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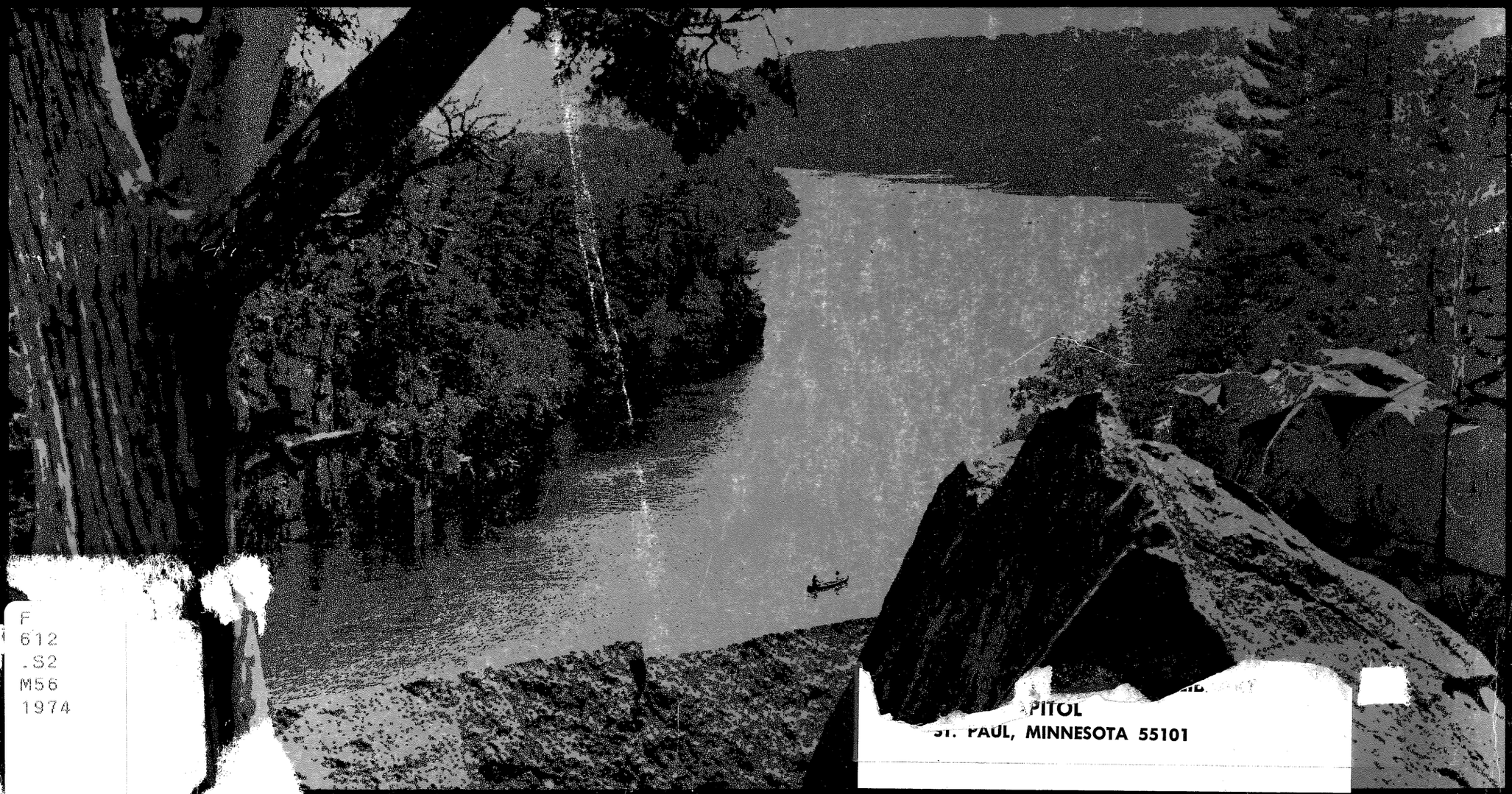
Upper St. Croix Resource Management Plan

Minnesota Department of Natural Resources



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Upper St. Croix Resource Management Plan

Minnesota Department of Natural Resources

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*Acknowledgments

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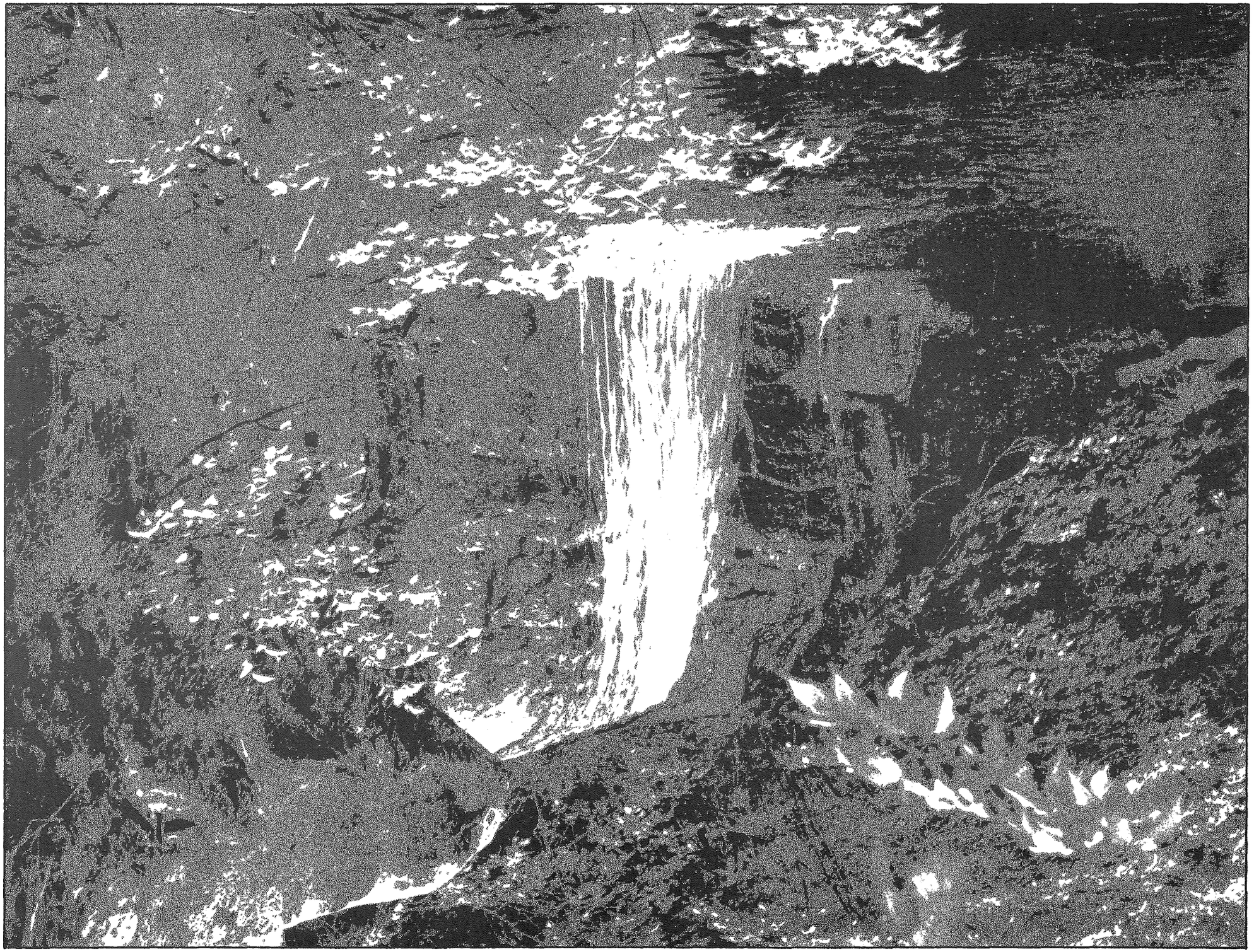


Introduction

The Upper St. Croix River, province of beaver, deer and eagle, and early home of the Dakota and Ojibwa, has remained refreshingly unchanged despite man's many attempts to tame its wilderness character.

The first white man to penetrate its pristine forests were French traders and trappers. Fur trapping, however, proved difficult in this rugged wilderness and the trappers soon moved on to new, untrapped horizons. Nearly 100 years passed before a new era in the economic exploitation of the Valley began. Lumber barons invaded the region's lush green forests about the turn of the century to harvest a rich bounty of White Pine. But the timber boom was to last only as long as the Pine.

After the loggers attempts were made to utilize the river for hydroelectric power but these efforts were also short-lived or failed altogether. Even the early settlers found the Upper St. Croix Valley reluctant to share its natural gifts. Poor soil conditions provided for only meager crops and forest fires were a constant threat.

And so, the Upper St. Croix River has retained much of its natural beauty. But ironically, its natural amenities combined with the Valley's close proximity to a heavily-populated metropolitan area, may be the region's undoing. Today its majestic, clean waters and peaceful forests lure thousands of visitors each year and once again, the beauty and tranquility of this wilderness area is jeopardized.

The protectors of this wildness are under constant pressure to surrender it to development and commercial use. Even legally safeguarded areas are in danger of damage from more recreational wear than they can sustain. The rapid population growth of the near-by Twin City area is a salient reminder that without planning and management, the Upper St. Croix, whose productive existence can be measured in millions of years, will die.

To preserve rivers such as the St. Croix, whose extraordinary recreational, aesthetic and natural resource values make them unique, Congress passed the Wild and Scenic Rivers Act in 1968. This study is an attempt to outline the planning and management effort necessary to carry out the act--to protect the Upper St. Croix from overuse and mismanagement.

The study is a new innovation in total resource planning and management. Computer-drawn composite maps of the area's resources aid in the selection of the best sites for recreation facilities and guide the creation of a master management plan. The plan, as delineated in this volume, is the preliminary preparation necessary for the wisest utilization of the Upper St. Croix.

Wild and Scenic Rivers Act

Concern for preserving the wilderness majesty of the St. Croix River began in the mid-1950's when Northern States Power Company (NSP) reserved some 31,000 acres above Taylors Falls.

In the early 1960's the federal government began to explore the possibility of giving national protection to the country's unique river systems. A number of rivers were studied initially, among them the St. Croix. In the mid-1960's, a study team recommended that the entire St. Croix River be protected under a federal-state plan which was then passed on to Congress.

Those persons from Minnesota and Wisconsin who had worked so hard to seek permanent protection for the St. Croix and its picturesque valley grew apprehensive when, in 1968, the proposed National Wild and Scenic River Act was floundering in Congress. To avoid losing any momentum, Northern States Power Company in June, 1965, formed a Task Force in an attempt to provide perpetual management and protection for this unique wilderness legacy.

This Task Force recommended that the Upper St. Croix and its major tributaries, principally the Namekagon in Wisconsin, be preserved as relatively free-flowing rivers at near primitive conditions and to make the river reasonably accessible for public use under optimum resource management guidelines.

This plan took on added significance and urgency with the passage of the Wild and Scenic Rivers Act by the 90th Congress on Oct. 2, 1968. This Act designated the Upper St. Croix and its main tributary the Namekagon as one of eight components of the National Rivers System.

The Act declared "It is hereby...the policy of the United States that certain selected rivers of the Nation which, with their immediate environments, possess outstanding remarkable scenic, recreational, geologic, fish and wildlife, historic, cultural, or other similar values shall be preserved in free flowing condition, and that they and their immediate environment shall be protected for the benefit and enjoyment of present and future generations". Section 3 (a) (6) of the Act states that a portion of the St. Croix River, Minnesota and Wisconsin, is designated to be incorporated into the National Rivers System.

The Act also states that rivers so designated shall be classified and administered as one of the following:

1. Wild river areas
2. Scenic river areas
3. Recreational river areas

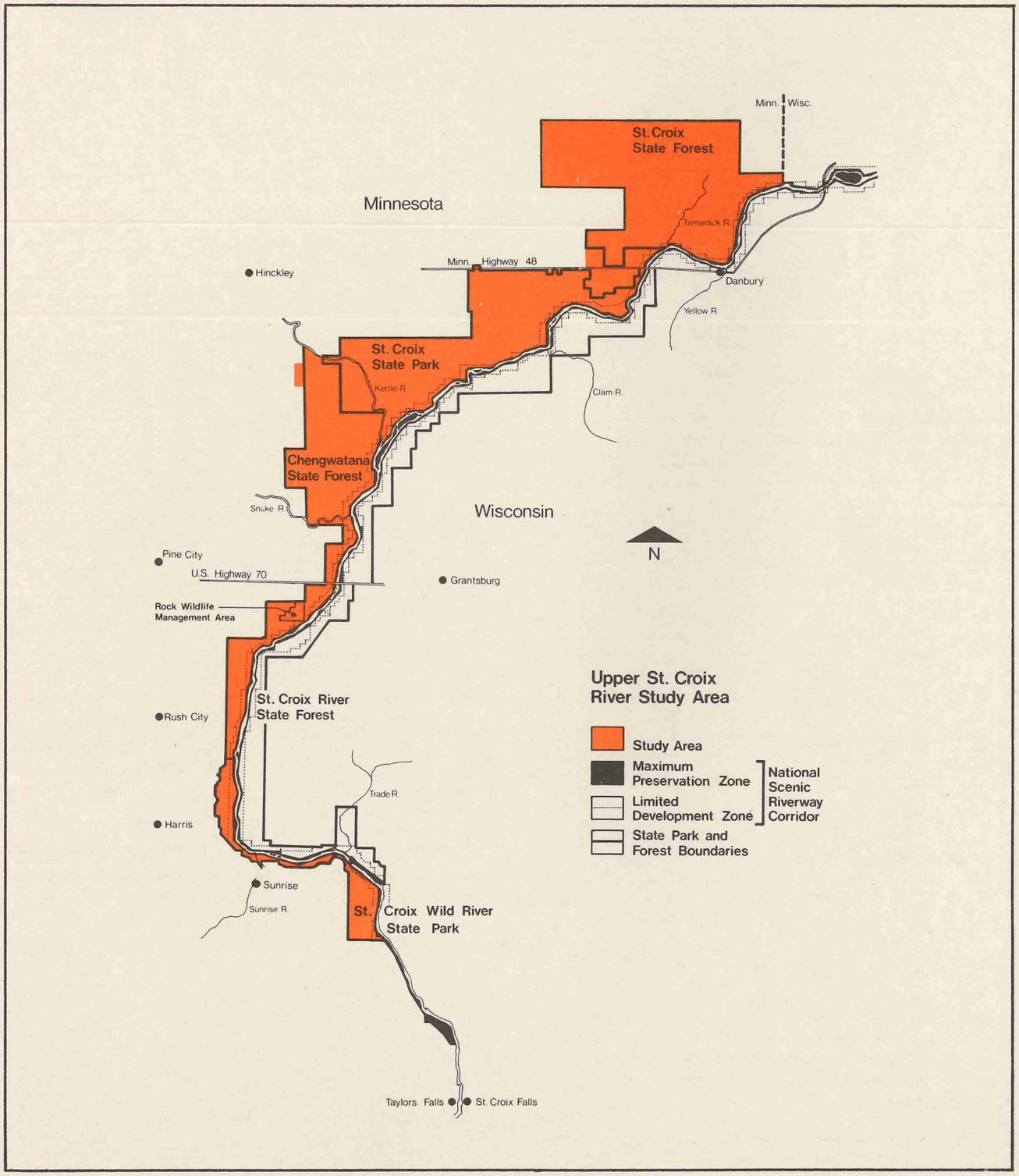
The Upper St. Croix River has been classified as a Scenic river area though a small portion of its corridor is designated as Recreational. Statements within this Act made mandatory the drafting of a proposed Cooperative Agreement between the Northern States Power Company, a major land donator within the riverway boundary, and the United States.

A Task Force was formed between the Northern States Power Company, the National Park Service and the states of Minnesota and Wisconsin to complete the Cooperative Agreement. This Agreement, signed in 1969, set forth general boundary lines and provisions that will be followed by the original parties represented in the Task Force.

Upon a recommendation by the Task Force and by request of the Upper Great Lakes Regional Commission, the St. Croix Interim Management Commission was established to monitor the progress of the riverway. The Commission is comprised of representatives from NSP, NPS, and the Department of Natural Resources of both Minnesota and Wisconsin.

The National Park Service as well as each state must prepare preservation and management plans for the sections of riverway that each entity will administer. This must be accomplished before NSP relinquishes all ties to the lands they wish to donate.

The following resource management plan has been prepared by the State of Minnesota to fulfill its part of the Cooperative Agreement.



Purpose

Intent of Plan

The objective of the "Upper St. Croix Resource Management Plan" is to provide a comprehensive approach to the preservation, restoration, development and management of the Upper St. Croix Valley.

Spawned by requirements of the 1969 Cooperative Agreement, the Department of Natural Resources' plan will provide direction for development of those lands donated by NSP to the State of Minnesota and also the facilities necessary within the NPS Scenic River Corridor.

Preliminary reviews of this project indicated it would be of little value to study the narrow one-fourth mile strip paralleling the river without establishing management programs for the state land units adjacent to the corridor.

These units include two state forests (St. Croix and Chengwatana), two state parks (St. Croix and St. Croix Wild River), and one wildlife management area (Rock). Together, these units comprise about 115,000 acres of land.

Because every division within the DNR is directly or indirectly involved with management of these five areas, a departmental planning team was organized so that each division's interest would be represented in the drafting of a cooperative plan. The team's objective was to blend together various divisional management policies into one integrated program for the development and management of these areas.

Cooperative planning within the Department of Natural Resources is not a new concept. It has been an important element in the Department's

previous growth and improvement and will continue to be even more important. The comprehensive planning goal of the Department of Natural Resources as adopted on May 22, 1972 is: "To achieve optimum and beneficial natural resource planning, protection, and development responsive to public need, consistent with resource potentials, and for the social, spiritual and economic well-being of both present and future generations through an effective and efficient organization".

This study is only the first step in planning and managing the Upper St. Croix Valley. Its intent is to establish departmental policies, guidelines and goals that will be firm enough for orderly development, yet flexible enough for improvements to be incorporated as time and experience dictates.

This plan should guide development programs as they are funded through legislative appropriations and other sources.

It is important that detailed analysis, site review, engineering, planning and design take place prior to physical development as monies are made available for specific projects.

The river is truly unique because of its wilderness character. Consequently, if the river and valley are to retain this character, they must be properly planned and managed. If not, they will never survive.

General Conclusions

The Upper St. Croix Resource Management Plan is comprised of several plans specializing in specific resource disciplines. Each plan has been designed as an inter-related component of one cohesive resource management program, consisting of the following topics: wildlife, fish, recreation, forestry, waters, soils and minerals, enforcement and historical aspects.

The following general conclusions result from the combination of these resource studies:

Wildlife

1. Improve wildlife habitat by creating and maintaining small openings amid the forest canopies.

2. Produce forests of greater variety (types and ages) while perpetuating more herbaceous growth and brush which could create more food and cover for wildlife.

3. Better management of wildlife populations and the forest ecosystem by having occasional, restricted hunting seasons within state parks when necessary.

4. Increase in personnel and equipment to better manage and investigate wildlife populations and their habitats.

Fisheries

1. Acquire easements for providing accesses for trout fishermen, trout stream habitat improvement, boat accesses and trails.

2. Beaver control on trout streams.

3. Intensify fish management on several lakes within the study area.

4. Periodic surveys of fishery resources.

5. Increase stocking of fish species which are desirable for a particular stream or lake.

6. Increase personnel and equipment necessary to achieve the preceding improvements.

Recreation

1. In most cases, recreational facilities will be primitive in character to be compatible with the amenities of a wild and scenic river. Facilities will be kept to a minimum and will be located so as to preserve the natural environment.

2. More extensive forms of recreation such as picnicking, family campgrounds, multiple use trails, trail centers and vehicular parking will be located outside of the maximum preservation zone.

3. Only the most primitive forms of recreation such as primitive camping, hiking, canoeing, cross-country skiing, and snowshoeing will be allowed in the maximum preservation zone.

4. Increase in personnel and equipment will be needed to enforce, manage and maintain the study area.

Forestry

1. Forest management practices within each resource management zone have been expanded in detail. These zones consist of:

   Scenic Preservation Zone

   Developed Recreation Zone

   Historical, Cultural Zone

   Fisheries Zone

   Wildlife Zone

   Natural Resource Zone

   Primitive Zone

   Scientific Natural Zone

2. Merchantable timber production has been evaluated in relation to number of acres per species of tree.

3. Forest management procedures for State Forests and Parks differ in department policy. The forest management plan for the St. Croix and Chengwatana State Forests deals specifically with improved forest production and wildlife habitat. In St. Croix and St. Croix Wild River State Parks, forest management is directed toward preservation, aesthetics, wildlife and recreation.

4. Disease prevention methods by eliminating diseased and over-mature trees.

5. Fire prevention by increased fire-break trails.

6. Increase personnel and equipment needed to achieve goals.

Waters, Soils, and Minerals

1. Management and controls for the larger tributaries to the Upper St. Croix River.

   a. Prevention of wood pulp mills on the Kettle River.

   b. Prevention of industrial and municipal waste on the Kettle, Snake, and Sunrise Rivers.

   c. Prevention of nutrient run-off caused by agriculture on the Snake and Sunrise Rivers.

2. Problems in locating ground water because of extensive, impervious lava rock formations.

Enforcement

1. The future increase in recreational user activities will increase the existing enforcement problems, thus requiring an increase in enforcement personnel.

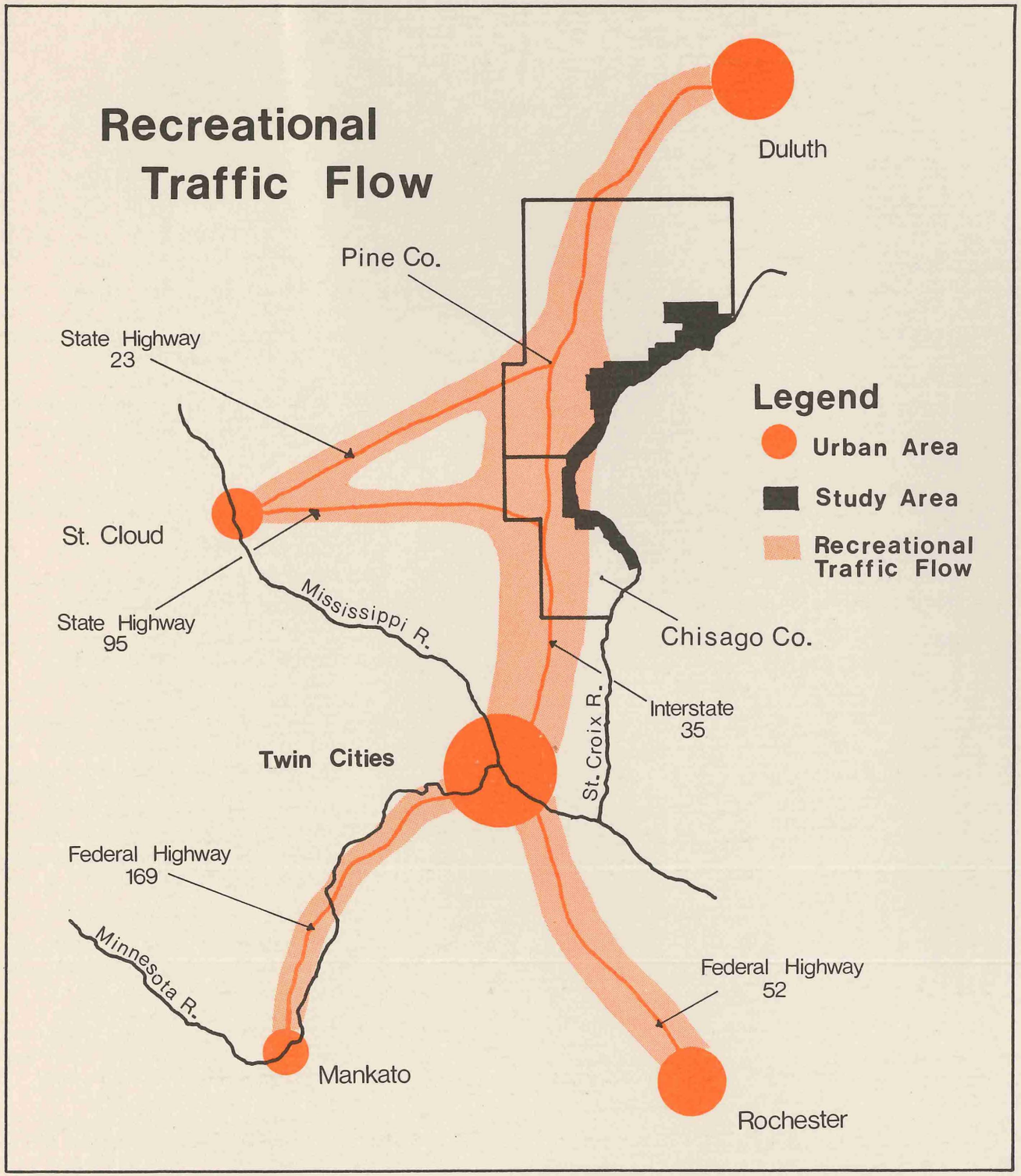
2. Enforcement training and authority to issue citations should be given to other Department of Natural Resource' personnel such as park managers, foresters and game managers.

Historical

1. Additional historical investigation is needed within the Upper St. Croix Study Area.

2. Known historical and archeological sites have been interconnected with the overall recreational system and will be interpreted.

3. All sites to be developed will be investigated for historical and archeological value before being constructed.



Regional Analysis

The entire study area lies within sparsely populated Pine and Chisago counties. They comprise about two percent of the total land within the state. Combined population of the counties is about 34,000, of predominantly white European background.

A primary objective of the Management Plan is to increase the recreational potential of the Upper St. Croix River while maintaining its natural environment. This increase will have an economic and social impact on the counties by increasing tourism, private enterprise, and automobile traffic.

General Traffic Pattern

Most Minnesotans using the Upper St. Croix River for recreation are from the southern portion of the state, and particularly from urban centers such as Mankato, Rochester, St. Cloud and the Twin Cities Metropolitan area. They follow a definite traffic pattern, using various highways as arterials to the major circulation route, Interstate #35.

By adding more recreation along the river, traffic flows on I-35 and those county roads leading directly to recreational areas will increase proportionately.

The population centers of northern Minnesota are drawn to other high quality recreational and wilderness areas within close proximity of these cities and towns.

Demography

Minnesota has an abundance of unique recreational areas in the northern section of the

state. Because recreational demand is a direct function of population, it is why demand for recreational facilities is critical around the heavily populated Metropolitan area. Seldom can a high quality resource area be found so close to major populations concentrations, as with the St. Croix Valley.

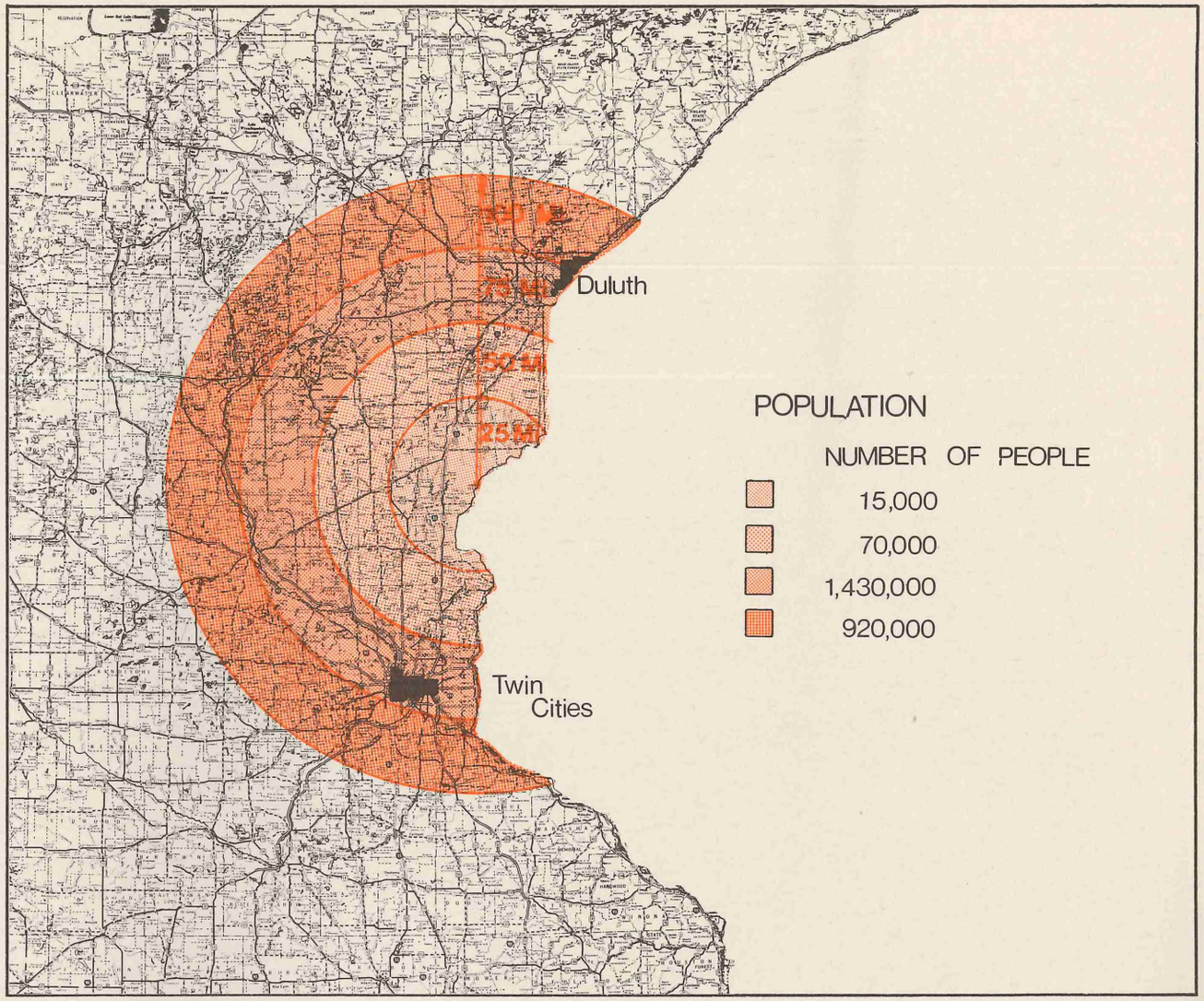
The 1968 Minnesota Outdoor Recreation Plan identifies Region 7, which includes the St. Croix area, as the region with the greatest need for recreational facilities. Presently this area is within the reach of over two million persons as a day-use facility. Adjacent are the populations within the various radii from the center of St. Croix State Park.

Today, the need for facilities in this area is great, but demand will become critical in the future if population increases continue.

Land Use

The land of Pine and Chisago counties is predominately agricultural and forested. Reforestation would perpetuate pulpwood logging, although lumbering will never return to its former importance. In Chisago County the trend is towards urbanization, though recreation is also becoming a major factor in land use.

Public and private recreational facilities are expanding significantly in the two-county region. Similarly, manufacturing and industry are growing, leading to increases in population and urbanization. Private recreation areas are appearing near larger accessible public lands. These areas will



Population Trend

	1960	1970	1980	1990	2000
Pine Co.	17,004	16,821	15,497	13,950	12,515
Chisago Co.	13,419	17,492	22,592	29,164	36,873
Metro (7 County)	1,525,297	1,874,380	2,271,435	2,744,699	3,152,247
State	3,413,864	3,804,971	4,179,761	4,619,111	4,942,905

require such facilities as service stations, grocery stores, etc.

As public recreational facilities expand, local government will be responsible for creating and enforcing zoning laws that preserve the quality and character of public lands. They can expect growing pressure from private industry to change these rules.

Regional Economic Impact

An effort to evaluate the economic impact within the study area makes us aware of the vast number of variables and influencing factors that can substantially change a situation.

A discussion of economic impact should be divided into two sections. First, the direct effects that will probably occur within the boundaries of the area because of the planned developments.

In this situation, direct monetary impacts will be minimal. Previous land use provided few if any market outputs to either the private or public sector. If development occurs, some monetary effects will be generated through construction, maintenance, and possible concessions. It is also probable that an increase in leisure time, buying power and mobility could generate increased sales to businesses in the vicinity.

This increase would be limited to service stations, convenience groceries, restaurants, carry-outs, etc. The effects are minimal for the following reasons. First, metropolitan use will be centered around day use only, primarily on weekends during the summer months. Even if there were large sales per visitor per day, it is unlikely that with a maximum season of 19 weeks or approximately 40 days potential peak use, a substantial increase in economic activity would occur. This is even more apparent if evaluated on the basis of the total economic activity of existing businesses in the area. If the area contains even subsistent economic development, the relative proportion of total business in areas of potential gain is infinitesimal. If businesses do not presently exist in those areas, it is doubtful that sufficient business would be generated to support new ventures. From an employment standpoint, any increases in jobs would occur at peak employment periods and would be relatively low wage positions.

The metropolitan user usually brings most of his equipment and supplies with him. Thus, local sales per visitor day would be relatively small. In total, local area economic benefits will probably be meager.

The second area of consideration results from effects on the land bordering the study area. The probability of increased development because of the proximity of these lands is a very significant factor. The kind of developments considered here are large recreational complexes, seasonal homes, etc. Counties and other local units of government should carefully examine the potentials and problems associated with these types of development.

Physical Impact

The Upper St. Croix River Study is a comprehensive management plan prepared by the Department of Natural Resources to conserve and protect the Upper St. Croix River and valley.

LAND USE DIAGRAM - PINE AND CHISAGO COUNTY

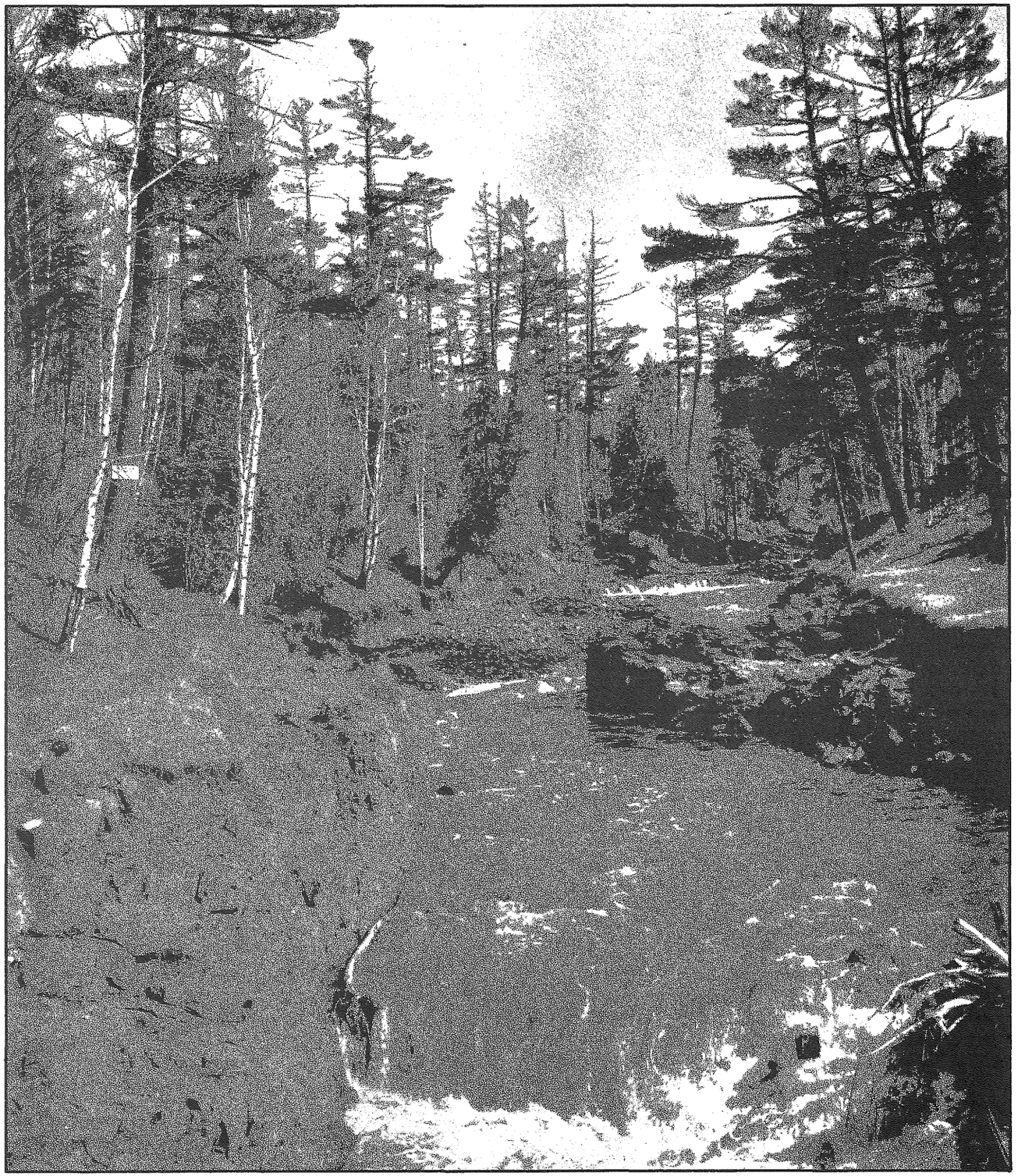
Land Use	Total 40 acre Parcels	Land Use % County	Land Use % State
Pine County - 22,854 - 40 acre parcels 1.7% total area of State			
1. Forested	14,106	61.7%	3.1%
2. Cultivated	2,536	11.1%	.4%
3. Water	246	1.1%	.3%
4. Marsh	1,226	5.4%	2.6%
5. Urban Nonresidential or Mixed Residential	151	.7%	.9%
6. Extractive	3	0%	.1%
7. Pasture & Open	4,436	19.4%	2.9%
8. Urban, Residential	146	.6%	1.1%
9. Transportation	5	0%	.7%
Chisago County - 7,164 - 40 Acre Parcel .5% total area of State			
Land Use	**Total 40 acre Parcels**	**Land Use % County**	**Land Use % State**
1. Forested	1,840	25.7%	.4%
2. Cultivated	2,797	39.0%	.5%
3. Water	349	4.9%	.4%
4. Marsh	179	2.5%	.4%
5. Urban Nonresidential or Mixed Residential	156	2.2%	.9%
6. Extractive	1	0%	0%
7. Pasture & Open	1,791	24.7%	1.2%
8. Urban, Residential	71	1.0%	.5%
9. Transportation	1	0%	.1%

The Division of Game and Fish has been working in conjunction with the other DNR divisions and outside agencies to improve habitat areas. Fisheries will be conducting controlled stocking, siltation and temperature control studies of the lakes and streams and balancing conflicting habitats such as beaver and trout. Habitat zones provide deer yards and sandhill crane nesting areas. Methods are presented to improve various habitat areas through the managing and regulating of vegetative types to increase game food, cover, and reproduction.

The Division of Lands and Forestry has developed a management plan to preserve the natural aesthetics and perpetuate forest areas. The plan places emphasis on natural perpetuation of a forest in conjunction with productive and aesthetic values.

The Division of Parks and Recreation is concerned with recreational impact on the environment. The Division is providing a plan that will satisfy recreational demands, yet preserve the natural resources of the Valley.

The University of Minnesota may conduct a recreational user impact study on our management areas along the Upper St. Croix River. Soils and vegetation analysis would be conducted on various recreational facility areas prior to construction, with permanent methods of collecting data being established. Soil compaction measurements and vegetative data would be obtained. For instance, data on a campground area would be gathered probably twice a year, for the duration of the study.



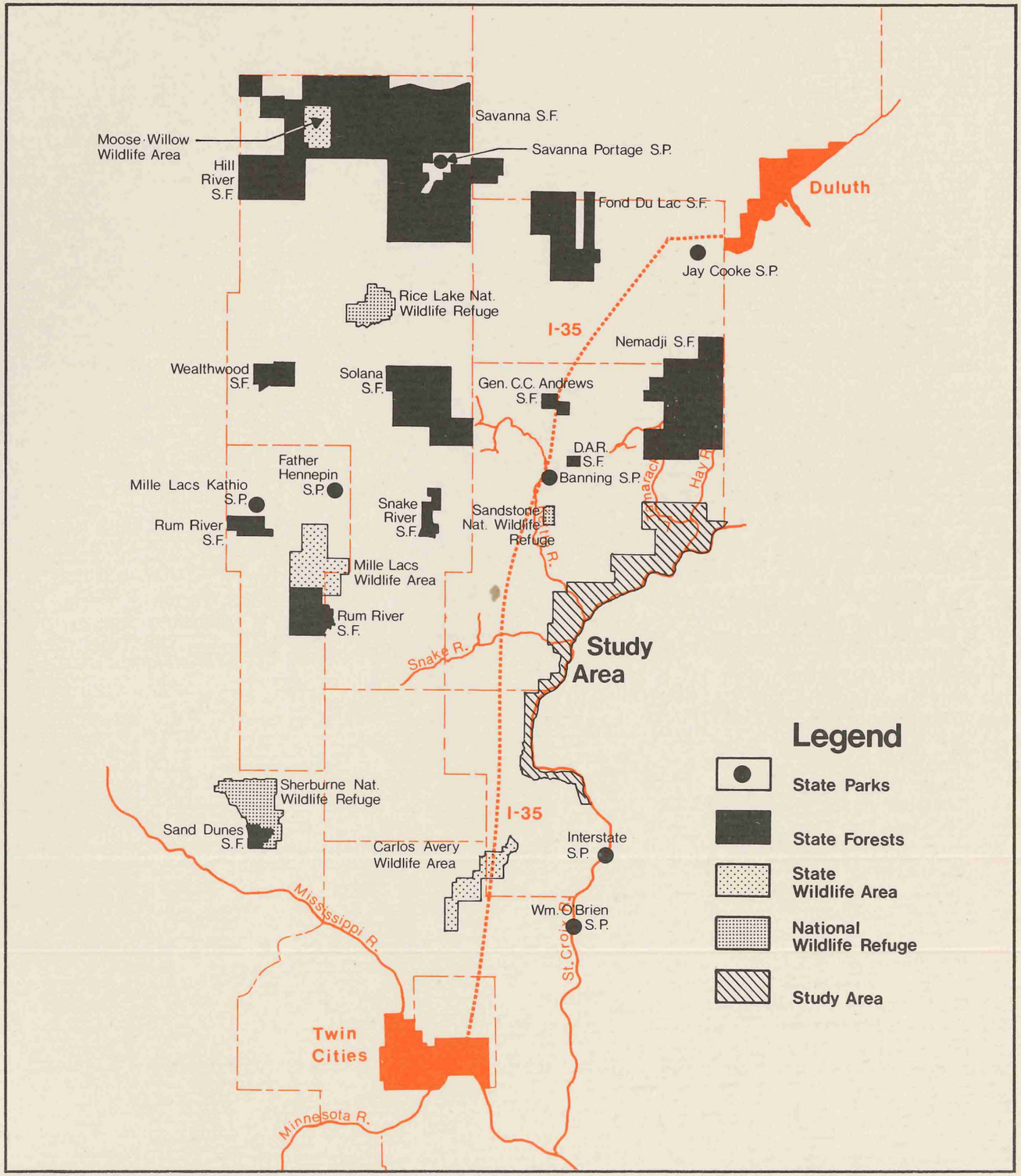
Time permitting, information will be collected on changes in the vegetation at the periphery of the use areas: damage as a result of vandalism, changes in soil compaction and stability, vegetation changes in floodplains, and fluctuations in mammal, bird and fish populations and reproductive patterns.

Results of the study should assist in determining better recreational facility designs. It will help in deciding the extensiveness and type of development an area can carry without endangering the natural environment. As recreational user impact begins to threaten natural amenities of the environment, regulations and restrictions will be necessary. Such guidelines could restrict the number of users per season, amount and type of recreational facility such as the number of users per trail, the number of campsites per acre, or a picnic area rather than a campground at a particular site.

Related Management Units

In order to gain the proper perspective of the study area, a brief description of the adjacent areas and facilities administered by the State is presented on the following page.

As the St. Croix becomes a major recreational attraction in the future, as seems probable, its popularity will have a "spill over" effect on adjacent areas. Careful attention should be given to the development of these areas in order to accommodate increased use while maintaining the natural environment.



FACILITIES

		Acres	# Campsites	# Picnic Tables	Beach Access		(Miles) Trails
Fond Du Lac	*SF	48640	20	15		X	20
Savanna	*SF	216960					18
Solana	SF	67840			X	X	33
Wealthwood	SF	14208					8
Rum River	SF	6880					26
Snake River	SF	8320					
Sand Dunes	SF	11040	27	7	X		18
Nemadji	SF	97040	9	1		X	61
General CC		7680	28			X	9
Andrews	SF						
D.A.R.	SF	640	5	3			
Sherburne	NWR	30500		6			54
Sandstone	NWR	3240					
Rice Lake	NWR	1805660		15		X	
Carlos Avery	WA	2785008					
Mille Lacs	WA	38300					
Moose Lake	SRA	965		10	X	X	10
Banning	SP	3,355	32	14		X	10
Father Henn-epin	SP	270	62	40		X	1
Interstate	SP	165	48	300		X	3
Jay Cooke	SP	8,920	94	186			45
Mille Lacs Kathio	SP	6,795	45	40	X	X	32
St. Croix	SP	30,920	126	50	X	X	200
William O'Brien	SP	30,530	125	225	X	X	2
Mille Lacs	WMA	37,964					
Savanna Portage	SP	14,605	62	15	X	X	60

Index

WMA - Wildlife Management Area
SRA - State Refuge Area
SF - State Forest
NWR - National Wildlife Refuge
WA - Wildlife Area
SP - State Park

*Note: Both Fond du Lac and Savanna State Forests do not include the areas located in St. Louis County, because of a lack of inventory data for that county, as of 8/29/72.

Use patterns provide some insight as to current recreational pressures. Below are attendance trends for three state parks for the past six years:

	Banning	Interstate	St. Croix
1972	21,604	401,863	389,024
1971	17,922	450,829	380,343
1970	13,539	446,504	320,471
1969	8,716	495,540	267,901
1968	6,331	331,436	202,684
1967	3,100	221,414	139,193

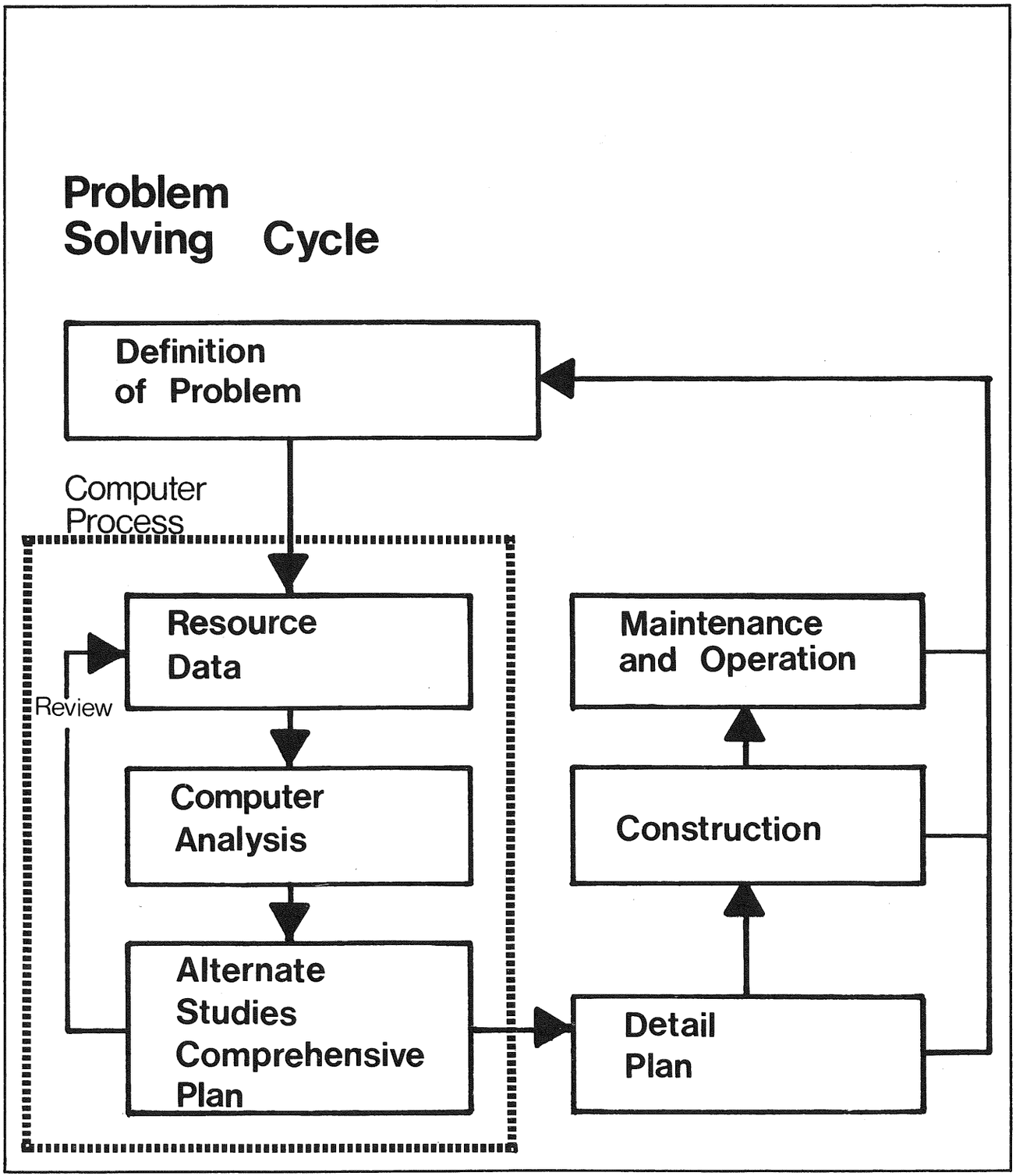
Banning, a relatively new park, has had an annual average use increase of 50 percent. Interstate Park, meanwhile, has remained at about the same level or with a slight decline in attendance since 1969. Many factors may have influenced these changes. Two major reasons might be that Interstate has reached its maximum usage and that completion of Interstate #35 has made accessibility to parks farther north, such as Banning, considerably easier.

Recreation pressure at both Interstate and St. Croix State Parks is presently too intensive and should be reduced to preserve the fragile natural

areas in these parks. For example, St. Croix State Park has recorded visitation increases of about 20 percent annually, while the average increase among all Minnesota State Parks has been about 13 percent a year during the past decade.

By better distributing recreation along the St. Croix River, heavy recreational use in these two parks will hopefully be dispersed to other areas. This, combined with wise utilization and management of available resources, is essential in maintaining the uniqueness of the Upper St. Croix Valley.

A unique opportunity exists here to deal with the area as a whole in terms of management decisions and development alternatives. Only through this type of management can we accomplish our objective of wise resource management.



Development of the Management Plan

The Upper St. Croix Management Plan resulted from a comprehensive environmental study focused on developing the area for recreation, forest and wildlife management and other related disciplines with a minimum of disturbances to the environment. The management study consists of the following procedures.

Inventory

Resource data was collected from various divisions of the Department of Natural Resources, including the Divisions of Water, Soils & Minerals, Enforcement and Field Services, Lands and Forestry, Parks and Recreation, and the Bureaus of Engineering and Planning. Outside agencies assisting were Northern States Power Company, National Park Service; USDA Soil Conservation Services, Wisconsin Department of Natural Resources, Minnesota State Planning Agency, Minnesota Highway Department, Minnesota Historical Society, and the University of Minnesota. Data was processed through a new computer program for easy reference and analysis. This program is tentatively referred to as the **Grid System.**

Computer System and Composite Maps

The Grid System has been created to provide a graphic display of information, using an XY coordinate system for reference.

To use the system, a transparent grid is placed over a data map of the unit to be analyzed. Each cell within the grid encompasses about 2 2/3 acres.

The cell is given an identifying set of coordinates. Data appearing on the map beneath each cell is recorded with a symbol. The number of the cell and its associated data are given to the computer.

Each map indicates distribution of **one** resource, for example, soil types. There **is** a data map for each resource pertinent to the study, which includes a histogram giving the percentage of each component of the resource on the map. After the grid is placed on each data map, and the information for each cell is recorded and programmed into the computer, it is possible to retrieve a composite map for each particular management project or recreation facility by combining the various resources pertinent to each. The data resources and composite maps used in this study include:

Data Maps	
Surficial Hydrology	Historical-Archaeological
Vegetation Overstory	Recreation - Existing Facilities
Ownership	Habitat Areas
Slope	Site Condition and Age of Overstory Vegetation
Slope Orientation	Understory Vegetation
Transportation	Size and Density of Overstory Vegetation
Soils	
Water Tables	Size and Density of Understory Vegetation
Permeability	

Composite Maps	
Primitive Campsites	Scenic Road Development
Picnic Areas	Parking Lots
Family Campgrounds	Snowshoe Trails
Hiking Trails	Swimming Beaches
Horseback Trails	Boat Accesses
Snowmobile Trails	Deer Habitat
Water Wells	Aspen Conifer Relationship
Sanitation Building	Grouse Habitat
Cross Country Ski Trails	Forest Production Lands

The composite maps can be used to determine the most favorable location for a particular management project or recreation facility. For instance, if a boat access were to be considered, all criteria (data maps) important to the development of a boat access would be coded into an arithmetic formula by placing an arithmetic value on each criteria and its components. The computer calculates and tabulates all the criteria in the formula for each and every cell of the grid. A value range of -10 to 0 to 10 has been initiated with -10 to 0 indicated negative effect and 0 to 10 positive effect.

In the following illustration, using boat access as the planned facility, it has been determined that the criteria having an influence on the development of a boat access are soils, water table and permeability. It was further determined that soils

were most important with water table and permeability being an equal second.

Thus, the formula for a boat access could be:

Boat Access = 4(soils) + 2(water table) + 2(permeability)

Next, each criterion in the above formula was given a mathematical value based on its effect with relation to the development of a boat access.

The formula will have a maximum value and minimum value. For example, the range could be -40 and 170, which may be further divided into seven equal value ranges, e.g. -40 to -10, -10 to 20, 20 to 50, 50 to 80, 80 to 110, 110 to 140, 140 to 170.

On the map printed by the computer, the highest value cells are depicted in light tones and the lower value cells in dark tones. From these composite maps, with their varying gray tones, the best location for the recreational facility in the management unit can be determined in relation to the total area.

Analysis

After composite maps of the study were completed, a preliminary plan was designed and taken into the field to be examined for further changes and adjustments. After each division of the Department of Natural Resources completed this procedure, they met to review their preliminary management plans, adjusting and compromising until each plan coincided with the goals of all concerned.

