minneapolis.

Hargrave, Bryan C., Minnesota DNR - Division of Forestry, Ecological Classification System, Draft Subsection Map of Minnesota, 1992.

Hogberg, R.K., R.E. Sloan, and Sarah Tufford. 1967. Guide to Fossil Collecting in Minnesota. Minnesota Geological Survey.

Kehret, Roger. 1974. Minnesota Caves of History and Legend. Superior Printing Company, Chatfield, MN.

Kehret, Roger. 1974. Your Guide to Mystery Cave. Superior Printing Company, Chatfield, MN.

LCMR Work Plan. 1991. Mystery Cave Resource Evaluation. Legislative Commission on Natural Resources, St. Paul, MN

Lothson, Gordon, and Robert Clouse. 1985. A Cultural Resource Review and Overview of Forestville State Park. Minnesota Historical Society

Leverson, Calvin On.; Arthur J. Gerk; Robert E. Sloan; and Lynne A. Bisagno. 1987. General Section of the Middle and Late Ordovician Strata of Northeastern Iowa, in: Sloan, Robert E. (ed.), Middle and Late Ordovician Lithostratigraphy and Biostratigraphy of the Upper Mississippi Valley. University of Minnesota, Report of Investigations 35, St. Paul, p. 25-39.

Matsch, Charles L. and Richard W. Ojakangas, Minnesota's Geology, Minneapolis, University of Minnesota Press, 1982.

Milske, J.A.; E.C. Alexander, Jr.; and R.S. Lively. 1983. Clastic Sediments in Mystery Cave, Southeastern Minnesota. NSS Bulletin 45: p. 55-75.

Minnesota Department of Natural Resources. 1988. Minnesota State Parks Interpretive Services Plan. Division of Parks and Recreation, St. Paul, MN.

Minnesota DNR. 1988. Lewiston Area Forest Resource Management Plan. Division of Forestry.

Minnesota DNR 1978. Forestville State Park Management Plan. Division of Parks and Recreation.

Minnesota Departments of Natural Resources and Trade & Economic Development, Minnesota's Outdoor Legacy: Strategies for the 90's, Statewide Comprehensive Outdoor Recreation Plan for 1990-1994 (SCORP).

Minnesota Laws. 1987. Session Laws of the State of Minnesota. State Register and Public Documents Division, Department of Administration, St. Paul, MN.

Minnesota Mining Directory, 1992.

Minnesota Office of Tourism, The Customer Profile: A Compilation of Data From Seasonal Surveys, 1981-1991.

Minnesota Speleological Survey. 1983. A Cave Explorer's Guide to Mystery Cave.

Minnesota Speleological Survey. 1983. A Spelunker's Guide to Mystery Cave. Special Publication Number 1.

Mohring, Eric Herbert. 1983. A Study of Subsurface Water Flow in a Southeastern Minnesota Karst Drainage Basin. M.S. Thesis, Minneapolis, University of Minnesota.

Montz, Gary R. 1989. Preliminary Report on the Aquatic Invertebrates of Mystery Cave. Department of Natural Resources, Department of Natural Resources, Ecological Services, St. Paul, MN.

Nelson, Doug. 1972. A History of Mystery Cave. Minnesota Speleology Monthly, July - December 1972, p. 25-28.

Ojakangas and Matsch, Minnesota's Geology, University of Minnesota Press, 1982.

Palmer, Arthur N. 1991. Personal Communication. State University of New York, College of Oneonta, New York.

Palmer, Arthur N. and Magaret V. Geology and Origin of Mystery Cave. Minnesota Department of Natural Resources, 1993.

Schwartz, George M. and George A. Thiel, Minnesota's Rocks and Waters a Geological Story, Minneapolis, University of Minnesota Press, 1973.

Sims, P.K. and G.B. Morey. 1972. Geology of Minnesota, Minnesota Geological Survey.

Sloan, Robert E. 1987. Introduction to the Middle and Late Ordovician Field Trips, in: Balaban, N.H. (ed.), Field Trip Guidebook for the Upper Mississippi Valley Minnesota, Iowa, and Wisconsin. Minnesota Geological Survey, p. 45-52.

Sweeting, M.M. 1973. Karst Landforms. Columbia University Press, New York, 362 p.

United States Census information, 1990.

Webers and Austin. Field Trip Guidebook for Paleozoic and Mesozoic Rocks of Southeastern Minnesota, Minnesota Geological Survey, 1972.

Weiss, M.P. 1953. The Stratigraphy and Stratigraphic Paleontology of Upper Middle Ordovician Rocks of Fillmore County, Minnesota. Unpublished Ph.D. dissertation, University of Minnesota.