BOAT ACCESS CRITERION RATINGS

Soils

Rating	Type
- 5	14
- 5	14T
5	20
3	20C
-10	22
5	104BC
5	104BE
- 2	124
2	125
5	133BC
7	154BC
7	154DE
9	155
8	155BC
10	156
9	156BC
9	156 DE
7	164
0	166
2	166BC
2	186
10	188
10	188BC
10	188DE
- 5	267W
10	352
10	352BC
4	R
-10	P
-10	
- 5	

Water Table

Rating	Depth
- 5	0- 1'
2	1- 4'
10	5-10'
10	10'+

Permeability

Rating	Depth less than 18"	Depth greater than 18"
1	0.6-2.0	0.2-0.6
2	0.6-2.0	0.6-2.0
4	"	6-20
5	"	20+
3	6-20	2.0-6.0
6	6-20	6-20
7	6-20	20+

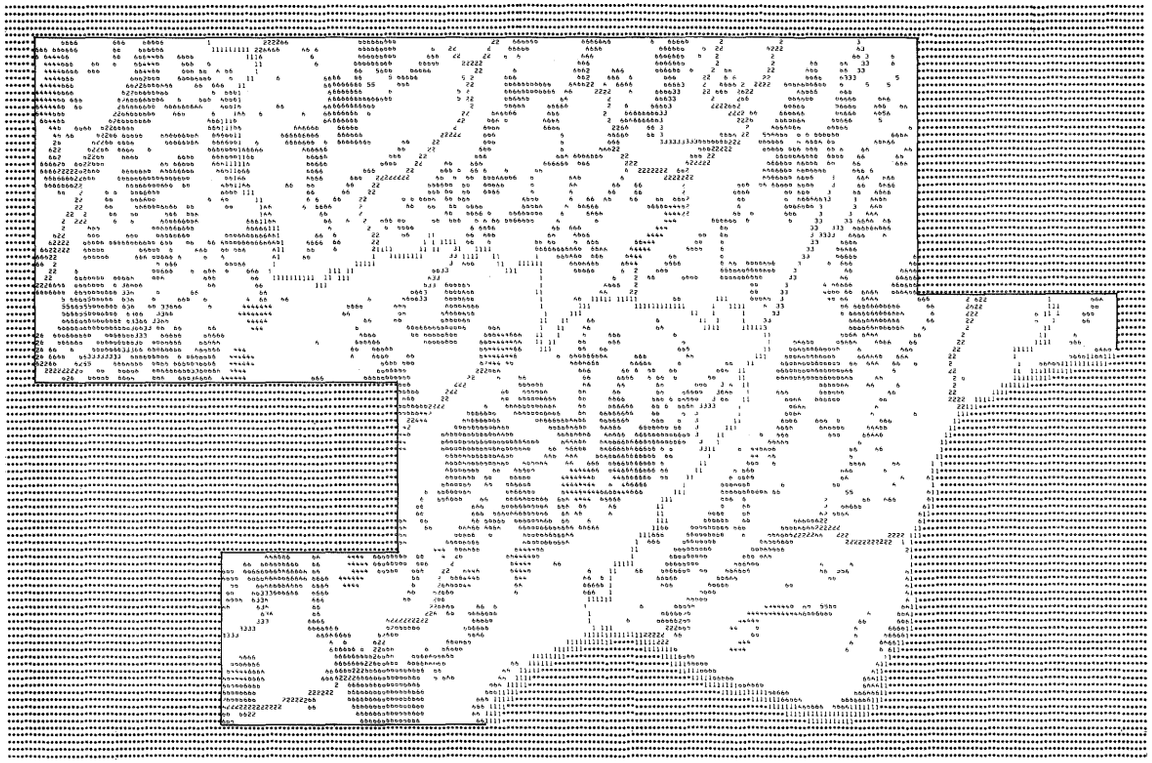
Then, if for one cell:

Soil-type 125	Mathematical value 2
Water table-range 10'	Mathematical value 10
Permeability-range 6-20' 2.0-6.0	Mathematical value 3

Formula:

Boat Access = 4(2) + 2(10) + 2(3)
= 8 + 20 + 6
= 34 - This cell would fall into the 20 to 50 gray tone range explained at left.

Surficial Hydrology



St. Croix State Forest

SURFICIAL HYDROLOGY

Legend		No. of acres	% Within Area
1.	River	1,689	3.79
2.	Permanent Stream	1,160	2.60
3.	Intermittent Stream	415	.93
4.	Lake	803	1.80
5.	Pond	199	.19
6.	Marsh	11,973	26.87
7.	Blank Areas (dry land)	28,435	63.82

Surficial hydrology is the study of intermittent and permanent bodies of water such as streams, lakes, ponds, marshes and artificial impoundments. The computer printouts define each type of hydrologic encountered in the study units by number. In this study, any standing body of water over five acres in size is considered a lake. If five acres or less, it is considered a pond. The delineation of marshes and streams was obtained from aerial photographs and USGS topographic quadrangle maps.

Surface water is the basis for all water-oriented recreation within the area. It also provides valuable fish and wildlife habitat and provides a water environment for a variety of other purposes, i.e. drinking water, etc.

Many individuals tend to concern themselves with lakes, streams, or bodies of water in which they can fish, boat and swim. However, ponds, smaller brooks and marshes are valuable in their contributions to the total hydrologic system. They may provide fish spawning and rearing areas, waterfowl nesting and feeding sites, and good habitat for many birds and animals. Marshes and small ponds are necessary for recharge to underground waterbearing strata, retention of flood water to prevent river overflow downstream, surface storage for general public water supply purposes, and entrapment and retention of nutrients and material that would impair other water resources of the area.

All aspects considered above relate to surficial hydrology and are of major importance in the development of a total management concept.

St. Croix State Park

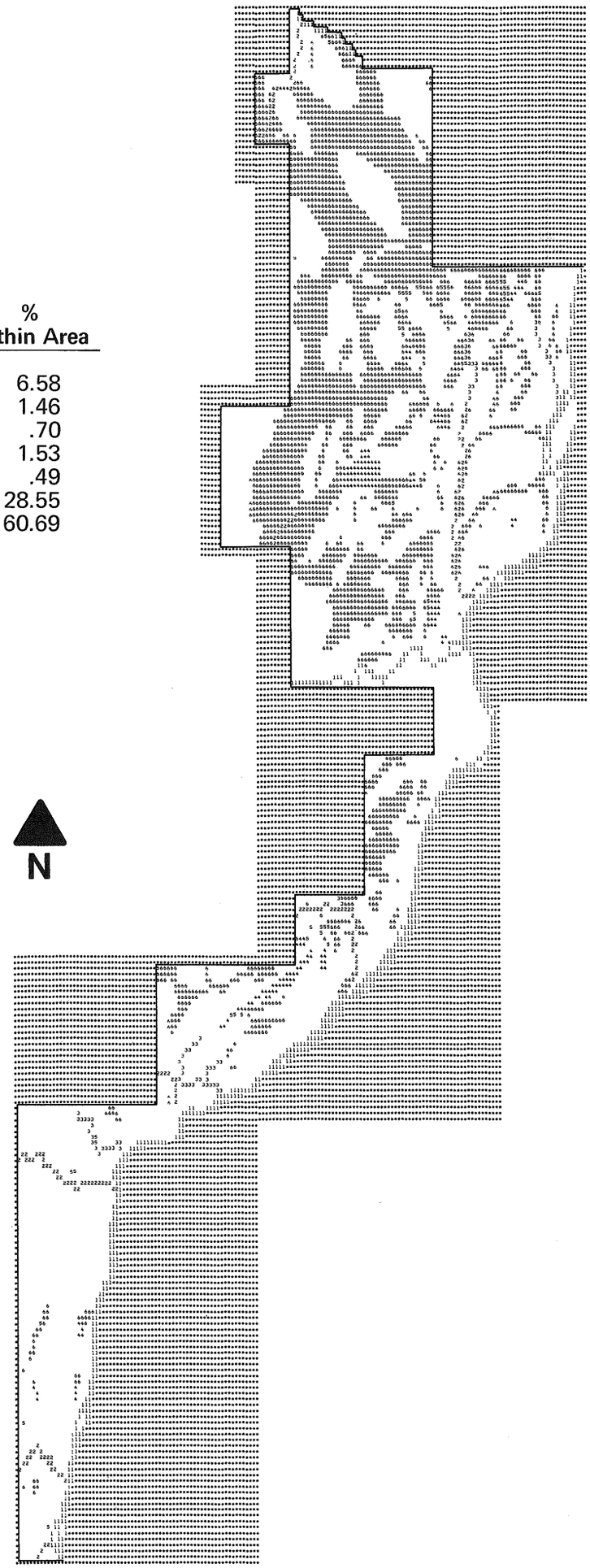
SURFICIAL HYDROLOGY

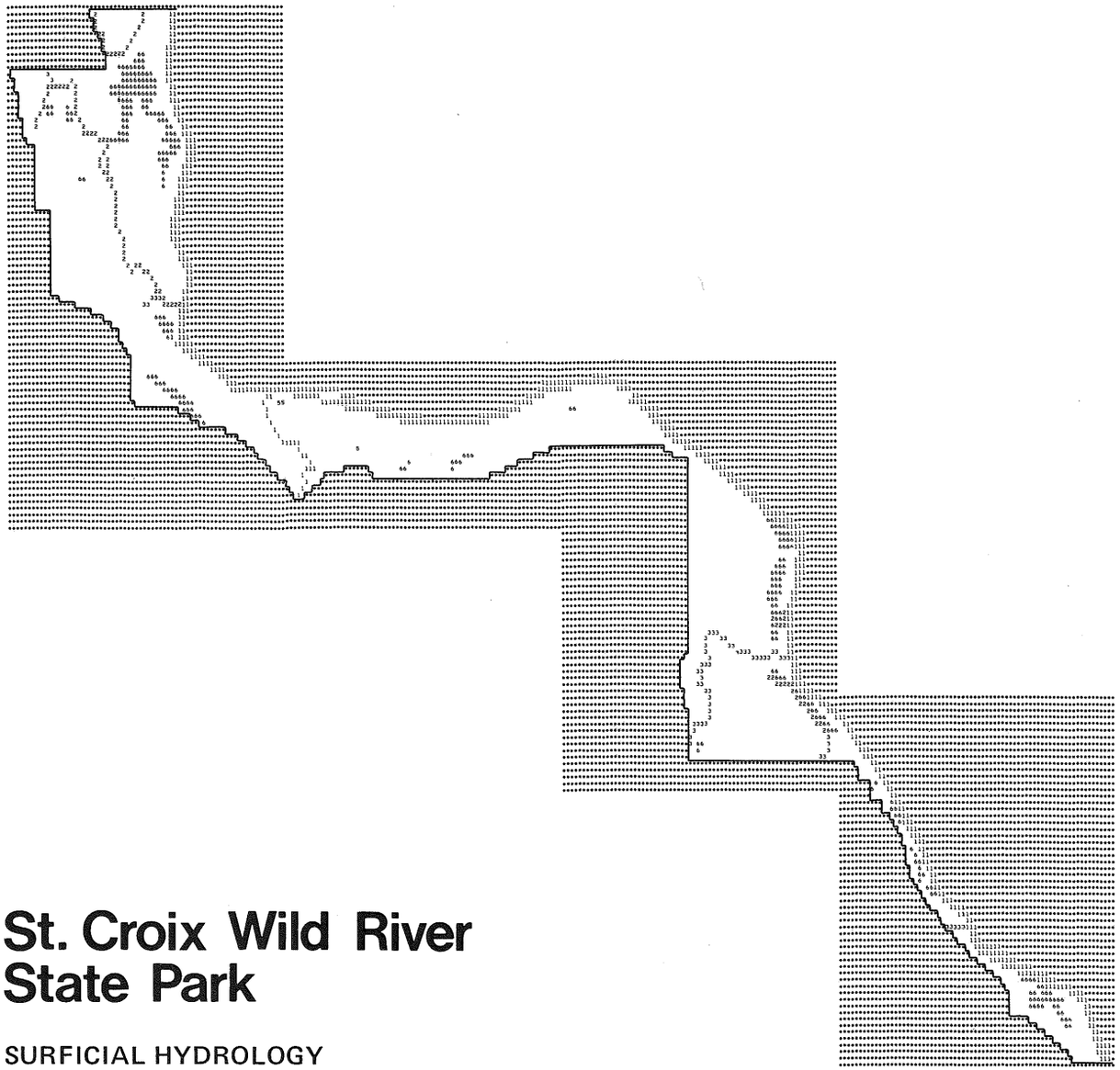
	Legend	No. of acres	% Within Area
1.	River	2,458	6.32
2.	Permanent Stream	1,157	2.98
3.	Intermittent Stream	85	.22
4.	Lake	130	.34
5.	Pond	34	.09
6.	Marsh	10,387	26.72
7.	Blank Areas (dry land)	24,620	63.34

Chengwatana State Forest

SURFICIAL HYDROLOGY

Legend	No. of acres	% Within Area
1. River	2,032	6.58
2. Permanent Stream	450	1.46
3. Intermittent Stream	215	.70
4. Lake	473	1.53
5. Pond	152	.49
6. Marsh	8,818	28.55
7. Blank Areas (dry land)	18,742	60.69



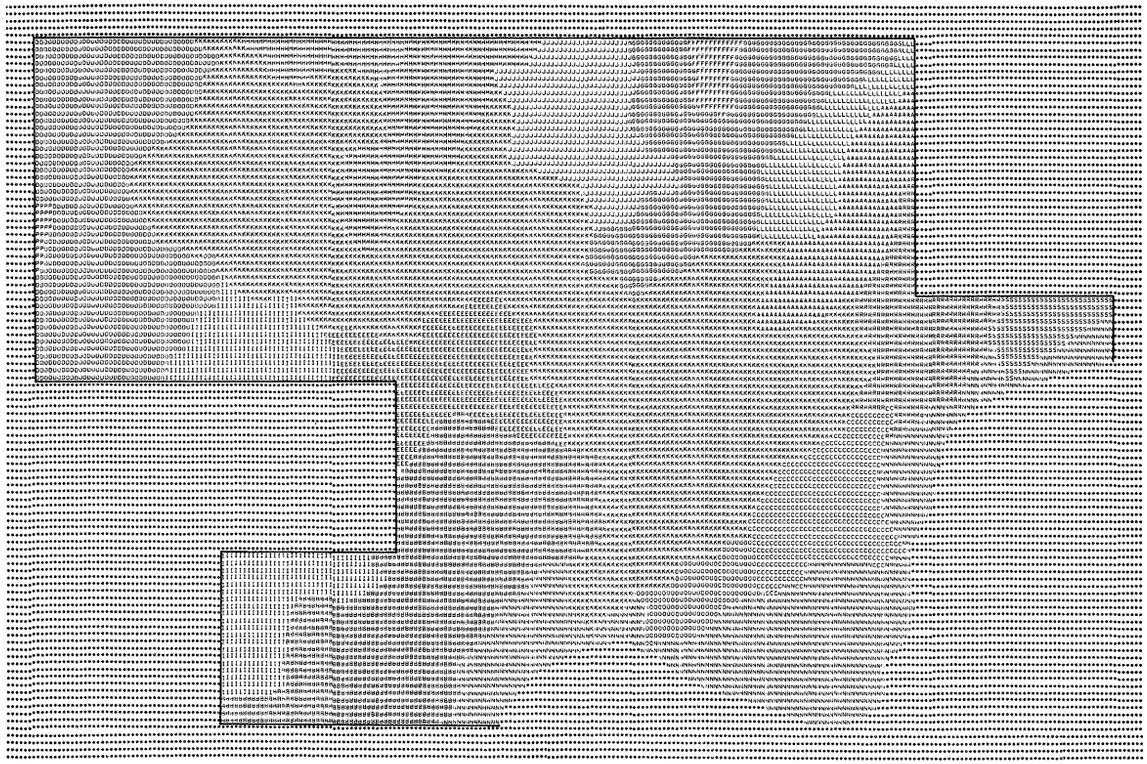


St. Croix Wild River State Park

SURFICIAL HYDROLOGY

Legend	No. of acres	% Within Area
1. River	1,756	13.63
2. Permanent Stream	279	2.17
3. Intermittent Stream	168	1.30
4. Lake	0	0
5. Pond	8	.06
6. Marsh	801	6.22
7. Blank Areas (dry land)	9,866	79.61

Watersheds



St. Croix State Forest

WATERSHEDS

A - Albrechts Cr.
B - Bangs Br.
C - Crystal Cr.
D - E. Fork Crooked Cr.
E - Graces Lake
F - Hanson Cr.
G - Hay Cr.
H - Keene Cr.
I - Kenney Br.
J - Langstrom Br.
K - L. Tamarack R.
L - Meeker Cr.
M - McDermott Cr.
N - St. Croix R.
O - Sangeta Cr.
P - Trout Br.
R - Thunder Cr.
S - U. Tamarack R.

A watershed is the total surface drainage area that contributes water to a river, stream, or lake. The St. Croix Management Plan watersheds were divided into four primary study units. These included St. Croix State Forest, St. Croix State Park, Chengwatana State Forest and St. Croix Wild River State Park.

Within each of these units a number of watersheds of two square miles or more were delineated. The boundary of each watershed is shown by numbers or letters for each study unit. The complete limits of major watersheds and of all sub-watersheds are not shown because in many instances they extend beyond the forest and park boundaries.

The physical characteristics of the watershed determine the surficial hydrology for the area. For example, pollution problems within a watershed will inevitably have some effect on the water into which the watershed drains. Flooding of rivers and streams, and lake level fluctuations are highly dependent on the character of the watershed.

The State is developing comprehensive water and land-related resource management plans. Existing water planning and management is generally limited to individual lakes or rivers. Shoreland regulations affect areas only within about 1/5 mile of a shoreline. However, the present somewhat piecemeal management will eventually result in total watershed management.

St. Croix State Park

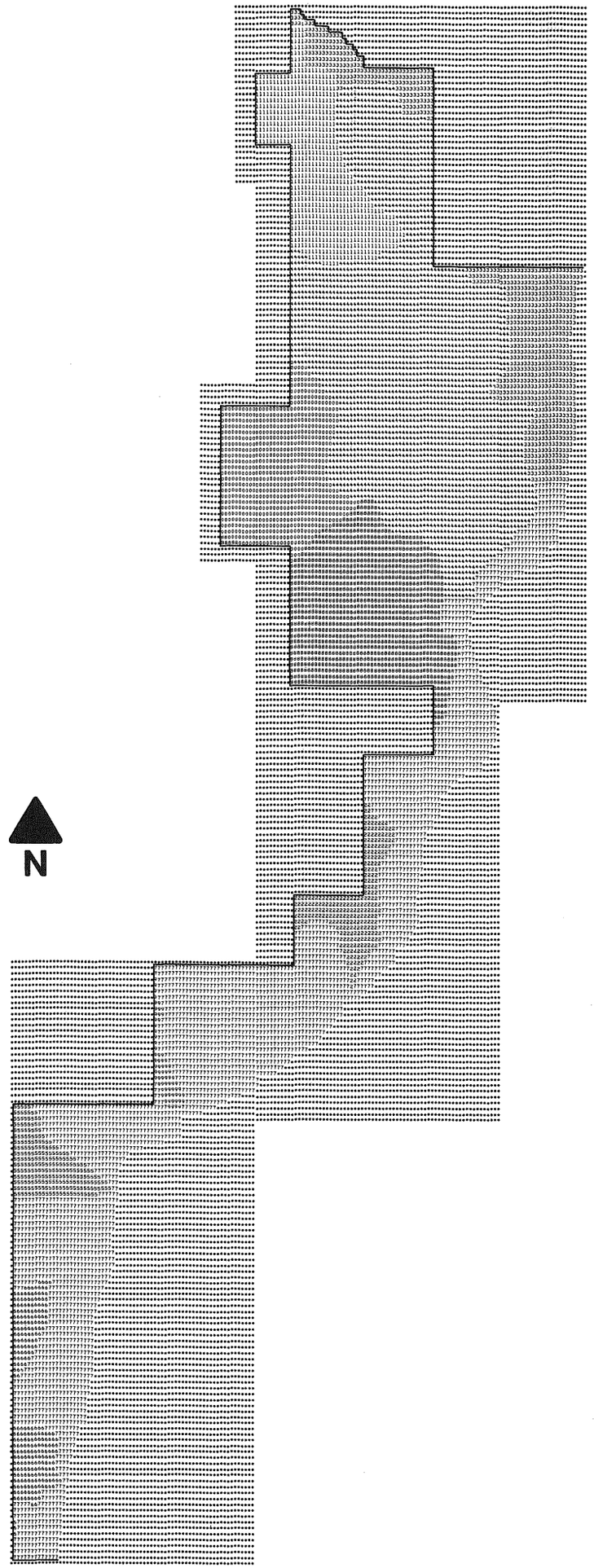
WATERSHEDS

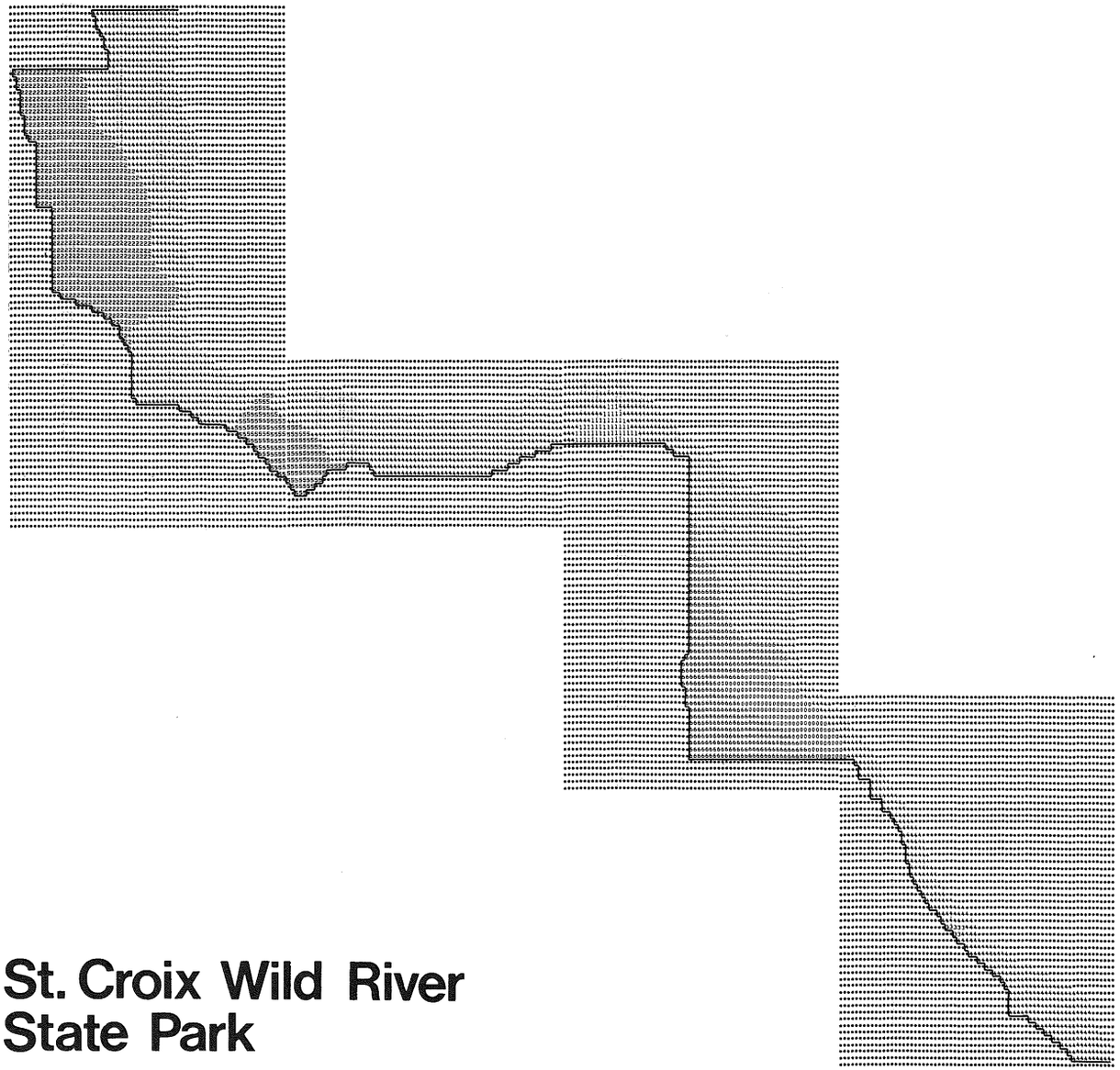
0 - Bangs Br.
1 - Bear Cr.
2 - Clover Cr.
3 - Crooked Cr.
4 - Kennedy Br.
5 - Kettle R.
6 - Lost Cr.
7 - St. Croix R.
8 - Sand Cr.
9 - Wilbur Br.

Chengwatana State Forest

WATERSHEDS

0 - Bass Cr.
1 - Cedar Cr.
2 - Drainage Cr.
3 - Kettle R.
4 - Red Horse Cr.
5 - Rock Cr.
6 - Rush Cr.
7 - St. Croix R.
8 - Snake R.
9 - Stevens Cr.

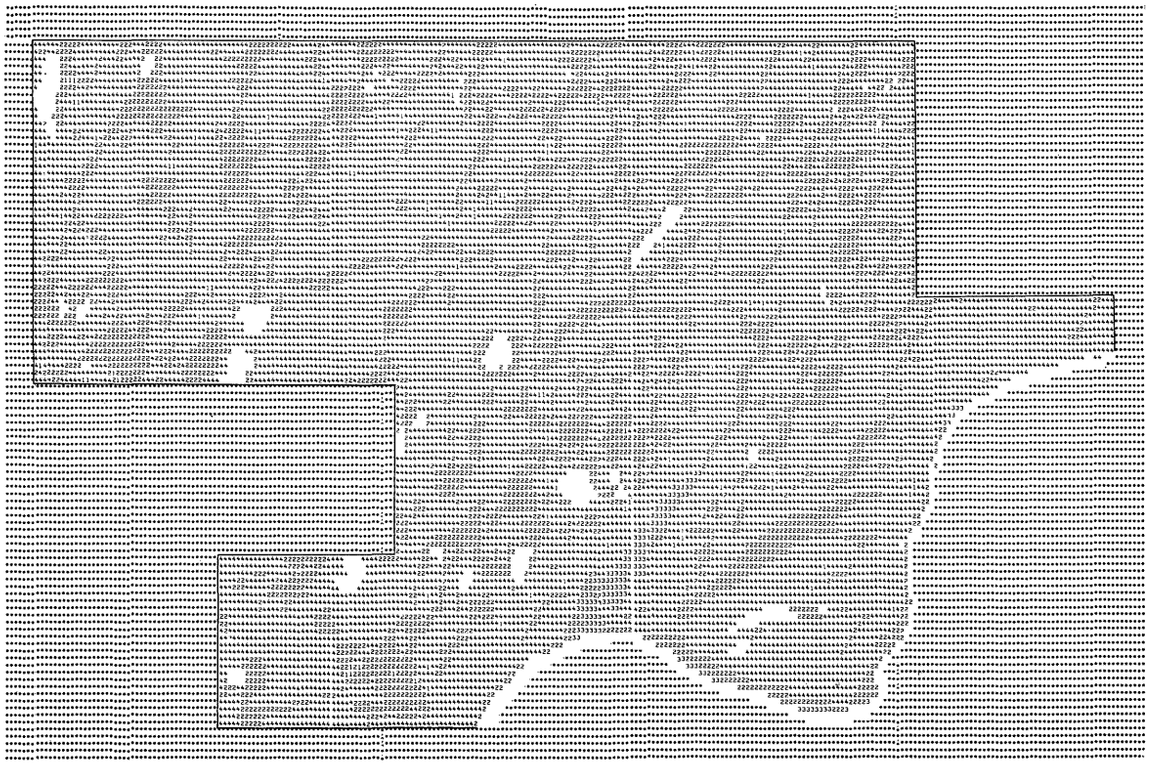




St. Croix Wild River State Park

WATERSHEDS

0 - Deer Cr.
1 - Dry. Cr.
2 - Goose Cr.
3 - Lower Dry Cr.
4 - St. Croix R.
5 - Sunrise R.
6 - Upper Dry Cr.



St. Croix State Forest

WATER TABLES

1 - 0-1'
2 - 1-4'
3 - 5-10'
4 - 10'
Blank Areas (water)

The Water Table Maps show the depth below the land surface at which soil formations are saturated with groundwater under normal atmospheric pressures.

Definition -- The water table represents the upper limit of the zone of saturation except where that surface is formed by an impermeable body.

Summary of Water Table - St. Croix State Forest

The soil formation predominating in St. Croix State Forest is red glacial till, 50-100 feet in depth, generally found above 1000 foot elevation. The best ground water potential for wells is in the glacial till because the underlying bedrock floor is composed of impervious Keweenawan lava rock. Lava rock generally has a low permeability and is considered to be a poor aquifer. Ground water is found in limited quantitities only along fracture zones within the rock. The higher landforms within this region are classified as terminal moraine (generally above elevation 1000-1040) and are constructed of a red sandy till.

Terminal moraine areas are expected to contain water tables greater than 10 feet below the land surface. Yields from wells are unpredictable because of complex deposition but usually for a domestic water supply 5-10gpm is adequate.

In ground moraine areas (elevation 1000-1040) water tables vary. In about 20 percent of the gound moraine area, water tables occur at depths greater than 10 feet below the surface, about 30 percent of the area may have water tables from 5-10 feet, 30 percent about 1-4 feet, and the remaining 20 percent from 0-1 foot.

St. Croix State Park

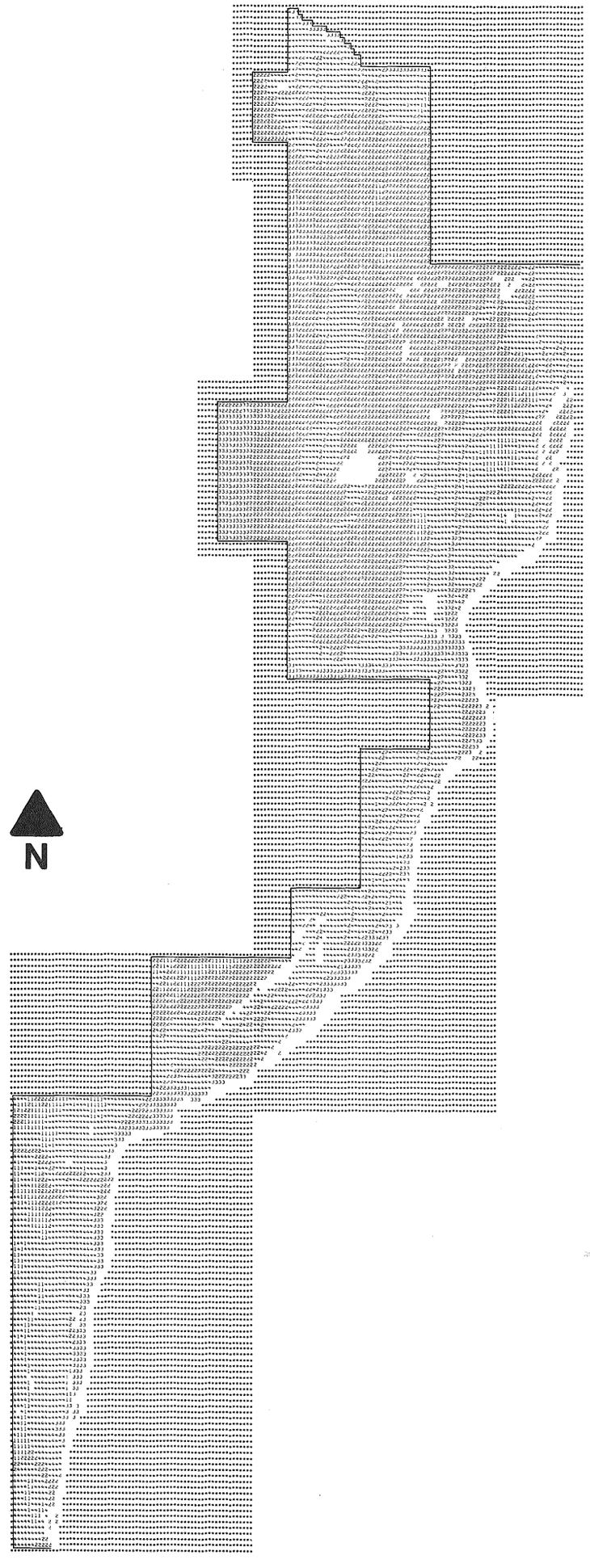
WATER TABLES

1 - 0-1′
2 - 1-4′
3 - 5-10′
4 - 10′
Blank Areas (water)

Chengwatana State Forest

WATER TABLES

1 - 0-1′
2 - 1-4′
3 - 5-10′
4 - 10′
Blank Areas (water)



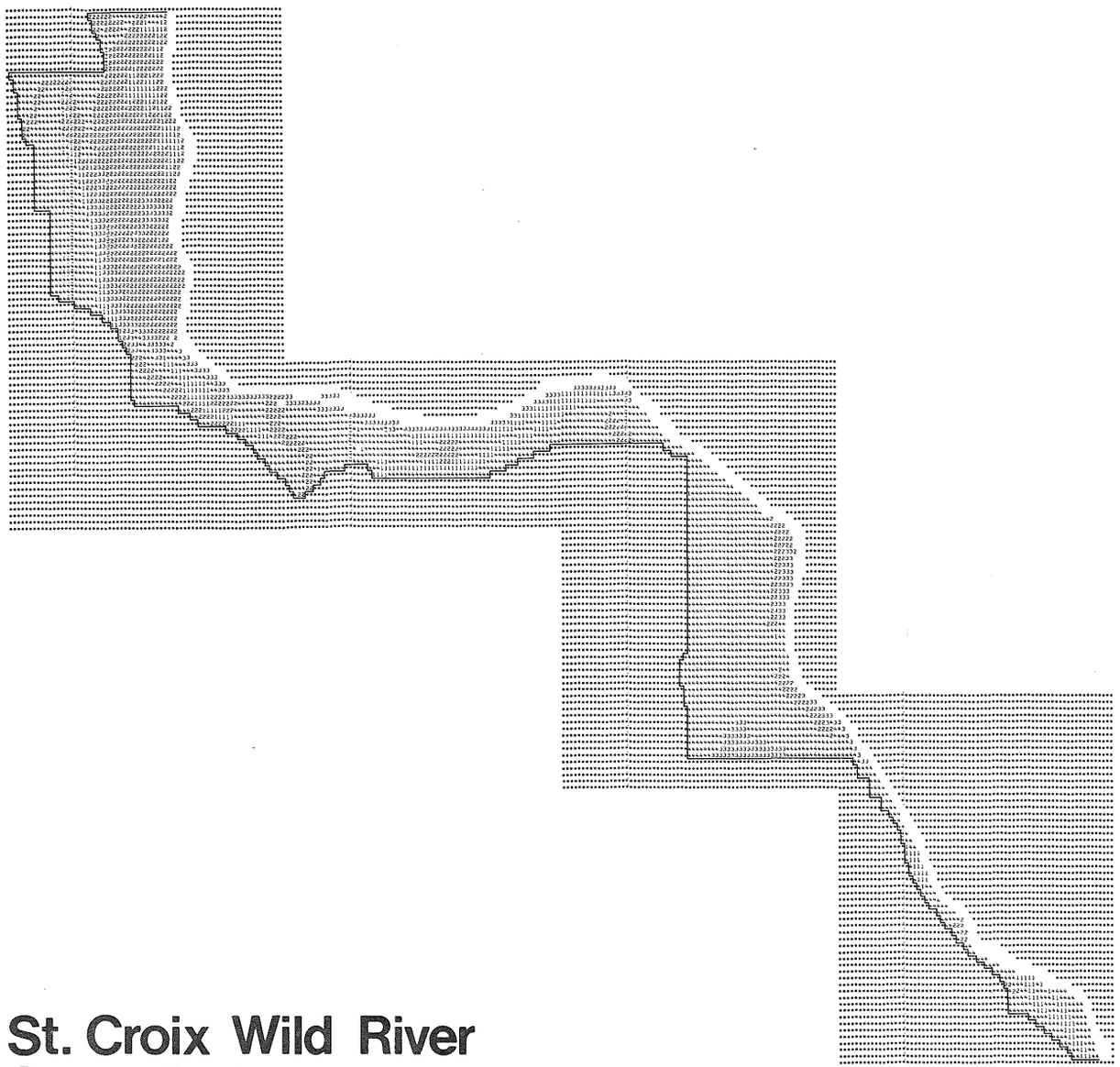
Summary of Water Table - St. Croix State Park

The combination of flat slopes and permeable granular soils found in St. Croix State Park are indicative of a glacial outwash deposit. Outwash deposits have an excellent potential for groundwater because of their long expanse of permeable granular soils, and ability to transmit large quantities of water to wells.

Logs of existing wells constructed in St. Croix State Park indicate the outwash range in the park is quite shallow, (between 20-50 feet in depth). Consequently, some marginal areas may have less than 10 feet of saturated thickness. Flat-lying, impervious lake sediments underlie much of the outwash. Springs are commonly found along the river valley where the river has eroded through the outwash gravels and exposed the contact zone between the outwash and the lake sediments.

Because the better aquifers for a water supply seem to be limited to the shallow outwash where the water table is close to the surface, the danger of pollution becomes a prime factor in selecting a site for wells used as a potable water supply. Therefore special precautions must be taken when planning the development in these areas.

Wells should not be constructed in locations that are subject to flooding, down-slope from sewage systems, or where the water table is less than 10 feet from the surface, unless special engineering precautions are applied to protect the aquifers from pollution.



St. Croix Wild River State Park

WATER TABLES

1 - 0-1′
2 - 1-4′
3 - 5-10′
4 - 10′
Blank Areas (water)

Summary of Water Tables - Chengwatana State Forest - St. Croix Wild River State Park

These two units retain the same terrain and groundwater hydrology, and thus can be considered synonymously.

The predominant topography consists of a series of old, braided, glacial stream channels filled with alluvium and capped with peat swamps. These channels were eroded by a large glacial stream carrying meltwater from the retreating glaciers in the Lake Superior Basin.

Uplands in this region represent old channel bars and streams terraces, and lowlands are the channels.

Roughly 60 percent of the Chengwatana-St. Croix Wild River Area consists of abandoned stream channels having a water table ranging from 0-4 feet. About 20 percent of the river corridor consists of upland (bars) of which one-half has a water table of 5-10 feet and the other half (10 percent) has a water table greater than 10 feet.

Drift wells used for a potable water supply should be located in areas where the water table is over 10 feet below the surface. Yields from 5-20 gpm can be expected.

Although the glacial channels may have an excellent ground water potential, the high water table (0-4 feet) may inhibit the use of these aquifers for a potable water supply because of pollution from flooding. The high water table conditions in the channels are favorable for creating open water areas for wildlife by means of excavation or explosives.

Keweenawan lava underlies the Chengwatana area and is considered to be a poor aquifer.

In Chisago County, the rock floor abruptly changes to sandstone formations which have an excellent ground water potential. These formations should be used for a potable water supply in this area because of the better quality of water and danger from pollution is diminished.

Because of these factors, cells designated as 1 and 3 on the map are poor locations for wells used for a potable water supply. They also represent either peat swamps, depressions in the outwash, or alluvial lands subject to flooding.

The bedrock underlying most of the park is believed to be Keweenawan lava flows, considered to be a poor aquifer. Finding an adequate water supply in this formation is unpredictable because ground water zones occur only along cracks and fractures within the rock. Several dry test holes have been drilled in the lava rock in the park.

Soils

St. Croix State Forest

The topography in St. Croix State Forest is primarily gently rolling to moderately rolling glacial features identified as ground moraine and terminal moraine.

Soils in this region are derived from a parent red drift deposited by a glacier that advanced from the Lake Superior region. The drift ranges between 50-100 feet in depth, and is underlain by impervious Keweenawan lava rock.

The terminal moraine area is characterized by steep slopes, well drained to poorly drained soils, surface boulders, complex deep soil formations, and frequent kettle holes. Water tables are usually over 10 feet from the surface.

Ground moraine areas have a more gently undulating surface, poor drainage, impervious soils (silts, clay-loam, sandy-loam etc.) and numerous small swamps. Water tables may frequently be 10 feet or less from the surface.

St. Croix State Park

The map indicates 31 types of soils in the park. Most of the park area is composed of granular soils that are well drained or excessively drained.

These soils are derived from glacial outwash deposits constructed of laminations of sand and gravel. Other moderately to poorly drained soils are concentrated in swales and depressions in the outwash which has slumped after deposition because of buried lenses of ice or irregularities in the underlying surface. Existing wells in the park indicate the outwash depth averages about 30 to 35 feet and probably does not exceed 50 feet. Impervious glacial lake sediments or red glacial till underlie the outwash and extend down 75 to 125 feet. The bedrock surface beneath the drift cover consists of impervious lava flows.

Because outwash deposits are highly permeable, cover large expanses, and are uniformly constructed, they are highly valued as a ground water resource and for building sites.

Permeability of the above-mentioned soils ranges from moderately rapid (2.0 to 6.3 inches per hour) to rapid (up to 20 inches per hour).

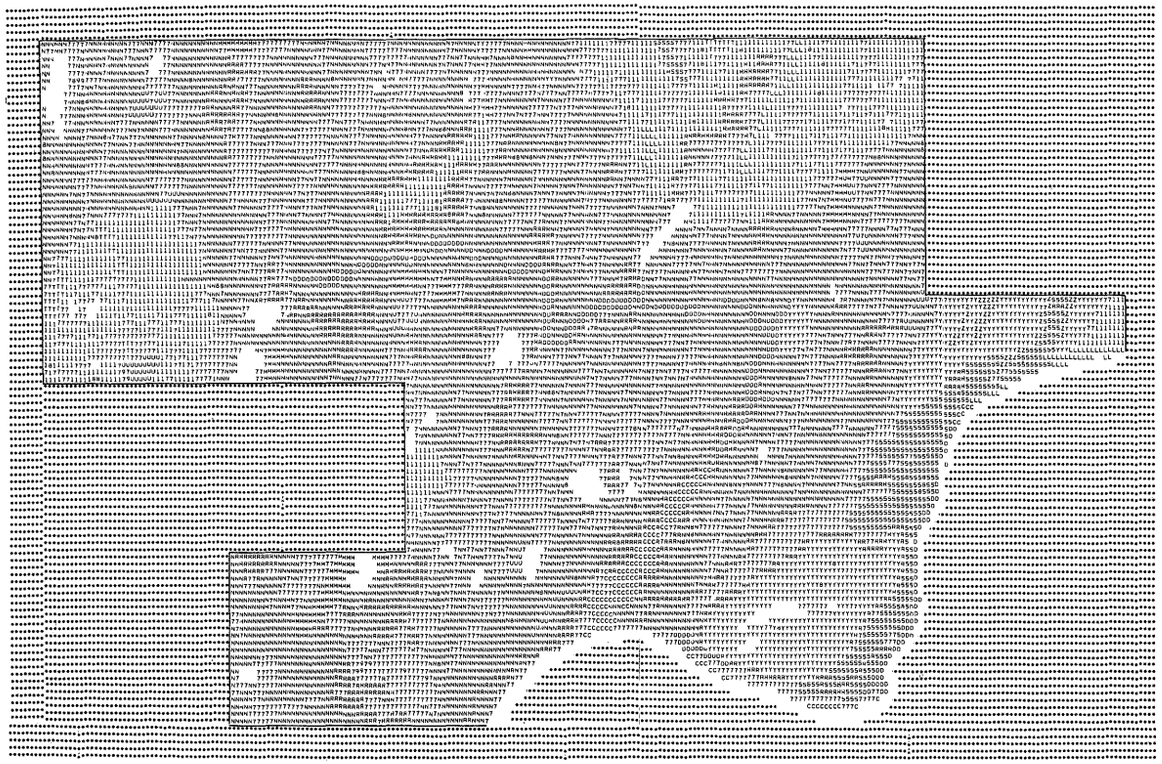
Soils map data is based on relatively shallow test holes (five feet); consequently, their value for interpreting deep soils formations is somewhat limited. However, when the patterns of glacial landforms are considered in conjunction with the test hole data, deep soils formations and approximate depth to bedrock can be generally indicated.

Detailed soil maps are valuable tools for planning reforestation, water resources development, constructing roads, trails, campgrounds, and other recreational facilities. Each symbol is keyed to a soil and its specific physical, chemical, and hydrologic properties.

Chengwatana-St. Croix Wild River Units

These study units have similar soils and can be grouped together as one. The area consists predominantly of old, braided stream channels and their associated alluvial deposits. Generally, the uplands are composed of well-drained sandy soils derived from low stream terraces or stream deposits constructed of sand and gravel.

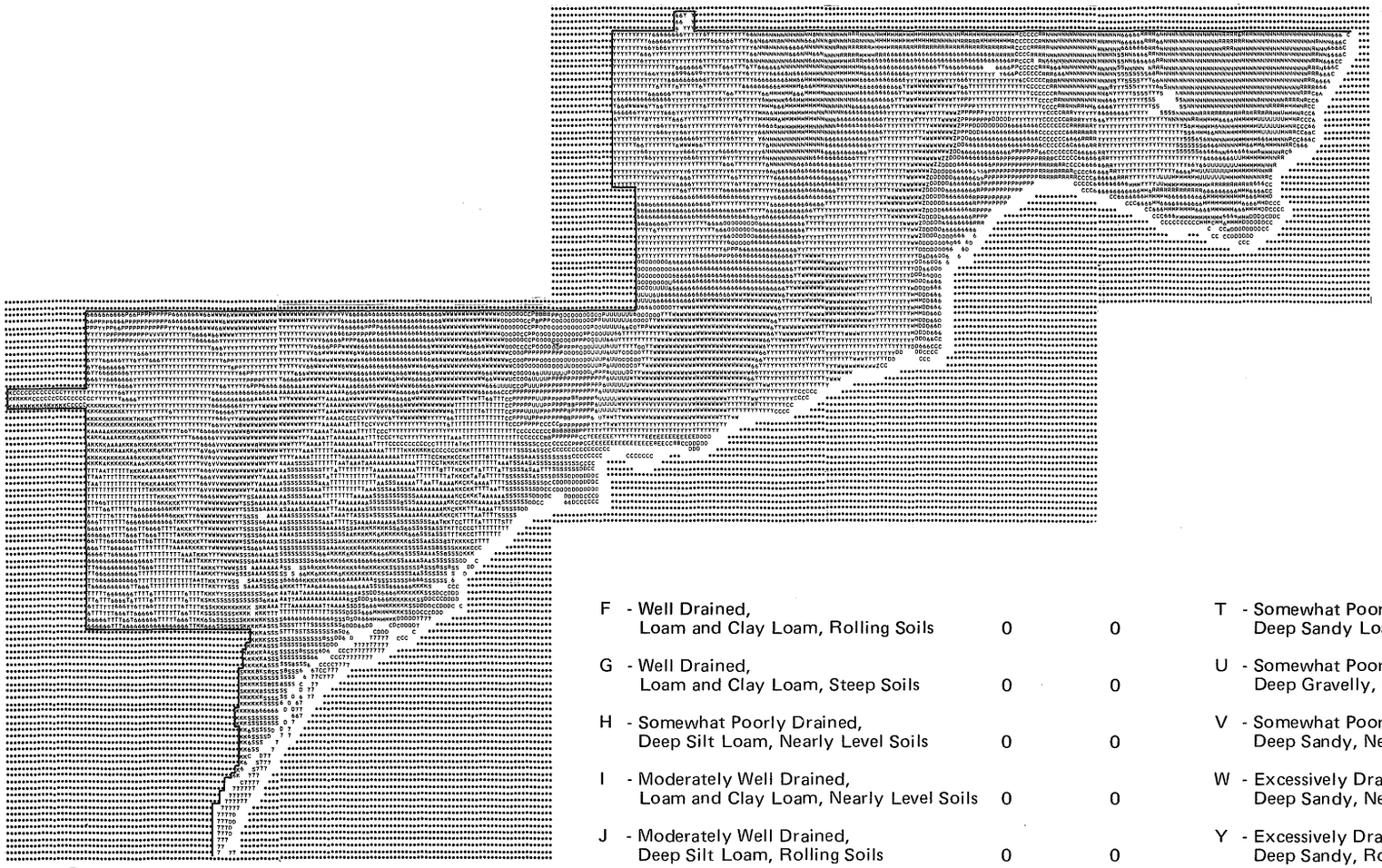
The wet lowlands represent the old glacial drainage channels. They are usually filled with bouldery gravel and capped by thin deposits of peat.



St. Croix State Forest

SOIL

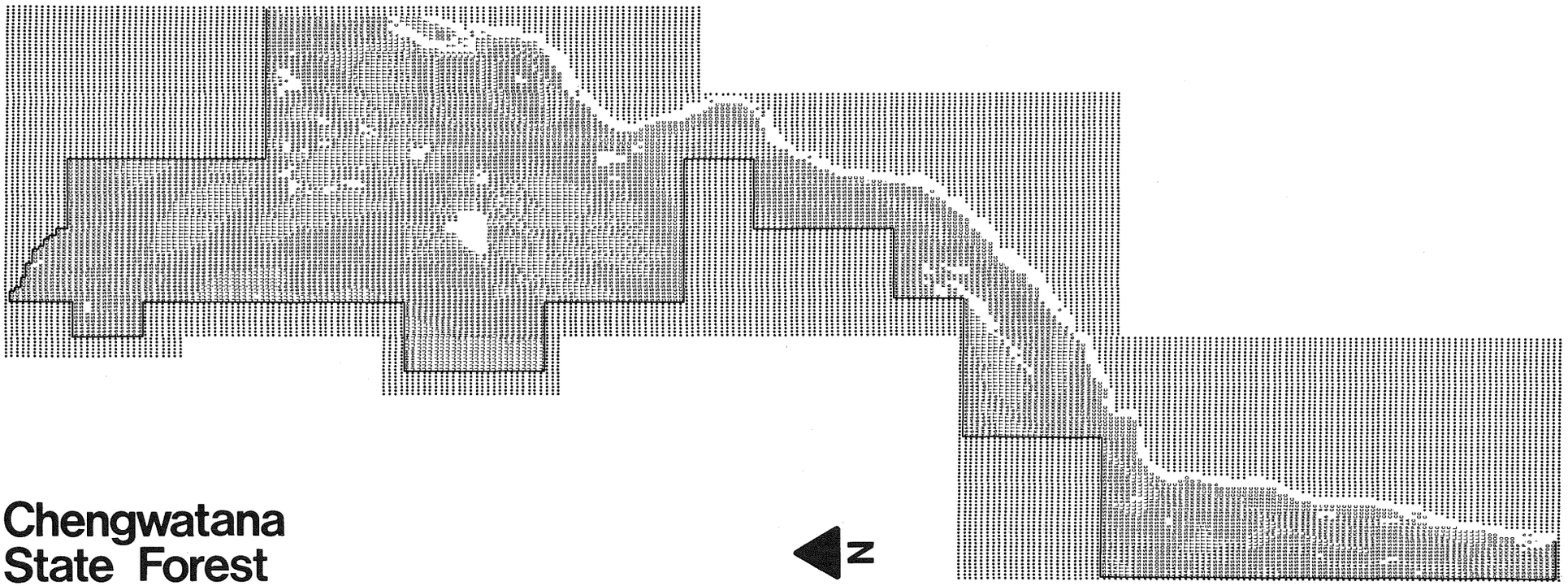
Legend	No. of acres	% Within Area
A - Poorly Drained, Deep Sandy Loam, Nearly Level Soils	0	0
B - Poorly Drained, Deep Gravelly, Nearly Level Soils	0	0
C - Alluvial Land, Occasionally Flooded	415	.80
D - Alluvial Land, Frequently Flooded	864	1.68
E - Seepage Land, Nearly Level to Steep	0	0
F - Well Drained, Loam and Clay Loam, Rolling Soils	0	0
G - Well Drained, Loam and Clay Loam, Steep Soils	0	0
H - Somewhat Poorly Drained, Deep Silt Loam, Nearly Level Soils	0	0
I - Moderately Well Drained, Loam and Clay Loam, Nearly Level Soils	0	0
J - Moderately Well Drained, Deep Silt Loam, Rolling Soils	0	0
K - Well Drained, Deep Sandy Loam, Rolling Soils	4330	8.40
L - Well Drained, Deep Sandy Loam, Steep Soils	250	.48
M - Well to Excessively Drained, Loamy over Gravel, Nearly Level Soils	548	1.06
N - Well to Excessively Drained, Loamy over Gravel, Rolling Soils	18,755	36.41
0 - Excessively Drained, Deep Gravelly, Nearly Level Soils	0	0
P - Excessively Drained, Deep Gravelly, Rolling Soils	0	0
R - Excessively Drained, Deep Gravelly, Steep Soils	3634	7.05
S - Moderately Well Drained, Deep Sandy Loam, Nearly Level Soils	48	.09
T - Somewhat Poorly Drained, Deep Sandy Loam, Nearly Level Soils	152	.29
U - Somewhat Poorly Drained, Deep Gravelly, Nearly Level Soils	324	.63
V - Somewhat Poorly Drained, Deep Sandy, Nearly Level Soils	0	0
W - Excessively Drained, Deep Sandy, Nearly Level Soils	0	0
Y - Excessively Drained, Deep Sandy, Rolling Soils	2213	4.29
2 - Excessively Drained, Deep Sandy, Steep Soils	138	.27
3 - Somewhat Poorly Drained, Deep Silty Clay Loam, Nearly Level Soils	0	0
4 - Excessive and Well Drained, Loamy over Gravel, Nearly Level Soils	0	0
5 - Excessive and Well Drained, Loamy over Gravel, Rolling Soils	1303	2.53
6 - Stony Land, Nearly Level to Rolling	0	0
7 - Peat, Nearly Level	9571	18.58
8 - Small Wet Area	285	.55
9 - Island in PeatBog	27	.05
Blank Areas (Water)	8658	16.80



St. Croix State Park

SOIL

Legend	No. of acres	% Within Area
A - Poorly Drained, Deep Sandy Loam, Nearly Level Soils	1604	4.18
B - Poorly Drained, Deep Gravelly, Nearly Level Soils	56	.14
C - Alluvial Land, Occasionally Flooded	1341	3.50
D - Alluvial Land, Frequently Flooded	822	2.14
E - Seepage Land, Nearly Level to Steep	98	.26
F - Well Drained, Loam and Clay Loam, Rolling Soils	0	0
G - Well Drained, Loam and Clay Loam, Steep Soils	0	0
H - Somewhat Poorly Drained, Deep Silt Loam, Nearly Level Soils	0	0
I - Moderately Well Drained, Loam and Clay Loam, Nearly Level Soils	0	0
J - Moderately Well Drained, Deep Silt Loam, Rolling Soils	0	0
K - Well Drained, Deep Sandy Loam, Rolling Soils	1522	3.97
L - Well Drained, Deep Sandy Loam, Steep Soils	0	0
M - Well to Excessively Drained, Loamy over Gravel, Nearly Level Soils	1109	2.89
N - Well to Excessively Drained, Loamy over Gravel, Rolling Soils	2407	6.28
O - Excessively Drained, Deep Gravelly, Nearly Level Soils	753	1.96
P - Excessively Drained, Deep Gravelly, Rolling Soils	1144	2.98
R - Excessively Drained, Deep Gravelly, Steep Soils	809	2.11
S - Moderately Well Drained, Deep Sandy Loam, Nearly Level Soils	1867	4.87
T - Somewhat Poorly Drained, Deep Sandy Loam, Nearly Level Soils	1939	5.06
U - Somewhat Poorly Drained, Deep Gravelly, Nearly Level Soils	466	1.21
V - Somewhat Poorly Drained, Deep Sandy, Nearly Level Soils	426	1.11
W - Excessively Drained, Deep Sandy, Nearly Level Soils	4301	11.21
Y - Excessively Drained, Deep Sandy, Rolling Soils	7980	20.80
2 - Excessively Drained, Deep Sandy, Steep Soils	61	.16
3 - Somewhat Poorly Drained, Deep Silty Clay Loam, Nearly Level Soils	0	0
4 - Excessive and Well Drained, Loamy over Gravel, Nearly Level Soils	0	0
5 - Excessive and Well Drained, Loamy over Gravel, Rolling Soils	162	.42
6 - Stony Land, Nearly Level to Rolling	6823	17.79
7 - Peat, Nearly Level	330	.86
8 - Small Wet Area	96	.25
9 - Island in Peat Bog	13	.03
Blank Areas (water)	2226	5.80



Chengwatana State Forest

N

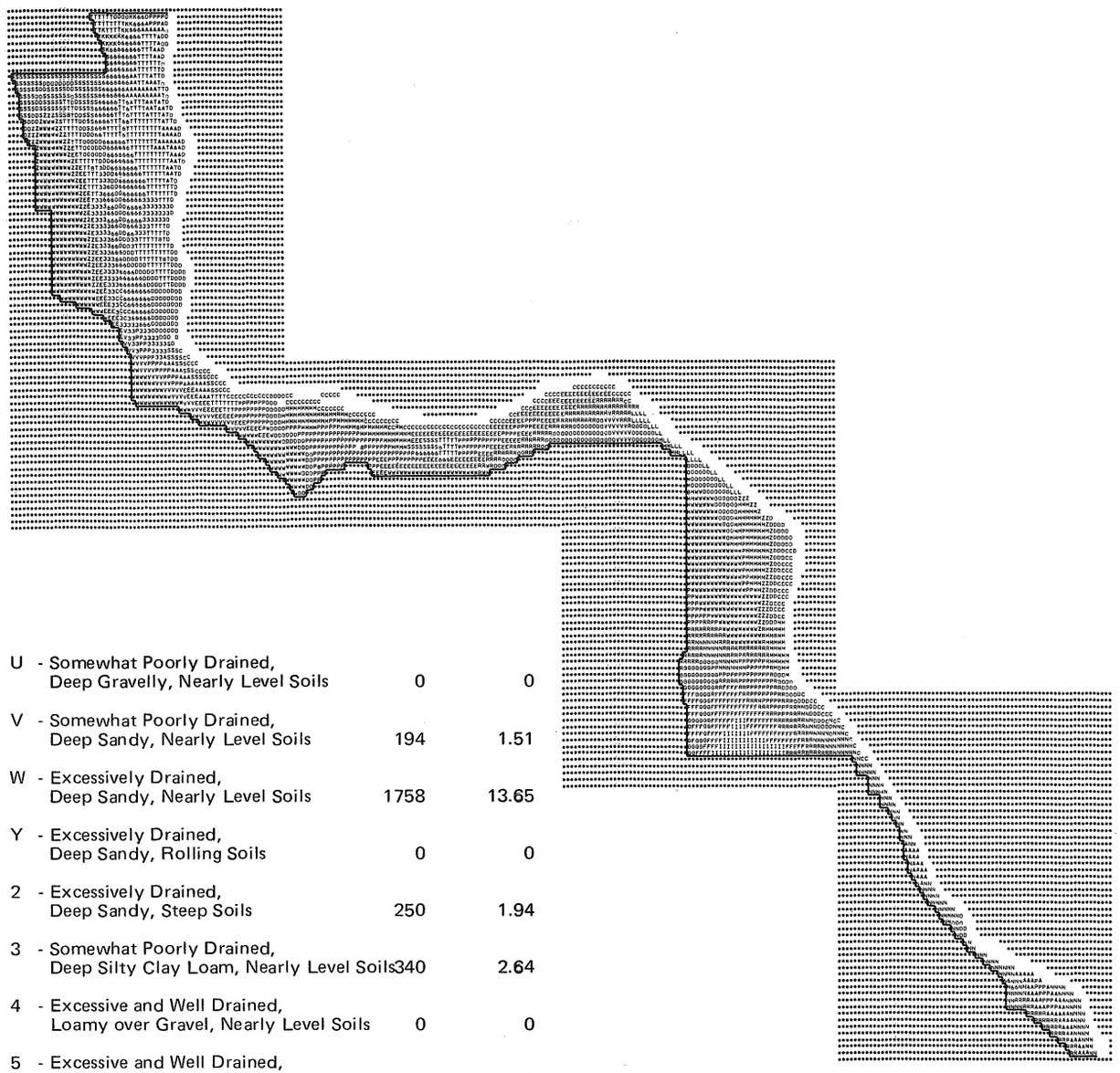
SOIL

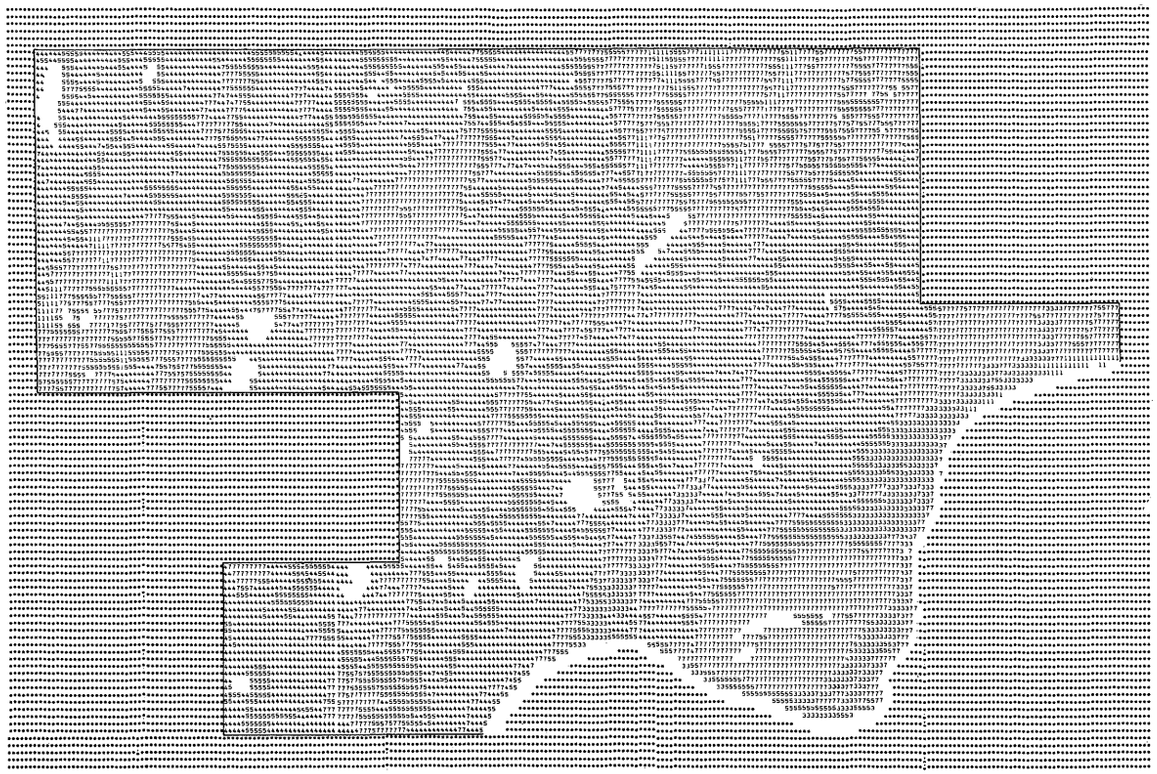
Legend	No. of Acres	% Within Area
A - Poorly Drained, Deep Sandy Loam, Nearly Level Soils	1083	3.50
B - Poorly Drained, Deep Gravelly, Nearly Level Soils	0	0
C - Alluvial Land, Occasionally Flooded	1372	4.44
D - Alluvial Land, Frequently Flooded	428	1.39
E - Seepage Land, Nearly Level to Steep	0	0
F - Well Drained, Loam and Clay Loam, Rolling Soils	0	0
G - Well Drained, Loam and Clay Loam, Steep Soils	0	0
H - Somewhat Poorly Drained, Deep Silt Loam, Nearly Level Soils	162	.52
I - Moderately Well Drained, Loam and Clay Loam, Nearly Level Soils	0	0
J - Moderately Well Drained, Deep Silt Loam, Rolling Soils	1098	3.56
K - Well Drained, Deep Sandy Loam, Rolling Soils	3059	9.90
L - Well Drained, Deep Sandy Loam, Steep Soils	769	2.49
M - Well to Excessively Drained, Loamy over Gravel, Nearly Level Soils	367	1.19
N - Well to Excessively Drained, Loamy over Gravel, Rolling Soils	68	.22
O - Excessively Drained, Deep Gravelly, Nearly Level Soils	98	.32
P - Excessively Drained, Deep Gravelly, Rolling Soils	218	.71
R - Excessively Drained, Deep Gravelly, Steep Soils	0	0
S - Moderately Well Drained, Deep Sandy Loam, Nearly Level Soils	5594	18.11
T - Somewhat Poorly Drained, Deep Sandy Loam, Nearly Level Soils	4751	15.38
U - Somewhat Poorly Drained, Deep Gravelly, Nearly Level Soils	0	0
V - Somewhat Poorly Drained, Deep Sandy, Nearly Level Soils	0	0
W - Excessively Drained, Deep Sandy, Nearly Level Soils	0	0
Y - Excessively Drained, Deep Sandy, Rolling Soils	0	0
2 - Excessively Drained, Deep Sandy, Steep Soils	82	.27
3 - Somewhat Poorly Drained, Deep Silty Clay Loam, Nearly Level Soils	0	0
4 - Excessive and Well Drained, Loamy over Gravel, Nearly Level Soils	753	2.44
5 - Excessive and Well Drained, Loamy over Gravel, Rolling Soils	684	2.21
6 - Stony Land, Nearly Level to Rolling	7629	24.70
7 - Peat, Nearly Level	231	.75
8 - Small Wet Area	74	.24
9 - Island in Peat Bog	0	0
Blank Areas (water)	2359	7.64

St. Croix Wild River State Park

SOIL

Legend	No. of Acres	% Within Area
A - Poorly Drained, Deep Sandy Loam, Nearly Level Soils	463	3.59
B - Poorly Drained, Deep Gravelly, Nearly Level Soils	0	0
C - Alluvial Land, Occasionally Flooded	500	3.88
D - Alluvial Land, Frequently Flooded	955	7.41
E - Seepage Land, Nearly Level to Steep	625	4.85
F - Well Drained, Loam and Clay Loam, Rolling Soils	356	2.77
G - Well Drained, Loam and Clay Loam, Steep Soils	194	1.51
H - Somewhat Poorly Drained, Deep Silt Loam, Nearly Level Soils	0	0
I - Moderately Well Drained, Loam and Clay Loam, Nearly Level Soils	162	1.26
J - Moderately Well Drained, Deep Silt Loam, Rolling Soils	0	0
K - Well Drained, Deep Sandy Loam, Rolling Soils	48	.37
L - Well Drained, Deep Sandy Loam, Steep Soils	101	.78
M - Well to Excessively Drained, Loamy over Gravel, Nearly Level Soils	564	4.38
N - Well to Excessively Drained, Loamy over Gravel, Rolling Soils	601	4.66
O - Excessively Drained, Deep Gravelly, Nearly Level Soils	383	2.97
P - Excessively Drained, Deep Gravelly, Rolling Soils	926	7.18
R - Excessively Drained, Deep Gravelly, Steep Soils	718	5.58
S - Moderately Well Drained, Deep Sandy Loam, Nearly Level Soils	412	3.20
T - Somewhat Poorly Drained, Deep Sandy Loam, Nearly Level Soils	859	6.67
U - Somewhat Poorly Drained, Deep Gravelly, Nearly Level Soils	0	0
V - Somewhat Poorly Drained, Deep Sandy, Nearly Level Soils	194	1.51
W - Excessively Drained, Deep Sandy, Nearly Level Soils	1758	13.65
Y - Excessively Drained, Deep Sandy, Rolling Soils	0	0
2 - Excessively Drained, Deep Sandy, Steep Soils	250	1.94
3 - Somewhat Poorly Drained, Deep Silty Clay Loam, Nearly Level Soils	340	2.64
4 - Excessive and Well Drained, Loamy over Gravel, Nearly Level Soils	0	0
5 - Excessive and Well Drained, Loamy over Gravel, Rolling Soils	0	0
6 - Stony Land, Nearly Level to Rolling	745	5.78
7 - Peat, Nearly Level	0	0
8 - Small Wet Area	24	.18
9 - Island in Peat Bog	0	0
Blank Areas (water)	1702	13.21





St. Croix State Forest

PERMEABILITY

Depth less than 18 inches	Depth greater than 18 inches
1. - 0.6 - 2.0 in./hr.	0.2 - 0.6 in./hr.
2. - 0.6 - 2.0 in./hr.	0.6 - 2.0 in./hr.
3. - 0.6 - 2.0 in./hr.	6 - 20 in./hr.
4. - 0.6 - 2.0 in./hr.	20 + in./hr.
5. - 6 - 20 in./hr.	2.0 - 6.0 in./hr.
6. 6 - 20 in./hr.	6 - 20 in./hr.
7. 6 - 20 in./hr.	20 + in./hr.

Blank Areas (water)

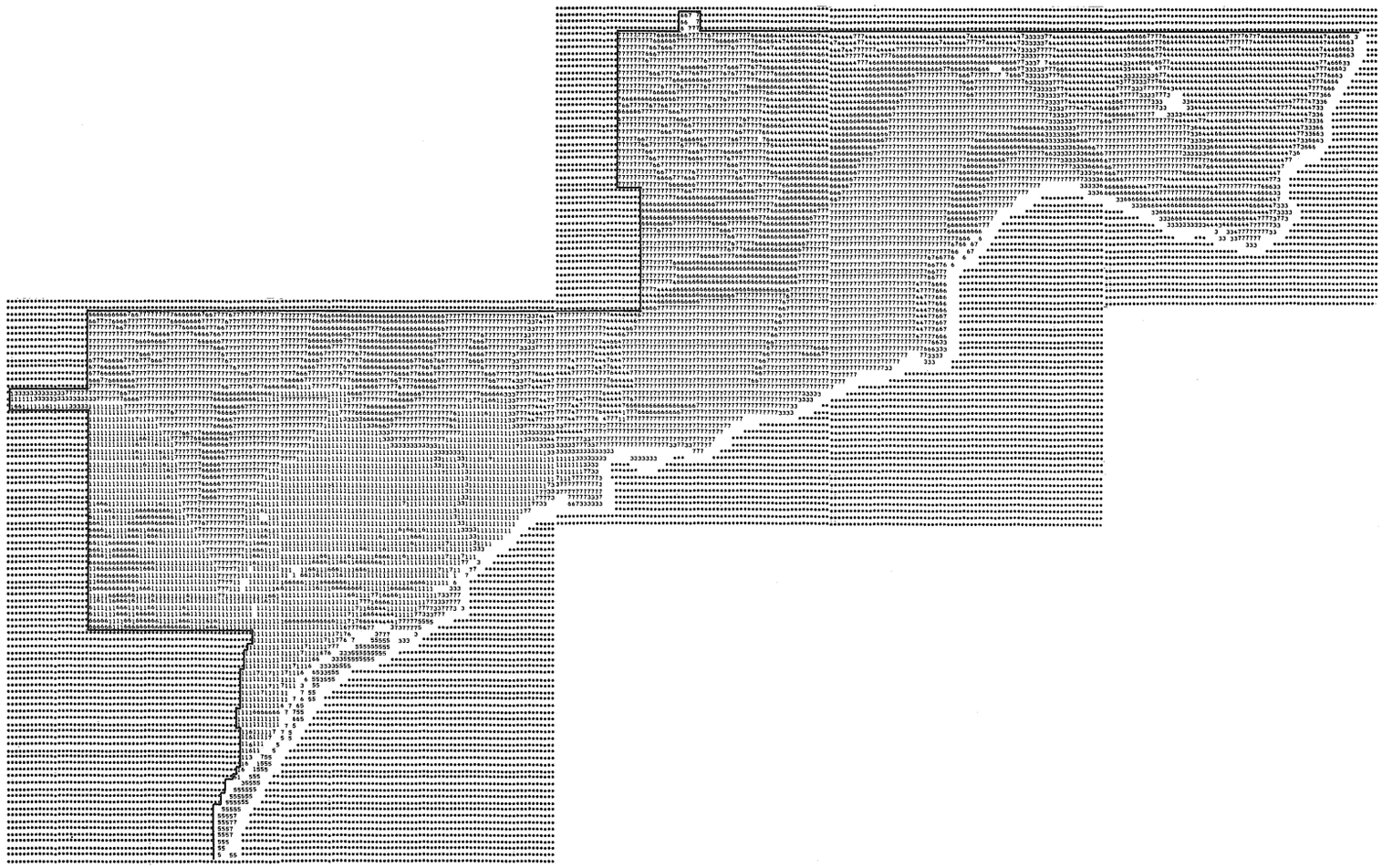
Permeability is the rate in inches per hour of water being absorbed into the soil.

Permeability is a key factor in determining and predicting surface drainage characteristics, run-off, compatible development and ground water potential. It is also essential for making engineering decisions in nearly all types of construction projects and pollution evaluations.

Soils having low permeability rates (symbol 1) are desirable locations for such projects as sewage lagoons, reservoirs and dikes.

Soils of moderate to moderately rapid permeability (symbol 2) are the best locations for sewage tanks and drain filter beds, while soils of rapid to very rapid permeability are good locations for buildings, roads, parking lots, trails, wells and athletic fields (symbol 3 & 4). Subsurface drainage is needed to prevent wetness or frost damage.

Special precautions should be taken to prevent pollution to ground water in areas having rapid to very rapid permeability (symbol 4) especially where the water table is 10 feet or less below the surface.



St. Croix State Park

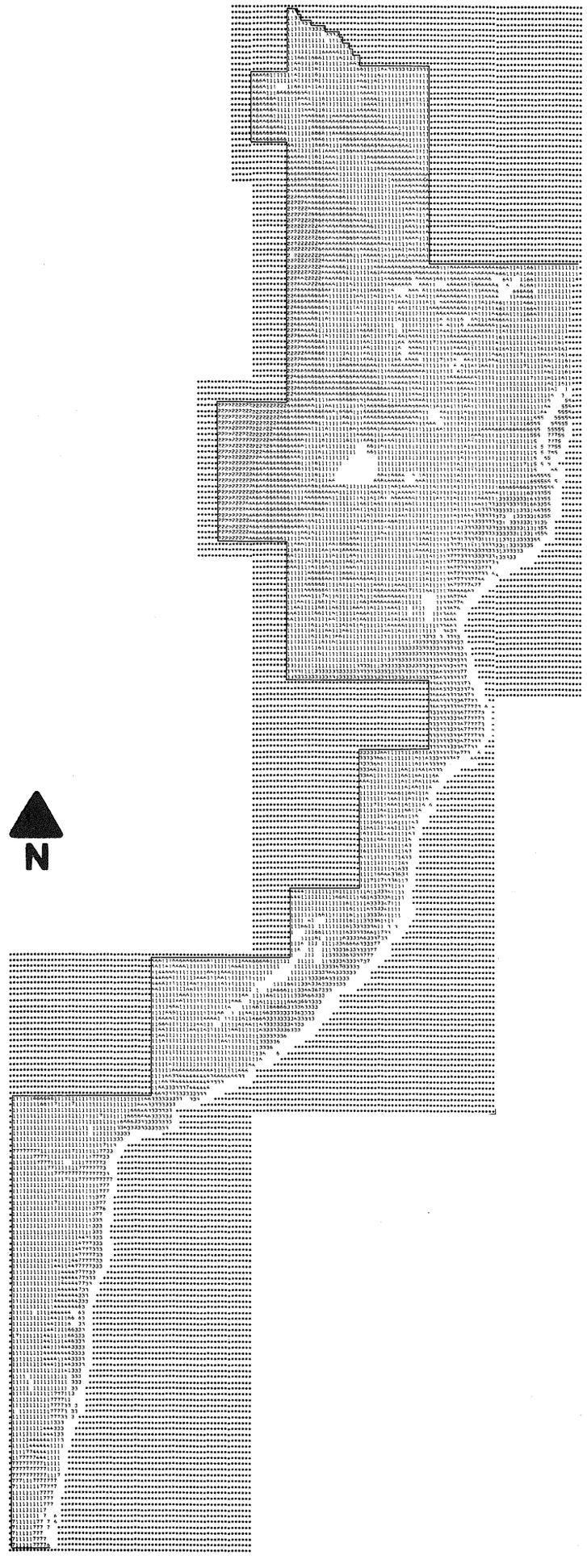
PERMEABILITY

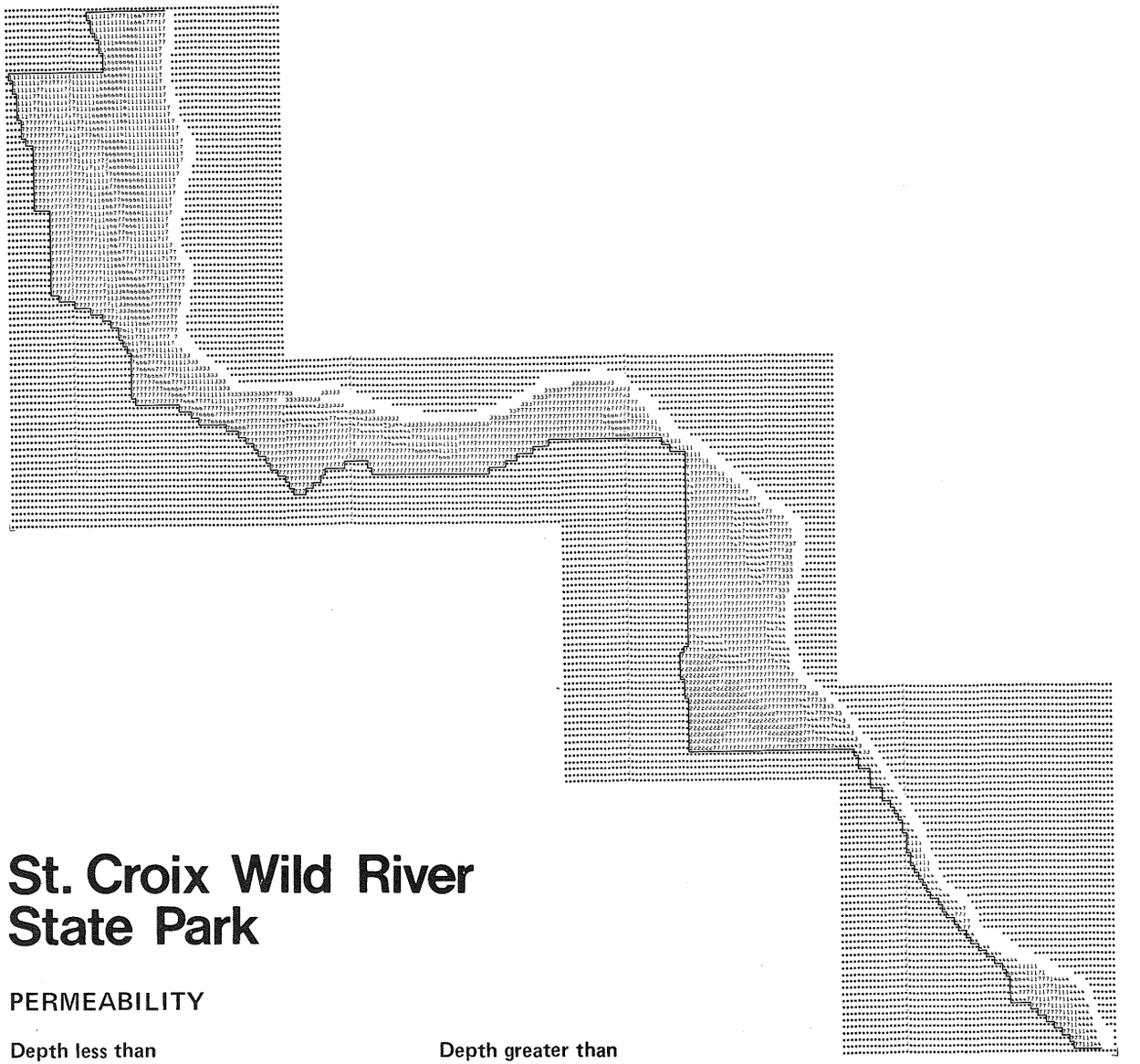
Depth less than 18 inches	Depth greater than 18 inches
1. - 0.6 - 2.0 in./hr.	0.2 - 0.6 in./hr.
2. - 0.6 - 2.0 in./hr.	0.6 - 2.0 in./hr.
3. - 0.6 - 2.0 in./hr.	6 - 20 in./hr.
4. - 0.6 - 2.0 in./hr.	20 + in./hr.
5. - 6 - 20 in./hr.	2.0 - 6.0 in./hr.
6. - 6 - 20 in./hr.	6 - 20 in./hr.
7. 6 - 20 in./hr.	20 + in./hr.
Blank Areas (water)	

Chengwatana State Forest

PERMEABILITY

Depth less than 18 inches	Depth greater than 18 inches
1. - 0.6 - 2.0 in./hr.	0.2 - 0.6 in./hr.
2. - 0.6 - 2.0 in./hr.	0.6 - 2.0 in./hr.
3. - 0.6 - 2.0 in./hr.	6 - 20 in./hr.
4. - 0.6 - 2.0 in./hr.	20 + in./hr.
5. - 6 - 20 in./hr.	2.0 - 6.0 in./hr.
6. - 6 - 20 in./hr.	6 - 20 in./hr.
7. 6 - 20 in./hr.	20 + in./hr.
Blank Areas (water)	

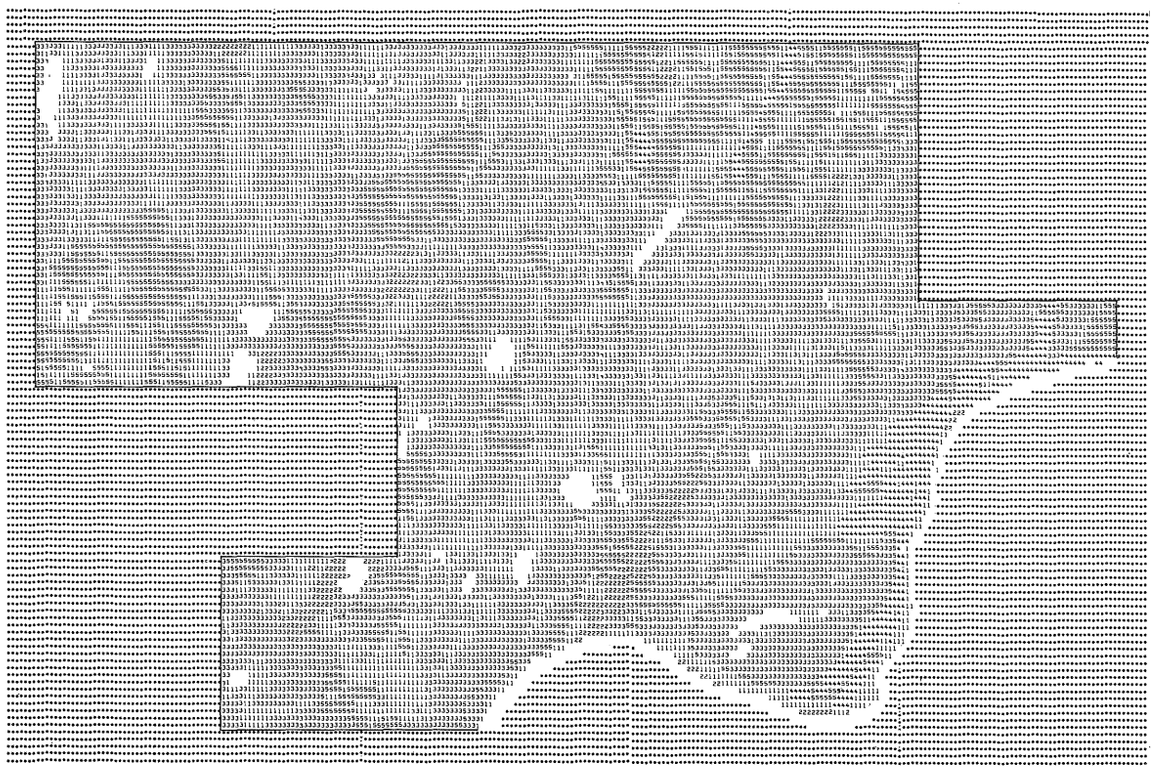




St. Croix Wild River State Park

PERMEABILITY

Depth less than 18 inches	Depth greater than 18 inches
1. - 0.6 - 2.0 in./hr.	0.2 - 0.6 in./hr.
2. - 0.6 - 2.0 in./hr.	0.6 - 2.0 in./hr.
3. - 0.6 - 2.0 in./hr.	6 - 20 in./hr.
4. - 0.6 - 2.0 in./hr.	20 + in./hr.
5. - 6 - 20 in./hr.	2.0 - 6.0 in./hr.
6. - 6 - 20 in./hr.	6 - 20 in./hr.
7. 6 - 20 in./hr.	20 + in./hr.
Blank Areas (water)	



St. Croix State Forest

SLOPE

1 - 0-2%
2 - 2-6%
3 - 6-12%
4 - 12-18%
5 - 18%
Blank Areas (water)

Slope is the configuration of the land surface expressed in a percentage range of fall per one hundred feet. For example, a two foot surface variation within one hundred feet, would constitute a 2 percent slope.

The map indicates most of the topography within the units is comparatively level, with slopes of 3 percent or less.

Gentle to undulating slopes of 5 percent are concentrated in areas of glacial moraine or valleys carved by meltwater channels; however, slopes over 18 percent are commonly found in the same area. Because of the size of the cells used in this study, it is difficult to identify slope in areas of terminal moraine where they may change abruptly within short distances.

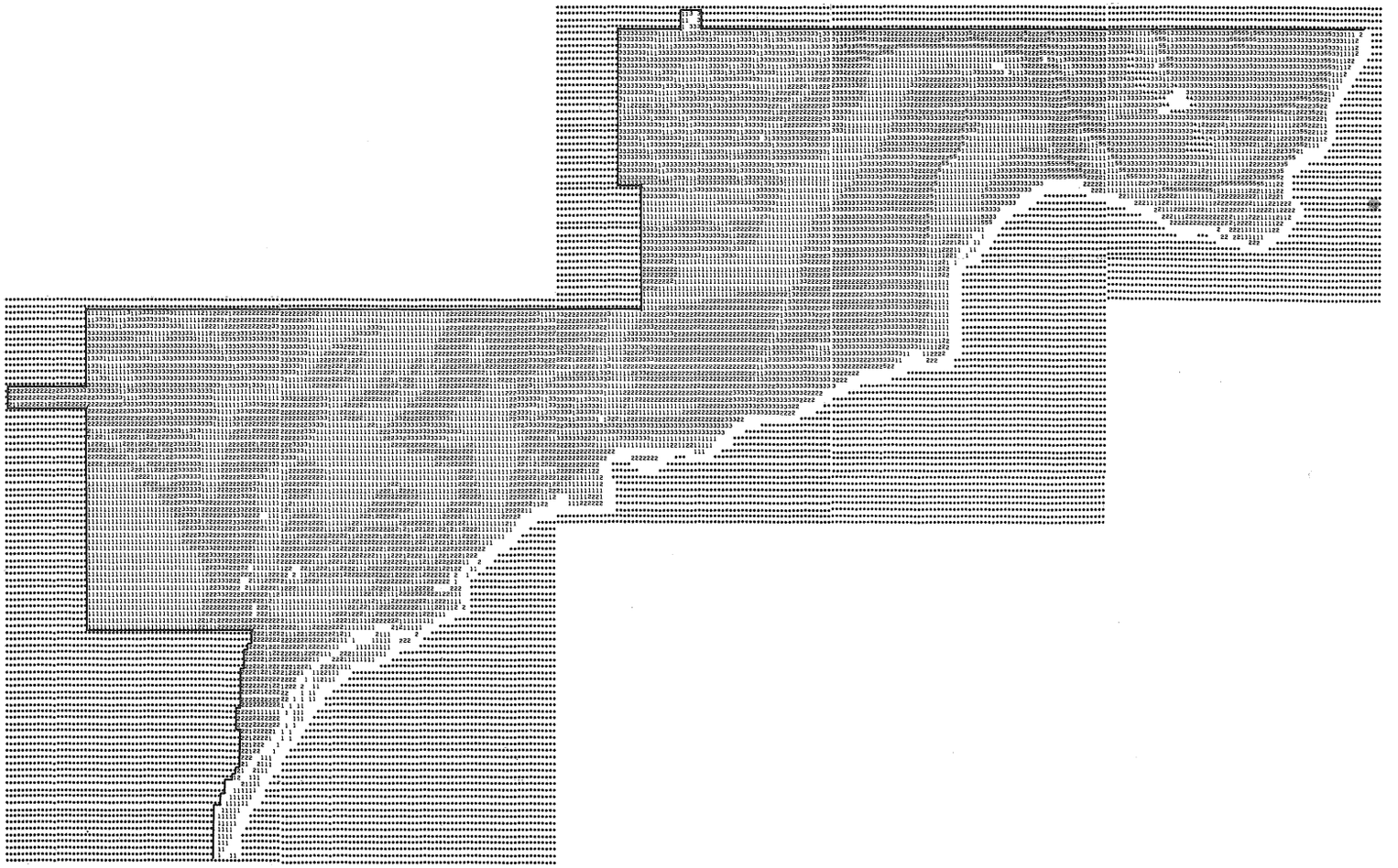
Surface runoff into stream drainages is related to slope and soils composition of landforms within the watershed.

Slope is a prime factor in locating sites for special recreational activities. Long, steep slopes over 24 percent are required for skiing and sledding. The slope of a river bed determines the location of waterfowls and rapids which are desirable for canoeing.

Slope is an important factor in the following types of construction:

1. **Sewage Lagoons** -- function best in nearly level soils that transmit water slowly.

2. **Septic Tank Filter Fields** -- should be located down slope from water wells. Slopes should



St. Croix State Park

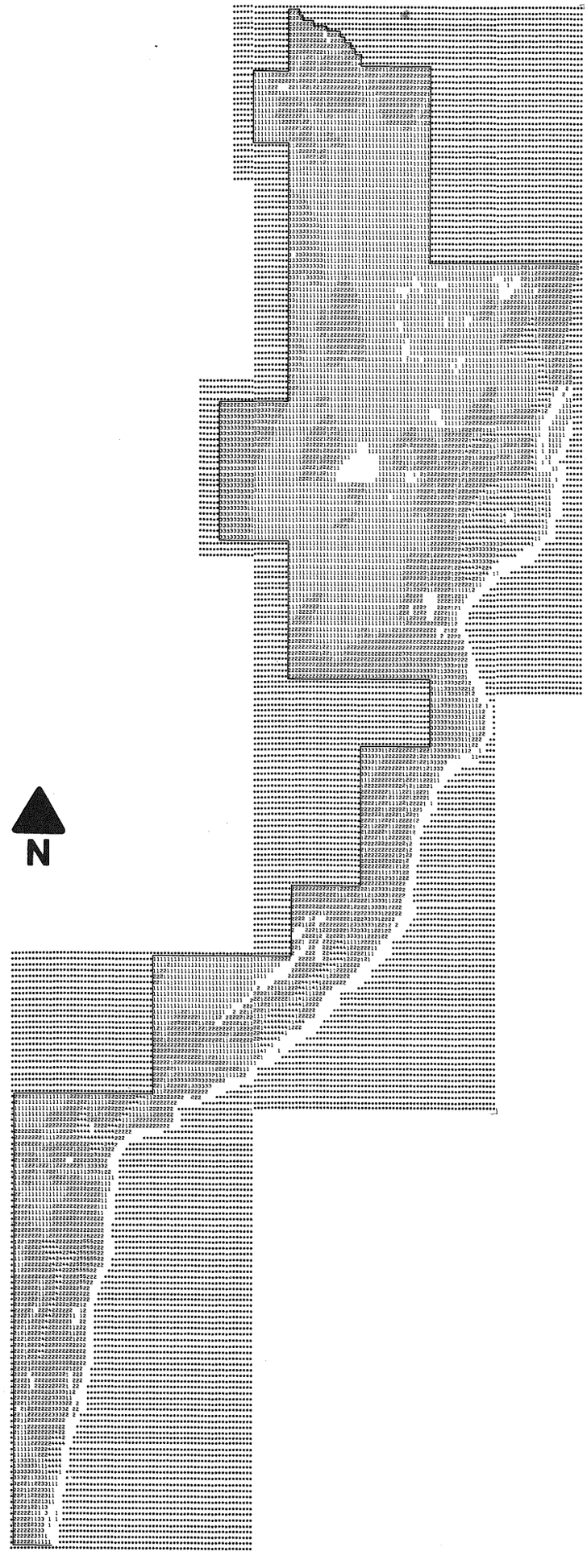
SLOPE

1 - 0-2%
2 - 2-6%
3 - 6-12%
4 - 12-18%
5 - 18%
Blank Areas (water)

Chengwatana State Forest

SLOPE

1 - 0-2%
2 - 2-6%
3 - 6-12%
4 - 12-18%
5 - 18%
Blank Areas (water)



not exceed 12 percent because effluent may flow to the surface at low points.

3. **Campgrounds and Parking Facilities** -- requires nearly level to gently sloping (0-6 percent slopes) terrain.

4. **Picnic Areas** -- require terrain ranging from nearly level slopes to rolling slopes (0-12 percent).

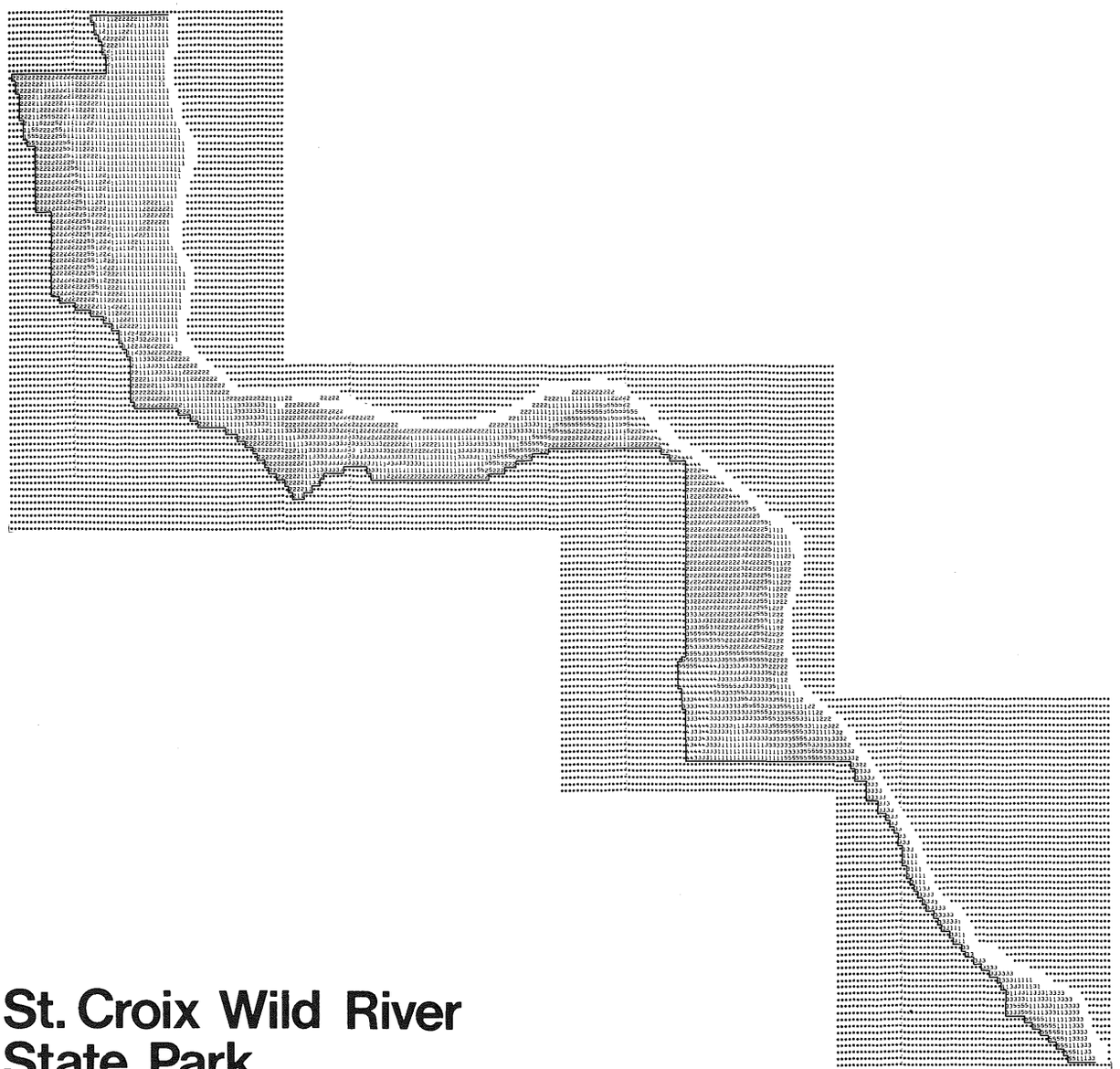
5. **Hiking Paths or Trails** -- may be constructed on slopes up to 15 percent.

6. **Snowmobile Trails** -- require a wide variety of slopes ranging from 1 to 24 percent.

7. **Roads** -- should be located on nearly level to rolling slopes (0-12 percent).

8. **Sanitary Landfills** -- slope should be under 6 percent.

9. **Building Sites** -- require nearly level terrain (0-6 percent).

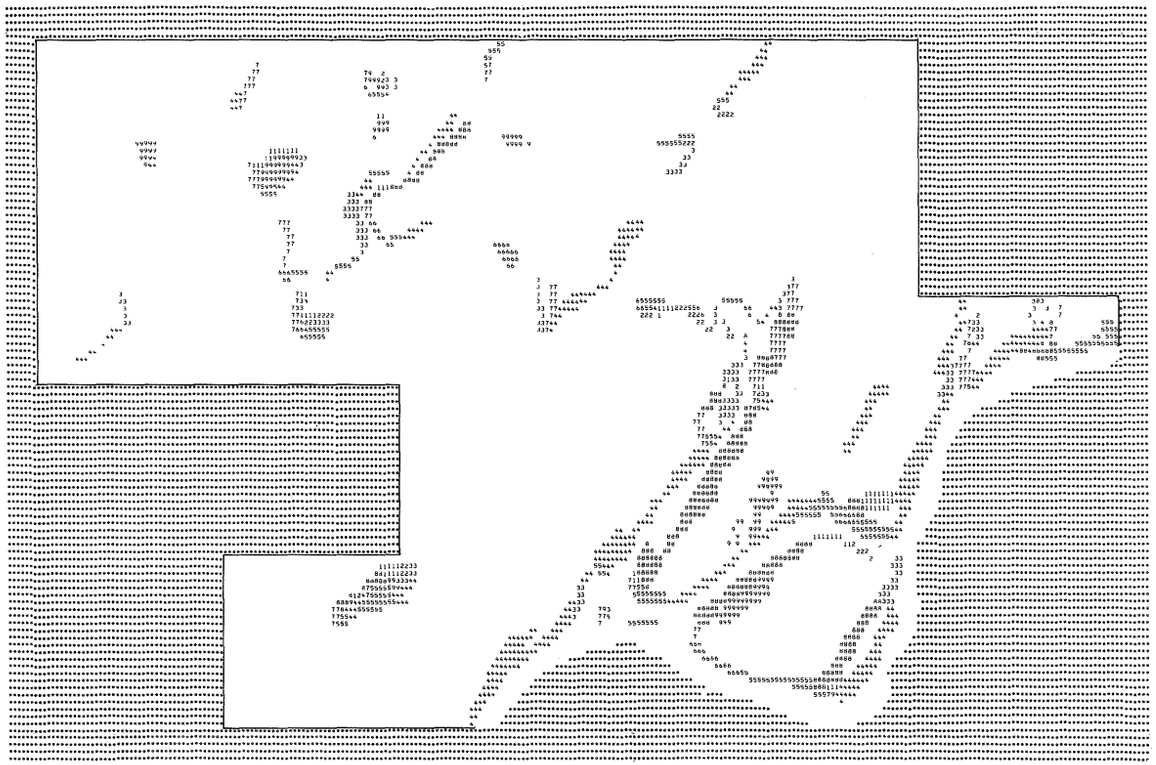


St. Croix Wild River State Park

SLOPE

1 - 0-2%
2 - 2-6%
3 - 6-12%
4 - 12-18%
5 - 18%
Blank Areas (water)

Slope Orientation



St. Croix State Forest

SLOPE ORIENTATION

1 - North
2 - Northeast
3 - East
4 - Southeast
5 - South
6 - Southwest
7 - West
8 - Northwest
9 - Promontory(top of hill)

Slope orientation relates to the direction of slope exposure which most consistently exposes a recreationist to the most favorable aspects of the natural elements (such as sun, wind, and rain) for his specific activity. For example, a swimming beach should face south for the most desirable exposure to the sun. Summer campsites should have southeast exposure so as to avoid strong winds but at the same time, take advantage of light breezes. Or, particular vegetative habitats require certain slope situations.

St. Croix State Park

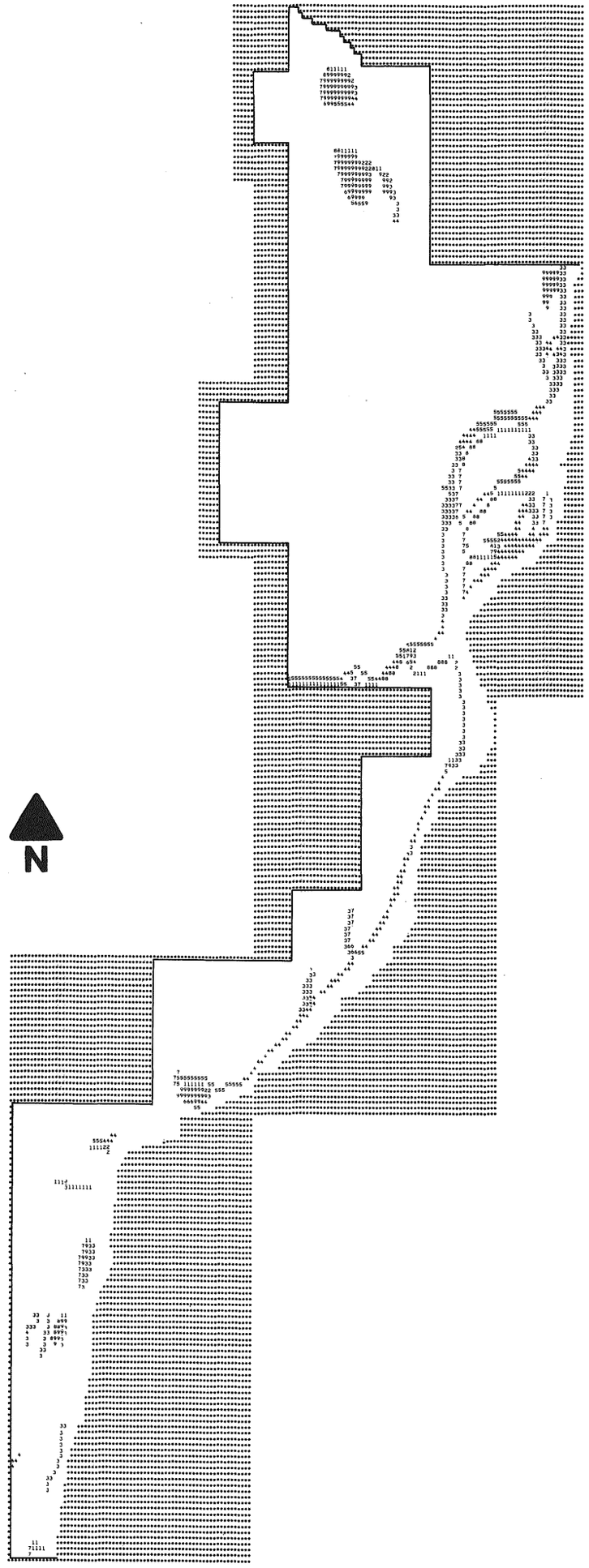
SLOPE ORIENTATION

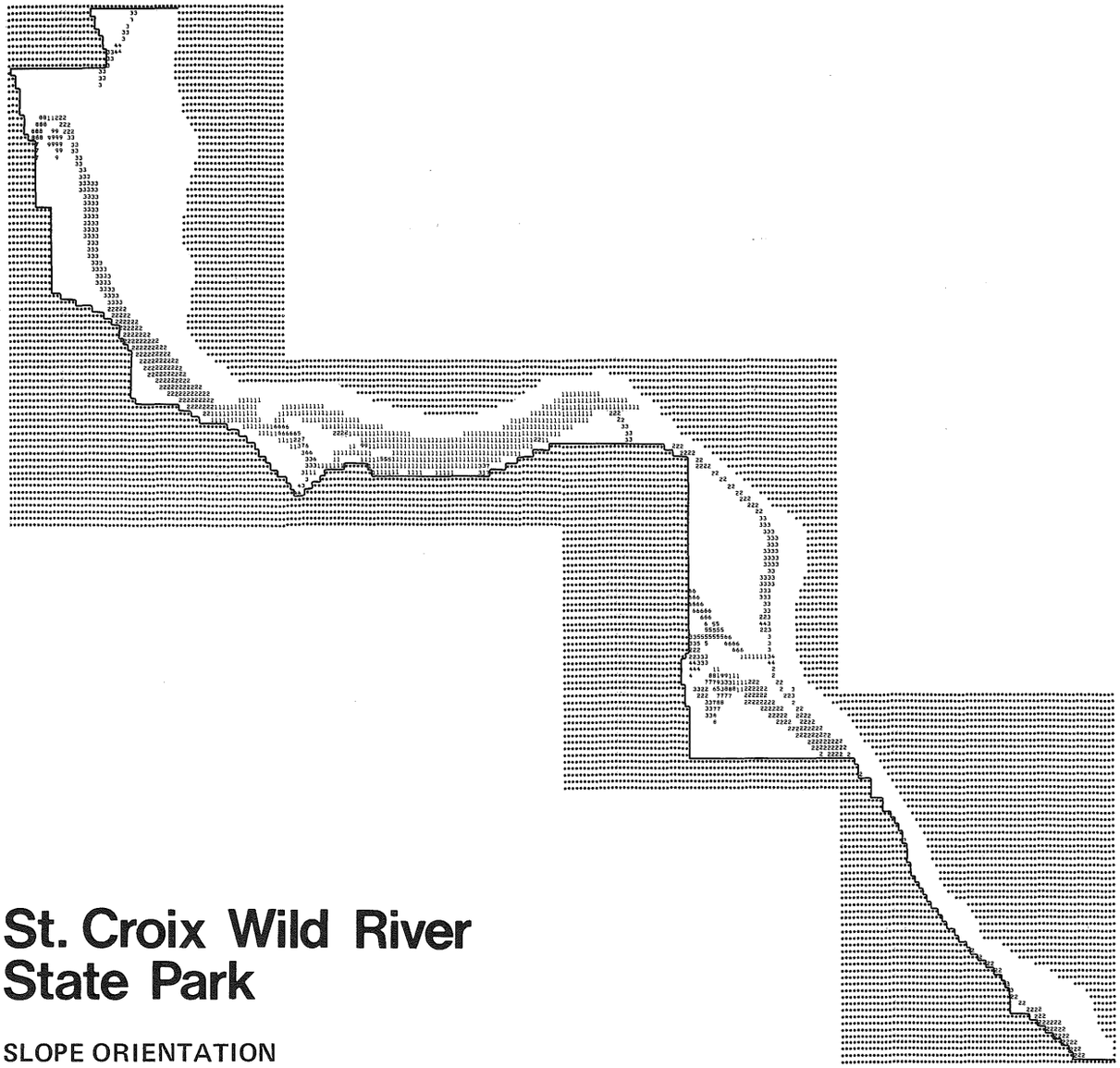
1 - North
2 - Northeast
3 - East
4 - Southeast
5 - South
6 - Southwest
7 - West
8 - Northwest
9 - Promontory(top of hill)

Chengwatana State Forest

SLOPE ORIENTATION

1 - North
2 - Northeast
3 - East
4 - Southeast
5 - South
6 - Southwest
7 - West
8 - Northwest
9 - Promontory (top of hill)



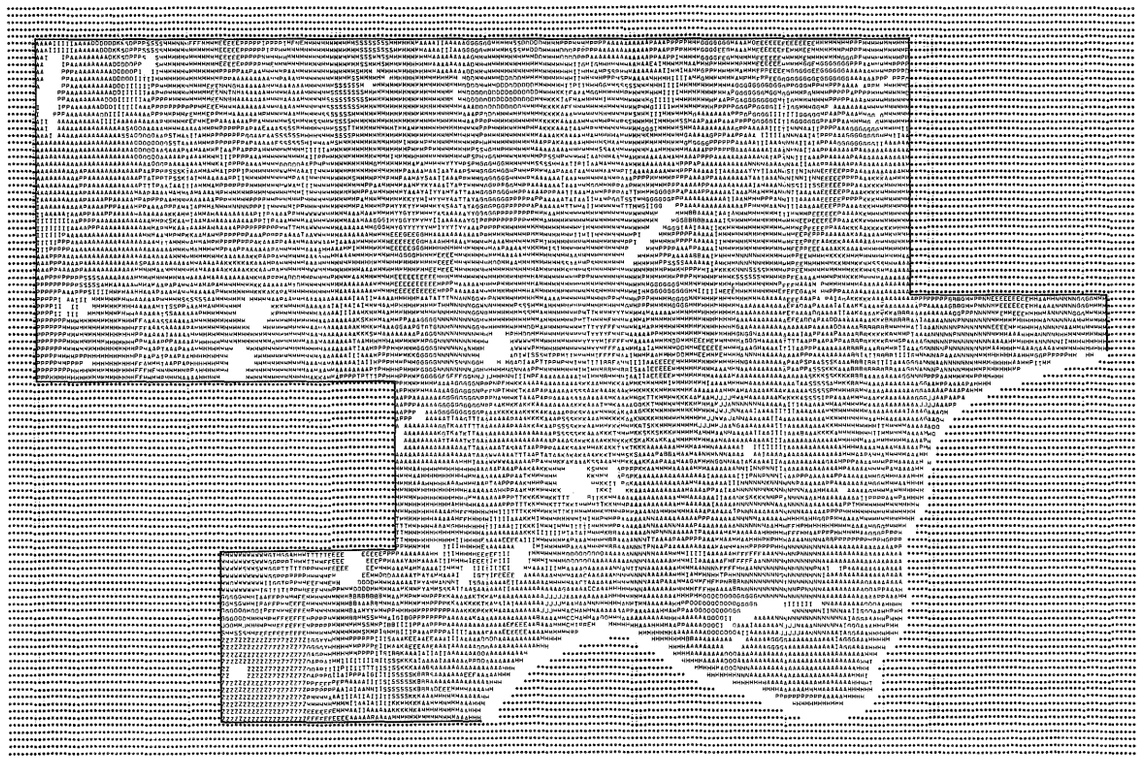


St. Croix Wild River State Park

SLOPE ORIENTATION

1 - North
2 - Northeast
3 - East
4 - Southeast
5 - South
6 - Southwest
7 - West
8 - Northwest
9 - Promontory(top of hill)

Overstory Vegetation



St. Croix State Forest

OVERSTORY VEGETATION

		No. of acres	% Within Area
W -	White Pine	258	.58
N -	Norway Pine	1729	3.88
J -	Jack Pine	128	.29
S -	Spruce	896	2.01
T -	Tamarack	442	.99
C -	Cedar	21	.05
M -	Northern Hardwoods	12,428	27.89
O -	Oak	362	.81
A -	Aspen	12,893	28.94
B -	Birch	375	.84
U -	Upland Brush	0	0
L -	Lowland Brush	0	0
H -	Bottomland Hardwoods	2431	5.46
F -	Spruce Balsam	204	.46
D -	No Overstory Grass	495	1.10
E -	No Overstory Farm	1184	2.66
G -	No Overstory Upland Brush	1490	3.34
I -	No Overstory Marsh	1987	4.46
K -	No Overstory Muskeg	1176	2.64
P -	No Overstory Lowland Brush	3514	7.88
R -	No Overstory Industry	13	.03
Z -	No Data	617	1.38
V -	Scotch Pine	0	0
Y -	No Overstory Mineral Land	207	.46
Blank Areas (water)		1708	3.83

Data on the maps was obtained primarily by stereoscopic study of aerial photographs followed by field examination.

A forest has a great variety of vegetation types. Some are quite homogeneous, others heterogeneous in composition. Some cover a small area, others cover many acres. Some are low-lying such as grasses, while others are very tall such as the white pines.

Foresters conceive of the forest as growing layers. The overstory (upper layer) is composed of the larger, taller, more scattered trees. The understory (lower layer) may comprise shorter trees, or vegetation other than trees, such as brush.

Overstory vegetation has been classified as follows:

Timber Producing Types

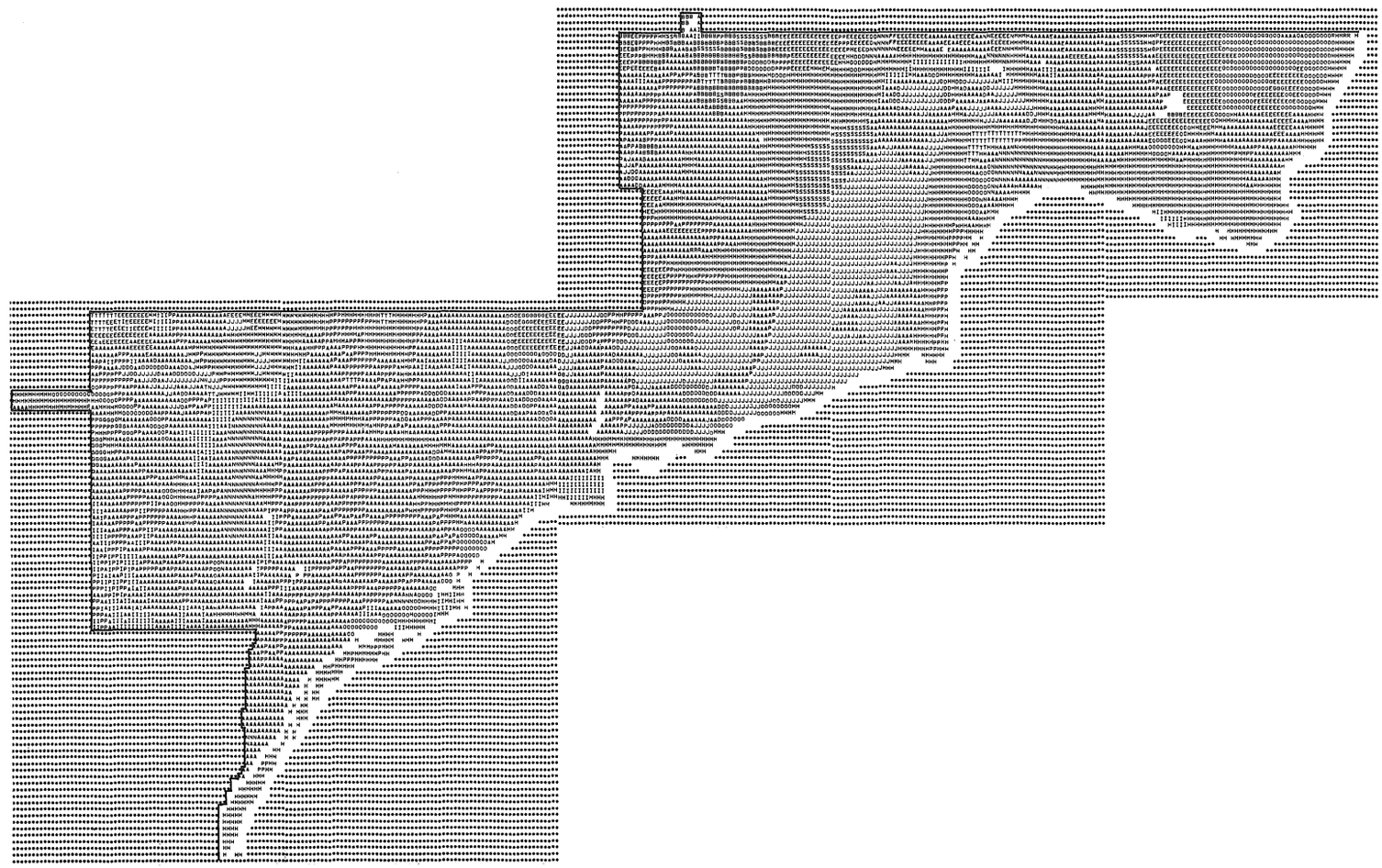
Type-Symbol-Description

White Pine (W) More than 50% pine, White Pine outweighing Norway and Jack Pine.

Norway Pine (N) More than 50% pine, Norway Pine outweighing White and Jack Pine.

Jack Pine (J) More than 50%, Jack Pine outweighing White and Norway Pine.

Black Spruce (S) More than 50% **swamp** conifers, Black Spruce outweighing other species.



St. Croix State Park

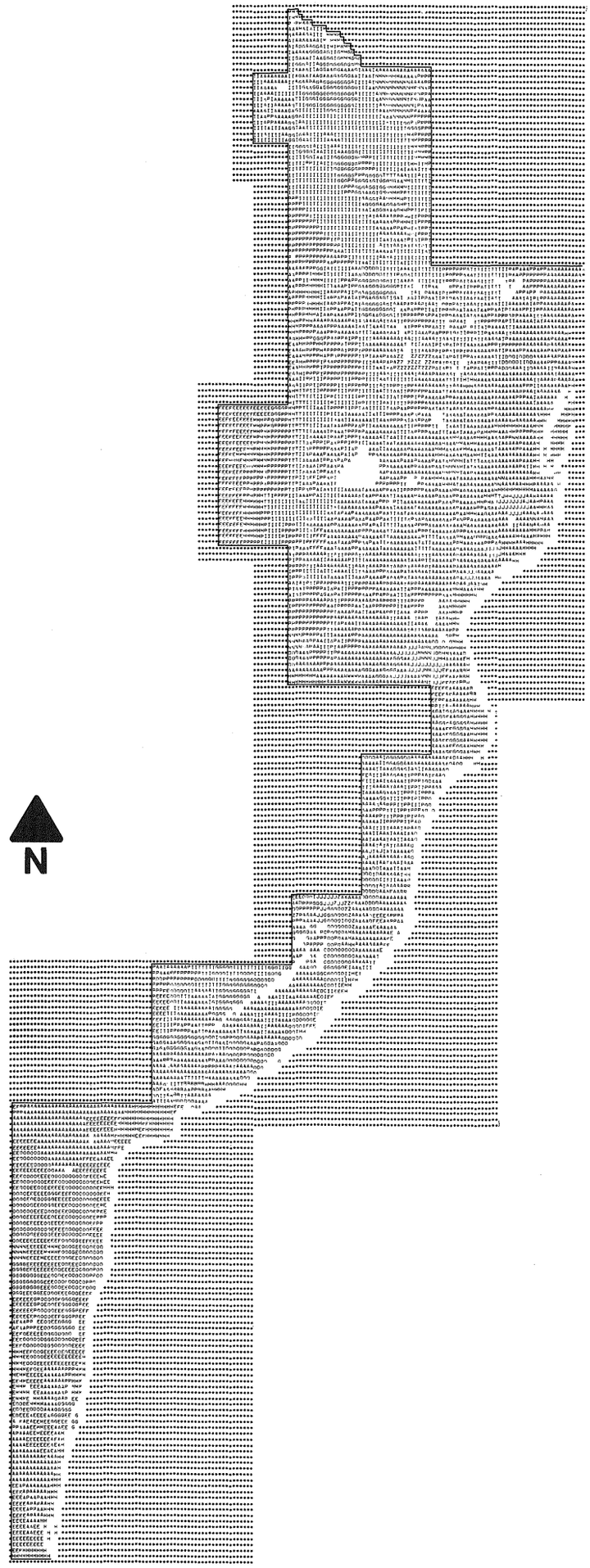
OVERSTORY VEGETATION

		No. of acres	% Within Area
W -	White Pine	0	0
N -	Norway Pine	662	1.70
J -	Jack Pine	4088	10.52
S -	Spruce	553	1.42
T -	Tamarack	189	.48
C -	Cedar	0	0
M -	Northern Hardwoods	548	1.41
O -	Oak	1505	3.87
A -	Aspen	13,912	35.79
B -	Birch	545	1.40
U -	Upland Brush	0	0
L -	Lowland Brush	0	0
H -	Bottomland Hardwoods	7219	18.57
F -	Spruce Balsam	11	.03
D -	No Overstory Grass	713	1.83
E -	No Overstory Farm	1726	4.44
G -	No Overstory Upland Brush	165	.42
I -	No Overstory Marsh	1194	3.07
K -	No Overstory Muskeg	0	0
P -	No Overstory Lowland Brush	3535	9.09
R -	No Overstory Industry	21	0.5
Z -	No Data	0	0
V -	Scotch Pine	0	0
Y -	No Overstory Mineral Land	0	0
Blank Areas (water)		2285	5.88

Chengwatana State Forest

OVERSTORY VEGETATION

		No. of acres	% Within Area
W -	White Pine	29	.09
N -	Norway Pine	340	1.10
J -	Jack Pine	287	.93
S -	Spruce	0	0
T -	Tamarack	154	.50
C -	Cedar	0	0
M -	Northern Hardwoods	519	1.68
O -	Oak	1524	4.93
A -	Aspen	10,560	34.19
B -	Birch	58	.19
U -	Upland Brush	0	0
L -	Lowland Brush	0	0
H -	Bottomland Hardwoods	1681	5.44
F -	Spruce Balsam	58	.19
D -	No Overstory Grass	332	1.08
E -	No Overstory Farm	2365	7.66
G -	No Overstory Upland Brush	1593	5.16
I -	No Overstory Marsh	4937	15.99
K -	No Overstory Muskeg	0	0
P -	No Overstory Lowland Brush	3955	12.80
R -	No Overstory Industry	27	.09
Z -	No Data	98	.32
V -	Scotch Pine	0	0
Y -	No Overstory Mineral Land	0	0
Blank Areas (water)		2362	7.65



Tamarack (T) More than 50% swamp conifers, Tamarack outweighing other species.

Northern White Cedar (C) More than 50% swamp conifers, White Cedar outweighing other species.

Northern Hardwoods (M) More than 50% northern or upland hardwood species. (Maple, Yellow Birch, Birch, Basswood, etc.)

Oak (O) More than 50% oak.

Aspen (A) More than 50% Trembling or Large Tooth Aspen and Paper Birch -- Aspen predominating.

Paper Birch (B) More than 50% Paper Birch and Aspen, Paper Birch predominating.

Spruce Balsam (F) A mixed hardwood-coniferous type characterized by substantial quantities of White Spruce and Balsam Fir, Balsam Fir predominating.

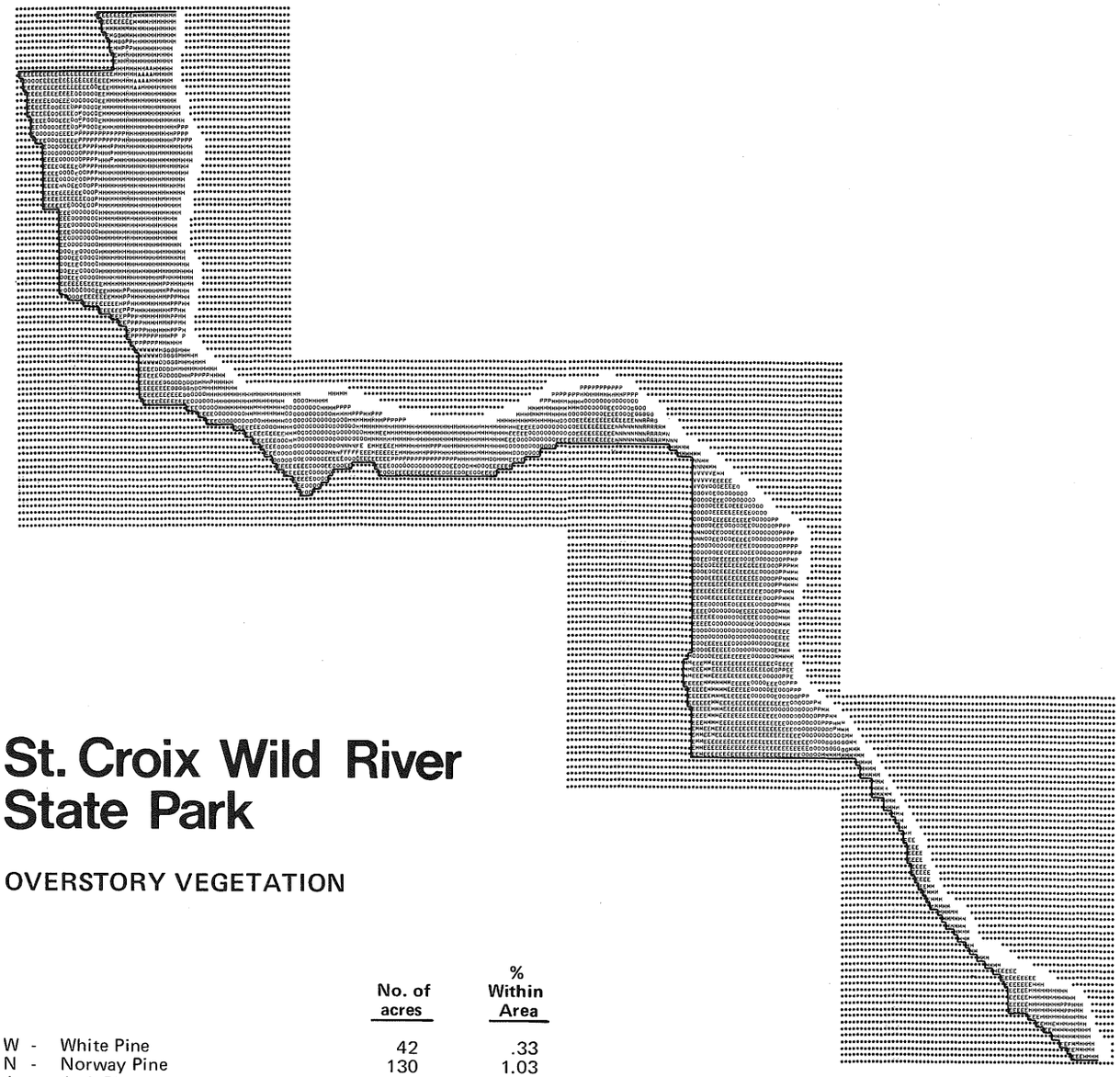
Bottomland Hardwoods (H) More than 50% ash and elm.

Scotch Pine (V) More than 50% Scotch Pine. In this study most Scotch Pine are in Scotch Pine Plantations.

Potential Timber Producing Types (Deforested)

Type-Symbol-Description

Upland Brush (U) Upland brush with forest canopy.



St. Croix Wild River State Park

OVERSTORY VEGETATION

		No. of acres	% Within Area
W -	White Pine	42	.33
N -	Norway Pine	130	1.03
J -	Jack Pine	0	0
S -	Spruce	0	0
T -	Tamarack	0	0
C -	Cedar	0	0
M -	Northern Hardwoods	724	5.62
O -	Oak	2535	19.68
A -	Aspen	32	.25
B -	Birch	0	0
U -	Upland Brush	0	0
L -	Lowland Brush	0	0
H -	Bottomland Hardwoods	3551	27.57
F -	Spruce Balsam	15	.12
D -	No Overstory Grass	58	.45
E -	No Overstory Farm	9157	24.51
G -	No Overstory Brush	120	.93
I -	No Overstory Marsh	0	0
K -	No Overstory Muskeg	0	0
P -	No Overstory Lowland Brush	732	5.68
R -	No Overstory Industry	42	.33
Z -	No Data	0	0
V -	Scotch Pine	37	.29
Y -	No Overstory Mineral Land	0	0
Blank Areas (water)		1700	13.20

Lowland Brush (L) Lowland brush with forest canopy.

Grass (D) Upland grass in the forest, less than 10% stocked with commercial tree species. (This also applies to abandoned farms where no farming or grazing is done.)

Upland Brush (G) Upland brush in forest area less than 10% stocked with commercial tree species.

Lowland Brush (P) Lowland brush on potential commercial forest land, less than 10% stocked with commercial tree species.

Nonforest Types

Type-Symbol-Description

Farm (E) Crop, orchard, or pasture but not farm woodland. Fenced farm woodlands more than 10 percent stocked to forest trees will be considered open pasture. (To be used only where the area is actively farmed, grazed, or used for hay production.)

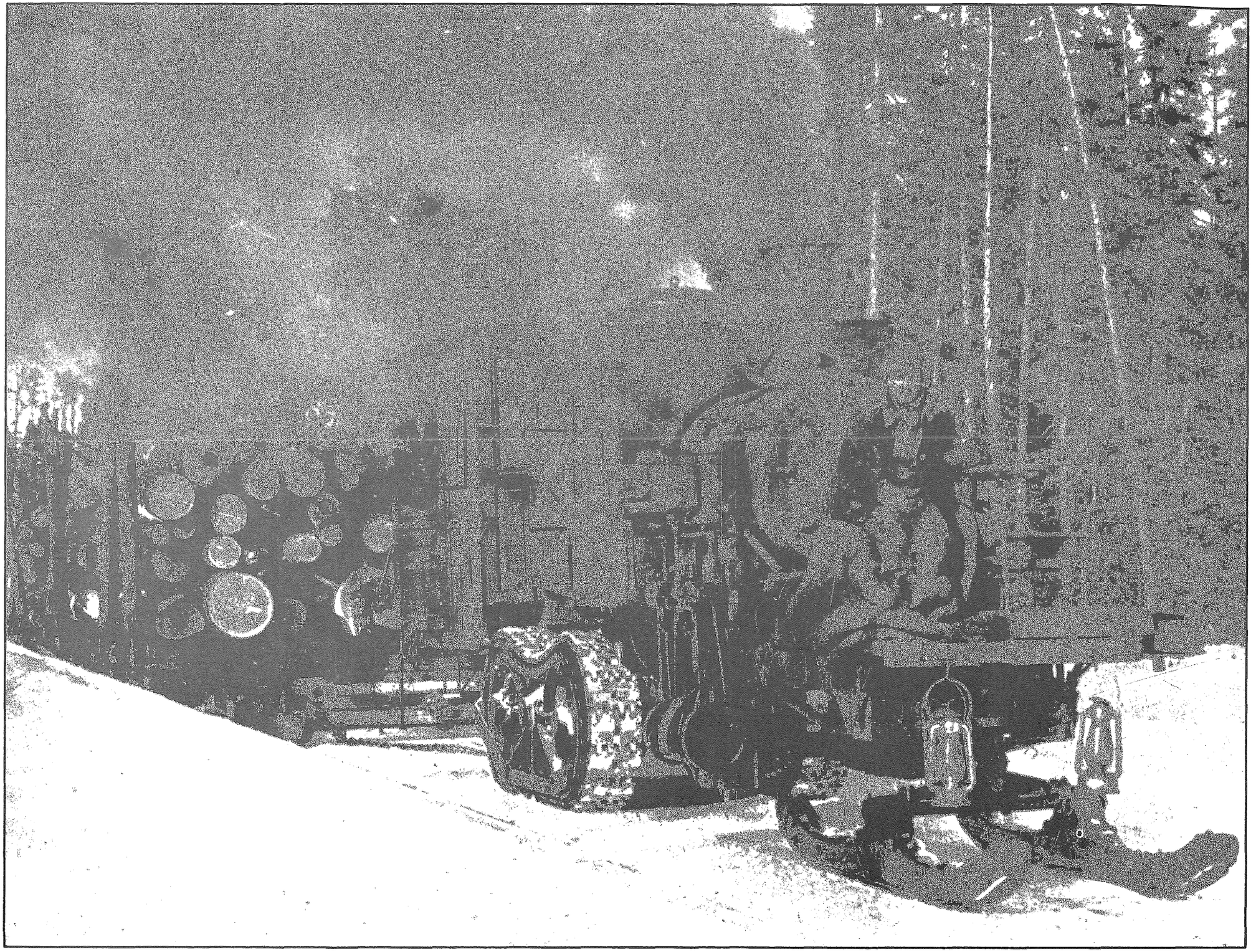
Industrial & Residential (R) Platted areas for industry or residence. Also roads, railroads, cutout rights-of-way, etc.

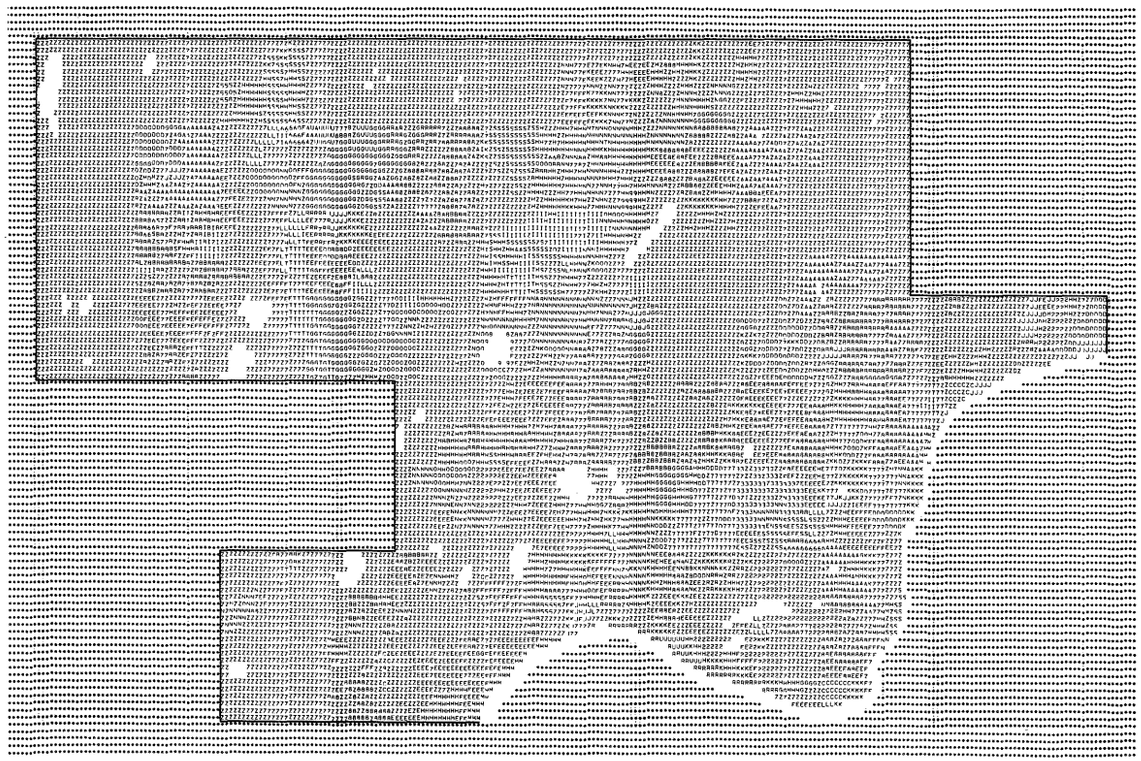
Marsh (I) Marsh land incapable of supporting a commercial forest. It includes wild grass, some willow or other scattered lowland brush.

Muskeg (K) Nonproductive peat land with a vegetation consisting of mosses and low shrubs such as leather leaf, laurel, labrador tea, cranberries, bog birch, etc., but not tall willows, alder, dogwood, etc. It is capable of supporting a 10 percent stocking of commercial species.

No data (Z)

No Overstory, Mineral Land (Y) Land having no vegetation and is used for gravel pits, quarries, etc.





St. Croix State Forest

OVERSTORY VEG. SITE CONDITION AND AGE

	AGE	SITE
1 -	0-5	Poor
2 -	0-5	Med.
3 -	0-5	Good
4 -	6-10	Poor
5 -	6-10	Med.
6 -	6-10	Good
7 -	11-20	Poor
8 -	11-20	Med.
9 -	11-20	Good
A -	21-30	Poor
B -	21-30	Med.
C -	21-30	Good
D -	31-40	Poor
E -	31-40	Med.
F -	31-40	Good
G -	41-50	Poor
H -	41-50	Med.
I -	41-50	Good
J -	51-60	Poor
K -	51-60	Med.
L -	51-60	Good
M -	61-80	Poor
N -	61-80	Med.
O -	61-80	Good
R -	81-120	Poor
S -	81-120	Med.
T -	81-120	Good
U -	121+	Poor
V -	121+	Med.
W -	121+	Good
Z -	No data	
	Blank Areas (water)	

Age & Site Condition

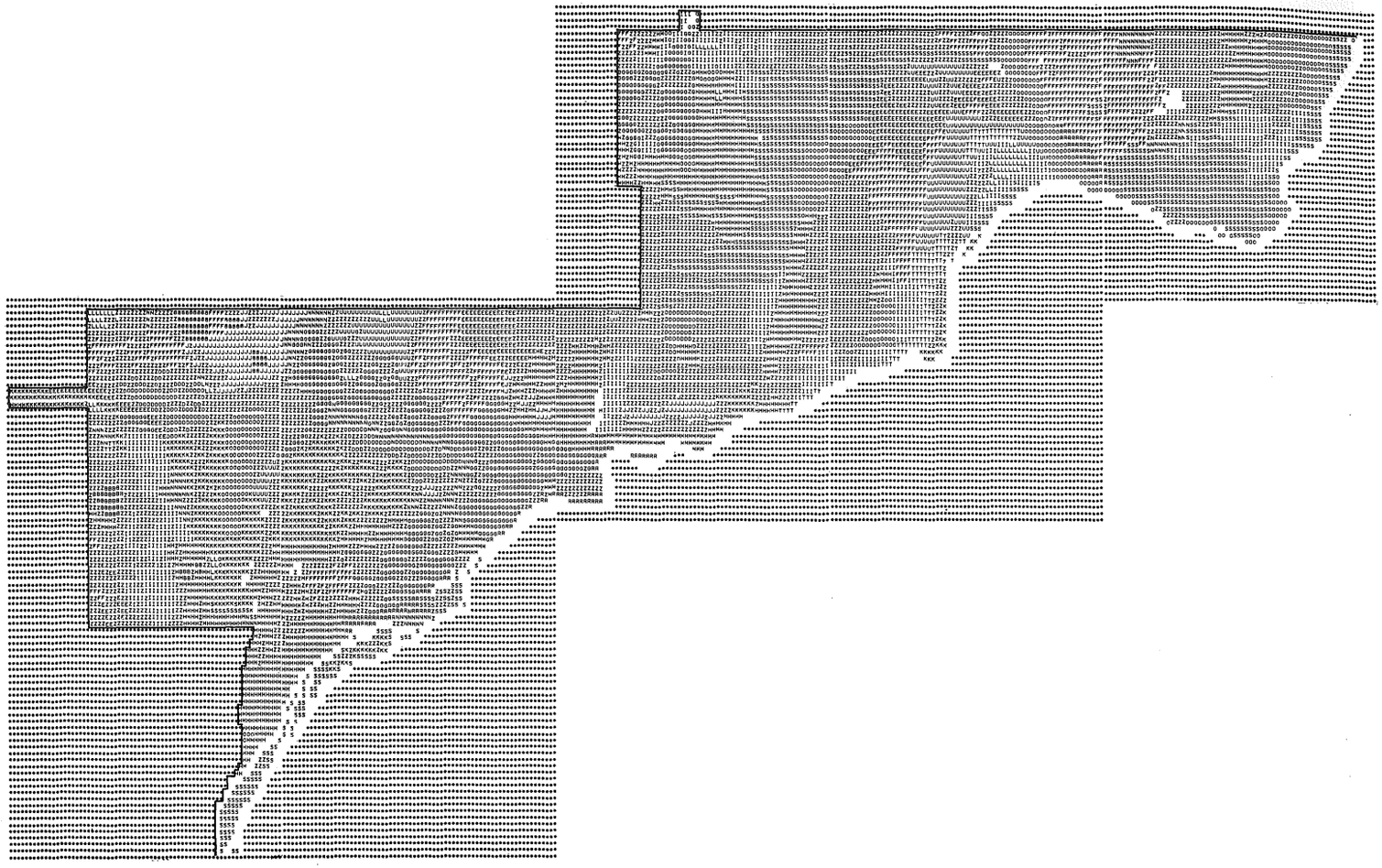
Overstory Vegetation

Age

Age is the average age of the stand of trees.

Site

Site is the growing ability of a stand of trees on the type of soil on which it is growing. This ability is rated as Poor (P), Medium (M), Good (G), or Excellent (E).



St. Croix State Park

OVERSTORY VEG. SITE CONDITION AND AGE

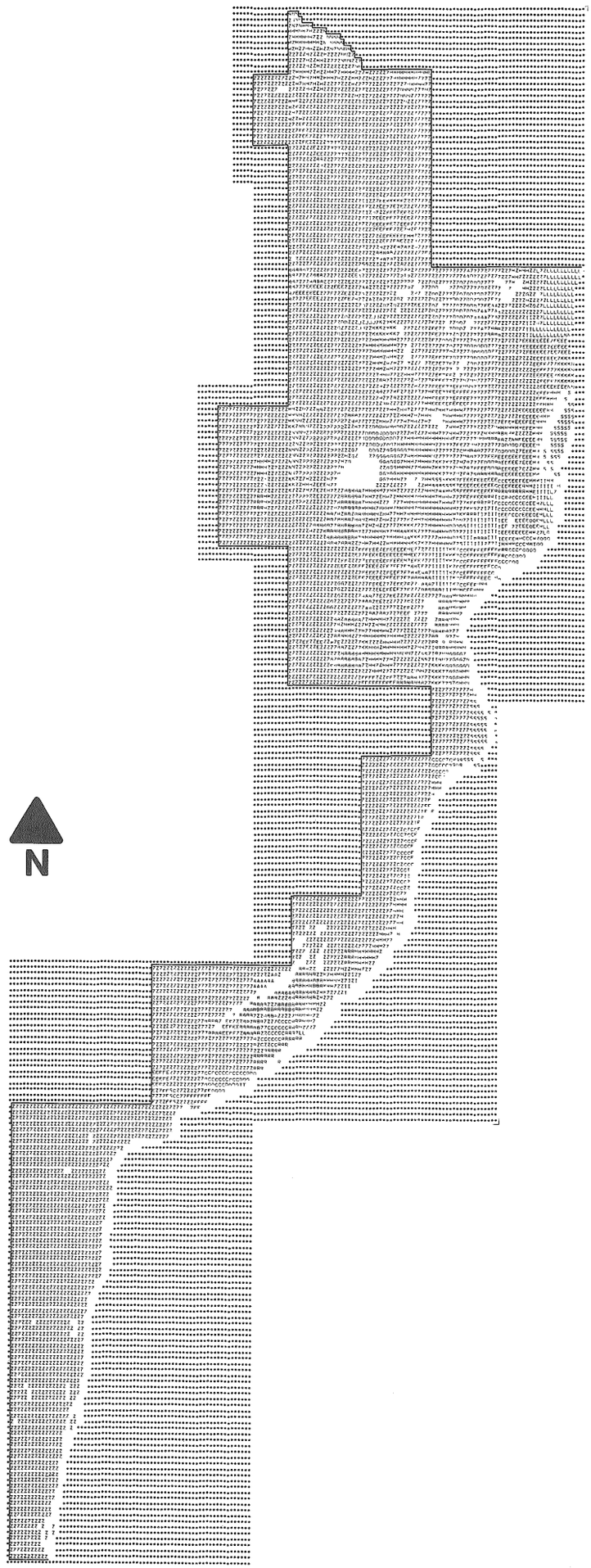
AGE	SITE										
1 - 0-5	Poor	A -	21-30	Poor	J -	51-60	Poor	U -	121+	Poor
2 - 0-5	Med.	B -	21-30	Med.	K -	51-60	Med.	V -	121+	Med.
3 - 0-5	Good	C -	21-30	Good	L -	51-60	Good	W -	121+	Good
4 - 6-10	Poor	D -	31-40	Poor	M -	61-80	Poor	Z -	No data	
5 - 6-10	Med.	E -	31-40	Med.	N -	61-80	Med.	Blank Areas (water)		
6 - 6-10	Good	F -	31-40	Good	O -	61-80	Good			
7 - 11-20	Poor	G -	41-50	Poor	R -	81-120	Poor			
8 - 11-20	Med.	H -	41-50	Med.	S -	81-120	Med.			
9 - 11-20	Good	I -	41-50	Good	T -	81-120	Good			

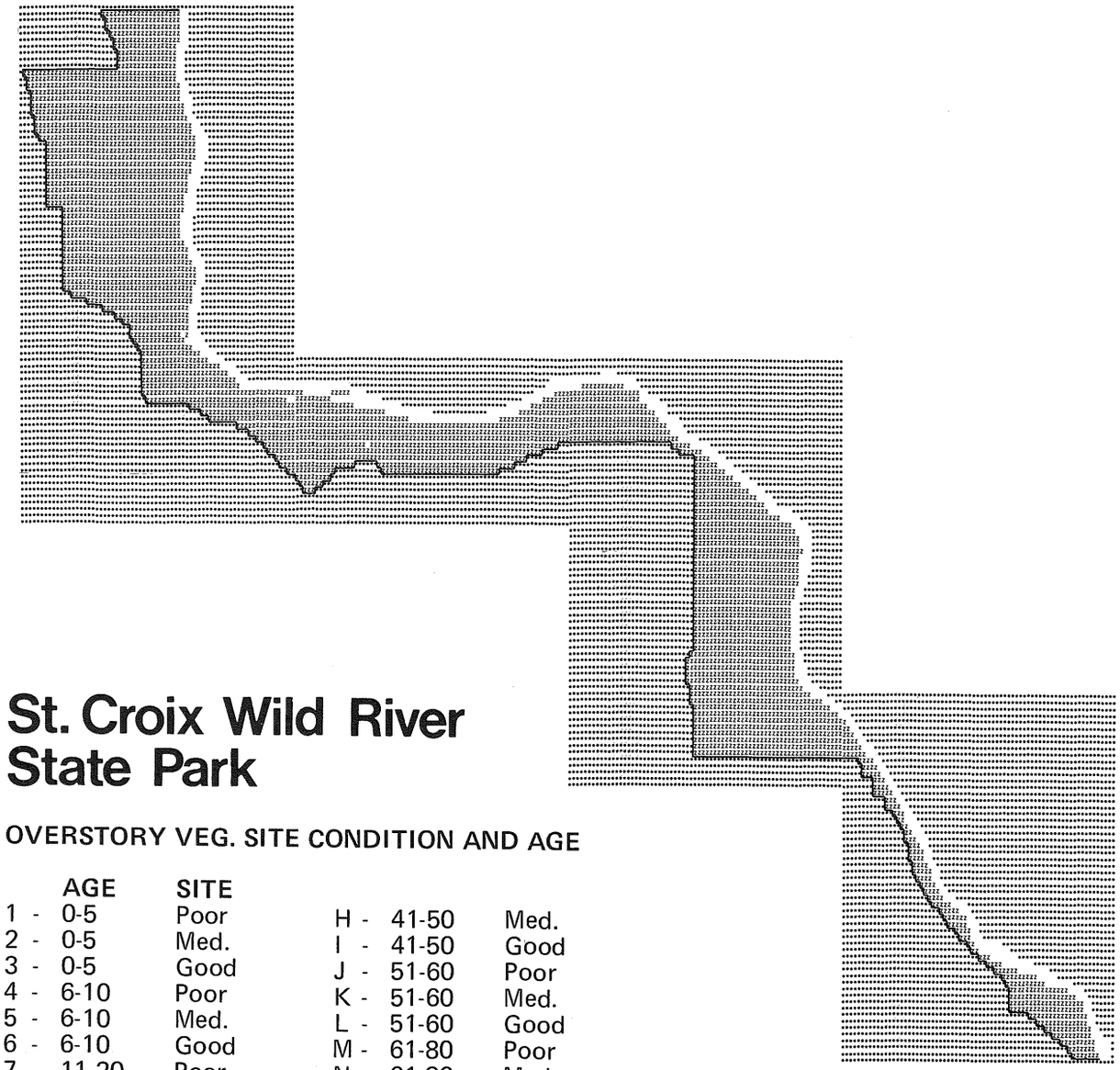
Chengwatana State Forest

OVERSTORY VEG. SITE CONDITION AND AGE

	AGE	SITE
1 -	0-5	Poor
2 -	0-5	Med.
3 -	0-5	Good
4 -	6-10	Poor
5 -	6-10	Med.
6 -	6-10	Good
7 -	11-20	Poor
8 -	11-20	Med.
9 -	11-20	Good
A -	21-30	Poor
B -	21-30	Med.
C -	21-30	Good
D -	31-40	Poor
E -	31-40	Med.
F -	31-40	Good
G -	41-50	Poor
H -	41-50	Med.
I -	41-50	Good
J -	51-60	Poor
K -	51-60	Med.
L -	51-60	Good
M -	61-80	Poor
N -	61-80	Med.
O -	61-80	Good
R -	81-120	Poor
S -	81-120	Med.
T -	81-120	Good
U -	121+	Poor
V -	121+	Med.
W -	121+	Good
Z -	No data	

Blank Areas (water)

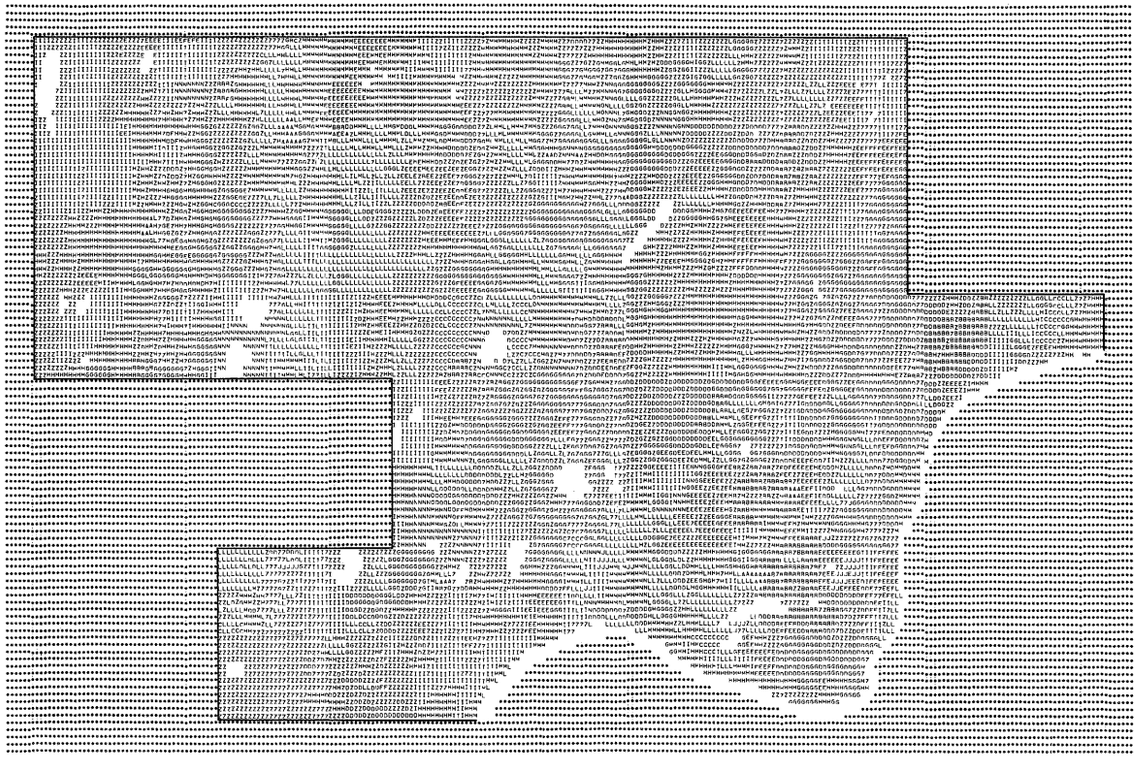




St. Croix Wild River State Park

OVERSTORY VEG. SITE CONDITION AND AGE

	AGE	SITE			
1 -	0-5	Poor	H -	41-50	Med.
2 -	0-5	Med.	I -	41-50	Good
3 -	0-5	Good	J -	51-60	Poor
4 -	6-10	Poor	K -	51-60	Med.
5 -	6-10	Med.	L -	51-60	Good
6 -	6-10	Good	M -	61-80	Poor
7 -	11-20	Poor	N -	61-80	Med.
8 -	11-20	Med.	O -	61-80	Good
9 -	11-20	Good	R -	81-120	Poor
A -	21-30	Poor	S -	81-120	Med.
B -	21-30	Med.	T -	81-120	Good
C -	21-30	Good	U -	121+	Poor
D -	31-40	Poor	V -	121+	Med.
E -	31-40	Med.	W -	121+	Good
F -	31-40	Good	Z -	No data	
G -	41-50	Poor	Blank Areas (water)		



St. Croix State Forest

OVERSTORY VEG. SIZE AND DENSITY

		No. of acres	% Within Area
A -	200-800 Seedlings/acre	125	.28
B -	800-1400 Seedlings/acre	1176	2.64
C -	1400 + " "	466	1.04
D -	100-400 Saplings/acre	3429	7.69
E -	400-700 Saplings/acre	2314	5.19
F -	700+ " "	72	.16
G -	1-3 Pole timber cords/acre	5753	12.91
H -	3-7 " " " "	6038	13.55
I -	7-13 " " " "	4620	10.37
J -	13-20" " " "	114	.26
K -	20+ " " " "	0	0
L -	1-2.6 Small saw timber cords/acre	3788	8.50
M -	2.6-5 " " " " "	3213	7.2
N -	5-10 " " " " "	888	1.99
O -	10-16 " " " " "	90	.20
P -	16+ " " " " "	0	0
R -	1-2.6 Large saw timber cords/acre	0	0
S -	2.6-9 " " " " "	0	0
T -	9-17 " " " " "	0	0
W -	17-26 " " " " "	0	0
V -	26+ " " " " "	0	0
Z -	No Data	10,757	24.14
	Blank Areas (water)	1692	3.83

Size & Density

Overstory Vegetation

To facilitate the management of forests, foresters further divide the overstory-vegetative types into the sizes and densities of trees.

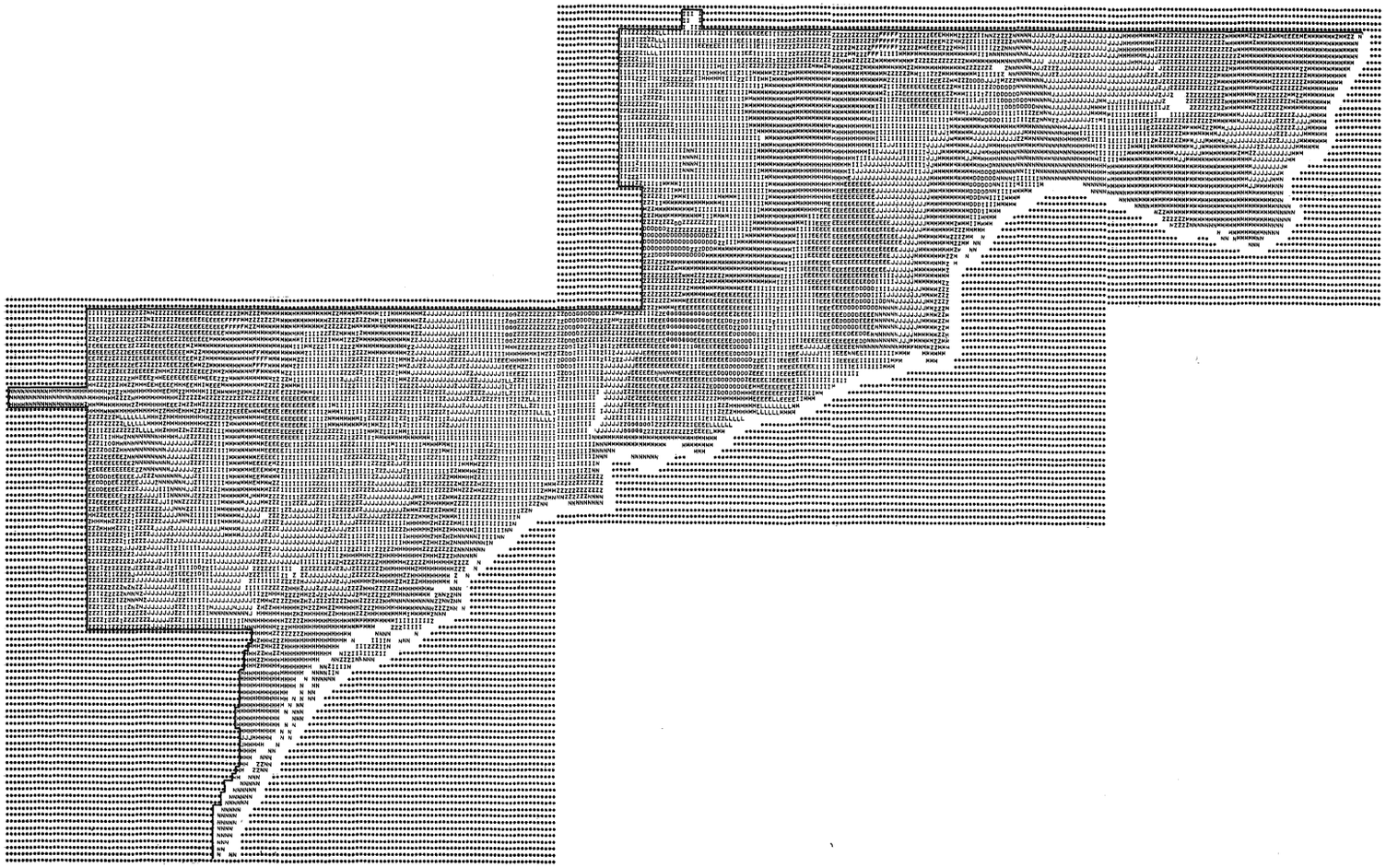
Size Classes

Trees are grouped according to the **diameter** of their poles at breast height (DBH).

Seedlings	0" - 1" DBH
Saplings	1" - 5" DBH
Poletimber	5" - 9" DBH
Small Saw Timber	9" - 15" DBH
Large Saw Timber	15" + DBH

Density

Density is a description of the amount of wood on an acre. Seedlings and saplings are classified by the number of stems per acre; for example, a poor stand of saplings has 100-400 stems per acre. Poletimber and sawtimber stands are classified by the number of merchantable cords per acre. A standard cord can be visualized as a pile of sticks 4 feet wide, 4 feet high and 8 feet long.



St. Croix State Park

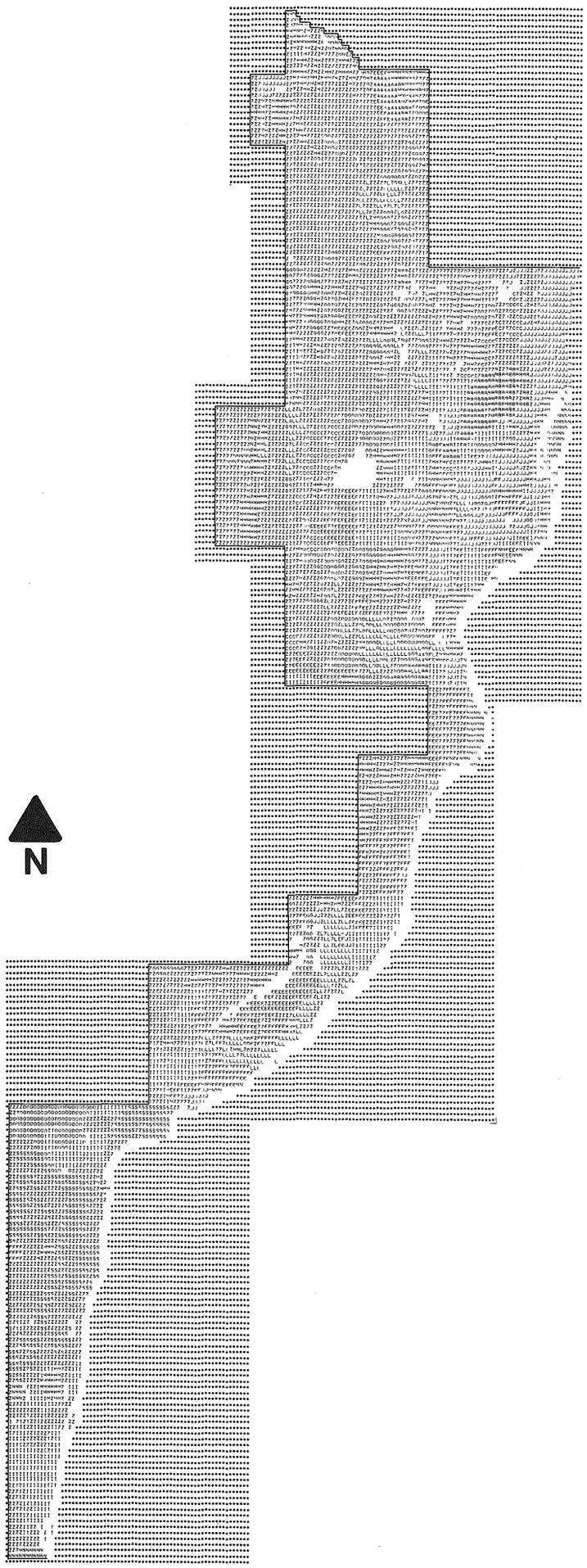
OVERSTORY VEG. SIZE AND DENSITY

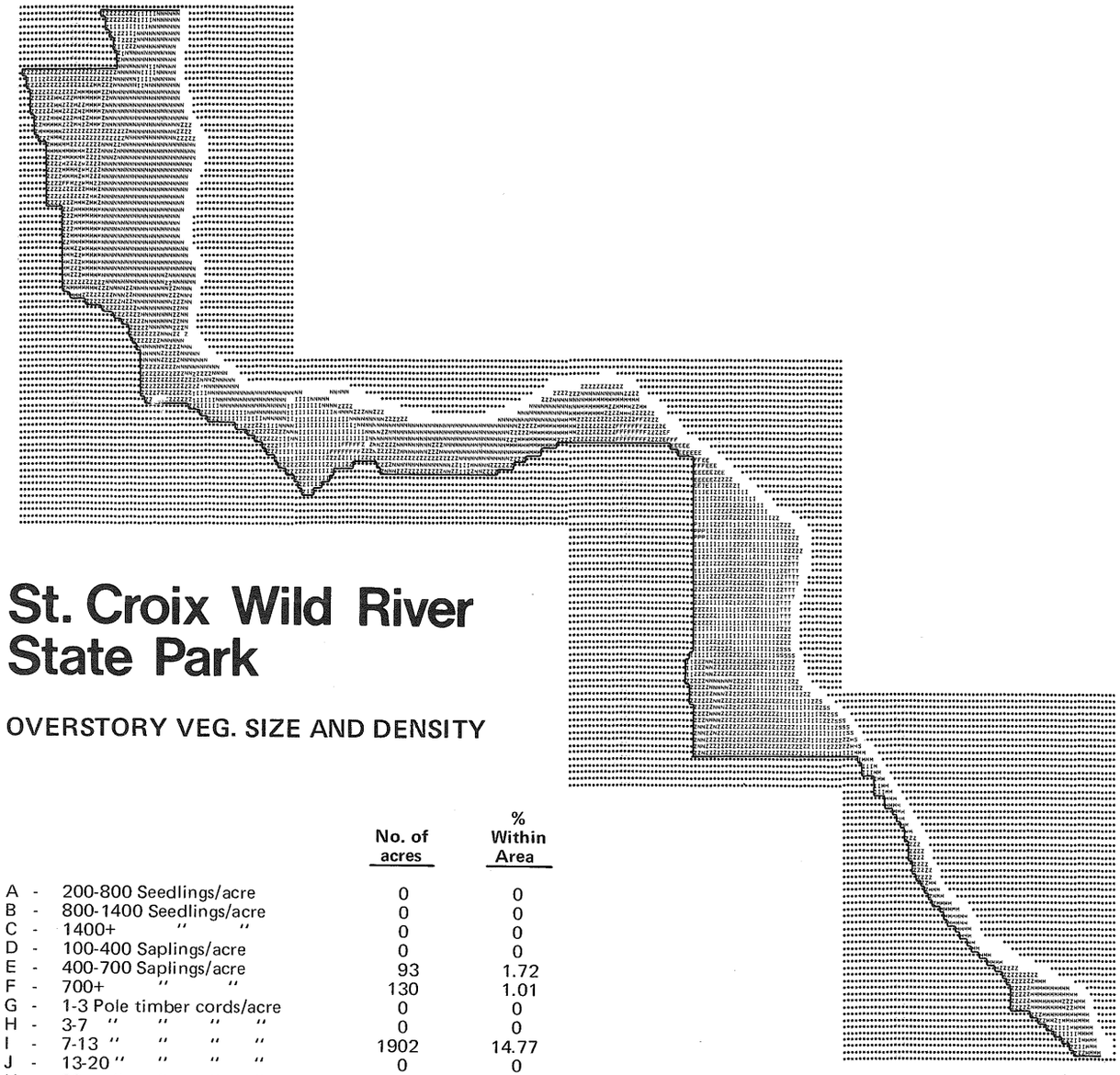
		No. of acres	% Within Area
A -	200-800 Seedlings/acre	0	0
B -	800-1400 Seedlings/acre	0	0
C -	1400 + " "	0	0
D -	100-400 Saplings/acre	835	2.15
E -	400-700 Saplings/acre	3234	8.32
F -	700+ " "	112	.29
G -	1-3- Pole timber cords/acre	194	.50
H -	3-7 " " " "	2607	6.70
I -	7-13 " " " "	8310	21.38
J -	13-20 " " " "	4370	11.24
K -	20+ " " " "	0	0
L -	1-2.6 Small saw timber cords/acre	192	.49
M -	2.6-5 " " " "	7283	18.74
N -	5-10 " " " "	2088	5.37
O -	10-16 " " " "	0	0
P -	16+ " " " "	0	0
R -	1-2.6 Large saw timber cords/acre	0	0
S -	2.6-9 " " " "	0	0
T -	9-17 " " " "	0	0
W -	17-26 " " " "	0	0
V -	26+ " " " "	0	0
Z -	No Data	7355	18.92
Blank Areas (water)		2282	5.87

Chengwatana State Forest

OVERSTORY VEG. SIZE AND DENSITY

	No. of acres	% Within Area
A - 200-800 Seedlings/acre	125	.40
B - 800-1400 Seedlings/acre	569	1.84
C - 1400+ " "	414	1.34
D - 100-400 Saplings/acre	1112	3.60
E - 400-700 Saplings/acre	1364	4.42
F - 700+ " "	777	2.52
G - 1-3 Pole timber cords/acre	966	3.13
H - 3-7 " " " "	1729	5.60
I - 7-13 " " " "	2575	8.34
J - 13-20 " " " "	1729	5.60
K - 20+ " " " "	0	0
L - 1-2.6 Small saw timber cords/acre	1011	3.27
M - 2.6-5 " " " " "	835	2.70
N - 5-10 " " " " "	822	2.66
O - 10-16 " " " " "	16	.05
P - 16+ " " " " "	0	0
R - 1-2.6 Large saw timber cords/acre	0	0
S - 2.6-9 " " " " "	1154	3.73
T - 9-17 " " " " "	0	0
W - 17-26 " " " " "	0	0
V - 26+ " " " " "	0	0
Z - No Data	13,324	43.14
Blank Areas (water)	2359	7.64



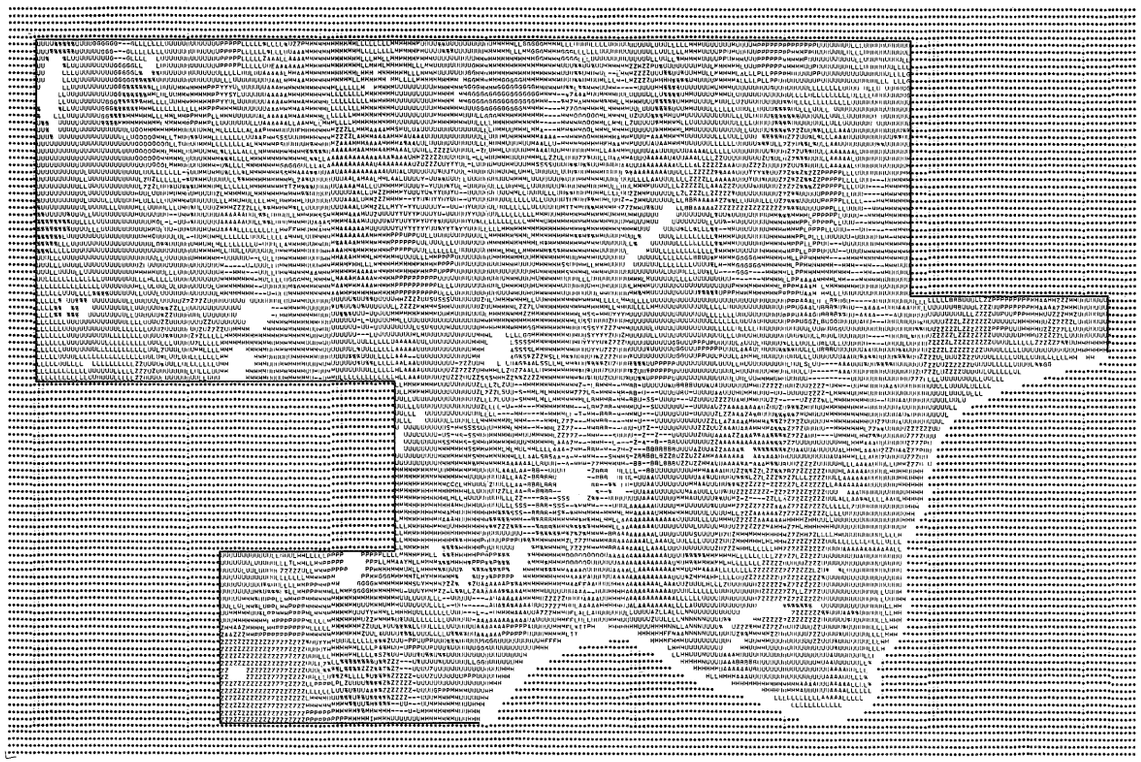


St. Croix Wild River State Park

OVERSTORY VEG. SIZE AND DENSITY

		No. of acres	% Within Area
A -	200-800 Seedlings/acre	0	0
B -	800-1400 Seedlings/acre	0	0
C -	1400+ " "	0	0
D -	100-400 Saplings/acre	0	0
E -	400-700 Saplings/acre	93	1.72
F -	700+ " "	130	1.01
G -	1-3 Pole timber cords/acre	0	0
H -	3-7 " " " "	0	0
I -	7-13 " " " "	1902	14.77
J -	13-20 " " " "	0	0
K -	20+ " " " "	0	0
L -	1-2.6 Small saw timber cords/acre	0	0
M -	2.6-5 " " " " "	1237	9.60
N -	5-10 " " " " "	3543	27.51
O -	10-16 " " " " "	0	0
P -	16+ " " " " "	19	.14
R -	1-2.6 Large saw timber cords/acre	0	0
S -	2.6-9 " " " " "	61	.48
T -	9-17 " " " " "	85	.66
W -	17-26 " " " " "	0	0
V -	26+ " " " " "	0	0
Z -	No Data	4110	31.91
Blank Areas (water)		1699	13.20

Understory Vegetation



St. Croix State Forest

UNDERSTORY VEGETATION

		No. of acres	% Within Area				
W -	White Pine	0	0	U -	Upland Brush	15,997	35.91
N -	Norway Pine	56	.12	% -	Marsh	1990	4.46
J -	Jack Pine	3	.00	- -	Muskeg	1338	3.00
S -	Spruce	247	.56	L -	Lowland Brush	5498	12.34
T -	Tamarack	32	.07	H -	Bottomland Brush	1205	2.70
C -	Cedar	8	.02	F -	Spruce - Balsam	45	.10
M -	Northern Hardwoods	8177	18.35	I -	Industry	13	.03
O -	Oak	168	.37	Z -	No Data	3189	7.16
A -	Aspen	2615	5.87	D -	Colorado Spruce	0	0
B -	Birch	370	.83	V -	Scotch Pine	0	0
G -	Grass	532	1.19	Y -	Duff	178	.40
P -	Farm	1184	2.66	Blank Areas (water)		1707	3.83

Understory vegetation has not been considered in relation to timber producing types or non-timber producing types because it may or may not be the desired species for the management goal. The desired vegetation for a specific management depends upon many factors such as soils, slope, and use of the area.

Type-Symbol-Description

White Pine (W) More than 50% pine, White Pine outweighing Norway and Jack Pine.

Norway Pine (N) More than 50% pine, Norway Pine outweighing White and Jack Pine.

Jack Pine (J) More than 50%, Jack Pine outweighing White and Norway Pine.

Black Spruce (S) More than 50% swamp conifers, Black Spruce outweighing other species.

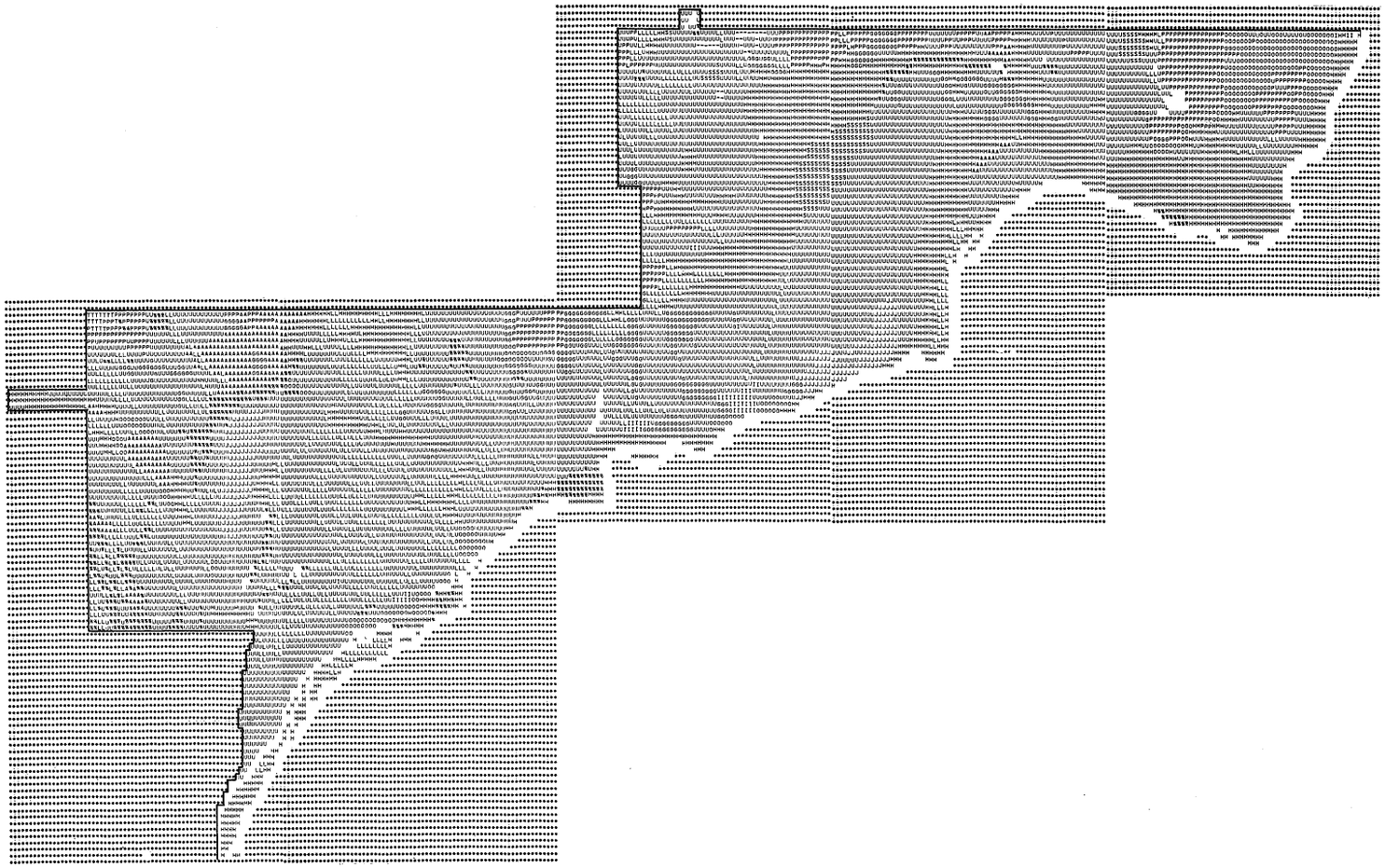
Tamarack (T) More than 50% swamp conifers, tamarack outweighing other species.

Northern White Cedar (C) More than swamp conifers, White Cedar outweighing other species.

Northern Hardwoods (M) More than 50% northern or upland hardwood species. (Maple, yellow birch, Birch, Basswood, etc.)

Oak (O) More than 50% oak.

Aspen (A) More than 50% Trembling or Large Tooth Aspen and Paper Birch -- Aspen predominating.



St. Croix State Park

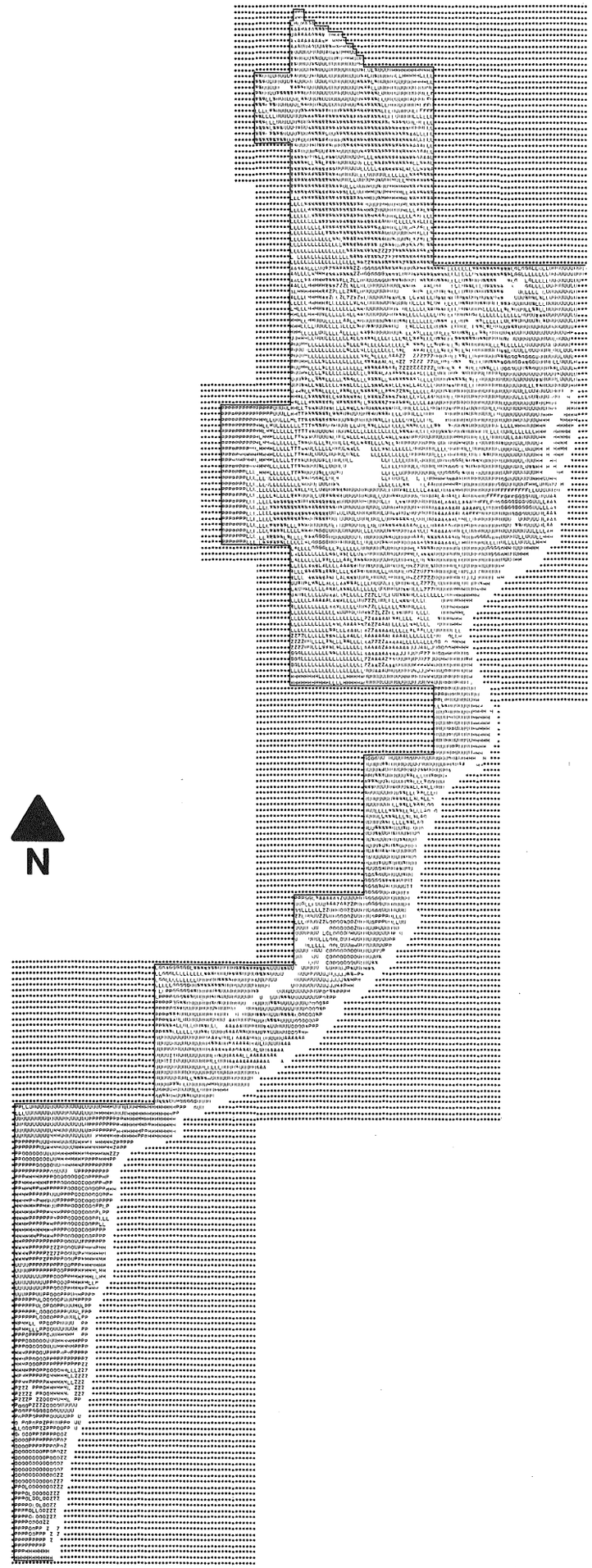
UNDERSTORY VEGETATION - ST. CROIX STATE PARK

		No. of acres	% Within Area
W -	White Pine	0	0
N -	Norway Pine	8	.02
J -	Jack Pine	726	1.87
S -	Spruce	513	1.32
T -	Tamarack	42	.11
C -	Cedar	0	0
M -	Northern Hardwoods	21	.05
O -	Oak	1184	3.04
A -	Aspen	830	2.13
B -	Birch	0	0
G -	Grass	1817	3.39
P -	Farm	1729	4.45
U -	Upland Brush	17,955	46.19
% -	Marsh	1194	3.07
- -	Muskeg	66	.17
L -	Lowland Brush	3642	9.34
H -	Bottomland Brush	7222	18.58
F -	Spruce - Balsam	0	0
I -	Industry	141	.36
Z -	No Data	0	0
D -	Colorado Spruce	0	0
V -	Scotch Pine	0	0
Y -	Duff	0	0
Blank Areas (water)		2282	5.87

Chengwatana State Forest

UNDERSTORY VEGETATION

		No. of acres	% Within Area
W -	White Pine	64	.21
N -	Norway Pine	19	.06
J -	Jack Pine	93	.30
S -	Spruce	0	0
T -	Tamarack	72	.23
C -	Cedar	0	0
M -	Northern Hardwoods	1091	3.53
O -	Oak	1181	3.82
A -	Aspen	1064	3.44
B -	Birch	13	.04
G -	Grass	577	1.87
P -	Farm	2367	7.66
U -	Upland Brush	9470	30.66
% -	Marsh	4945	16.01
- -	Muskeg	0	0
L -	Lowland Brush	5525	17.89
H -	Bottomland Brush	1293	4.19
F -	Spruce - Balsam	85	.28
I -	Industry	27	.08
Z -	No Data	638	2.07
D -	Colorado Spruce	0	0
V -	Scotch Pine	0	0
Y -	Duff	0	0
Blank Areas (water)		2359	7.64



Paper Birch (B) More than 50% Paper Birch and Aspen, Paper Birch predominating.

Spruce - Balsam (F) mixed hardwood - coniferous type characterized by substantial qualities of White Spruce and Balsam Fir, Balsam Fir predominating.

Colorado Spruce (D) More than 50% Colorado Spruce.

Scotch Pine (V) More than 50% Scotch Pine.

Grass (G) Upland grass in the forest, less than 10% stocked with commercial tree species. (This also applies to abandoned farms where no farming or grazing is done.)

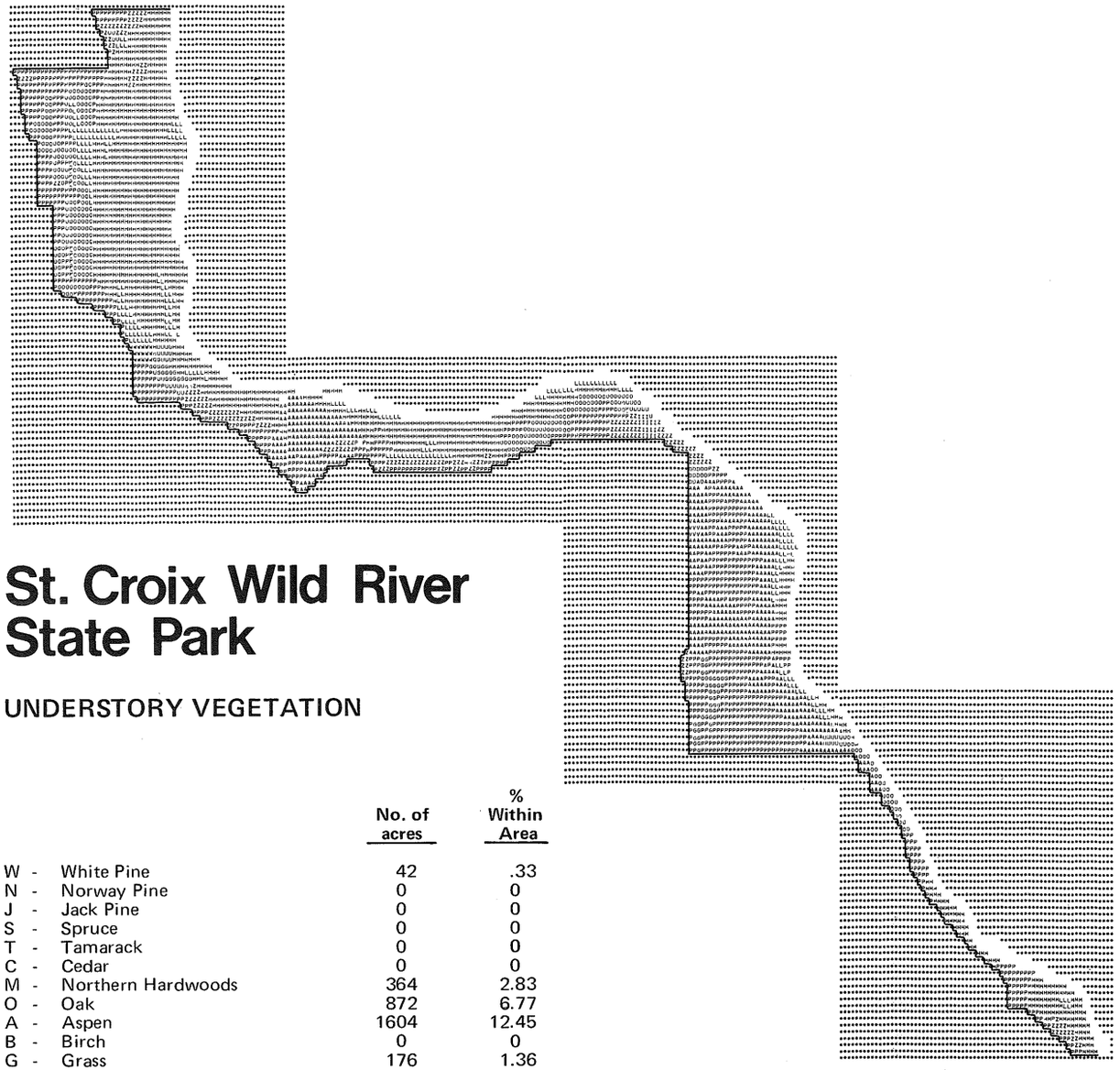
Upland Brush (U) Upland brush in forest areas less than 10% stocked with commercial tree species.

Lowland Brush (L) Lowland brush on potential commercial forest land, less than 10% stocked with commercial tree species.

Farm (P) Crop, orchard, or pasture but not farm woodland. Fenced farm woodlands more than 10 percent stocked to forest trees will be considered open pasture. (To be used only where the area is actively farmed, grazed, or used for hay production.)

Industrial & Residential (I) Platted areas for industry or residence. Also roads, railroads, cutout rights-of-ways, etc.

Marsh — (%) — land incapable of supporting a commercial forest. It includes wild grass, some willow or other scattered lowland brush.



St. Croix Wild River State Park

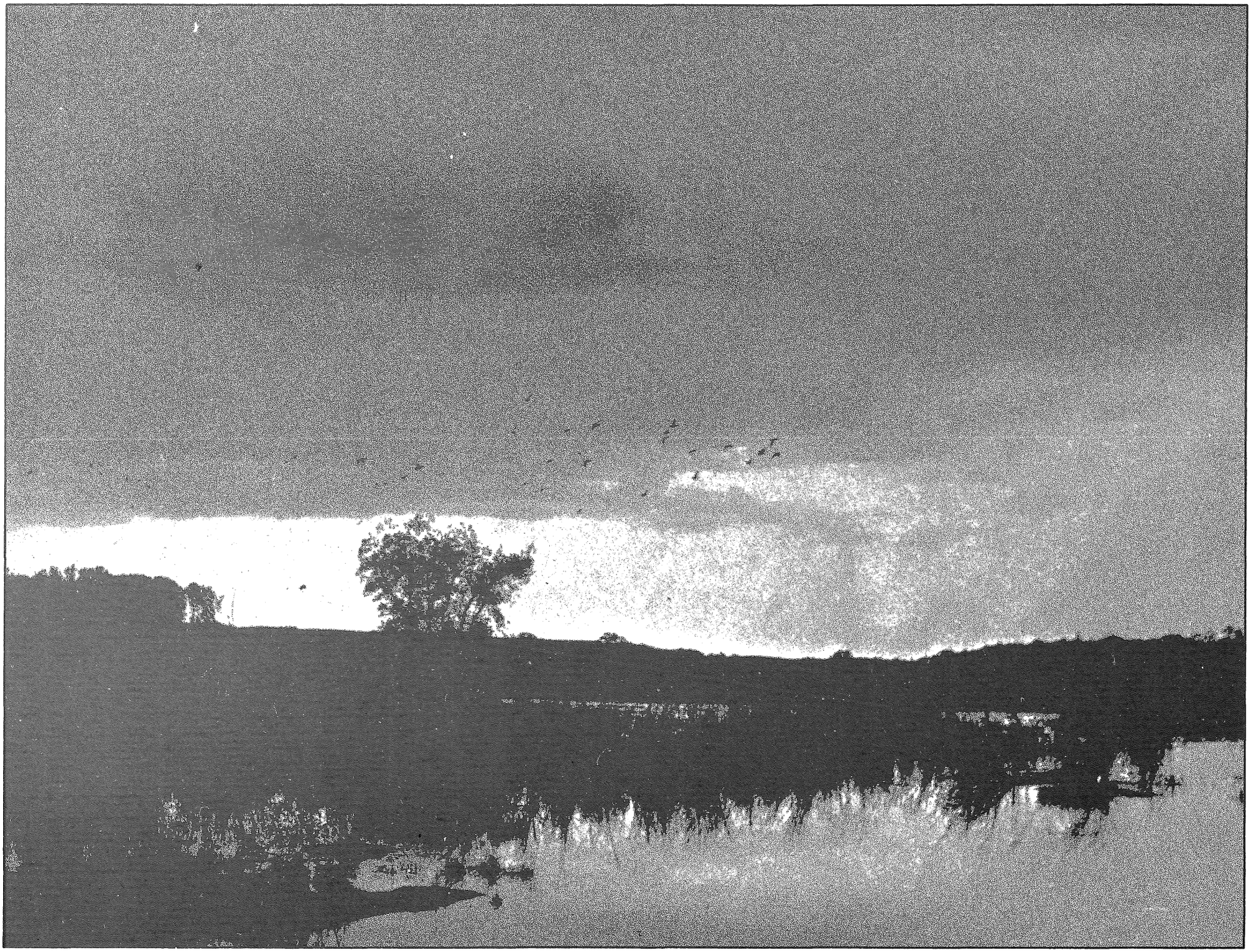
UNDERSTORY VEGETATION

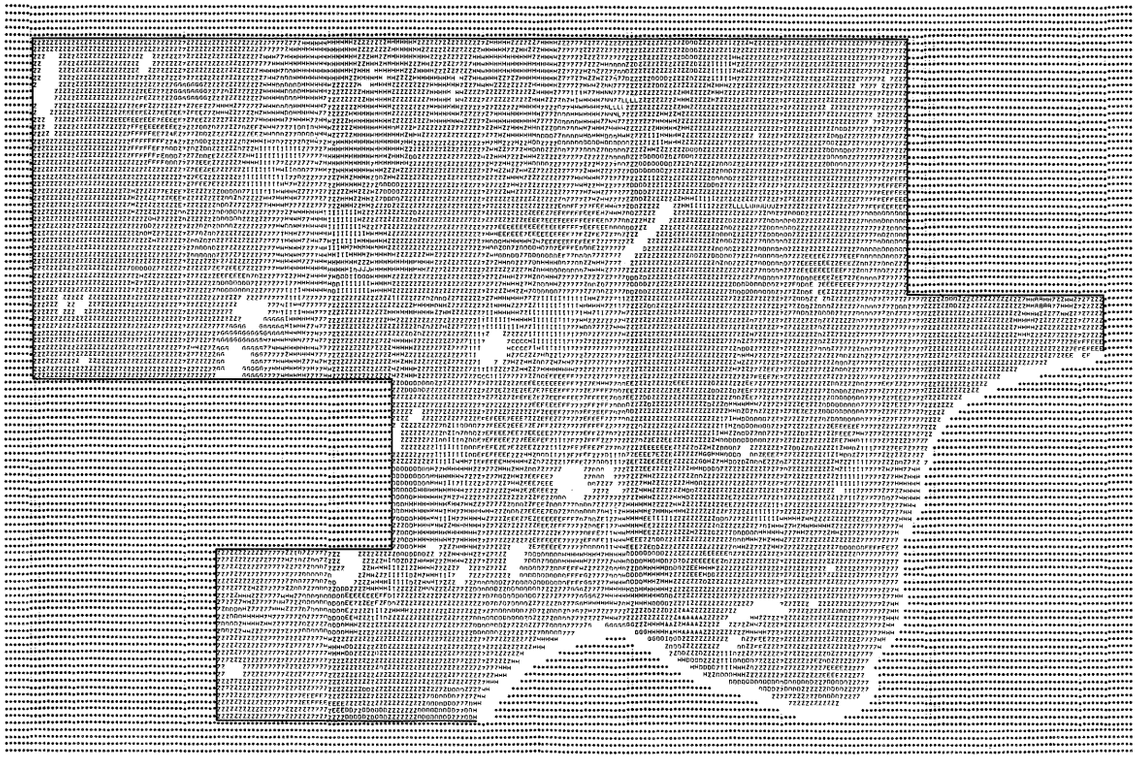
		No. of acres	% Within Area
W -	White Pine	42	.33
N -	Norway Pine	0	0
J -	Jack Pine	0	0
S -	Spruce	0	0
T -	Tamarack	0	0
C -	Cedar	0	0
M -	Northern Hardwoods	364	2.83
O -	Oak	872	6.77
A -	Aspen	1604	12.45
B -	Birch	0	0
G -	Grass	176	1.36
P -	Farm	3157	24.51
U -	Upland Brush	120	.93
% -	Marsh	0	0
- -	Muskeg	0	0
L -	Lowland Brush	732	5.68
H -	Bottomland Brush	3458	26.85
F -	Spruce - Balsam	0	0
I -	Industry	43	.33
Z -	No Data	556	4.32
D -	Colorado Spruce	37	.29
-	Scotch Pine	19	.14
Y -	Duff	0	0
Blank Areas (water)		1700	13.20

Muskeg (–) Nonproductive peat land with a vegetation consisting of mosses and low shrubs such as leather leaf, laurel, Labrador tea, cranberries, bog birch, etc., but not tall willows, alder, dogwood, etc. It is capable of supporting a 10 percent stocking of commercial species, but is often characterized by scattered, severely stunted black spruce and tamarack of less than site index 23 at 50 years. Stumps or large snags showing evidence of former commercial stand should not be evident. (If so, the land probably is of lowland brush.)

Duff (Y) Herbaceous cover (ferns or annuals); mineral soil.

No data (Z)

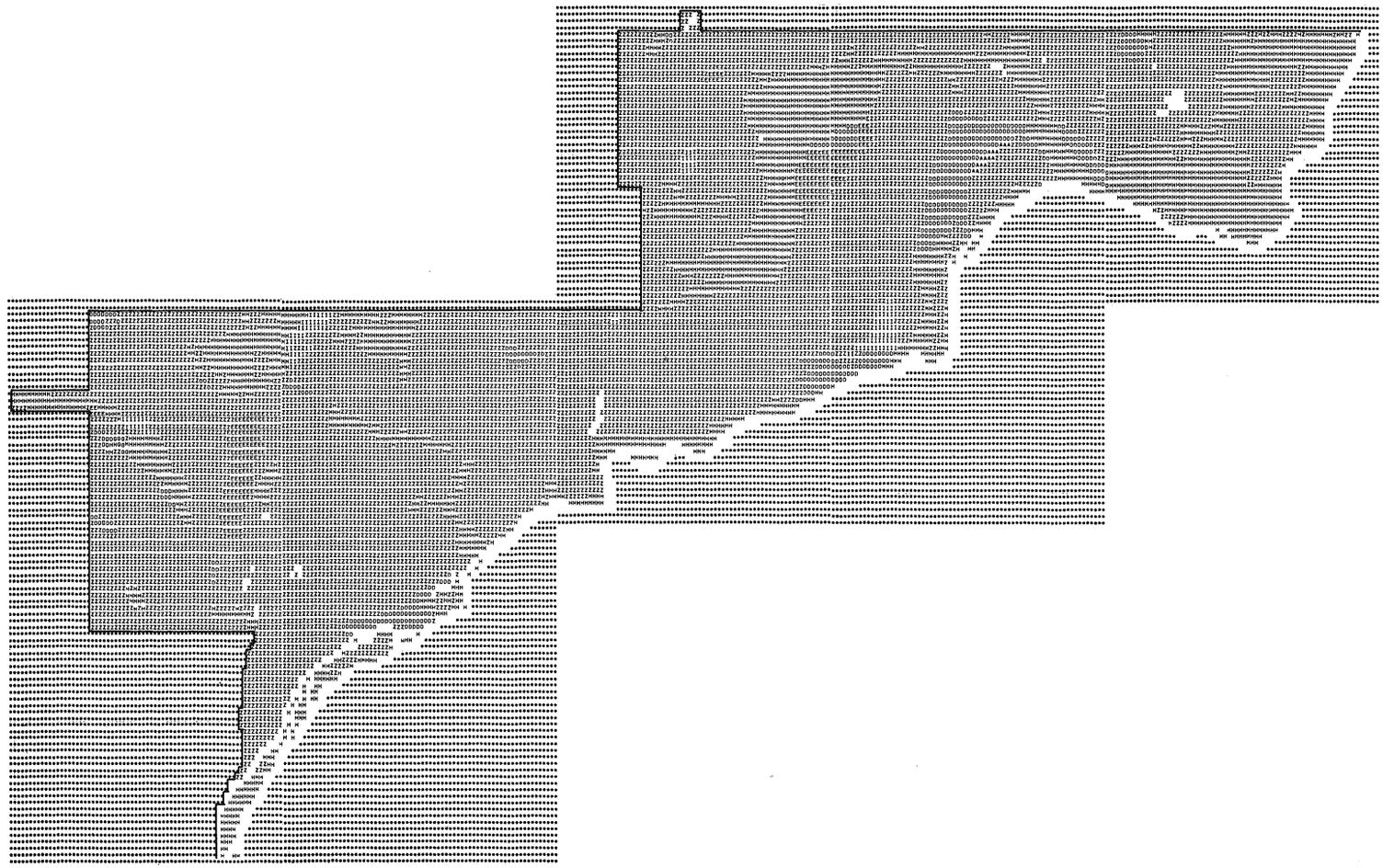




St. Croix State Forest

UNDERSTORY SIZE AND DENSITY

A - 200-800 Seedlings/acre
B - 800-1400 " "
C - 1400+ " "
D - 100-400 Saplings/acre
E - 400-700 " "
F - 700+ " "
G - 1-3 pole timber cords/acre
H - 3 - 7 " " " "
I - 7-13 " " " "
J - 13-20 " " " "
K - 20+ " " " "
L - 1-2.6 Small saw timber cords/acre
M - 2.6-5 " " " " "
N - 5-10 " " " " "
O - 10-16 " " " " "
P - 16+ " " " " "
Z - No Data
Blank Areas (water)



St. Croix State Park

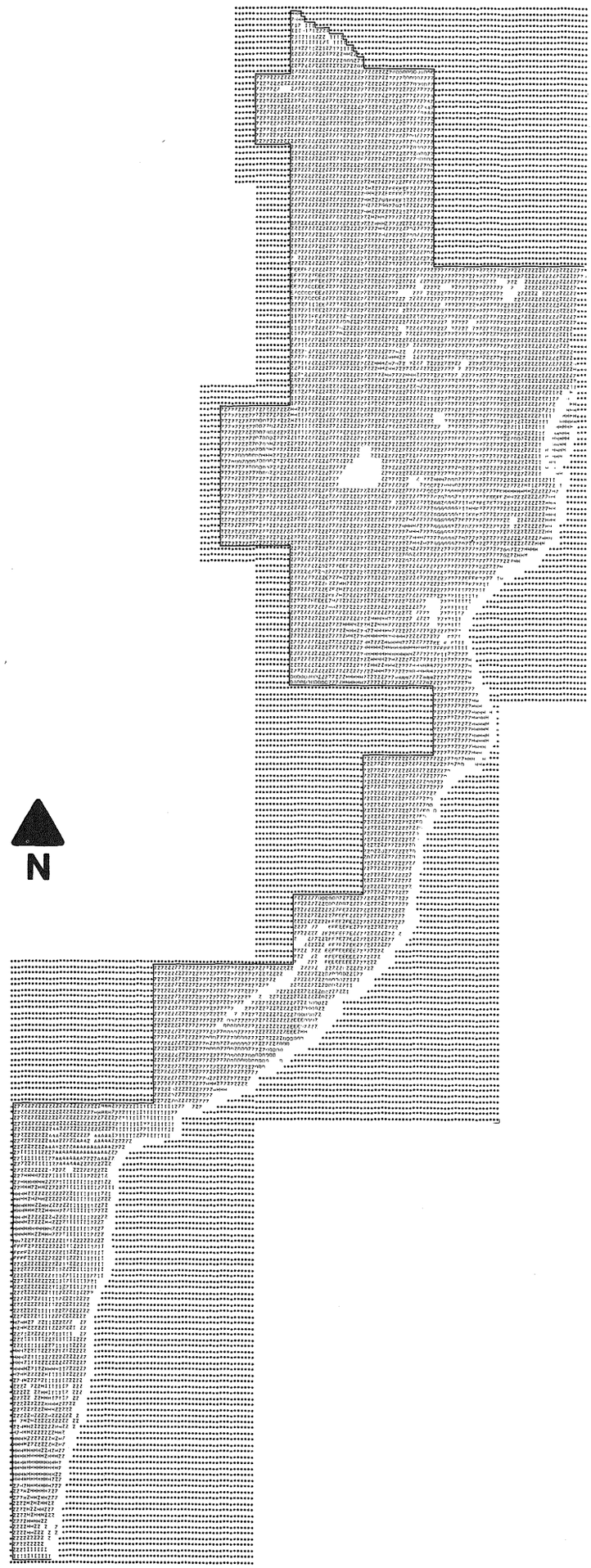
UNDERSTORY SIZE AND DENSITY

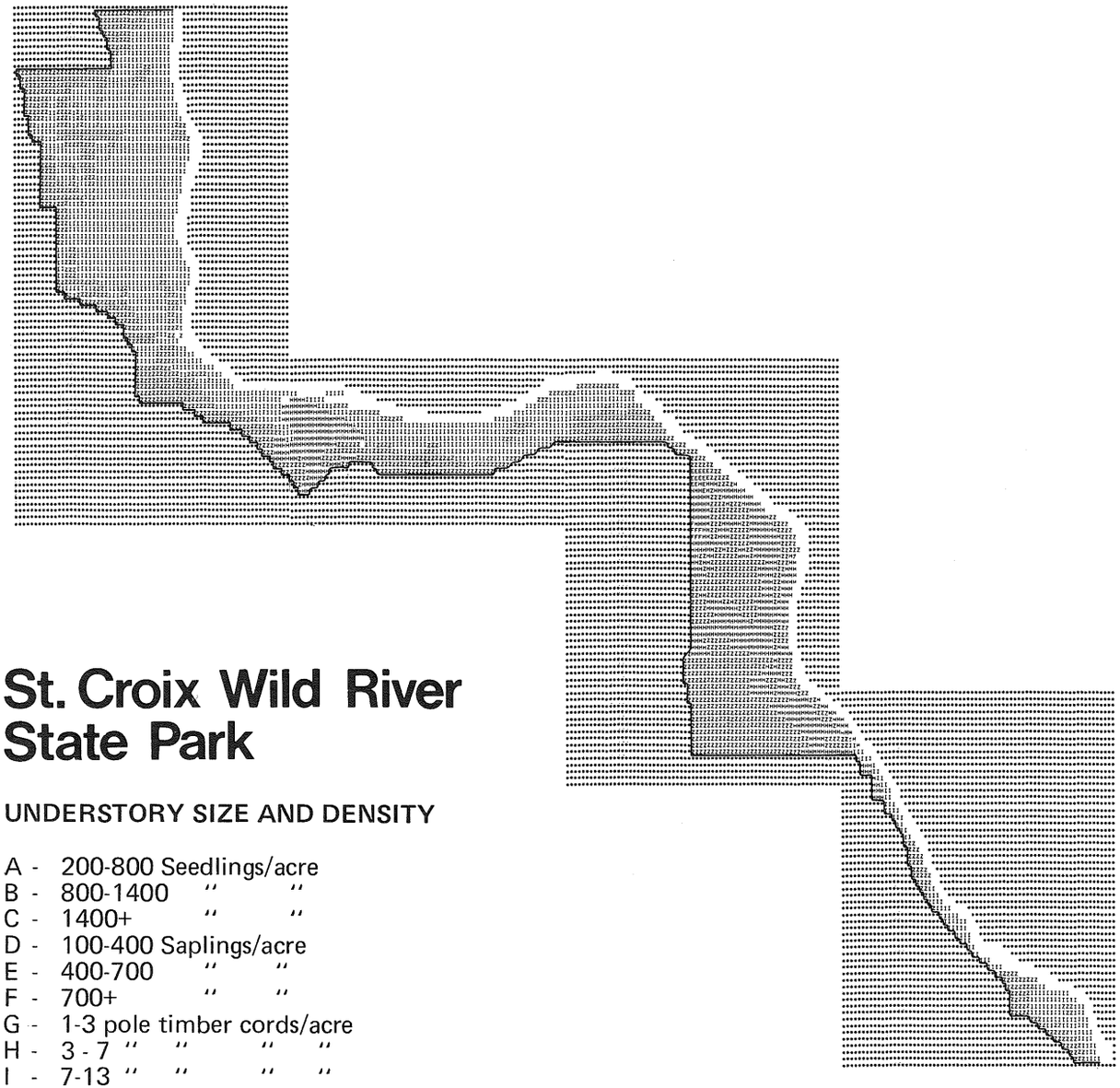
A - 200-800 Seedlings/acre
B - 800-1400 " "
C - 1400+ " "
D - 100-400 Saplings/acre
E - 400-700 " "
F - 700+ " "
G - 1-3 pole timber cords/acre
H - " " " "
I - 7-13 " " " "
J - 13-20 " " " "
K - 20+ " " " "
L - 1-2.6 Small saw timber cords/acre
M - 2.6-5 " " " " "
N - 5-10 " " " " "
O - 10-16 " " " " "
P - 16+ " " " " "
Z - No Data
Blank Areas (water)

Chengwatana State Forest

UNDERSTORY SIZE AND DENSITY

A - 200-800 Seedlings/acre
B - 800-1400
C - 1400+ " "
D - 100-400 Saplings/acre
E - 400-700 " "
F - 700+ " "
G - 1-3 pole timber cords/acre
H - 3 - 7 " " " "
I - 7-13 " " " "
J - 13-20 " " " "
K - 20+ " " " "
L - 1-2.6 Small saw timber cords/acre
M - 2.6-5 " " " " "
N - 5-10 " " " " "
O - 10-16 " " " " "
P - 16+ " " " " "
Z - No Data
Blank Areas (water)





St. Croix Wild River State Park

UNDERSTORY SIZE AND DENSITY

A - 200-800 Seedlings/acre
B - 800-1400 " "
C - 1400+ " "
D - 100-400 Saplings/acre
E - 400-700 " "
F - 700+ " "
G - 1-3 pole timber cords/acre
H - 3 - 7 " " " "
I - 7-13 " " " "
J - 13-20" " " "
K - 20+ " " " "
L - 1-2.6 Small saw timber cords/acre
M - 2.6-6 " " " " "
N - 5-10 " " " " "
O - 10-16 " " " " "
P - 16+ " " " " "
Z - No Data
Blank Areas (water)

Ownership

Determining land ownership is of great importance in formulating an overall management plan.

The study area contains approximately 115,000 acres and is divided into four major units: St. Croix State Forest (42,000 acres), St. Croix State Park (34,000 acres), Chengwatana State Forest (29,000 acres), and St. Croix Wild River State Park (10,000 acres). About 67 percent of these lands will be administered by a governmental agency (federal or state) after N.S.P. has donated it's lands along the St. Croix. This ranges from a high of 89 percent in St. Croix State Park to a low of 45 percent in St. Croix Wild River State Park with St. Croix State Forest (65 percent), and Chengwatana State Forest (60 percent).

Although the "Wild and Scenic Rivers Act" provided for a one-fourth mile corridor along the river, the remaining private lands within the study units should be acquired or legislation passed to limit their development. This would consolidate the areas into one comprehensive unit providing a continuous recreational system, better controls on wildlife and forestry, and a more exclusive buffer to preserve the natural state of the river. The following lands should be added to the statutory boundaries of St. Croix State Forest, St. Croix State Park, and St. Croix Wild River State Park to achieve this goal.

St. Croix State Forest

T 41 N, R 17 W, Sec. 21, 23, and 24 on Minnesota's side of the River. This area consists of 1,560 acres and would facilitate coordinated management of St. Croix State Forest and St. Croix State Park.

St. Croix State Park

In T 41 N, R 17 W, the remainder of Sections 26, 27, 28, 33, and 34. Area contains 1,960 acres and is needed to strengthen connecting link of St. Croix State Forest with St. Croix State Park.

St. Croix Wild River State Park

The land area proposed for inclusion within the park's statutory boundaries is quite extensive. It includes the following sections and parts of sections, consisting of about 3,614 acres of land.

T 36 N, R 21 W, Sec. 1, 12, 13, 24, and 25.

T 36 N, R 20 W, Sec. 30, 31, 32, 33, and 36.

T 36 N, R 19 W, Section 31.

T 35 N, R 20 W, Sec, 5, 4, 3, 2, and 1.

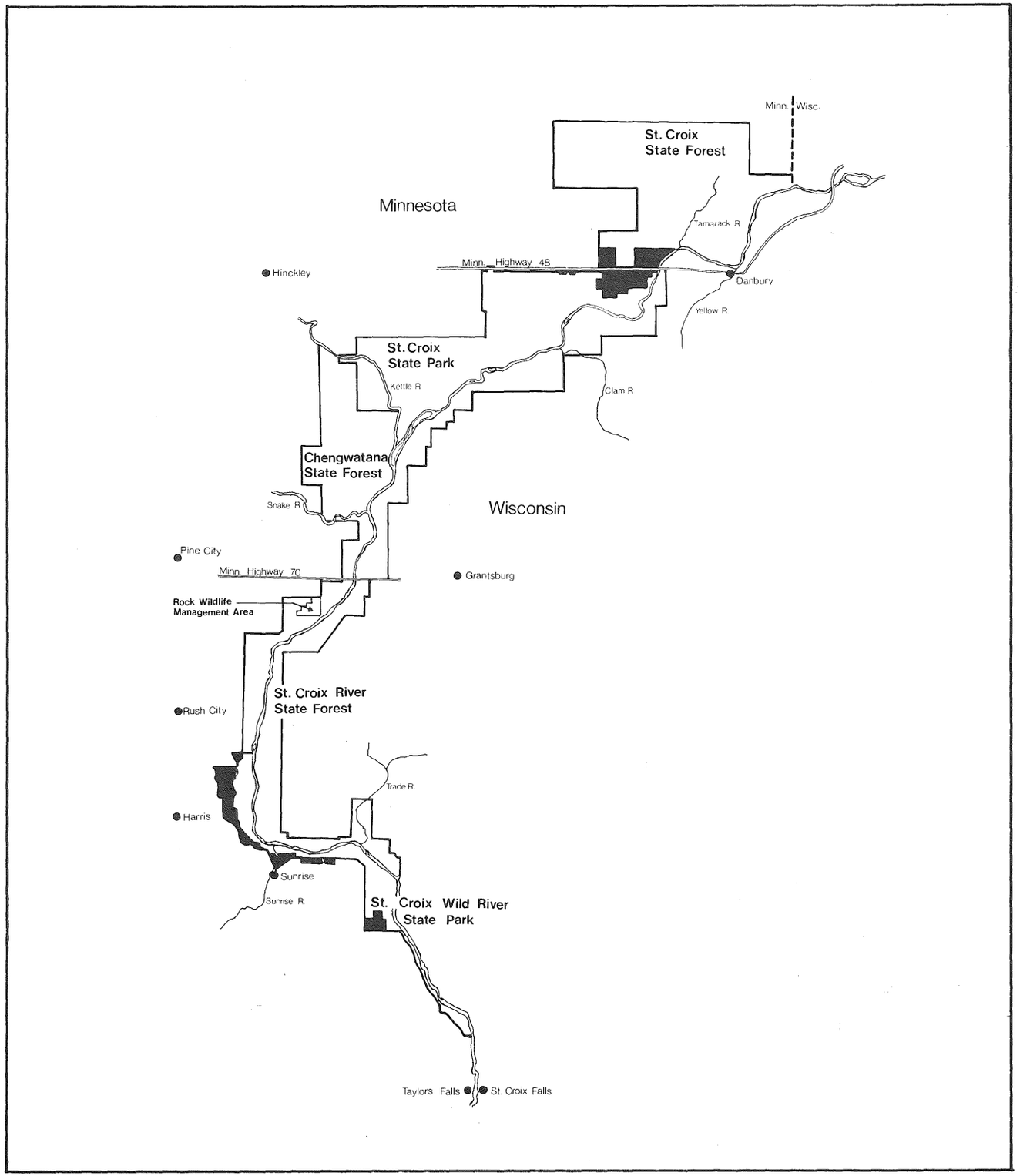
T 35 N, R 19 W, Section 20 and 21.

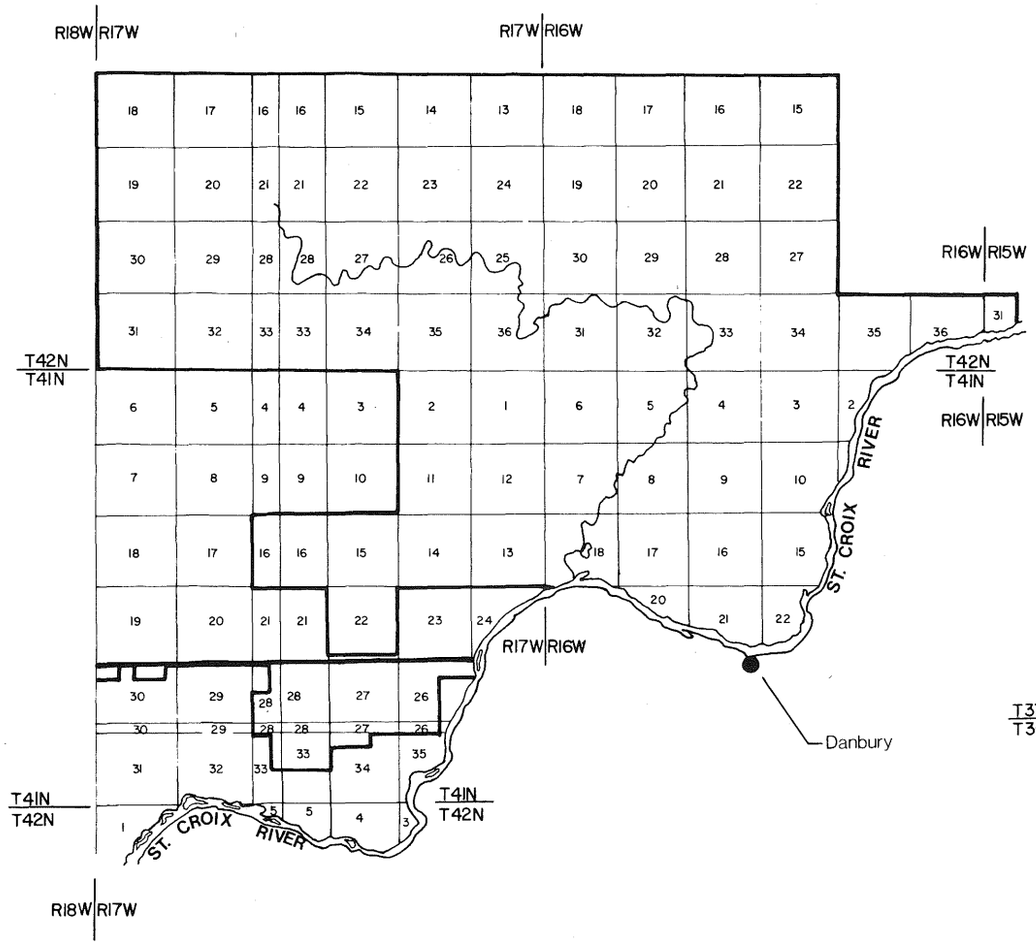
The old boundary line determined by ownership alone, would then be converted to a more natural boundary determined by the peripheral roads, vegetation and topography. This adjustment would simplify and improve management, development, maintenance, control and enforcement of the St. Croix Wild River State Park. (Refer to schematic that includes all units, page 72.)

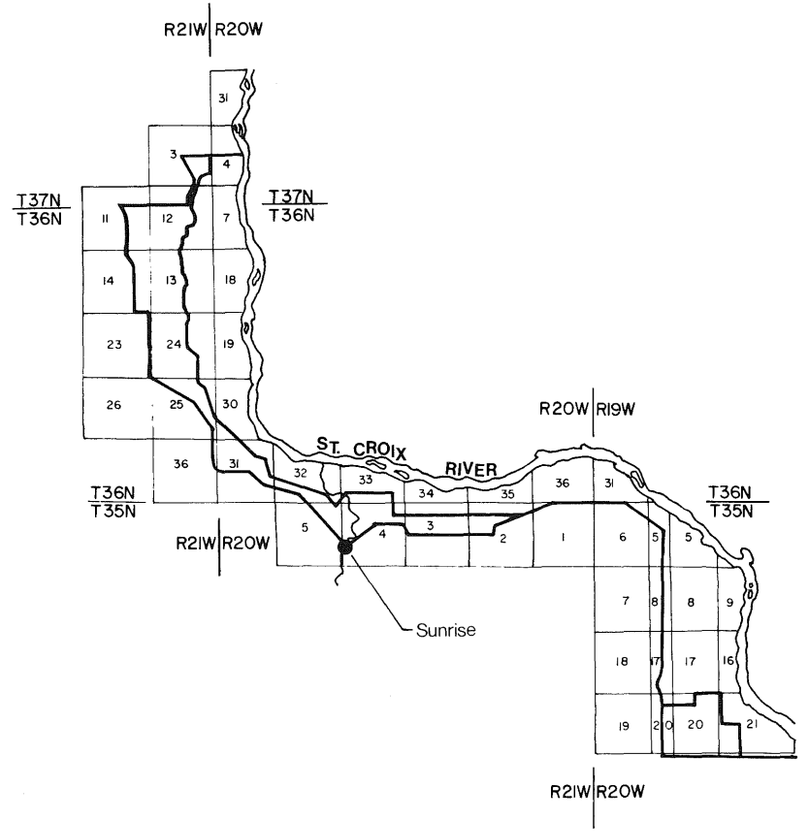
Lands proposed for purchases or inclusion within the statutory boundaries of St. Croix State Forest, St. Croix State Park, and St. Croix Wild River State Park have been included and analyzed as part of these study units throughout the management plan.

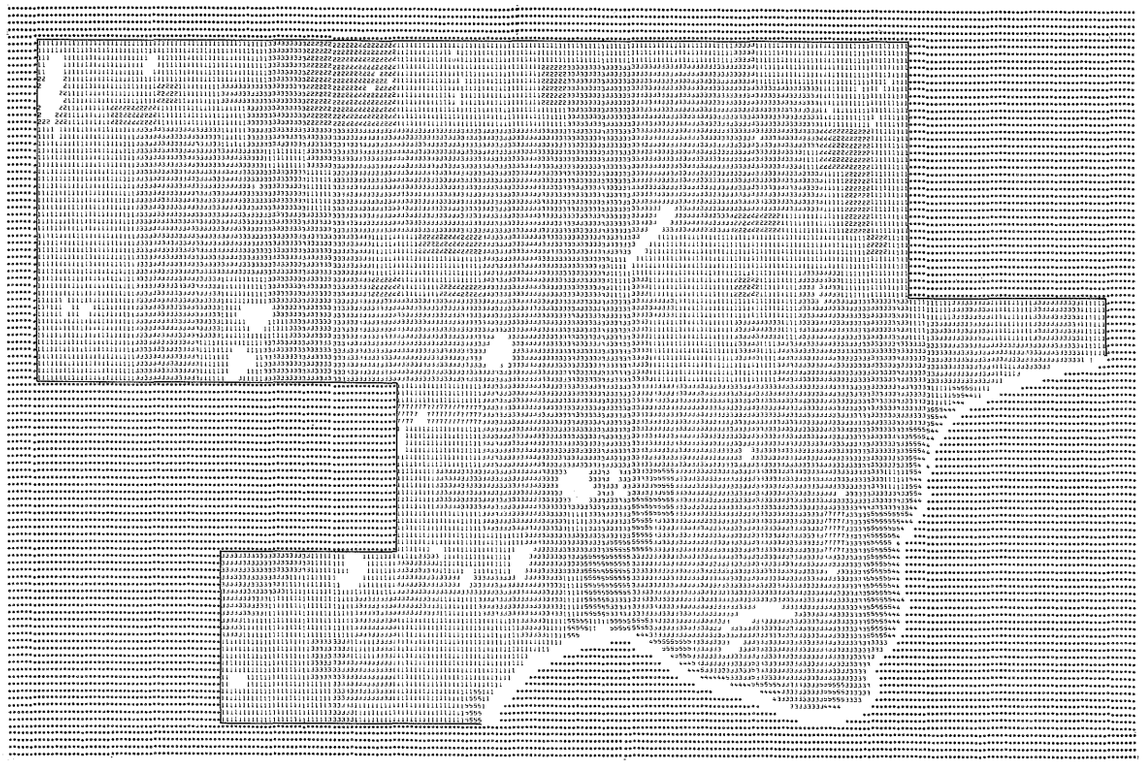
A breakdown of ownership within the four units is shown below:

Index	St. Croix State Forest Acres - %	St. Croix State Park Acres - %	Chengwatana State Forest Acres - %	St. Croix Wild River State Park Acres - %
Private	14220 - 31.92	1904 - 4.90	8828 - 28.59	5714 - 44.36
County	1678 - 3.76	0 - 0	0 - 0	24 - .18
State	25336 - 56.86	27842 - 71.63	14313 - 46.35	0 - 0
NSP-NPS	268 - .60	450 - 1.16	1612 - 5.22	1290 - 10.03
NSP-State	1138 - 2.55	6158 - 15.84	2721 - 8.81	3751 - 29.12
NSP	0 - 0	0 - 0	1051 - 3.40	404 - 3.13
Indian	226 - .51	268 - .69	0 - 0	0 - 0
Water	1692 - 3.80	2248 - 5.78	2357 - 7.63	1697 - 13.18


Minn.
Wisc.
St. Croix
State Forest
Minnesota
Tamarack R.
Minn. Highway 48
Hinckley
Danbury
Yellow R.
St. Croix
State Park
Kettle R.
Clam R.
Chengwatana
State Forest
Snake R.
Wisconsin
Pine City
Minn. Highway 70
Grantsburg
Rock Wildlife
Management Area
St. Croix River
State Forest
Rush City
Trade R.
Harris
Sunrise
Sunrise R.
St. Croix Wild River
State Park
Taylors Falls
St. Croix Falls


R18W R17W
R17W R16W
R16W R15W
T42N
T41N
T41N
T42N
ST. CROIX RIVER
Danbury

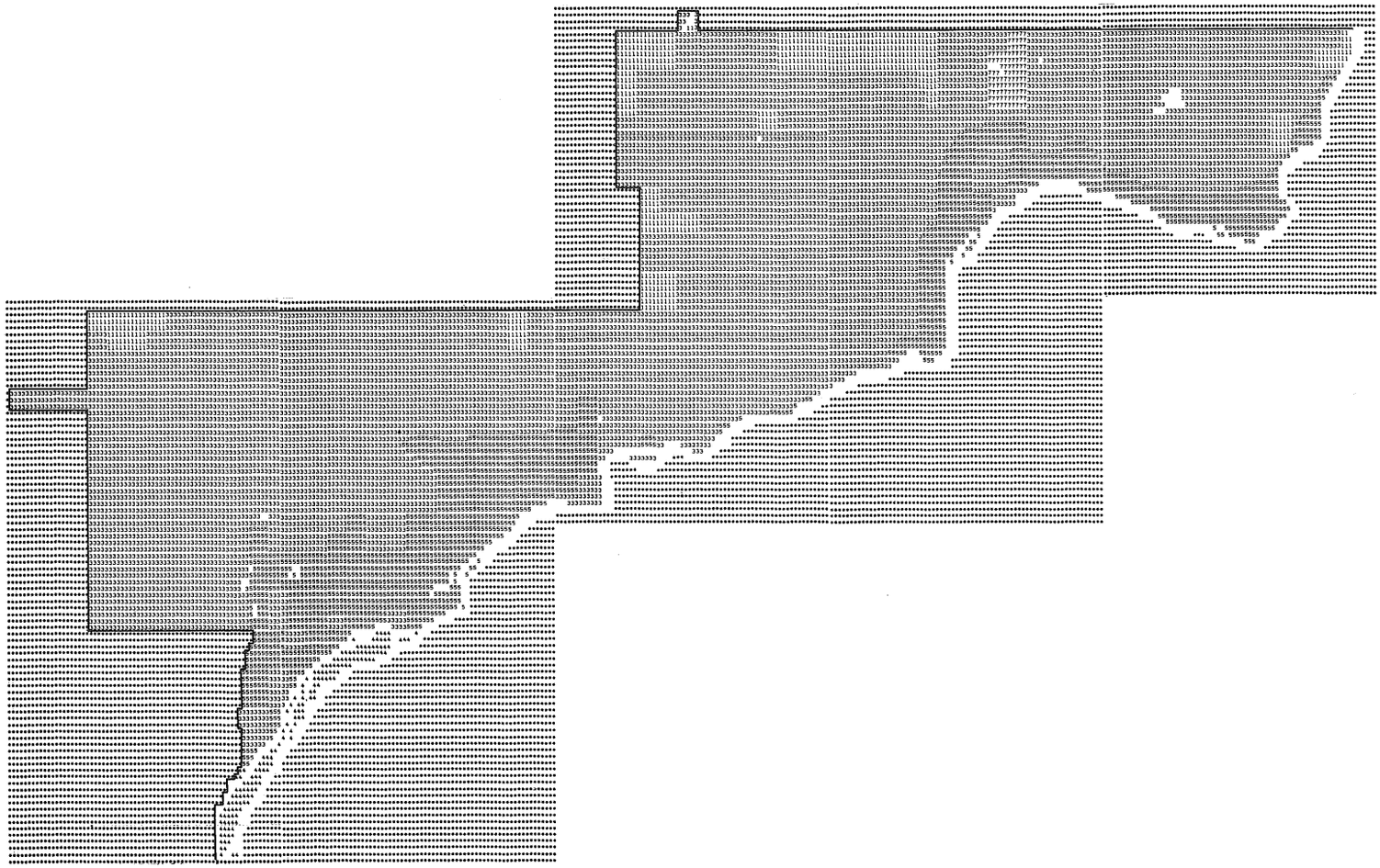

R21W R20W
T37N
T36N
R20W R19W
ST. CROIX RIVER
T36N
T35N
R21W R20W
Sunrise



St. Croix State Forest

OWNERSHIP

1 - Private
2 - County
3 - State
4 - NSP - NPS
5 - NSP - State
6 - NSP
7 - Indian
Blank Areas (water)



St. Croix State Park

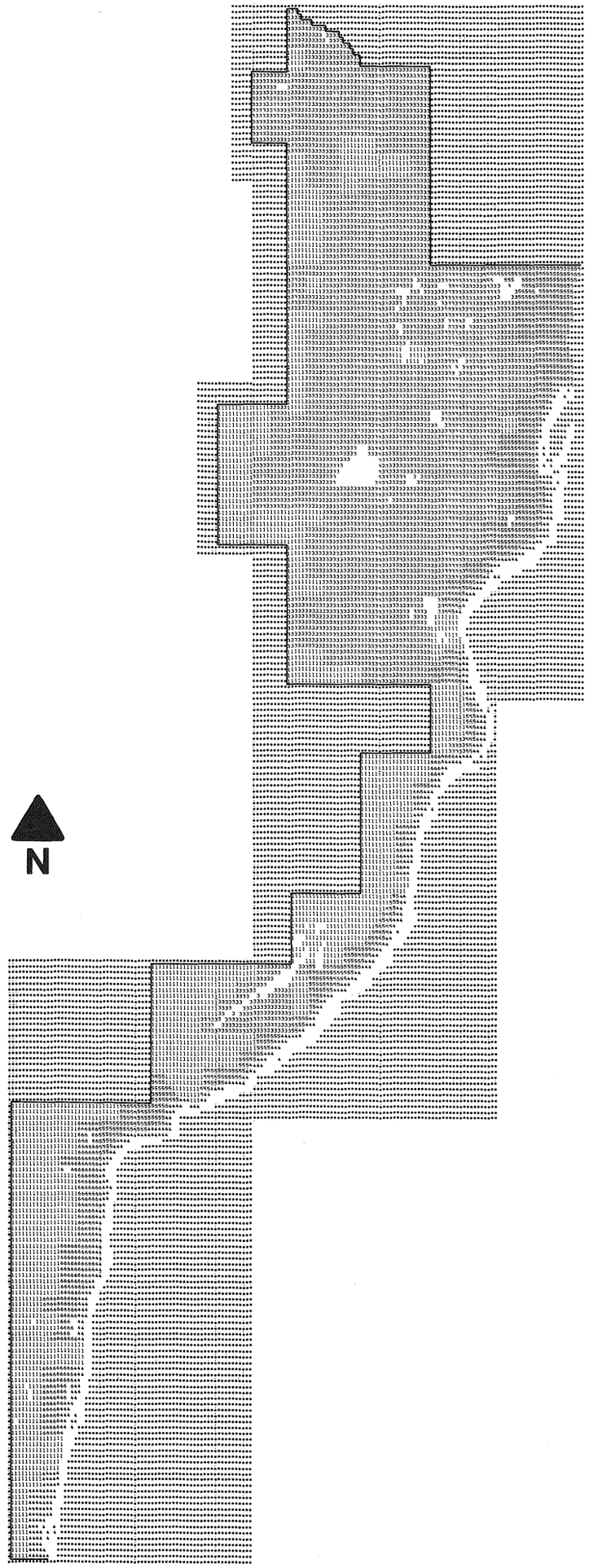
OWNERSHIP

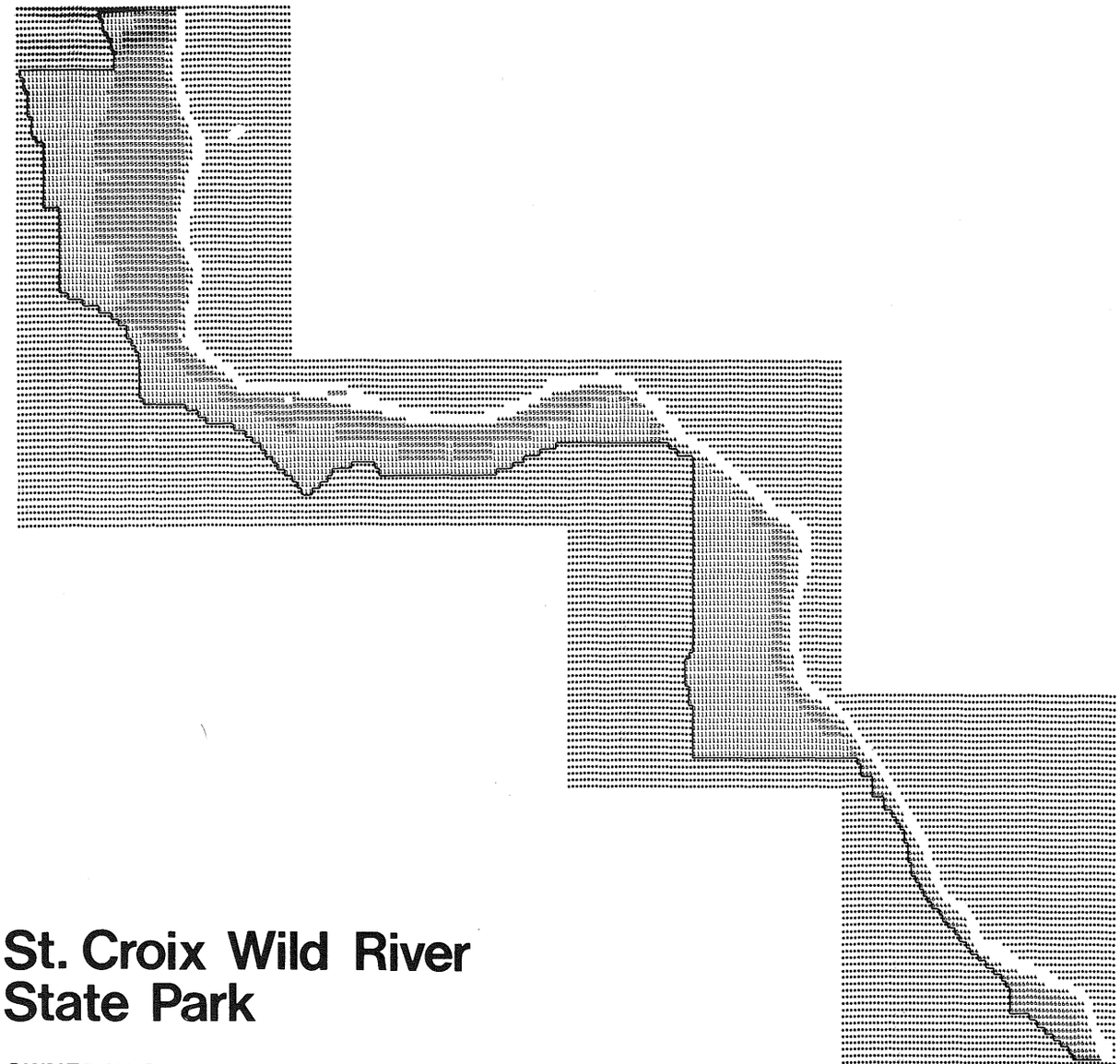
1 - Private
2 - County
3 - State
4 - NSP - NPS
5 - NSP - State
6 - NSP
7 - Indian
Blank Areas (water)

Chengwatana State Forest

OWNERSHIP

1 - Private
2 - County
3 - State
4 - NSP - NPS
5 - NSP - State
6 - NSP
7 - Indian
Blank Area (water)

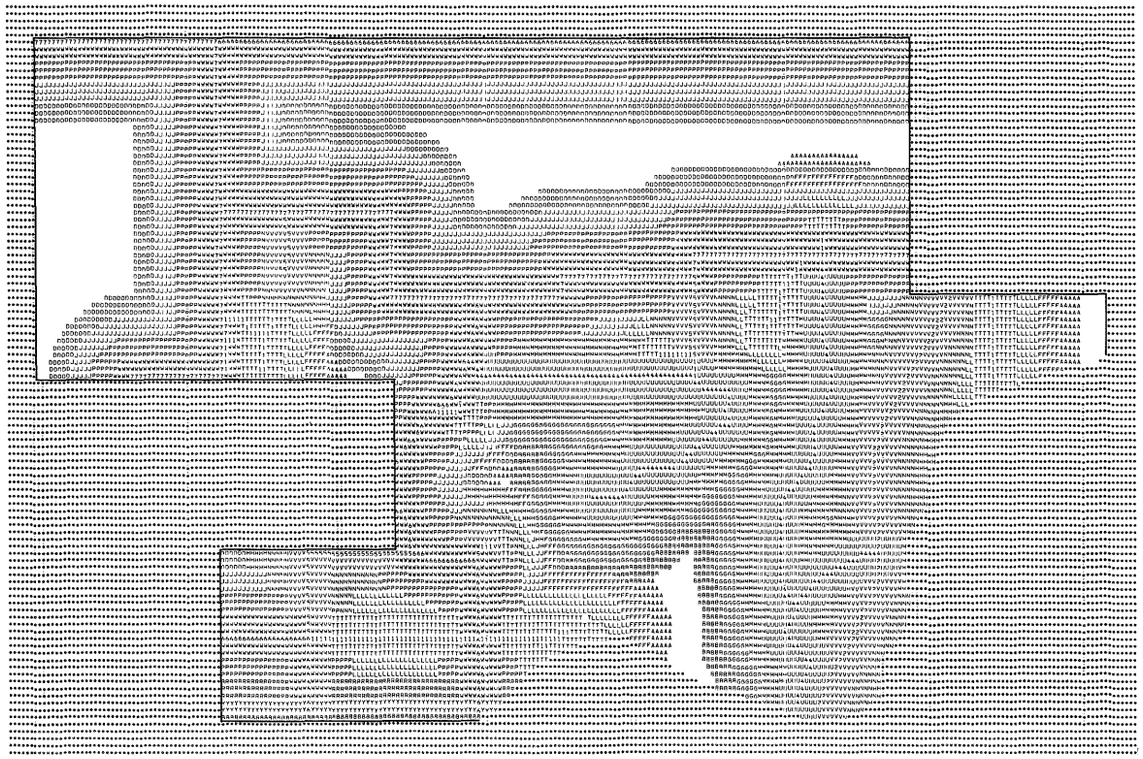




St. Croix Wild River State Park

OWNERSHIP

1 - Private
2 - County
3 - State
4 - NSP - NPS
5 - NSP - State
6 - NSP
7 - Indian
Blank Areas (water)



St. Croix State Forest

TRANSPORTATION

0	-	Fire break trail	
1	-	Logging road	
2	-	Park road	
3	-	Forest road	
4	-	Railroad	
5	-	Township road	
6	-	County road	
7	-	County state aid highway	
8	-	State highway	
9	-	U.S. highway	
Y	-	0-1/4	mile from US and State Hwy.
W	-	0-1/4	mile from CSAH and county road
V	-	0-1/4	mile from township road and railroad
U	-	0-1/4	mile from forest road and park road
T	-	0-1/4	mile from logging road and fire break trail
R	-	1/4-1/2	mile from U.S. and state highway
P	-	1/4-1/2	mile from CSAH and county road
N	-	1/4-1/2	mile from township road and railroad
M	-	1/4-1/2	mile from forest road and park road
L	-	1/4-1/2	mile from logging road and fire break trail
K	-	1/2-3/4	mile from U.S. and state highway
J	-	1/2-3/4	mile from CSAH and county road
H	-	1/2-3/4	mile from township road and railroad
G	-	1/2-3/4	mile from forest road and park road
F	-	1/2-3/4	mile from logging road and fire break trail
E	-	3/4-1	mile from US and State Hwy.
D	-	3/4-1	mile from CSAH and county road
C	-	3/4-1	mile from township road and railroad
B	-	3/4-1	mile from forest road and park road
A	-	3/4-1	mile from logging road and fire break trail

The St. Croix basin contains an intricate network of federal, state and local highways. Weekend travel on these roadways continues to increase because of an evergrowing number of sightseers, and thousands more who enjoy hiking, boating, canoeing, fishing, hunting, camping, picnicking, snowmobiling, snowshoeing and cross-country skiing in the region.

These same highways, however, can have a detrimental effect on the environment. Motor vehicles bring pollution in many forms-noise, smell and visual. Road kills of wildlife from deer to porcupine, are not uncommon.

Additionally, the roads affect adjacent vegetation, wildlife habitat and restrict movements of animals to some degree.

Federal, state and county highway systems have a much greater impact on the environment than do park and forest roads, and recreation trails. The reasons are obvious--higher traffic counts, faster speed zones and expansive design sections.

The environmental impact of each type of roadway is illustrated on the transportation map where corridors from 0 to 1/4 mile, 1/4 to 1/2 mile, 1/2 to 3/4 mile, and 3/4 to 1 mile reveal different impact intensities. In any composite formula where transportation is a factor each of these corridors is weighted with regard to the facility being programmed.

St. Croix State Park

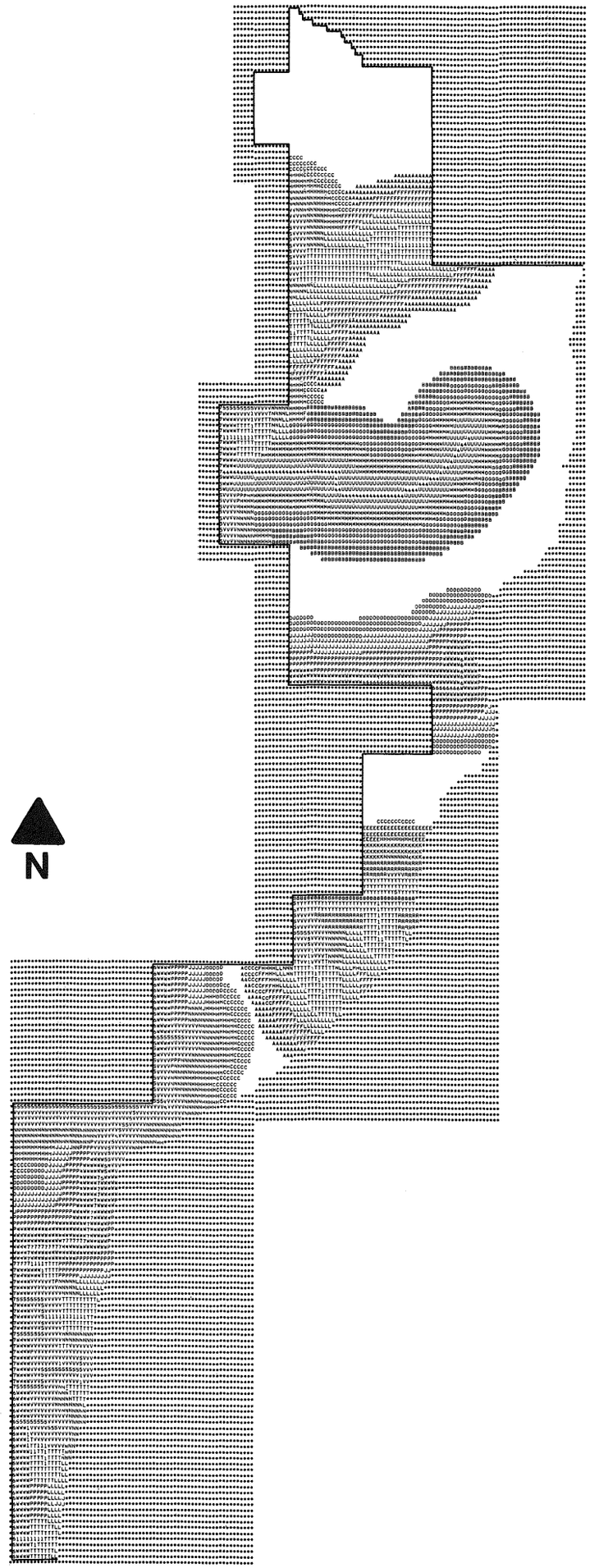
TRANSPORTATION

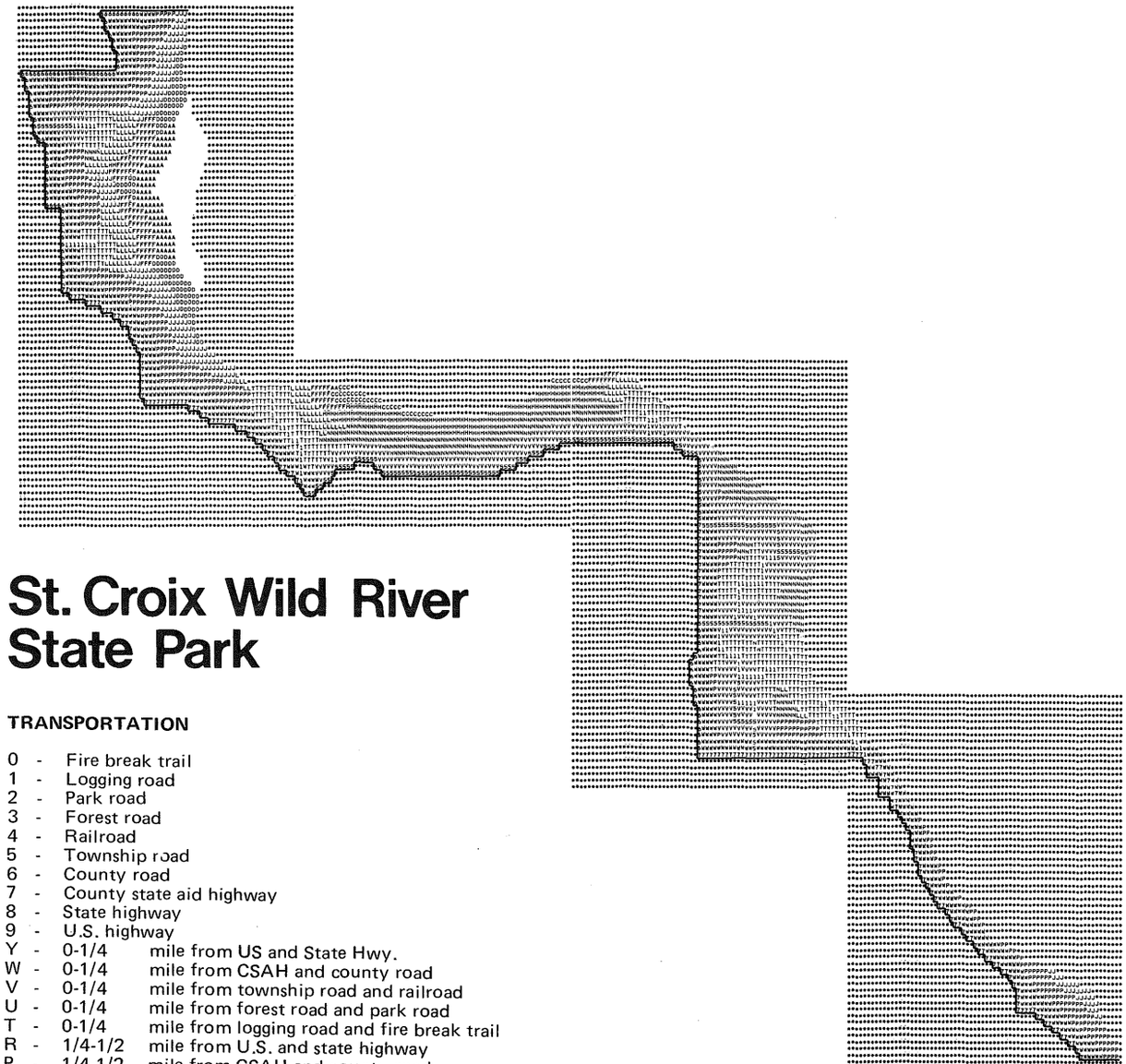
0	-	Fire break trail
1	-	Logging road
2	-	Park road
3	-	Forest road
4	-	Railroad
5	-	Township road
6	-	County road
7	-	County state aid highway
8	-	State highway
9	-	U.S. highway
Y	-	0-1/4 mile from US and State Hwy.
W	-	0-1/4 mile from CSAH and county road
V	-	0-1/4 mile from township road and railroad
U	-	0-1/4 mile from forest road and park road
T	-	0-1/4 mile from logging road and fire break trail
R	-	1/4-1/2 mile from U.S. and state highway
P	-	1/4-1/2 mile from CSAH and county road
N	-	1/4-1/2 mile from township road and railroad
M	-	1/4-1/2 mile from forest road and park road
L	-	1/4-1/2 mile from logging road and fire break trail
K	-	1/2-3/4 mile from U.S. and state highway
J	-	1/2-3/4 mile from CSAH and county road
H	-	1/2-3/4 mile from township road and railroad
G	-	1/2-3/4 mile from forest road and park road
F	-	1/2-3/4 mile from logging road and fire break trail
E	-	3/4-1 mile from US and State Hwy.
D	-	3/4-1 mile from CSAH and county road
C	-	3/4-1 mile from township road and railroad
B	-	3/4-1 mile from forest road and park road
A	-	3/4-1 mile from logging road and fire break trail

Chengwatana State Forest

TRANSPORTATION

0 - Fire break trail
1 - Logging road
2 - Park road
3 - Forest road
4 - Railroad
5 - Township road
6 - County road
7 - County state aid highway
8 - State highway
9 - U.S. highway
Y - 0-1/4 mile from US and State Hwy.
W - 0-1/4 mile from CSAH and county road
V - 0-1/4 mile from township road and railroad
U - 0-1/4 mile from forest road and park road
T - 0-1/4 mile from logging road and fire break trail
R - 1/4-1/2 mile from U.S. and state highway
P - 1/4-1/2 mile from CSAH and county road
N - 1/4-1/2 mile from township road and railroad
M - 1/4-1/2 mile from forest road and park road
L - 1/4-1/2 mile from logging road and fire break trail
K - 1/2-3/4 mile from U.S. and state highway
J - 1/2-3/4 mile from CSAH and county road
H - 1/2-3/4 mile from township road and railroad
G - 1/2-3/4 mile from forest road and park road
F - 1/2-3/4 mile from logging road and fire break trail
E - 3/4-1 mile from US and State Hwy.
D - 3/4-1 mile from CSAH and county road
C - 3/4-1 mile from township road and railroad
B - 3/4-1 mile from forest road and park road
A - 3/4-1 mile from logging road and fire break trail



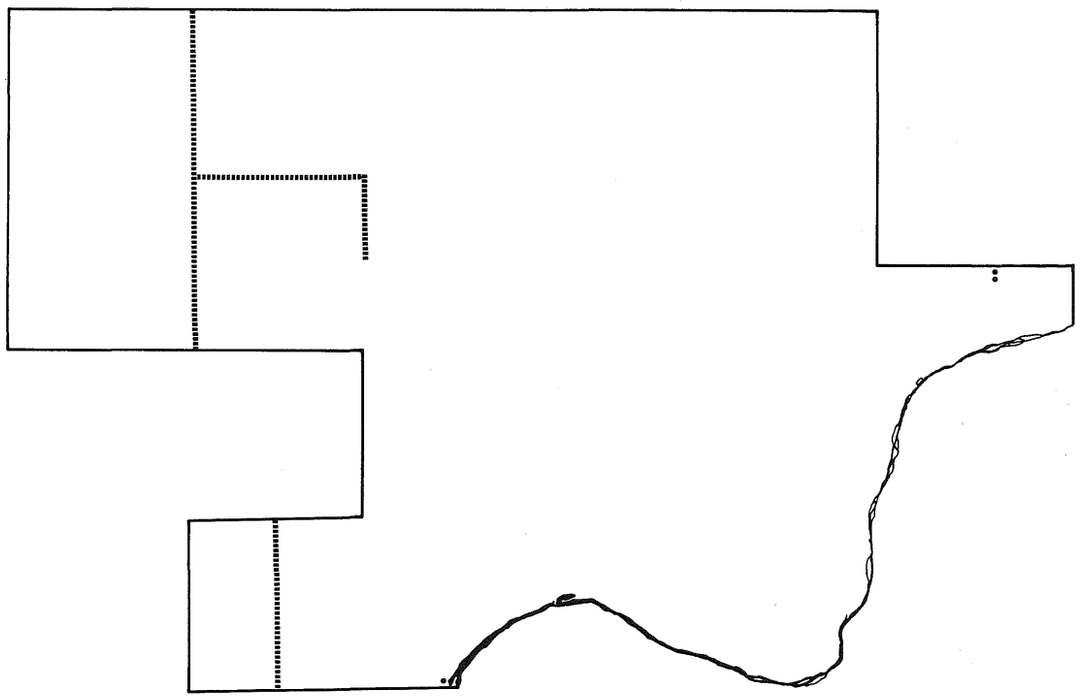


St. Croix Wild River State Park

TRANSPORTATION

0 - Fire break trail
1 - Logging road
2 - Park road
3 - Forest road
4 - Railroad
5 - Township road
6 - County road
7 - County state aid highway
8 - State highway
9 - U.S. highway
Y - 0-1/4 mile from US and State Hwy.
W - 0-1/4 mile from CSAH and county road
V - 0-1/4 mile from township road and railroad
U - 0-1/4 mile from forest road and park road
T - 0-1/4 mile from logging road and fire break trail
R - 1/4-1/2 mile from U.S. and state highway
P - 1/4-1/2 mile from CSAH and county road
N - 1/4-1/2 mile from township road and railroad
M - 1/4-1/2 mile from forest road and park road
L - 1/4-1/2 mile from logging road and fire break trail
K - 1/2-3/4 mile from U.S. and state highway
J - 1/2-3/4 mile from CSAH and county road
H - 1/2-3/4 mile from township road and railroad
G - 1/2-3/4 mile from forest road and park road
F - 1/2-3/4 mile from logging road and fire break trail
E - 3/4-1 mile from US State Hwy.
D - 3/4 - 1 mile from CSAH and county road
C - 3/4-1 mile from township road and railroad
B - 3/4-1 mile from forest road and park road
A - 3/4-1 mile from logging road and fire break trail

Utilities



St. Croix State Forest

UTILITIES

Overhead telephone
Underground telephone
Overhead Distribution Line
High Voltage Transmission Line

This map shows the location of electric distribution lines and telephone cables. Determining location and availability of these lines is important for planning any developments.

Electric Power Lines

A 230 KV overhead transmission line by Northern States Power Company runs across the northern area of St. Croix Wild River State Park and along the northwestern boundary of Chengwatana State Forest. This line requires a 125-foot right-of-way to provide easy access for line maintenance. Local distribution lines (7.2 KV) are provided by three utility companies.

1. Northern States Power Company provides power to the southern area of St. Croix Wild River State Park.

2. Northwestern Wisconsin Electric Company provides power to the eastern edge of St. Croix State Forest and the five major recreational areas of the St. Croix State Park.

3. East Central Electric Association provides power to the western edge of Chengwatana State Forest and the northern area of St. Croix Wild River State Park.

Park areas require electric power for lighting, water well pumps, sewer lift stations and for convenience outlets in trailer parks. Distribution lines are usually underground within park areas for esthetic and safety reasons.

St. Croix State Park

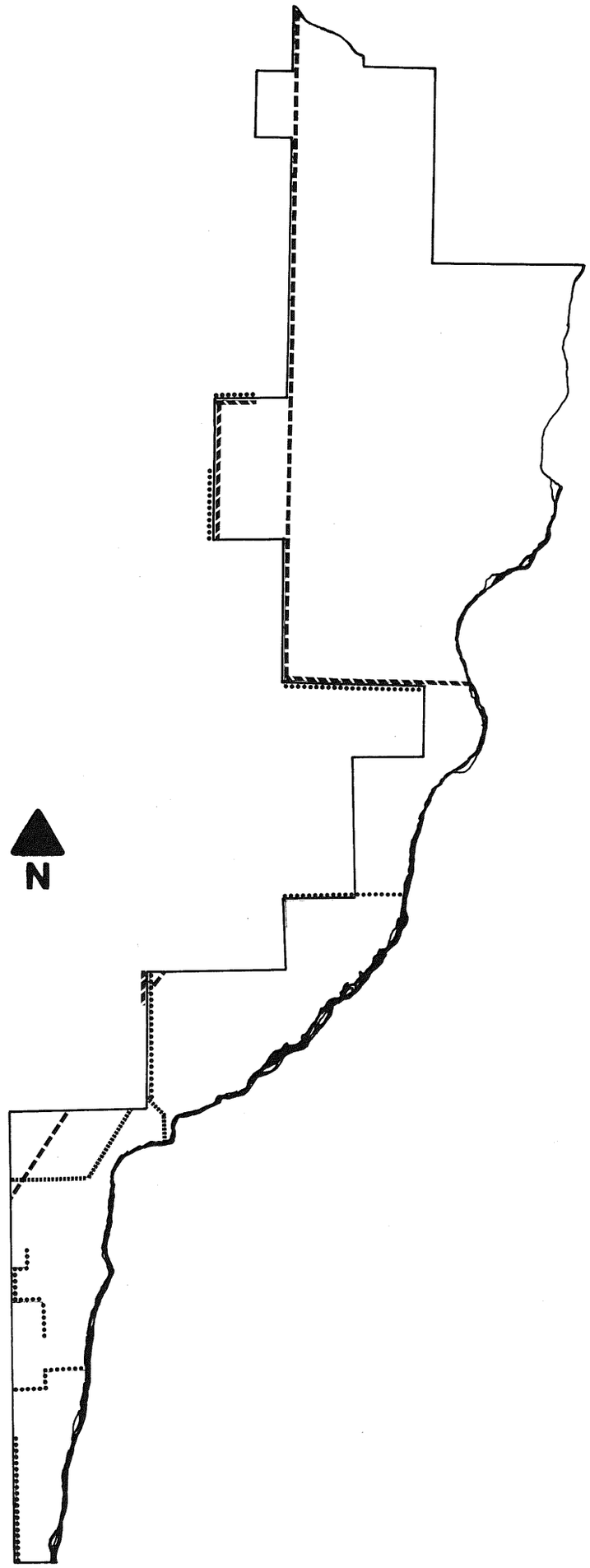
UTILITIES

Overhead telephone
Underground telephone
Overhead Distribution Line
High Voltage Transmission Line

Chengwatana State Forest

UTILITIES

- Overhead telephone
- Underground telephone
- Overhead Distribution Line
- High Voltage Transmission Line



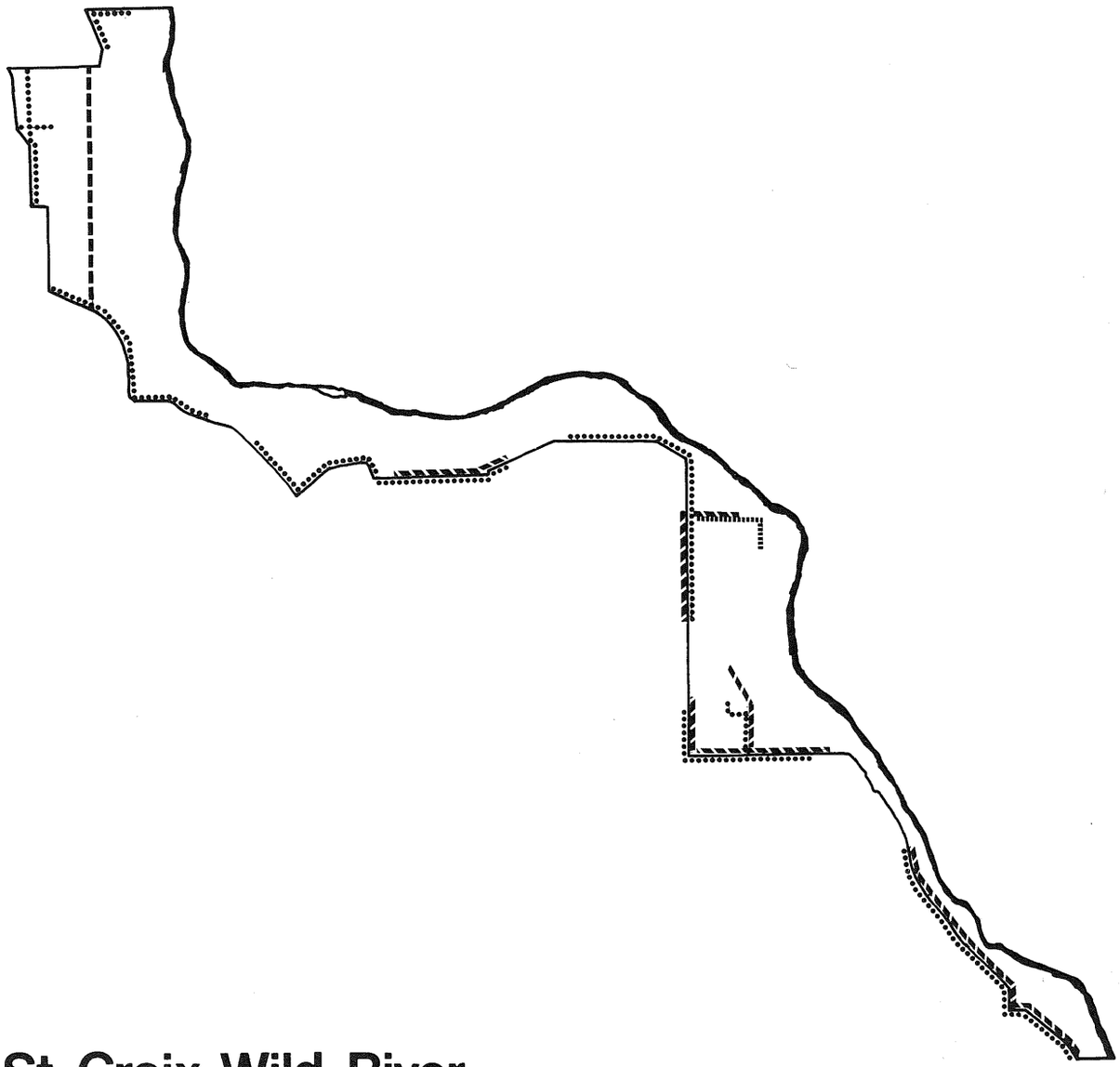
Telephone Service

Telephone cables run to and/or through the areas. St. Croix State Forest and St. Croix Wild River State Park have some overhead lines, but all other cables are buried underground.

Sewer, Water and Gas Lines

St. Croix State Park has a sewer system for disposal of liquid and solid wastes. It was completed in 1971 and consists of a sewage disposal tank and field for every major recreational area. Natural gas lines are not required because bottle gas is used.

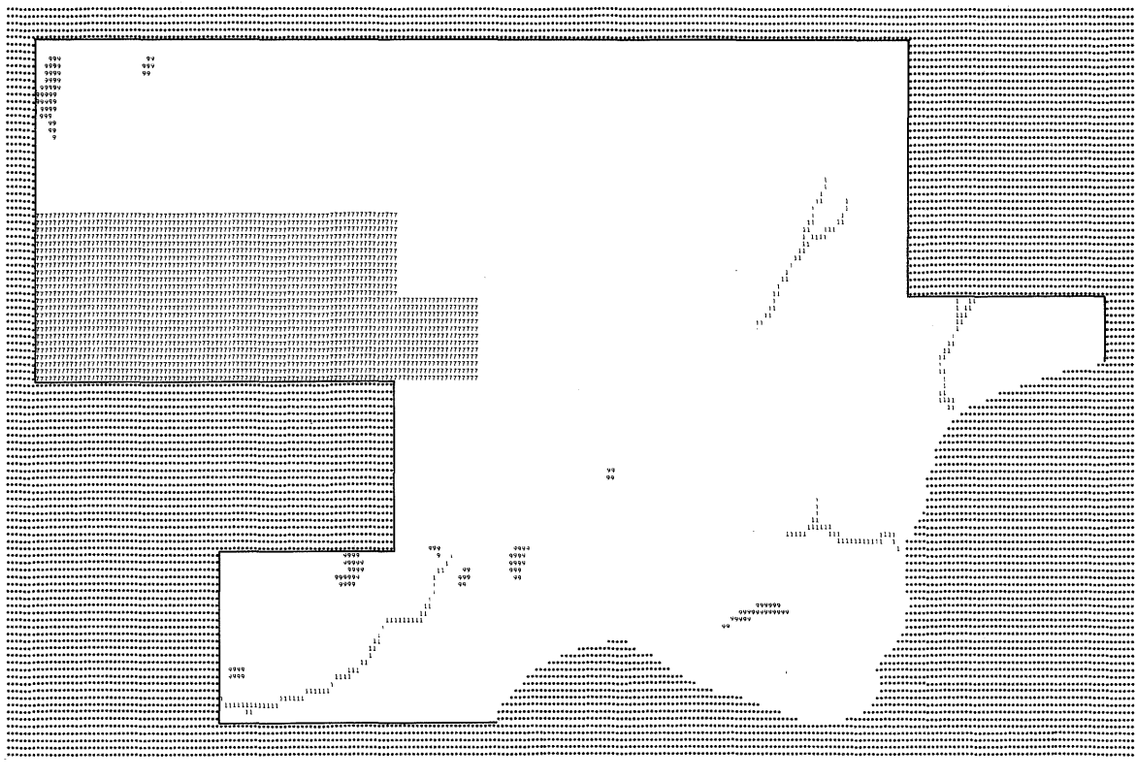
No other sites have sewer, water, or gas lines at present, but such systems can be installed locally if the need arises.



St. Croix Wild River State Park

UTILITIES

Overhead telephone
Underground telephone
Overhead Distribution Line
High Voltage Transmission Line



St. Croix State Forest

HABITAT AREAS

1 - Trout stream
2 - Fish Rearing Pond
3 - Wildlife Management Area
4 - Deer Yard
5 - Duck Ponds
6 - Upland Game Birds
7 - County Game Refuge
8 - Sand Hill Crane Area
9 - Fishing Lake

Habitat Areas

The data presented on the following maps represent identifiable fish and wildlife resources. These may include, but are not limited to, trout streams, sandhill crane nesting areas, fish rearing ponds, fresh water fishing lakes, etc. Some resources not incorporated at this time because of unavailable information are deer yards, eagle and osprey nesting trees, etc.

Trout Streams

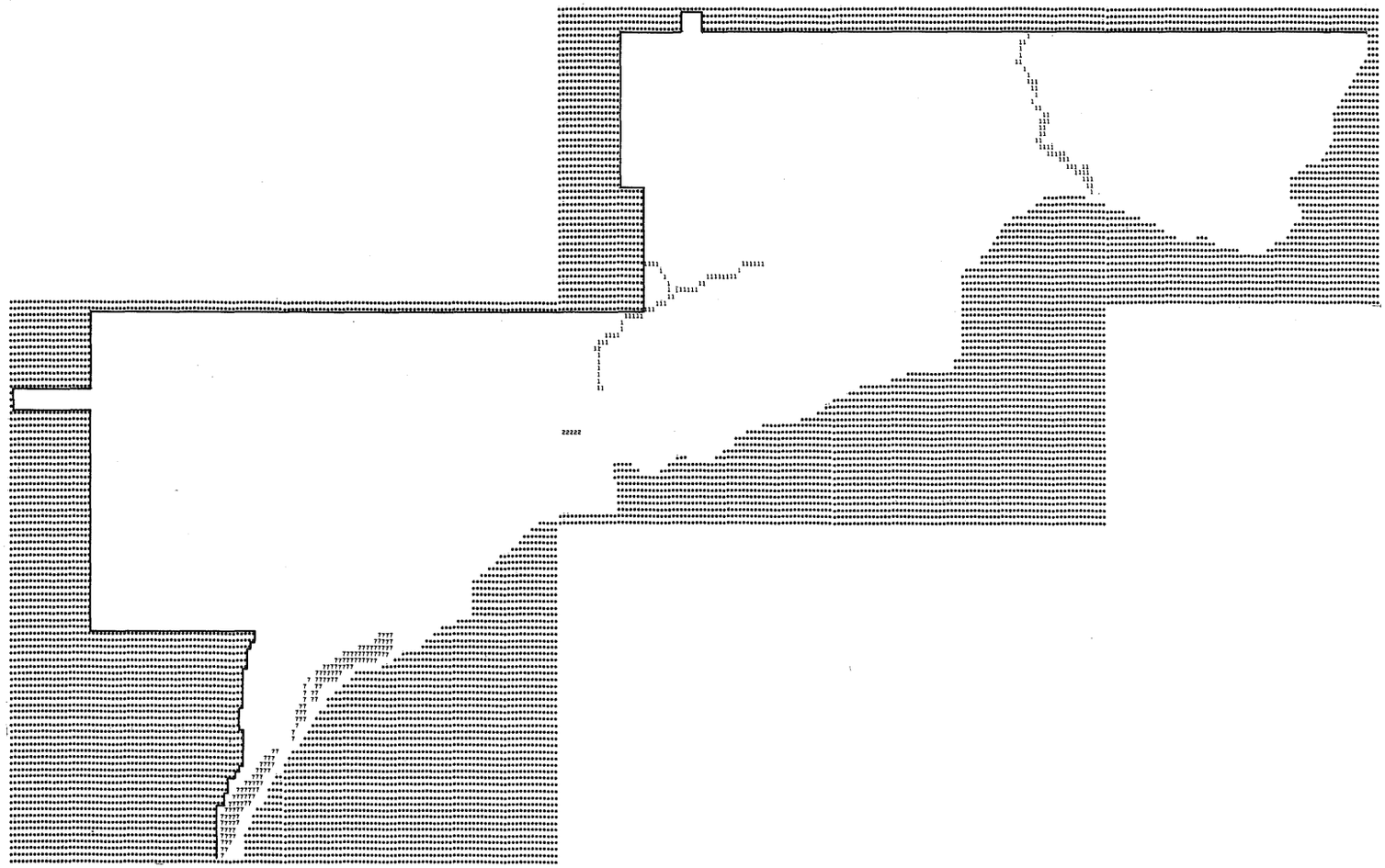
A small percentage of the total stream miles are capable of supporting natural trout populations. The environmental and habitat requirements of trout include cool summer stream temperatures, permanent flowing streams, food, cover, and spawning areas. Any adverse impact on these specific requirements will drastically reduce if not completely destroy the limited trout stream resource within the study area. These streams must be preserved and enhanced with proper management techniques if they are to provide trout fishing opportunities.

Fish Rearing Pond

This is usually a pond stocked with newly-hatched game fish. These fish are then raised to a size large enough to insure good survival when restocked into lakes or streams. Many rearing ponds can be drained to eliminate or reduce competing species of fish and other aquatic organisms. A water supply and control structure are usually included to maintain water levels during the rearing period.

Fishing Lakes

Fishing lakes are generally those which do not become depleted of oxygen during winter. When



St. Croix State Park

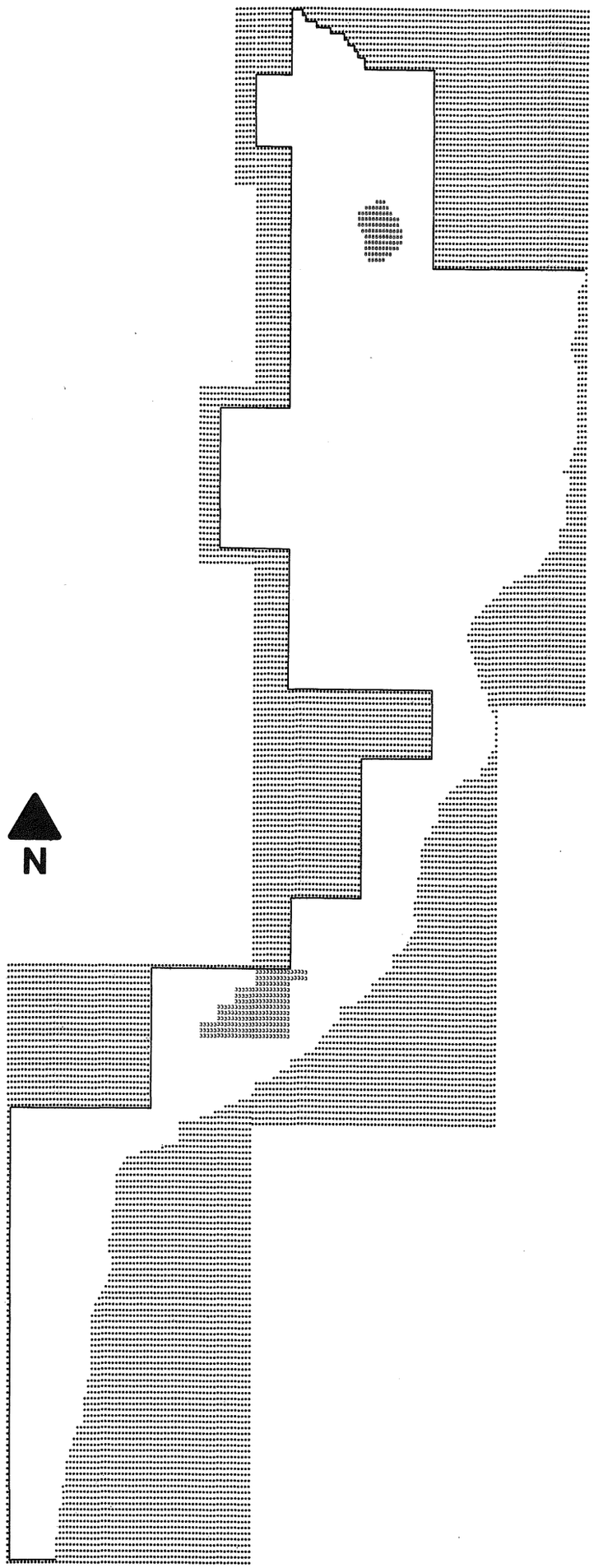
HABITAT AREAS

1 - Trout stream
2 - Fish Rearing Pond
3 - Wildlife Management Area
4 - Deer Yard
5 - Duck Ponds
6 - Upland Game Birds
7 - County Game Refuge
8 - Sand Hill Crane Area
9 - Fishing Lake

Chengwatana State Forest

HABITAT AREAS

1 - Trout stream
2 - Fish Rearing Pond
3 - Wildlife Management Area
4 - Deer Yard
5 - Duck Ponds
6 - Upland Game Birds
7 - County Game Refuge
8 - Sand Hill Crane Area
9 - Fishing Lake



properly managed, they are capable of providing substantial public fishing if access is provided.

Sandhill Crane

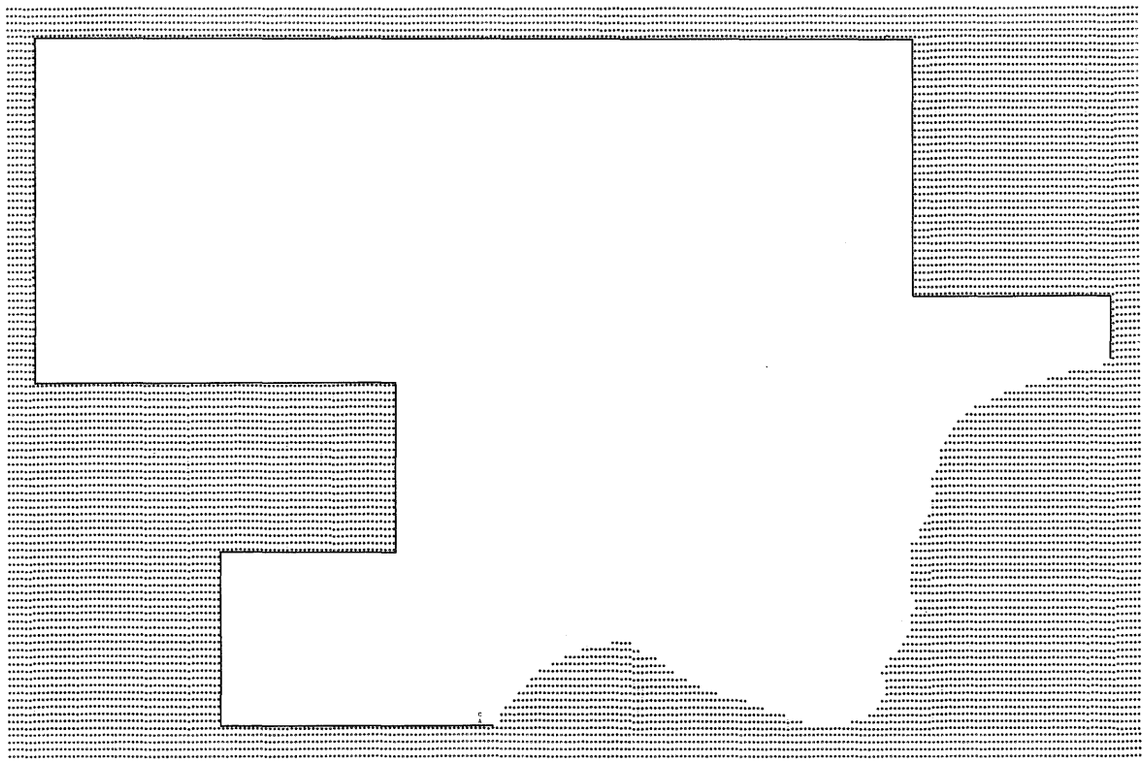
The Sandhill Crane was once a common summer resident of Minnesota's prairie regions. Because of loss of habitat, only several pair still nest in the jack pine barrens along the St. Croix River. The bird normally nests in wet marshlands or low prairie areas.

St. Croix Wild River State Park - There are no known habitat areas at this time.

St. Croix Wild River State Park

HABITAT AREAS

1 - Trout stream
2 - Fish Rearing Pond
3 - Wildlife Management Area
4 - Deer Yard
5 - Duck Ponds
6 - Upland Game Birds
7 - County Game Refuge
8 - Sand Hill Crane Area
9 - Fishing Lake



St. Croix State Forest

HISTORICAL - ARCHAEOLOGICAL

A - Archaeological Area
B - Historic Village
C - Ferry Landing
D - Old Railroad Grade
E - Indian Cultural Site
F - Indian Mounds
G - Old Milling Site
H - Cemetery
I - Ghost Town
J - Fur Trading Post
K - Dam Site

Historical & Archaeological

Preservation and interpretation of historically significant sites is as important to this management plan as protection of natural elements.

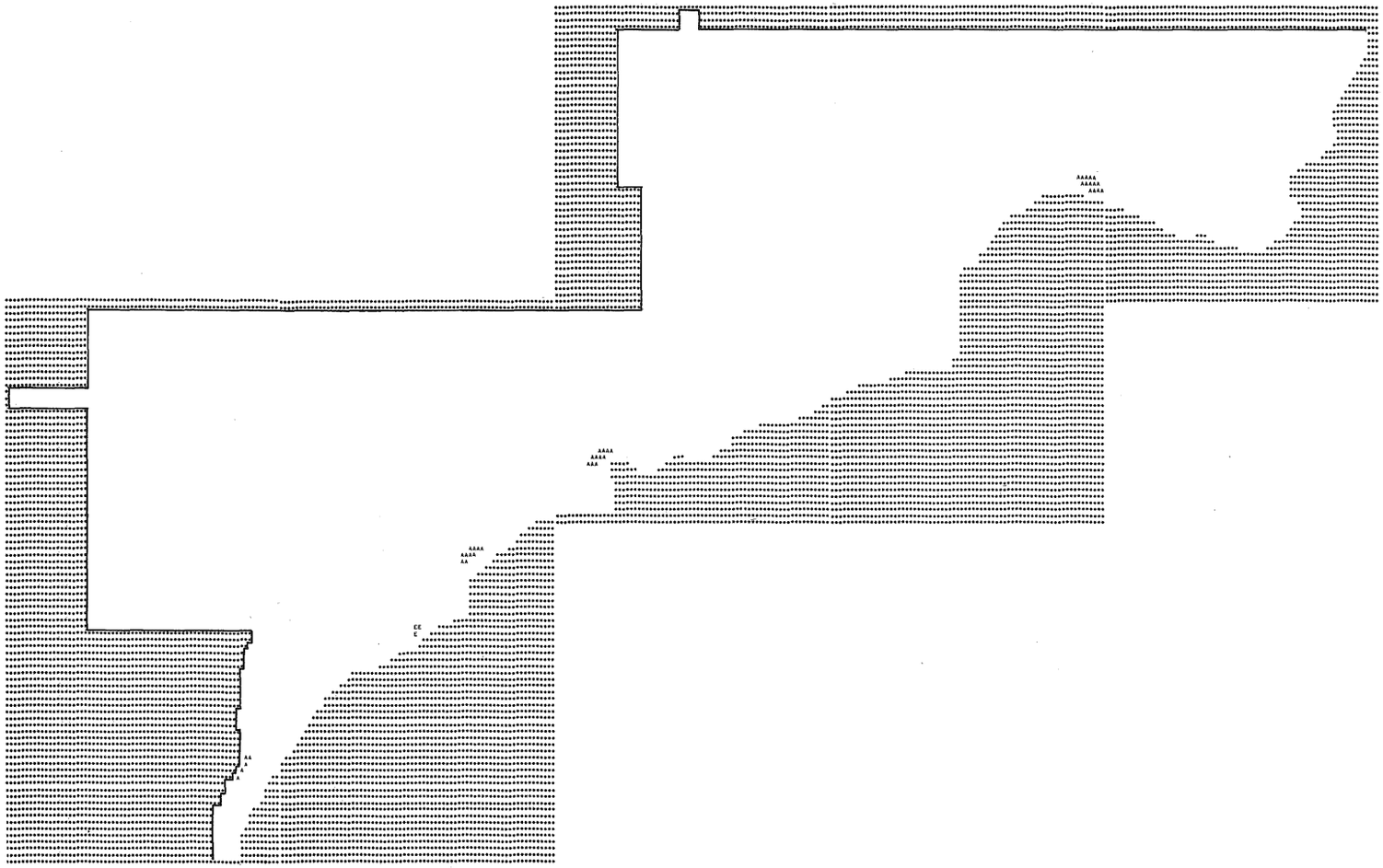
Humans find their own past fascinating and revealing. Unfortunately, there is only sparse information available on the prehistoric and historic sites in the Upper St. Croix area.

Four aboriginal burial mound sites, a few historic towns and trading posts, and one French fort known as Fort St. Croix have been located. Existence of these sites is assurance that an extensive archaeological survey would discover many others.

Man occupied this region 6,000 years ago and perhaps earlier. The river later became the home of the Dakota and Chippewa Tribes and eventually a trading and logging center for the French and English.

Trading posts were first established on the river in 1784 and the first mission at Yellow Lake in 1833. Logging eventually became the dominant economic base, continuing extensively for 80 years. The map indicates known prehistoric and historic sites.These sites, however, are only a few of the archaeological remains that exist in the valley.

These significant prehistoric and historic sites should be adequately investigated and, if necessary, maintained. But it is impossible to plan for such management without a comprehensive archaeological survey which would pinpoint all significant sites in the area.



St. Croix State Park

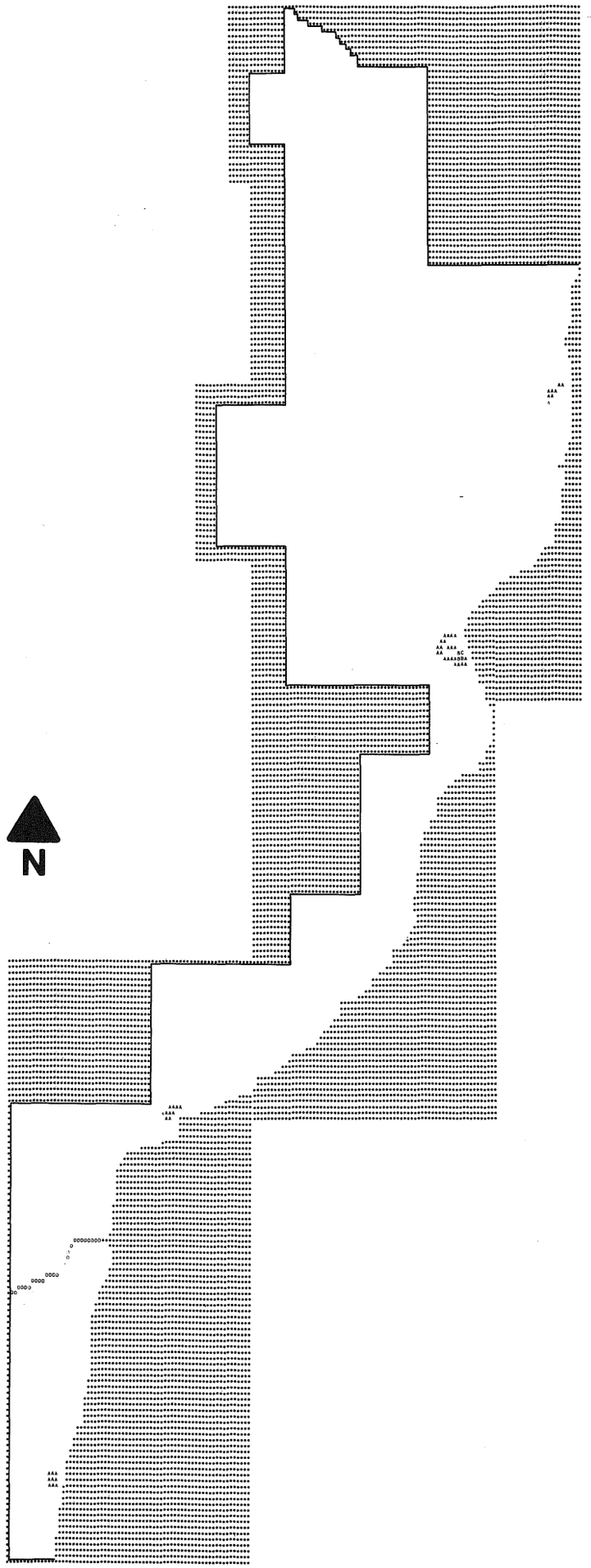
HISTORICAL - ARCHAEOLOGICAL

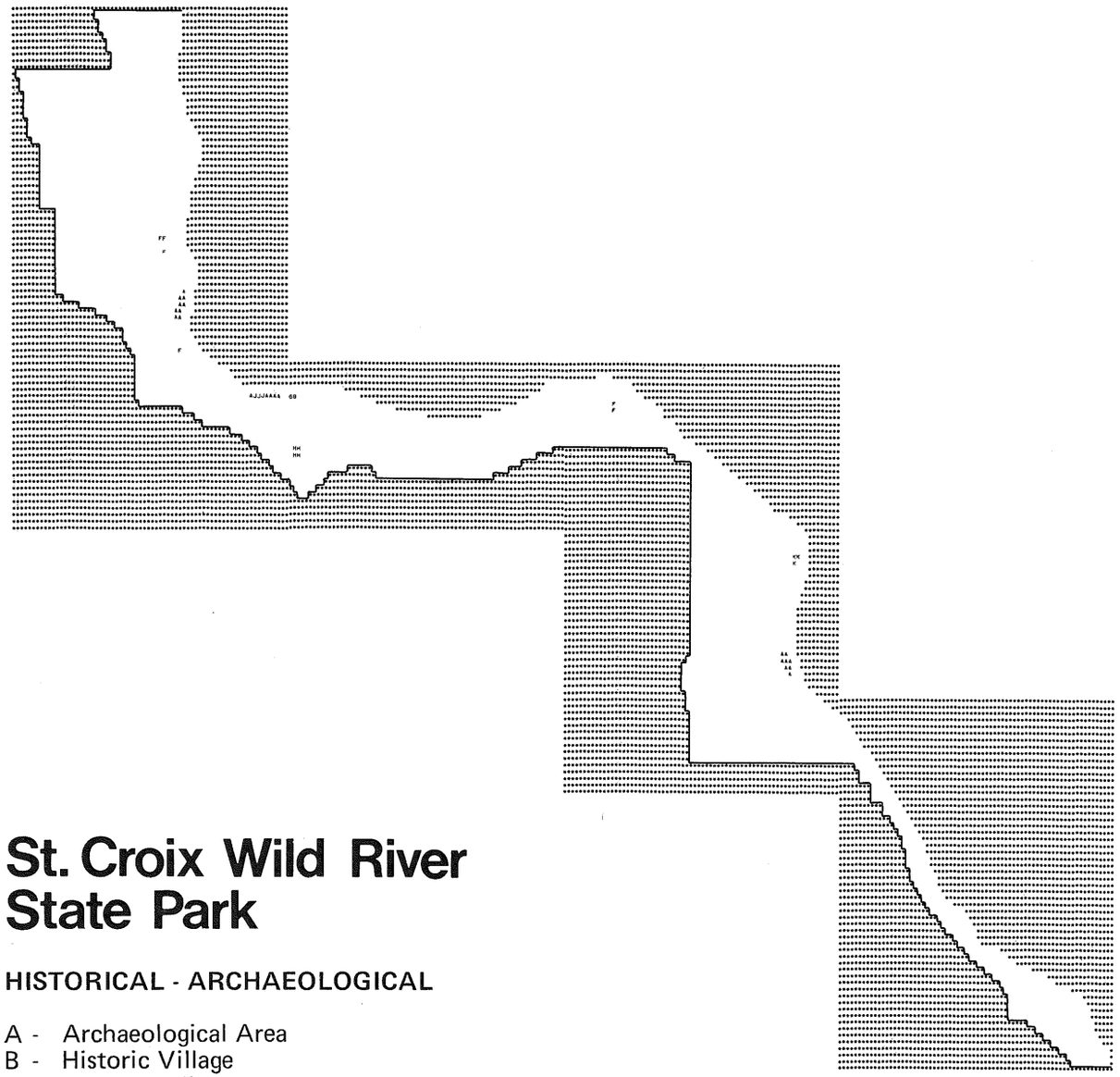
A - Archaeological Area
B - Historic Village
C - Ferry Landing
D - Old Railroad Grade
E - Indian Cultural Site
F - Indian Mounds
G - Old Mill Site
H - Cemetery
I - Ghost Town
J - Fur Trading Post
K - Dam Site

Chengwatana State Forest

HISTORICAL - ARCHAEOLOGICAL

A - Archaeological Area
B - Historic Village
C - Ferry Landing
D - Old Railroad Grade
E - Indian Cultural Site
F - Indian Mounds
G - Old Mill Site
H - Cemetery
I - Ghost Town
J - Fur Trading Post
K - Dam Site



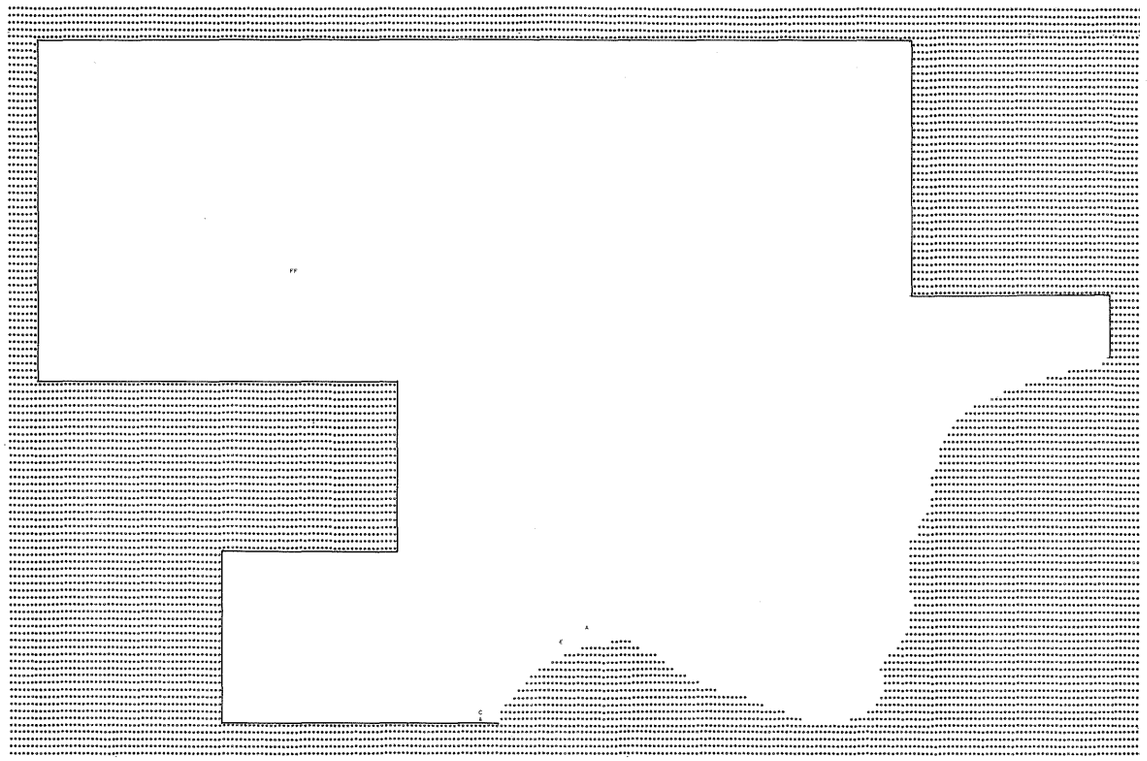


St. Croix Wild River State Park

HISTORICAL - ARCHAEOLOGICAL

A - Archaeological Area
B - Historic Village
C - Ferry Landing
D - Old Railroad Grade
E - Indian Cultural Site
F - Indian Mounds
G - Old Mill Site
H - Cemetery
I - Ghost Town
J - Fur Trading Post
K - Dam Site

LEGISLATIVE REFERENCE LIBRARY
STATE OF MINNESOTA



St. Croix State Forest

RECREATION

A - Private access
B - Public access
C - Canoe campsite
D - Public campground
E - Private group camp
F - Public group camp
G - Picnic Area
H - Swimming Beach
I - Trail center
J - Ski area
Trails

1 - Multiple Use
2 - Cross country ski
3 - Hiking
4 - Nature
5 - Horse
6 - Snowmobile

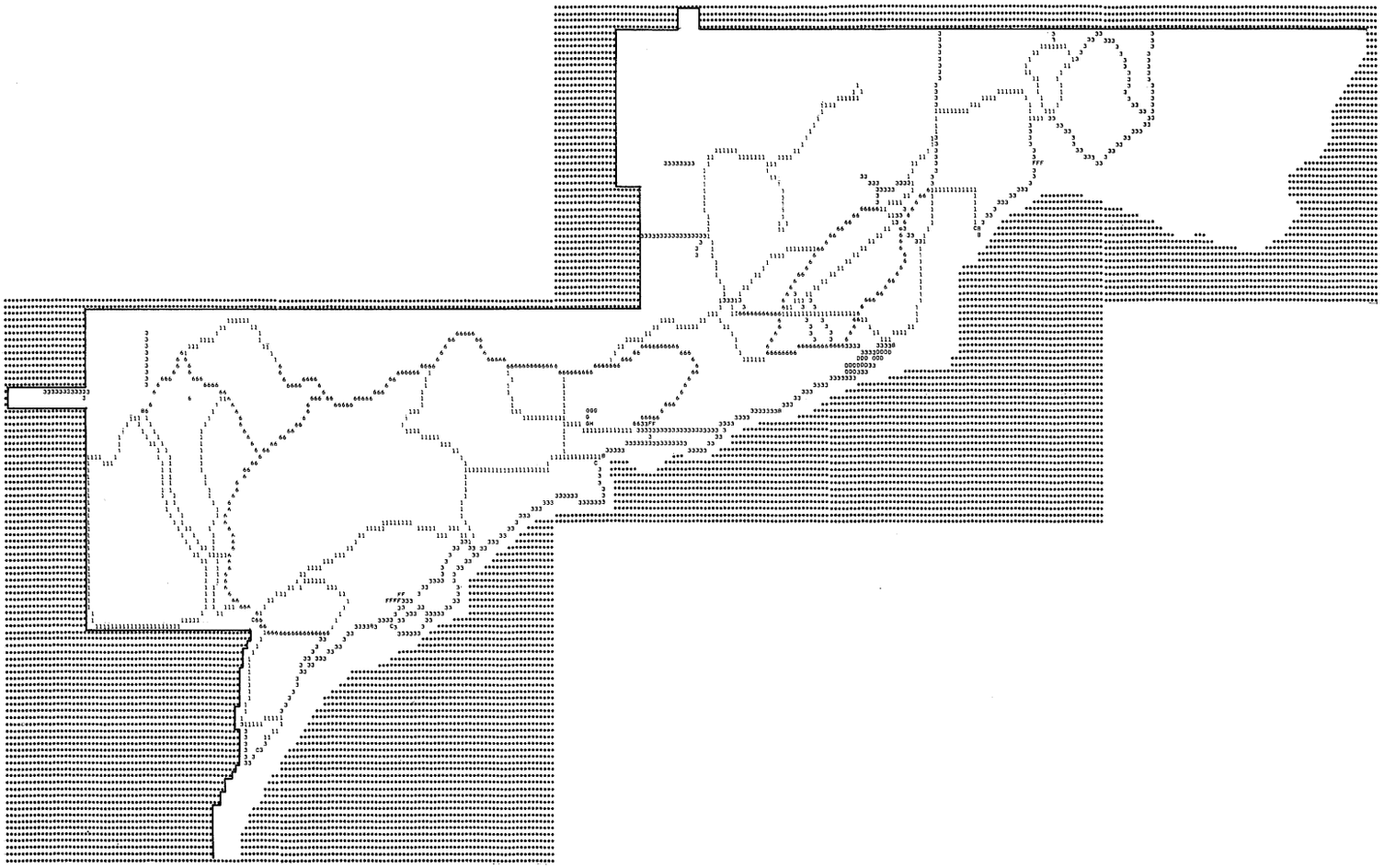
Major recreational use of the St. Croix region is confined to spring, summer, and fall, although winter-oriented sports are gaining in popularity. Fishing is heavy during the spring season while summer and fall seasons include a greater diversity of recreational activities.

A variety of game species make the region very popular during hunting seasons. Much of the region is covered with brush and second growth timber where deer, small game and upland game birds are common. An abundance of lakes and marshes provide good waterfowl hunting.

The river is especially adaptable to float trips by canoe or other craft for one-day excursions or overnight camping trips. Camping constitutes a supporting activity for canoeing and rafting. Motorboat users are primarily fishermen in local waters. Fishing access trails exist along portions of the river and are generally associated with existing road access points. The region has **good** smallmouth bass fishing and fair trout fishing.

Although the St. Croix area is predominantly rural, the agricultural yield is low. Many area residents have developed recreational facilities to attract tourists and vacation trade for supplemental income. Camps, hotels, and resort cabins cater to vacationists, including such activities as swimming, boating, canoeing and fishing.

The state-owned facilities supplement private recreation enterprise. St. Croix State Park provides the most modern facilities and caters to more recreation activities than all others. Activities include: tourist camping, picnicking, swimming,



St. Croix State Park

RECREATION

A - Private access
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C - Canoe campsite
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G - Picnic Area
H - Swimming Beach
I - Trail center

J - Ski area
Trails

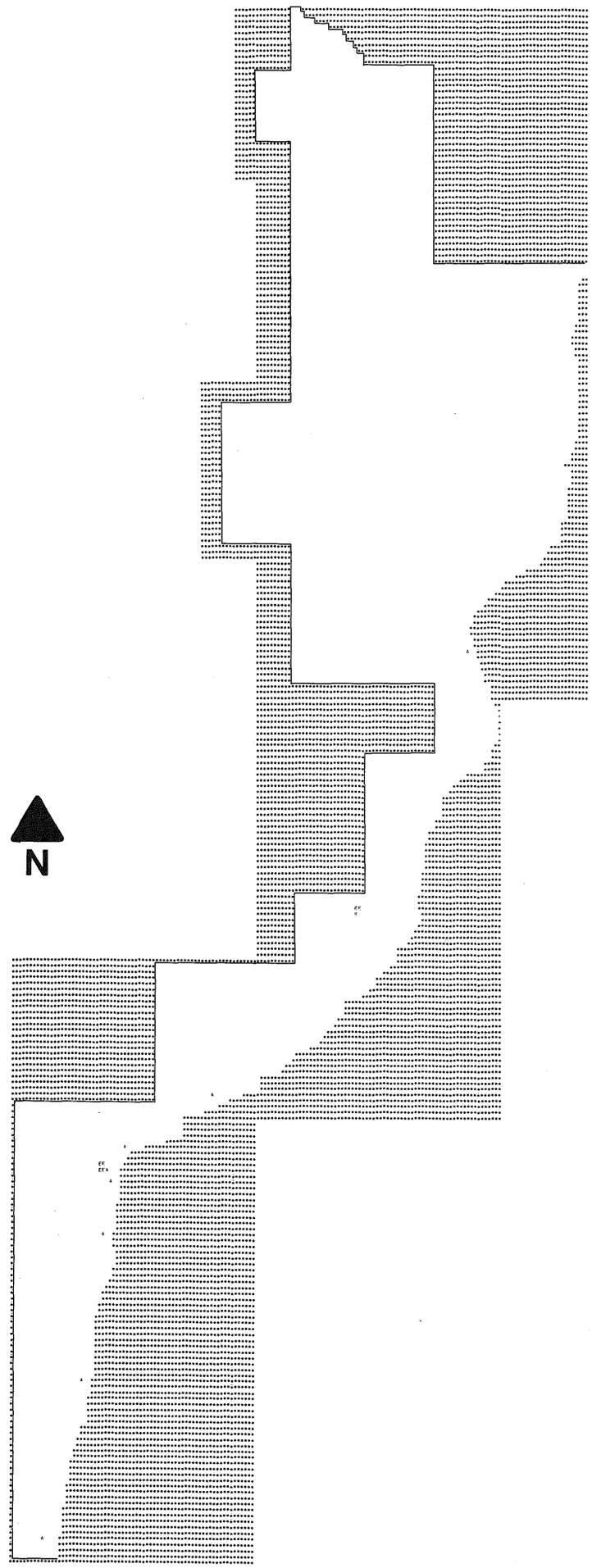
1 - Multiple Use
2 - Cross country ski
3 - Hiking
4 - Nature
5 - Horse
6 - Snowmobile

Chengwatana State Forest

RECREATION

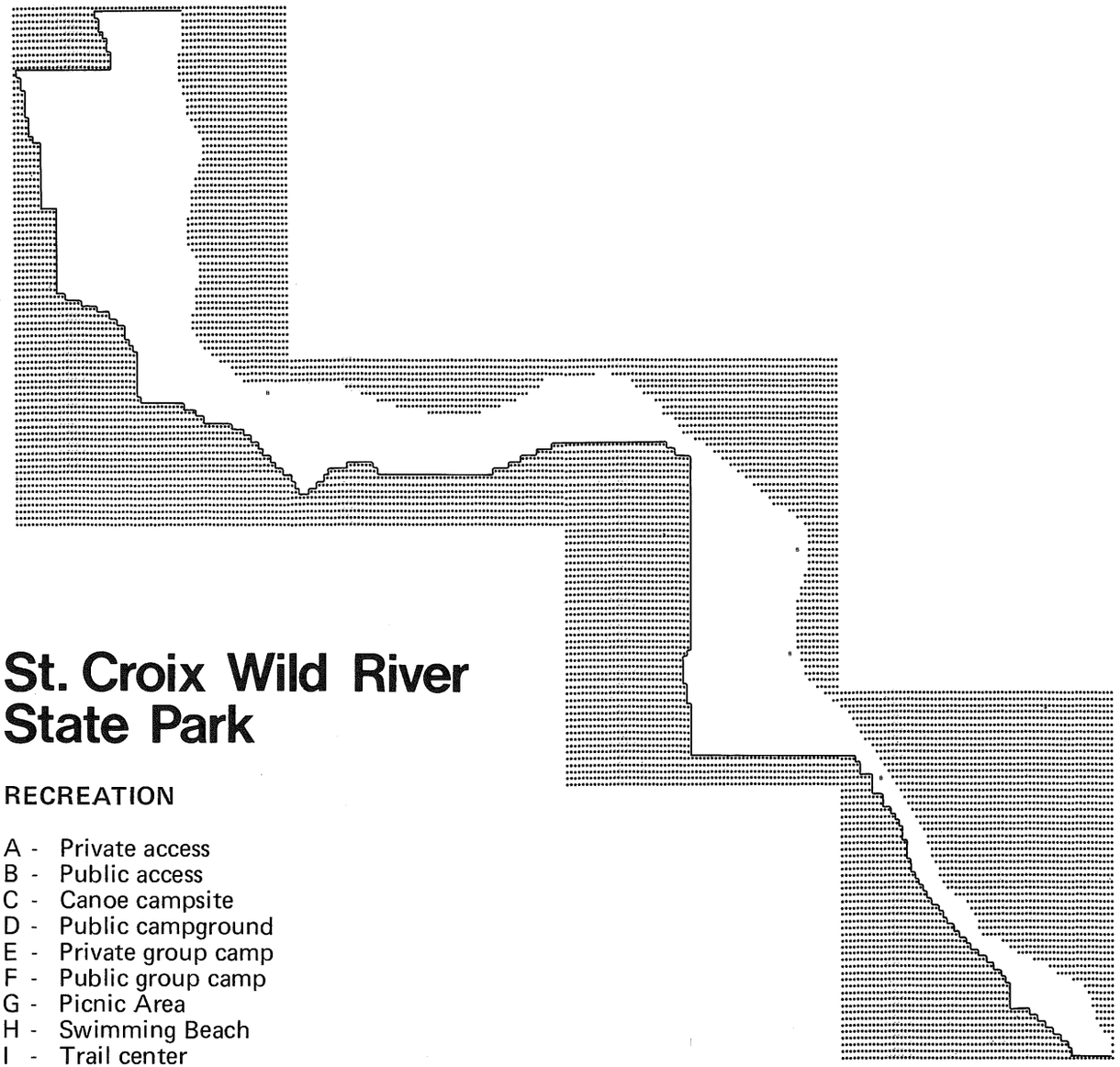
A - Private access
B - Public access
C - Canoe campsite
D - Public campground
E - Private group camp
F - Public group camp
G - Picnic area
H - Swimming beach
I - Trail center
J - Ski area
Trails

1 - Multiple Use
2 - Cross country ski
3 - Hiking
4 - Nature
5 - Horse
6 - Snowmobile



stream fishing, bicycling, hiking, horseback riding, canoeing, nature study and organized group camping. Winter activities include snowmobiling, snow-shoeing, cross-country skiing and sledding.

The state forests provide family camping areas, hunting, lake and stream fishing, hiking, and picnicking. Winter activities are similar to those available in the park. Rock Wildlife Management Area's greatest asset is nature interpretation, wildlife production and hunting.



St. Croix Wild River State Park

RECREATION

A - Private access
B - Public access
C - Canoe campsite
D - Public campground
E - Private group camp
F - Public group camp
G - Picnic Area
H - Swimming Beach
I - Trail center
J - Ski area
Trails

1 - Multiple Use
2 - Cross country ski
3 - Hiking
4 - Nature
5 - Horse
6 - Snowmobile

Composite Maps

Computer composite maps were used in the overall design approach for the Upper St. Croix resource management plan. They will be used in the future for detailed planning and research. These composite maps, previously mentioned on page 13 , assist in locating the most favorable sites for a particular management project or recreational facility. Only a few composite maps will be illustrated in this booklet to give the reader an idea of their value in design and management processes.

The following composite maps have a definition of the facility or site desired, and an explanation of the formula and specific factors considered. It must be remembered that the lightest tones on the composite maps are the best locations for a desired facility; the darkest are the least desirable.

All composite maps have been evaluated only in relation to the Upper St. Croix Study Area. Therefore, lighter-colored locations are those most favorable and may not be the most ideal site but are the best within the study area.

Family Campground

Composite Map

Definition:

Campground accessible by vehicle and containing numerous campsites or camping spurs for tent or trailer camping. Utilities to consist of water source, toilet facilities, picnic tables, fire rings, and waste receptacles.

Factors considered by order of importance:

Soils - Considered for stability (bearing and carrying capacity) regarding esthetic enhancement.

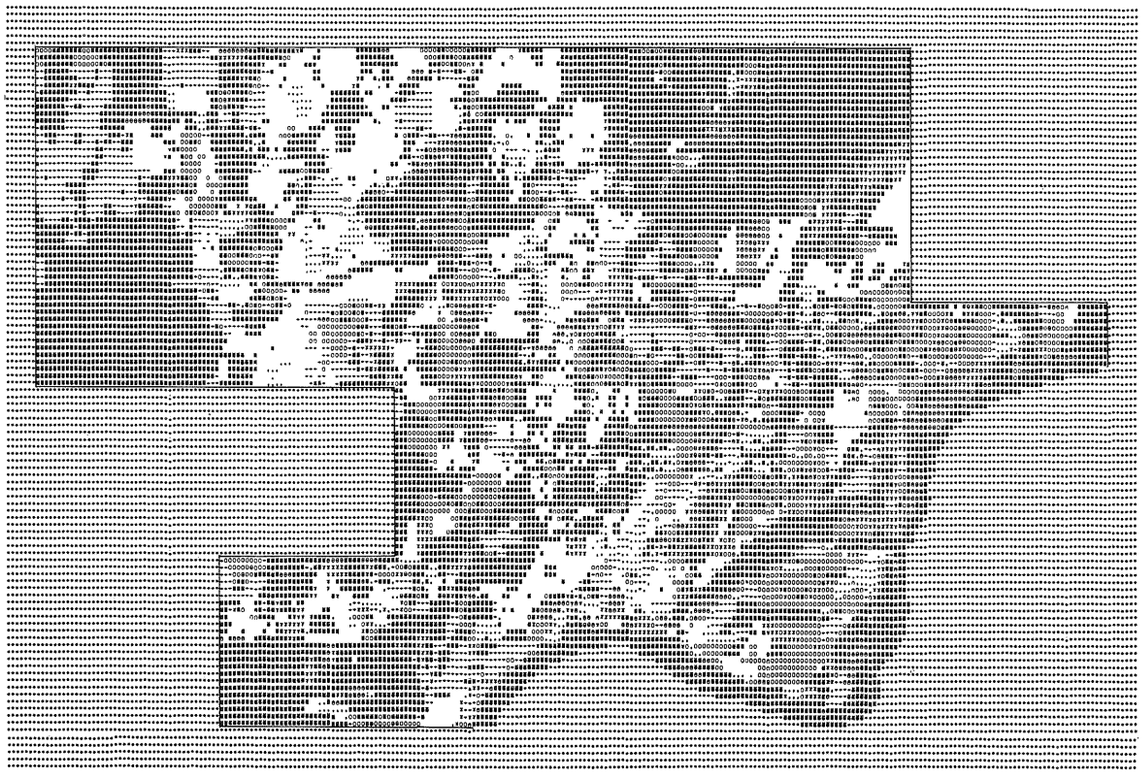
Slope - The overall camping area should be level to nearly level for tent sites and spurs for trailer parking sites.

Slope Orientation - Considered for protection from wind, and to obtain the most desirable sun exposure.

Water Table - A deep water table is needed to protect against flooding, wet site conditions and pollution. Also important for acquiring a water supply of sufficient quality and volume for public use.

Permeability - The ability of a soil to conduct or reject the movement of water through its saturated body. This relates to surface and sub-surface site drainage.

Overstory Vegetation - Considered for the protection it affords from the natural elements and esthetic values (spatial enclosure, texture, etc.).



St. Croix State Forest

Family Campground

Overstory Size-Density - The size and density will have an effect on the protection a camper receives from the natural elements (sun, rain, etc.), as well as future maturity facets and re-generation requirements.

Transportation - Positive value for easy access. Scenic drive preferred for esthetic and passive qualities.

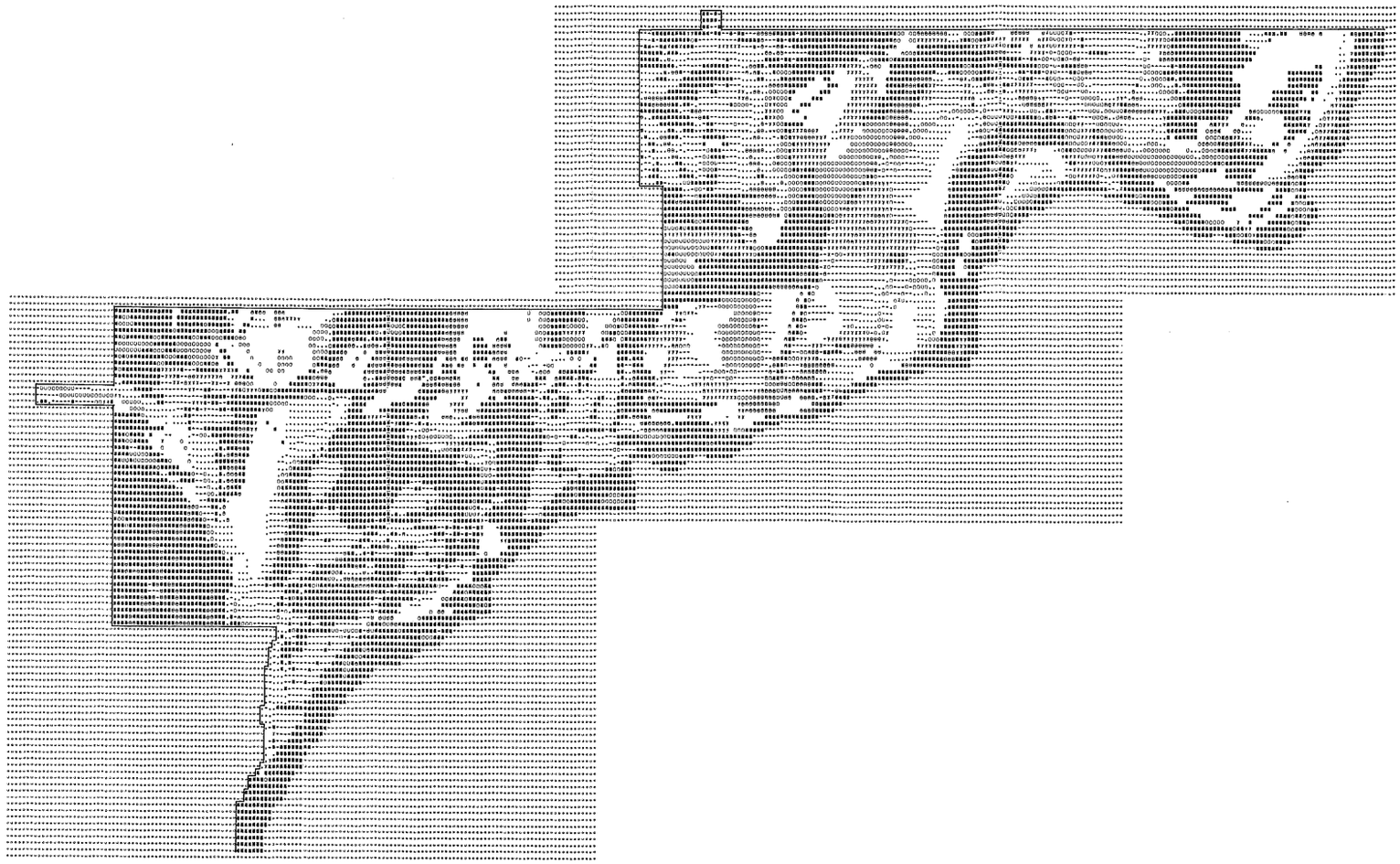
Understory Vegetation - Considered for its ability to protect other environmental factors such as soils, micro-climate flora and fauna; and esthetic values in relation to spatial enclosure and character (texture qualities, etc.).

Understory Size-Density - The size and density will have impact on the character of the site and its ability to alleviate erosion, provide natural screening, etc.

Historical - Archaeological Sites Interpretation of historical and archaeological sites should be considered when locating campgrounds. Such sites should be protected from campground construction and heavy recreation use which may destroy the very existence of the site.

Habitat - Habitat is a positive factor in locating campgrounds because it allows for wildlife interpretation. Specified habitat areas, however, such as deer yards and sand hill crane nesting areas, should be avoided.

Surficial hydrology will be considered by placing a clear acetate overlay over the composite printout

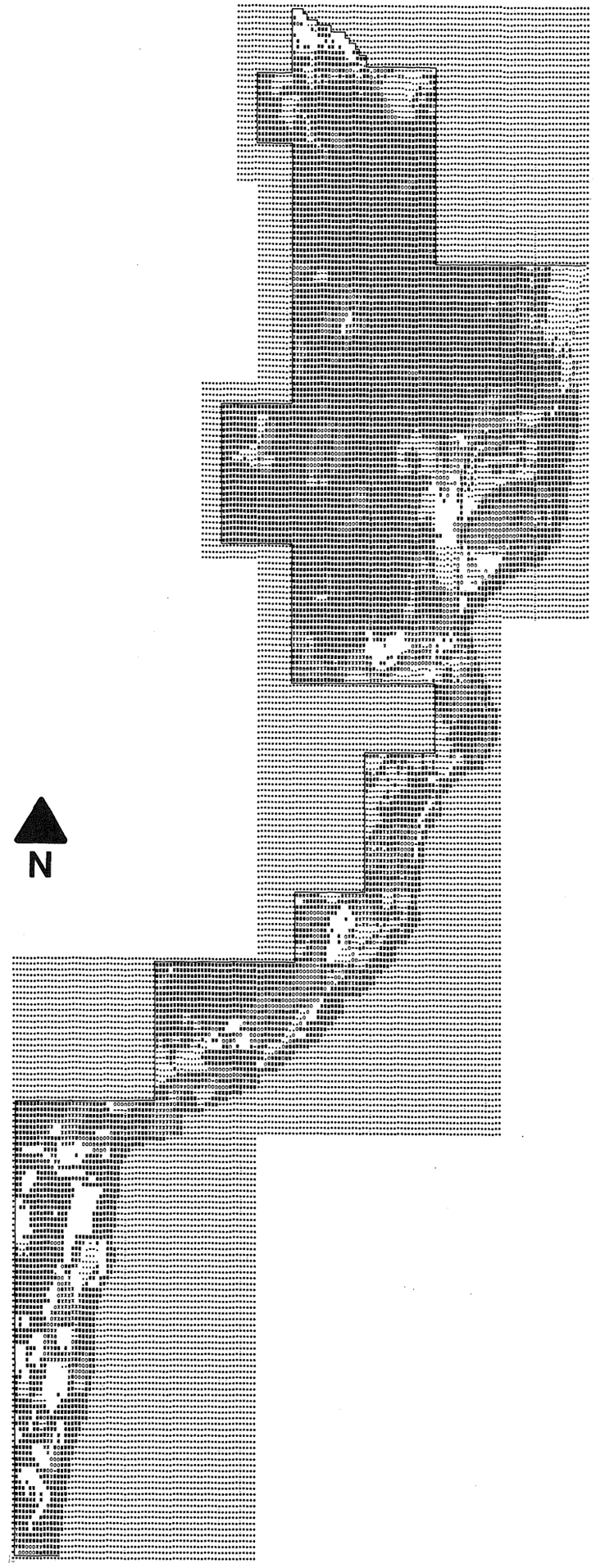


St. Croix State Park

Family Campground

Chengwatana State Forest

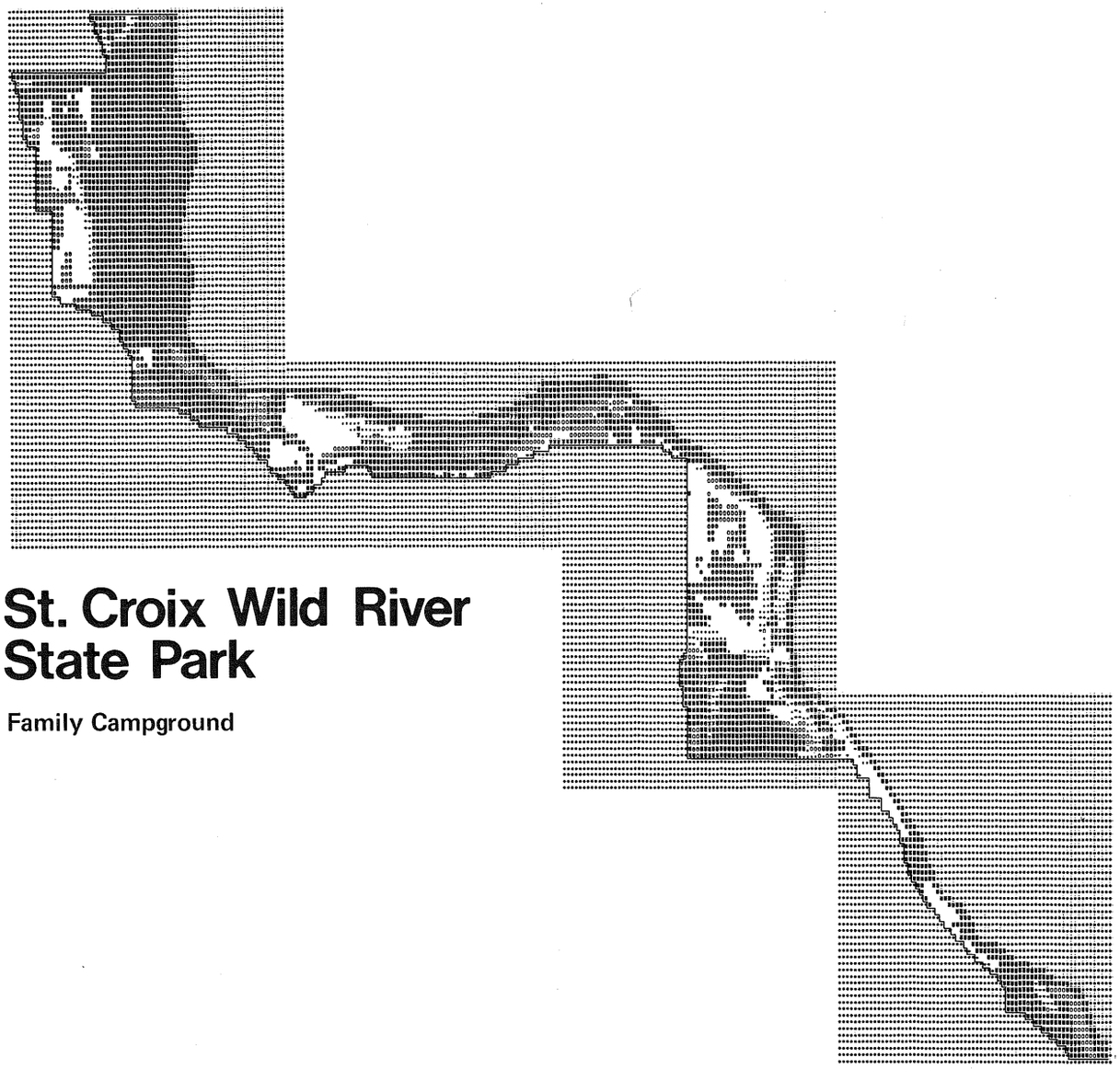
Family Campground



map to determine site locations relative to surface water features.

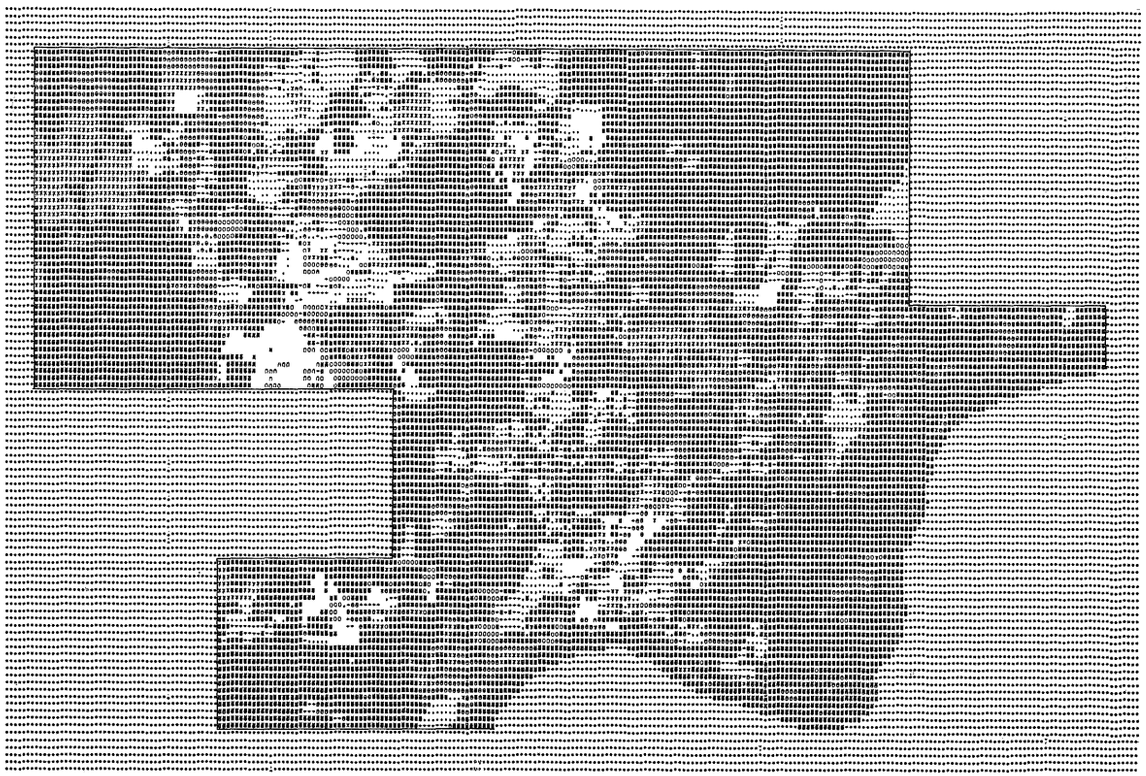
Formula:

Family Campground = 7(soils) + 5(slope) + 3(slope orientation) + 3(water table) + 3(permeability) + 1(transportation) + 6(overstory vegetation) + 3(overstory size-density) + 3(understory vegetation) + 3(understory size-density) -1 (historical - archaeological) + 1(habitat).



St. Croix Wild River State Park

Family Campground



St. Croix State Forest

Picnic Area

Picnic Area

Composite Map

Definition:

A passive form of recreation directed toward the peaceful and natural amenities of the environment. Picnic grounds should interrelate with other recreation facilities such as hiking trails, swimming beaches, etc.

Factors considered by order of importance:

Soils - Necessary in determining the use impact or carrying capacity of a site, in relation to erosion, runoff, compaction, etc.

Slope - Level or nearly level area needed to support picnic facilities - tables, fire rings, etc., but should have some topographic relief for esthetic enhancement.

Slope Orientation - Considered for protection from wind, and most desirable sun exposure during the various periods of a day.

Transportation - Positive value for easy access. Scenic drive preferred for esthetic and passive qualities.

Water Table - Important in acquiring a water source of sufficient volume for public use. A deep water table for protection against pollution and wet site conditions.

Overstory Vegetation - Considered for its protection against the natural elements and its esthetic values.

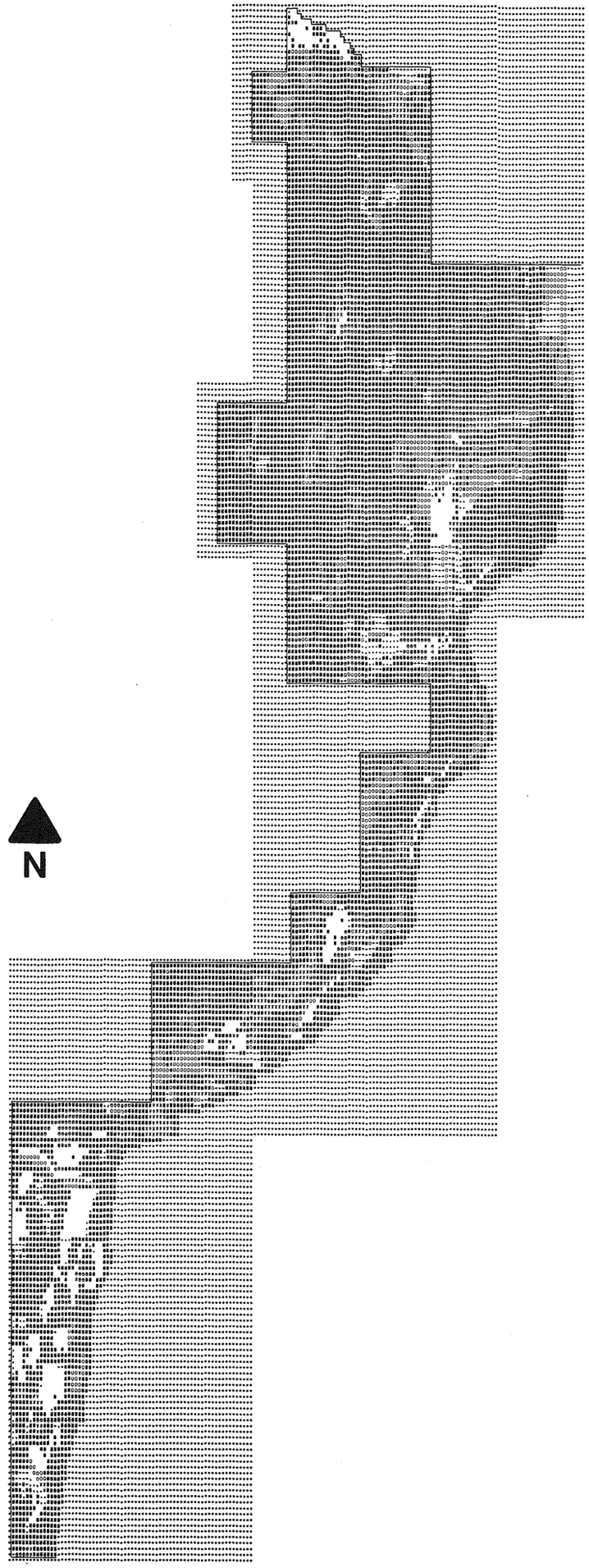
Overstory Size-Density - Affording protection yet having spatial qualities conducive to picnic

St. Croix State Park

Picnic Area

Chengwatana State Forest

Picnic Area



area development and operation with future maturity and regeneration requirements considered.

Overstory Age and Site Condition - Considered for esthetic value in relation to the structural characteristics of a tree.

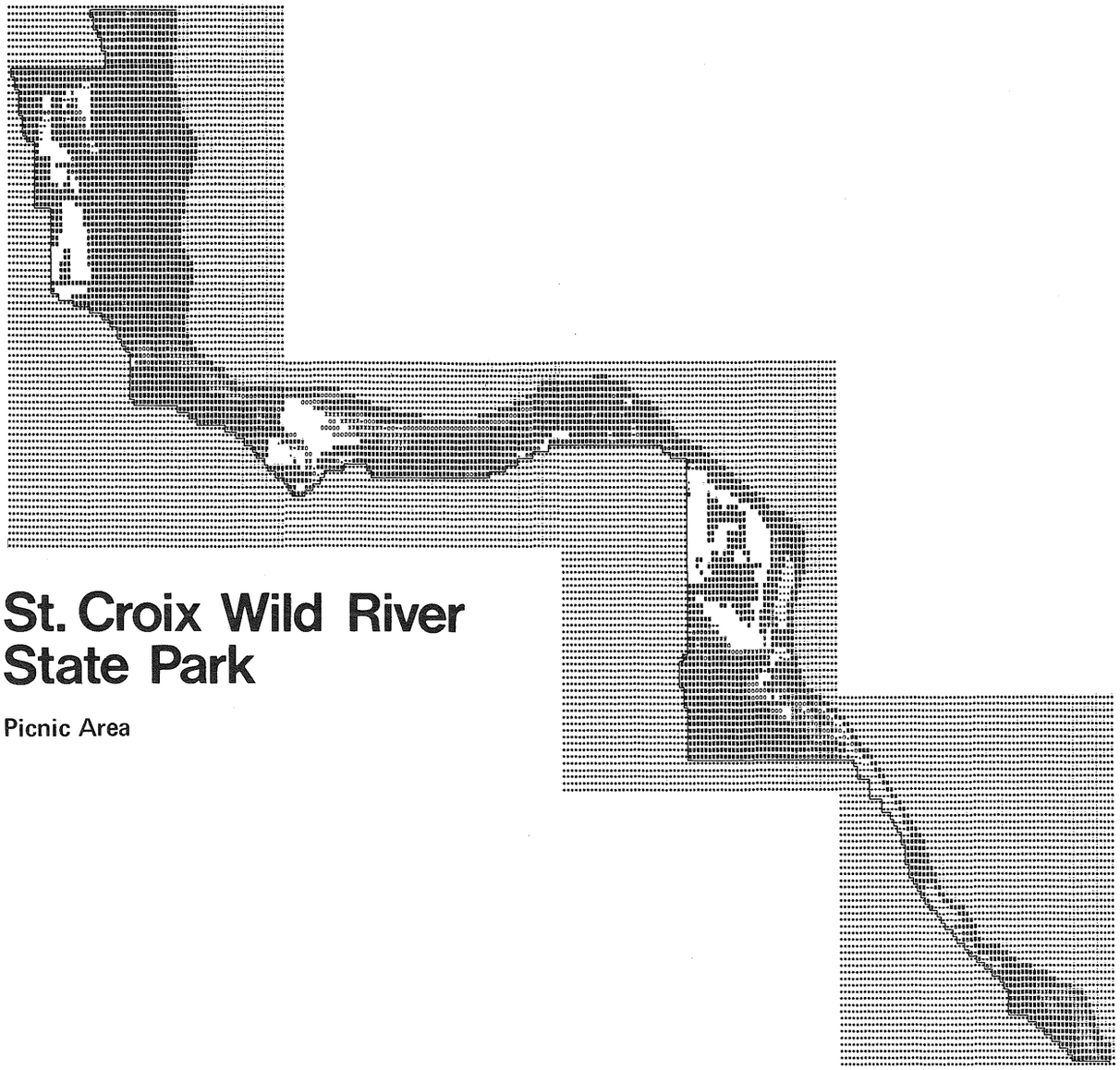
Understory Vegetation - Considered for its ability to protect other environmental factors such as soils, micro climate flora and fauna; and its esthetic values in relation to spatial enclosure and character.

Permeability - The ability of a soil to conduct or reject the movement of water through its saturated body. This relates to the surface and subsurface drainage of the site.

Habitat - Habitat is a positive factor in locating picnic areas because it allows for wildlife interpretation. Specified habitat areas, however, such as deer yards and sand hill crane nesting areas, should be avoided.

Historical - Archaeological Sites - Picnic areas should not be located on a historical or archaeological site in order to protect the site from picnic area construction that may destroy the very existence of the site. Thus, interpretation of historical and archaeological sites should be considered when locating picnic areas.

Surficial hydrology will be considered by placing a clear acetate overlay over the composite printout map to determine site locations relative to surface water features.



St. Croix Wild River State Park

Picnic Area

Snowmobile Trail

Composite Map

Formula:

Picnic Area - 8(soils) + 8(slope) + 5(slope orientation) + 2(transportation) + 2(water tables) + 5(overstory vegetation) + 5(understory vegetation) + 3(overstory size-density) + 3(overstory age) + 3(understory size-density) + 2(permeability) + 2(habitat areas) - 2(archaeological - historical).

Definition:

A trail for the active sport of snowmobiling. It should be constructed where snowmobiles will have little or no environmental impact. It should have variety in vegetation and slope to create excitement and interest. If possible and desirable, the snowmobile trail should inter-connect with other recreational facilities such as winter campgrounds, picnic areas, etc.

Factors considered by order of importance:

Slope - A flat or medium slope should be used to prevent soil erosion. However, the slope of the trail should vary to create interest.

Transportation - Considered as a positive value for snowmobiling. Roads give easy access and low use roads can possibly be used as trails.

Overstory Size-Density - Density affects accessibility and environmental impact.

Understory Size-Density - Density affects accessibility and environmental impact.

Recreation Areas - Sometimes it is beneficial to have snowmobile trails inter-connect with other recreation facilities, winter camping, picnicking, etc.

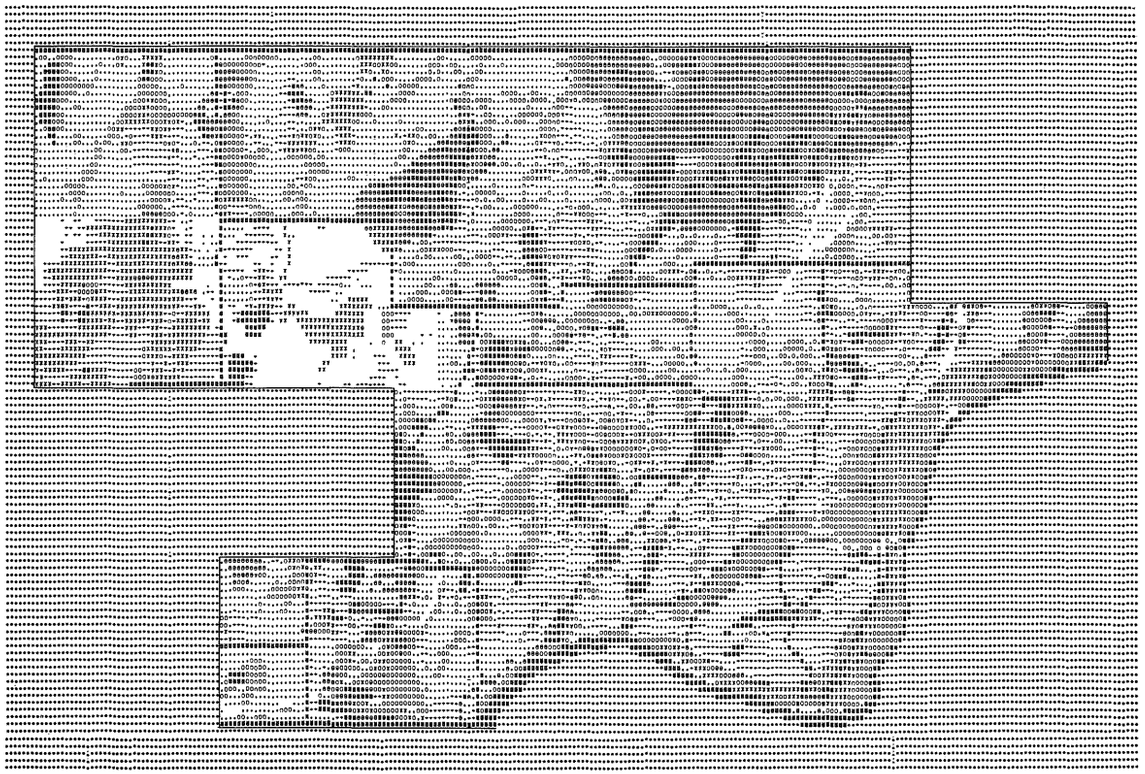
Habitat Areas - Snowmobiles may have a negative impact on wildlife concentrations and should be kept away from these areas.

Historical - Archaeological Sites - These sites could be very interesting to the snowmobiler. However, if there is a chance that snowmobiling will have any detrimental effect on the site, it should be left undisturbed.

Surfical hydrology will be considered by placing a clear acetate overlay over the composite map to determine trail corridor relative to surface water features.

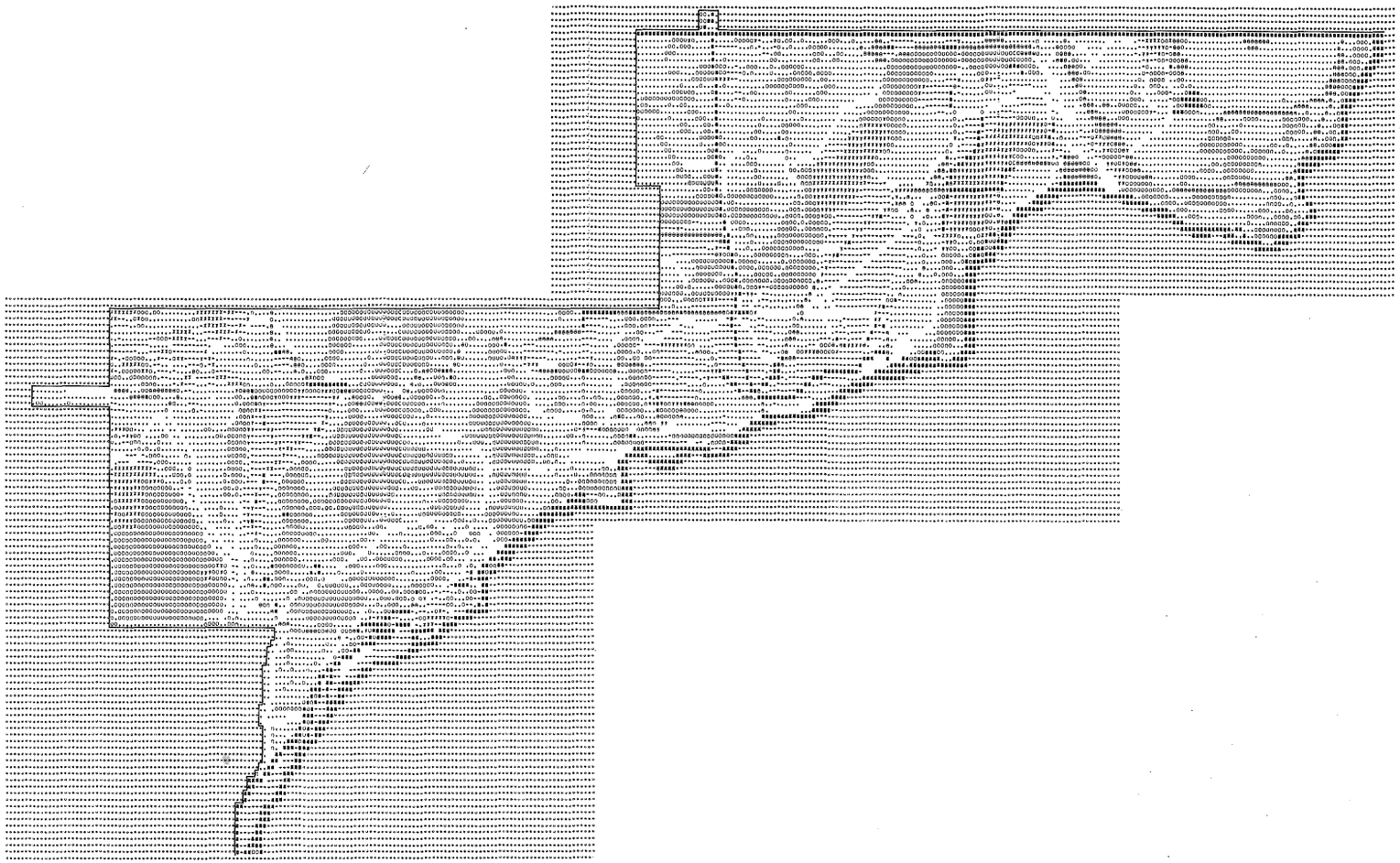
Formula:

Snowmobile Trail = 10(slope) + 8(transportation + 5(density over vegetation + 5(density under vegetation) + 2(recreation) + 2(habitat) + 2(historical).



St. Croix State Forest

Snowmobile Trail

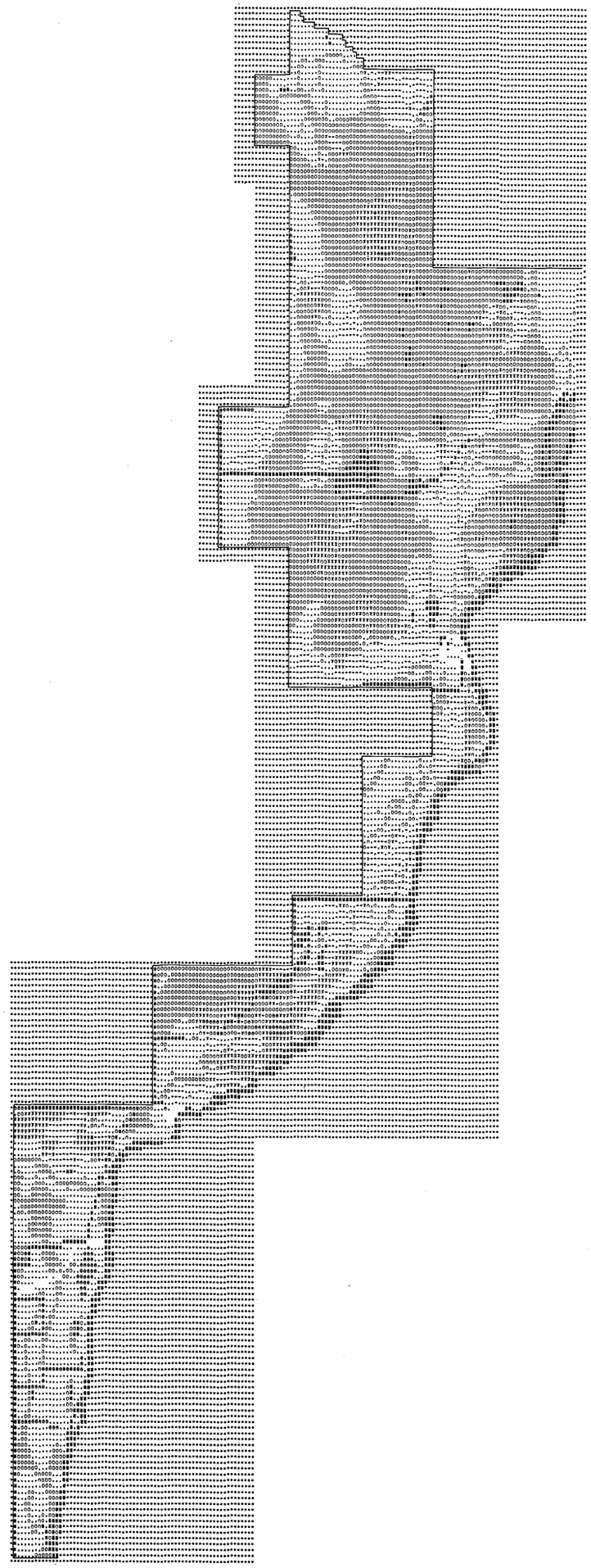


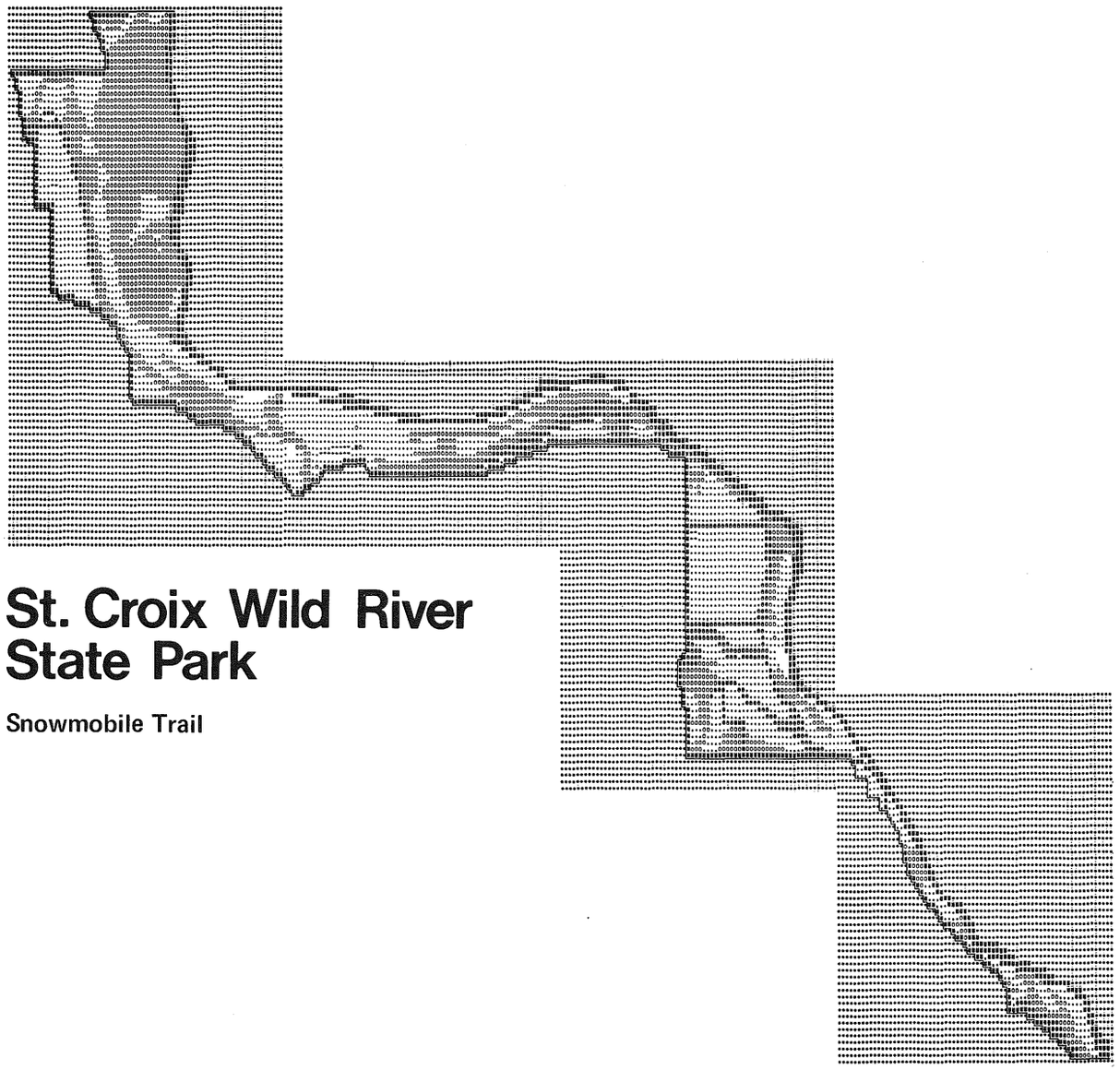
St. Croix State Park

Snowmobile Trail

Chengwatana State Forest

Snowmobile Trail





St. Croix Wild River State Park

Snowmobile Trail

Hiking Trail

Composite Map

Definition:

A very natural and passive trail allowing the user an opportunity to experience nature in its entirety. The trail should present variety in both vegetation and slope to create excitement and interest. If possible, these trails should interconnect with other recreational facilities and historical-archaeological areas.

Factors considered by order of importance:

Soils - Soils are important for trail construction and determine environmental impact from erosion, etc.

Slope - A flat or medium slope is most desirable for a hiking trail to reduce erosion. A higher slope could be considered, but not at the expense of the environment.

Transportation - Considered as a negative value because it interrupts the natural serenity of a hiking trail.

Recreation Area - It is sometimes beneficial to have these trails inter-connect with other recreational facilities, picnic areas, primitive campgrounds, etc.

Habitat Areas - The hiker should be given maximum opportunity to experience nature.

Historical & Archaeological Area - The trail user should again be given maximum opportunity to experience these areas of interest.

St. Croix State Forest

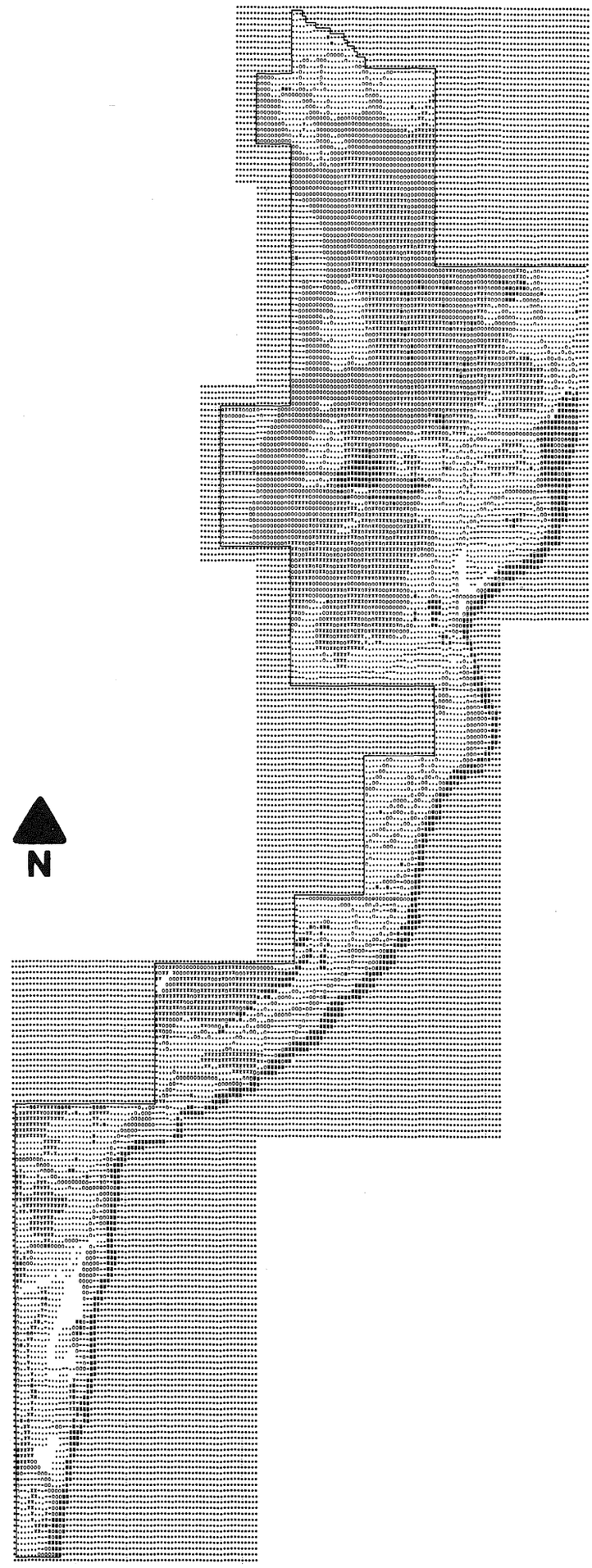
Hiking Trail

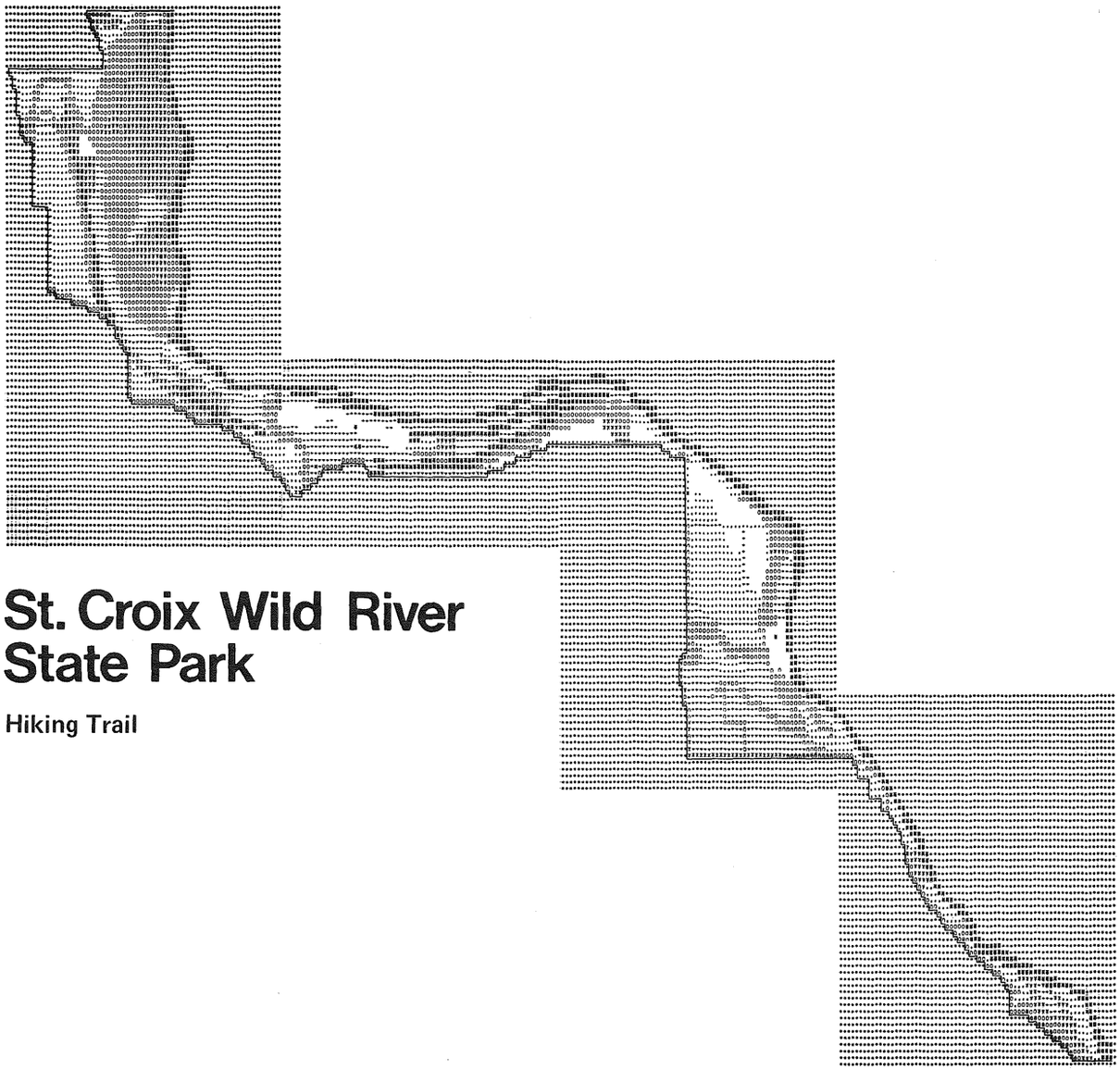
St. Croix State Park

Hiking Trail

Chengwatana State Forest

Hiking Trail





St. Croix Wild River State Park

Hiking Trail

Surficial hydrology will be considered by placing a clear acetate overlay over the composite map to determine site locations relative to surface water features. Also, variation maps of vegetation should be used to determine vegetation variety for the trail corridor.

Formula:

Hiking Trails = 8(soils) + 6(slope) + 4(water tables) + 4(transportation) + 2(recreation) + 2(habitat) + 2(historical).

Primitive Campsite

Composite Map

Definition:

A campground that allows the camper to experience nature in its entirety. The primitive campground consists of individual remote campsites accessible only by foot or canoe. Facilities include: hand pump for water, wilderness pit toilet, fire rings, and tent pads.

Factors considered by order of importance:

Soils - Necessary in determining the use impact or carrying capacity of a site in relation to erosion, runoff, compaction, etc.

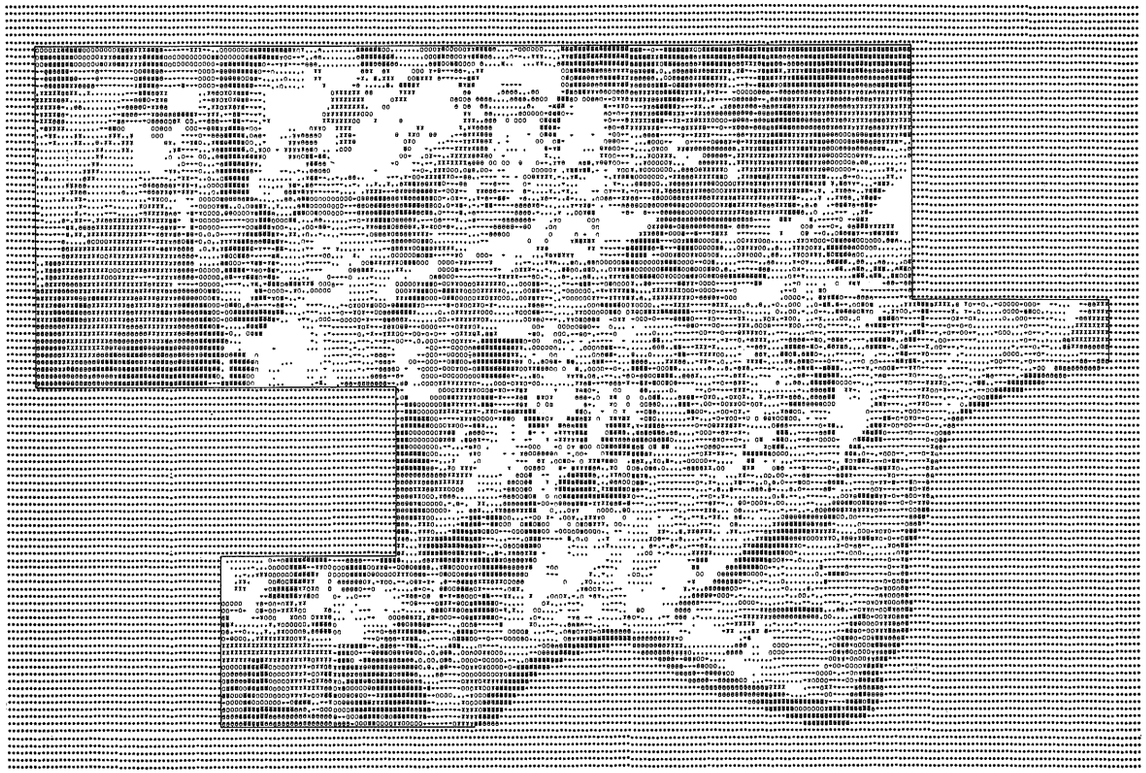
Slope - Terrain may be gently rolling but level to nearly level areas must exist for tent pad sites.

Slope Orientation - Considered for protection from wind and for most desirable sun exposure.

Overstory Vegetation - Considered for protection against natural elements and its esthetic values in relation to spatial enclosure and character (texture qualities, etc.).

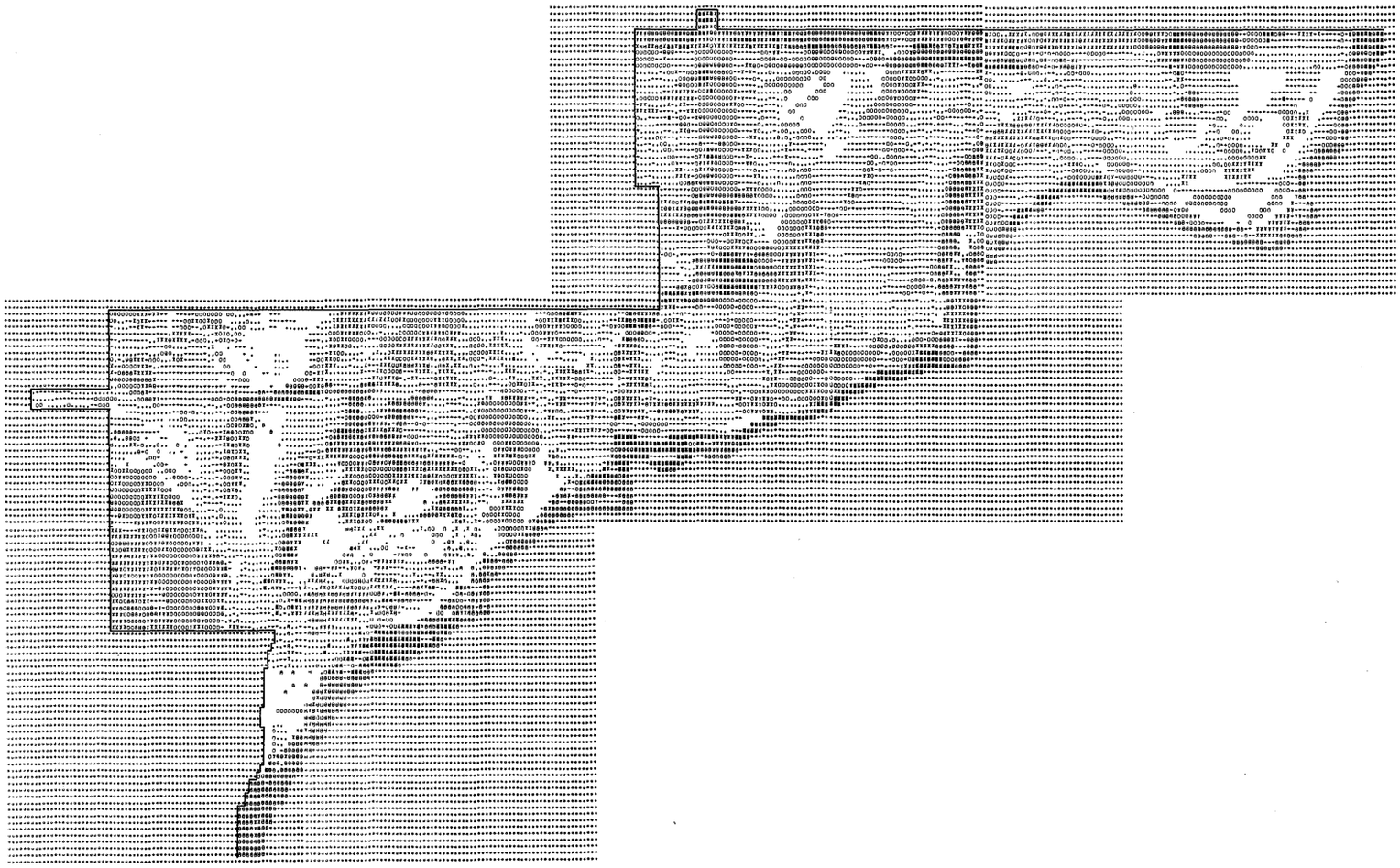
Understory Vegetation - Considered for its ability to protect other environmental factors, such as soils, micro-climate flora and fauna; and its esthetic values in relation to spatial enclosure and character (texture qualities).

Water Table - A deep water table is needed to protect against flooding and pollution of the water source.



St. Croix State Forest

Primitive Campsite

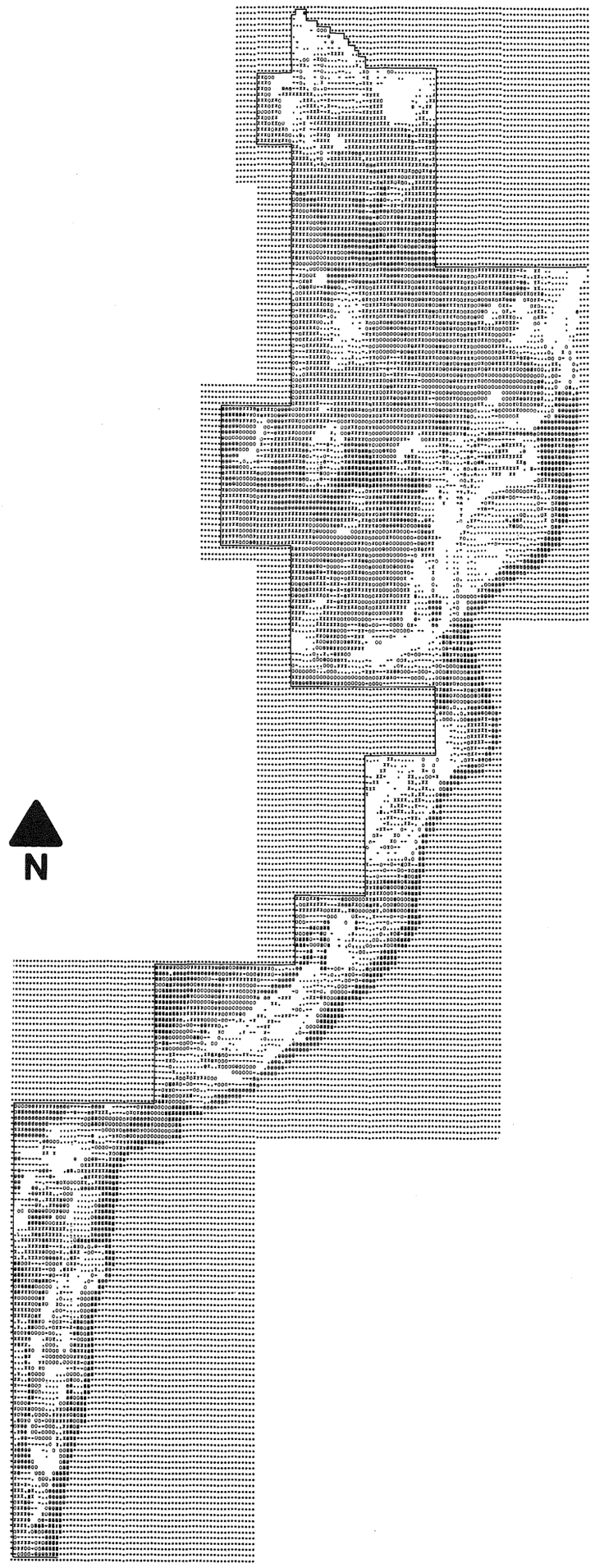


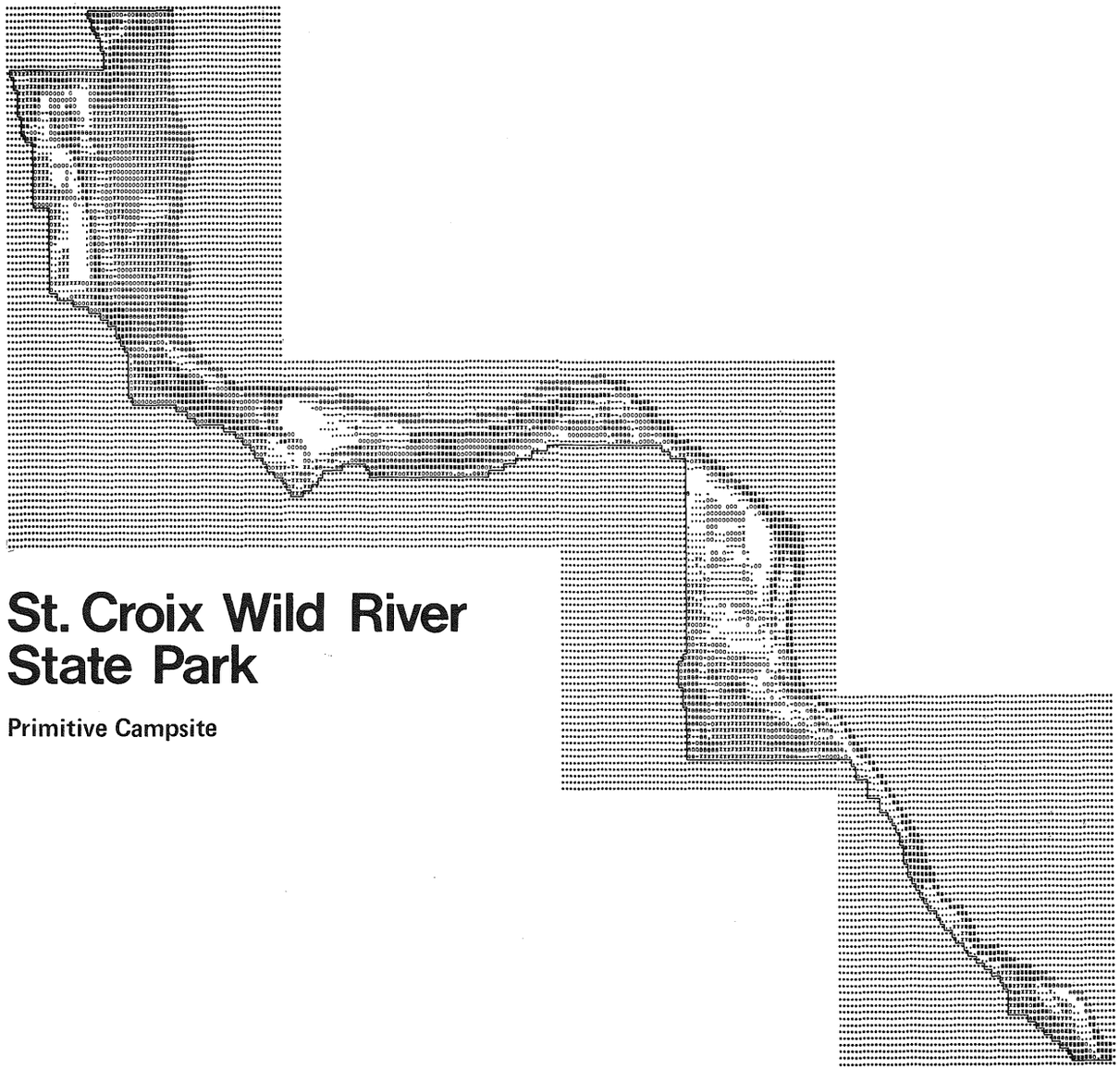
St. Croix State Park

Primitive Campsite

Chengwatana State Forest

Primitive Campsite





St. Croix Wild River State Park

Primitive Campsite

Transportation - Considered a detriment regarding noise, smell, and visual impact (distractions).

Historical - Archaeological Sites - Primitive campsites should not be located directly on a historical or archaeological site, but may be located in close proximity to facilitate interpretation.

Habitat - Habitat is a positive factor in locating primitive campsites because it allows for wildlife interpretation. Specified habitat areas, however, such as deer yards and sand hill crane nesting areas, should be avoided.

Surficial hydrology will be considered by placing a clear acetate overlay over the composite printout map to determine site locations relative to surface water features.

Formula:

Primitive Campsite = 1(soils) + 1(slope) + 1(slope orientation) + 1(overstory vegetation) + 1(understory vegetation) + 1(water table) - 2(transportation) - 2(historical-archaeological) + 1(habitat).

Water Well

Composite Map

Definition:

A water well is a shaft or pipe that is dug or drilled into unconsolidated soil or rock to intercept underground aquifers. From this, ground water can be pumped or bailed.

Factors considered by order of importance:

Soils - Sandy gravelly soils usually produce the highest yield of water/foot drawdown.

Water Table - Lower construction cost if water table is near the surface though pollution potential increases.

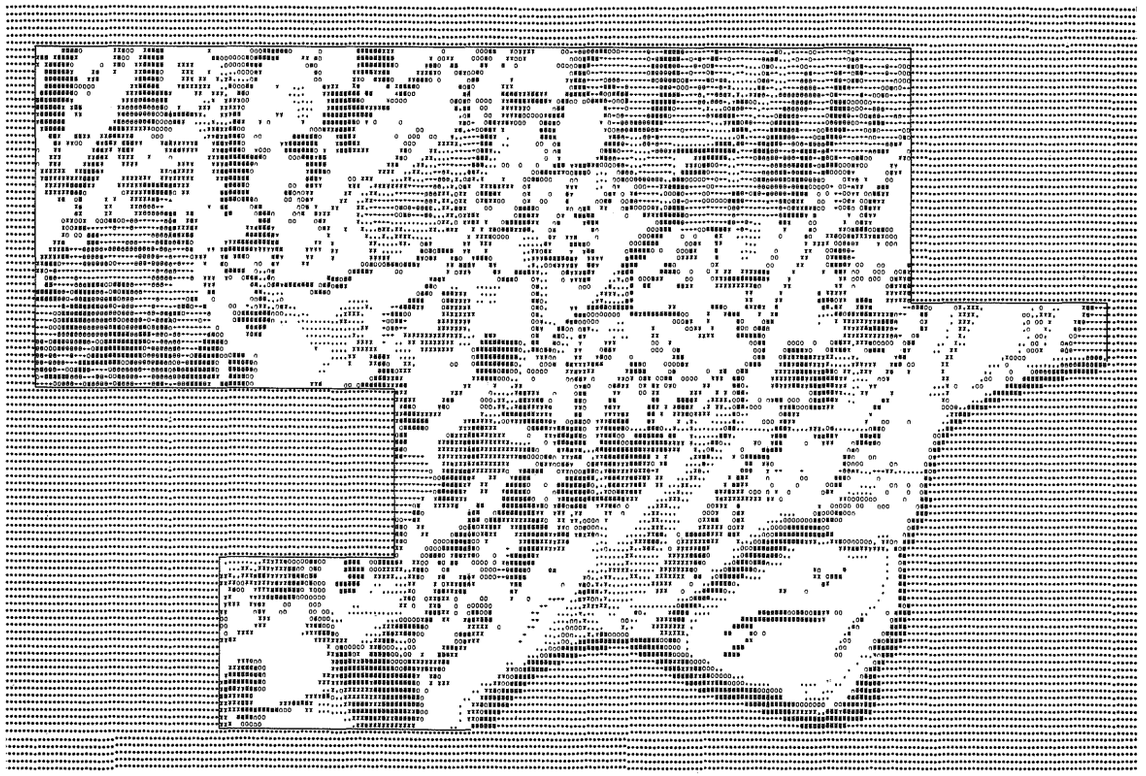
Permeability - Higher permeability - higher yield.

Slope - Well located upslope to eliminate any possible pollution.

Surficial Hydrology - Dry site necessary to prevent pollution.

Formula:

Water Well = 5(soils) + 5(water table) + 3(permeability) + 1(slope) - 5(hydrology).



St. Croix State Forest

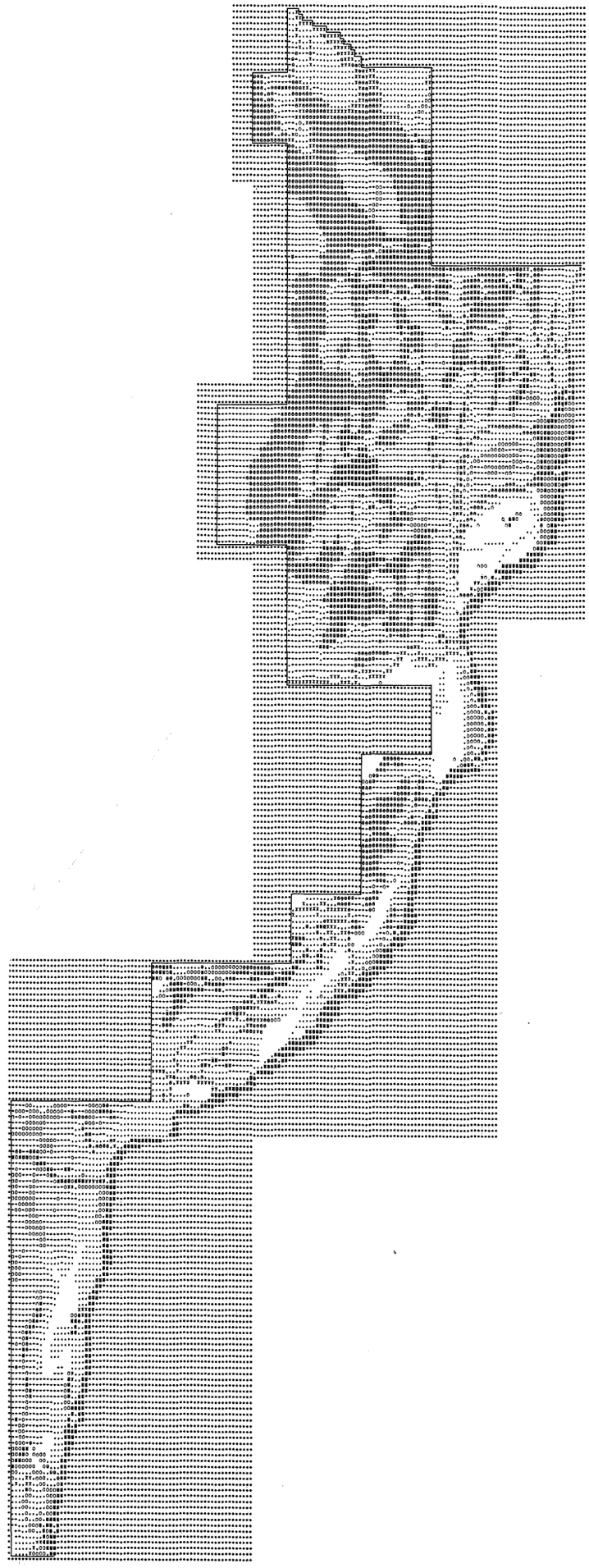
Water Well

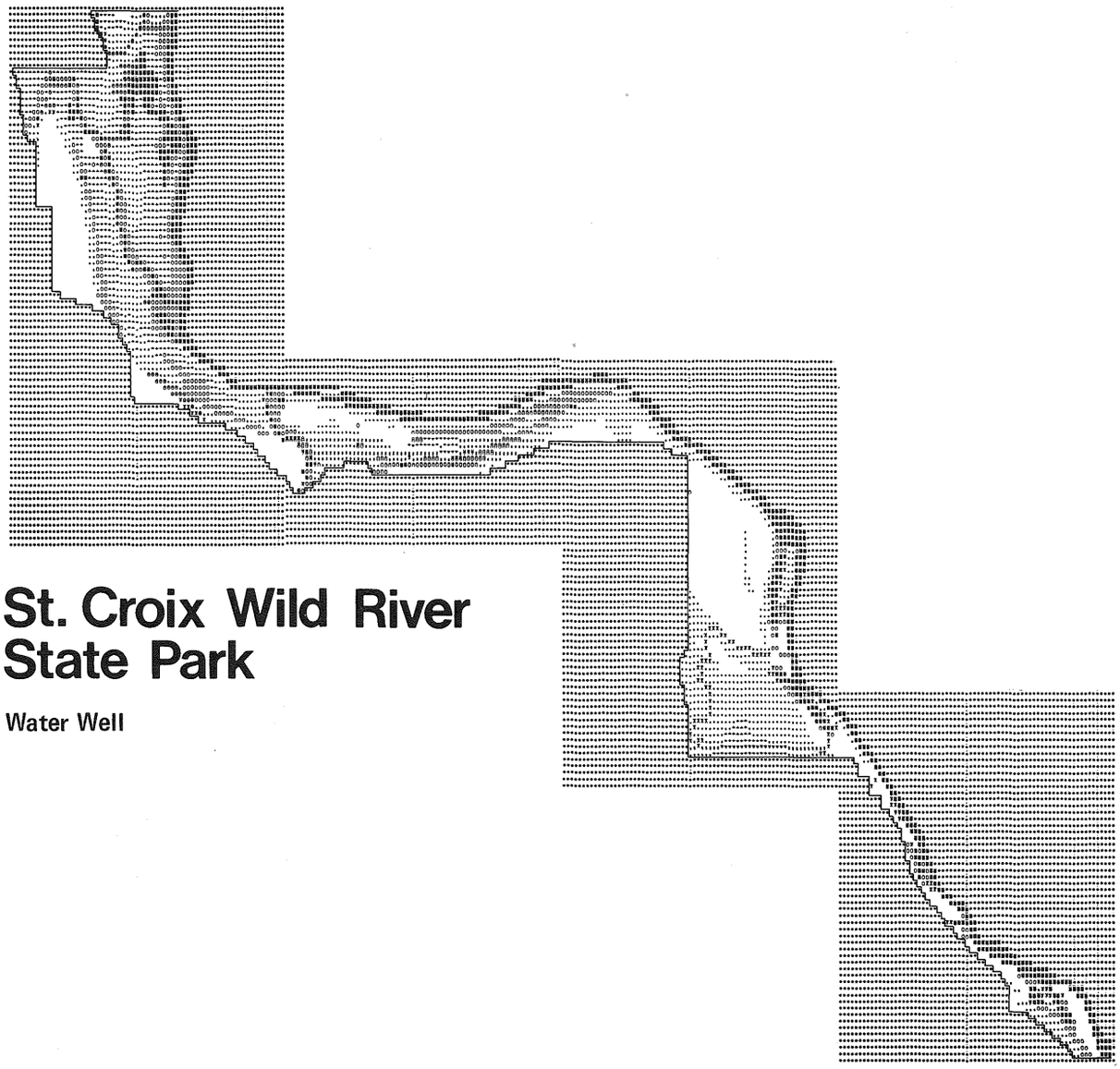
St. Croix State Park

Water Well

Chengwatana State Forest

Water Well





St. Croix Wild River State Park

Water Well

Management & Zoning Concept

Management of the Upper St. Croix River Valley will be the regional administrator's responsibility under guidelines of the Commissioner of Natural Resources. The administrator will determine how to best utilize region personnel to achieve various management objectives, including developments, maintenance and enforcement procedures (Refer to diagram 1).

To facilitate management of the Upper St. Croix Valley, a zoning concept has been developed. Categories or zones into which the area has been divided have been determined by resource capabilities. Eight zones have been established:

Zone I	Developed Recreation Zone
Zone II	Historical, Cultural Zone
Zone III	Fisheries Zone
Zone IV	Wildlife Habitat Zone
Zone V	Natural Resource Zone (Dispersed Use)
Zone VI	Scenic Preservation Zone
Zone VII	Primitive Zone - None were identified in the Upper St. Croix Study Area
Zone VIII	Scientific and Natural Zone

These zones were developed to accommodate all land uses and serve as a standardized medium for management activities. They are not exclusive of each other, providing the secondary use is compatible with primary objectives.

Zone I - Developed Recreation Zone

Physical Requirements - May have varied topography, interesting flora and fauna within a generally attractive natural or man-made setting adaptable to providing a wide range of recreational opportunities. Areas may range in size from a few acres to large tracts of land.

Location - That portion of the unit best suited for facility development and necessary buffer as determined by topography, soils, vegetation, and land forms.

Activities - Intensive development for such uses as camping, picnicking, fishing, various trail activities and outdoor games.

Development - Includes, but is not limited to boat access, parking areas, trails, picnic areas, campgrounds, beaches, and other man-made facilities which may vary in complexity.

General Management - Management shall be explicitly for recreational uses. Forest management should be directed toward maintaining and improving the esthetic appearance of the area. Game management should maintain species for the visual enjoyment of the visitor.

Zone II - Historical, Cultural Zone

Physical Requirements - Those sites associated with the history, tradition or cultural heritage that merit preservation or restoration.

Location - Location of historical features establishes the site. These sites should be

surrounded by sufficient natural buffers to minimize encroachment from other activities.

Activities - Interpretation of historic or cultural features.

Development - Activities should be limited to those which will not detrimentally affect such preservation and restoration of these sites. Access to each area should be adequate with on-site development limited to prevent overuse. Development should not detract from historic or cultural values.

General Management - Forest management activities should maintain historic and cultural values while insuring regeneration of native plant species. Fish management should be limited to maintaining and perpetuating existing fisheries. Recreation development will be restricted to more passive forms such as hiking trails, small picnic areas and primitive campsites.

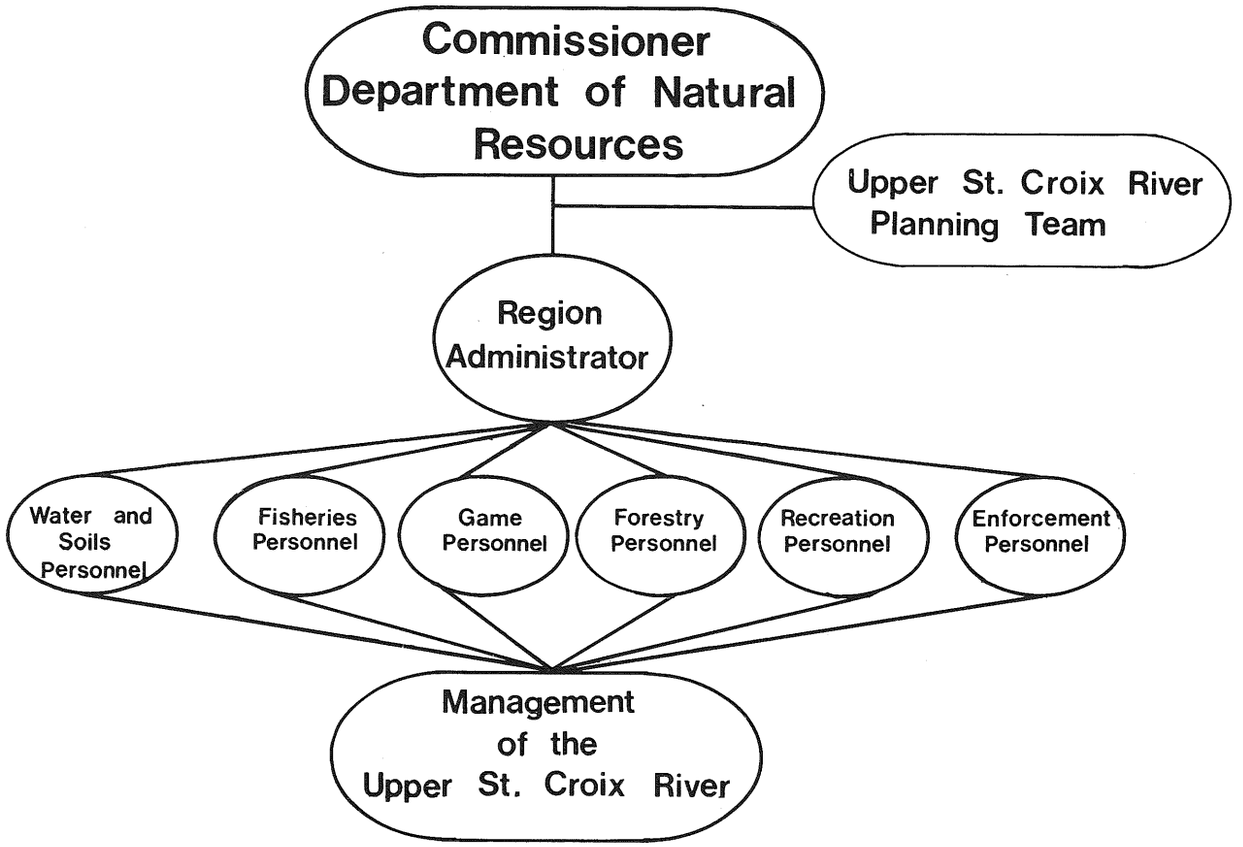
Zone III - Fisheries Zone

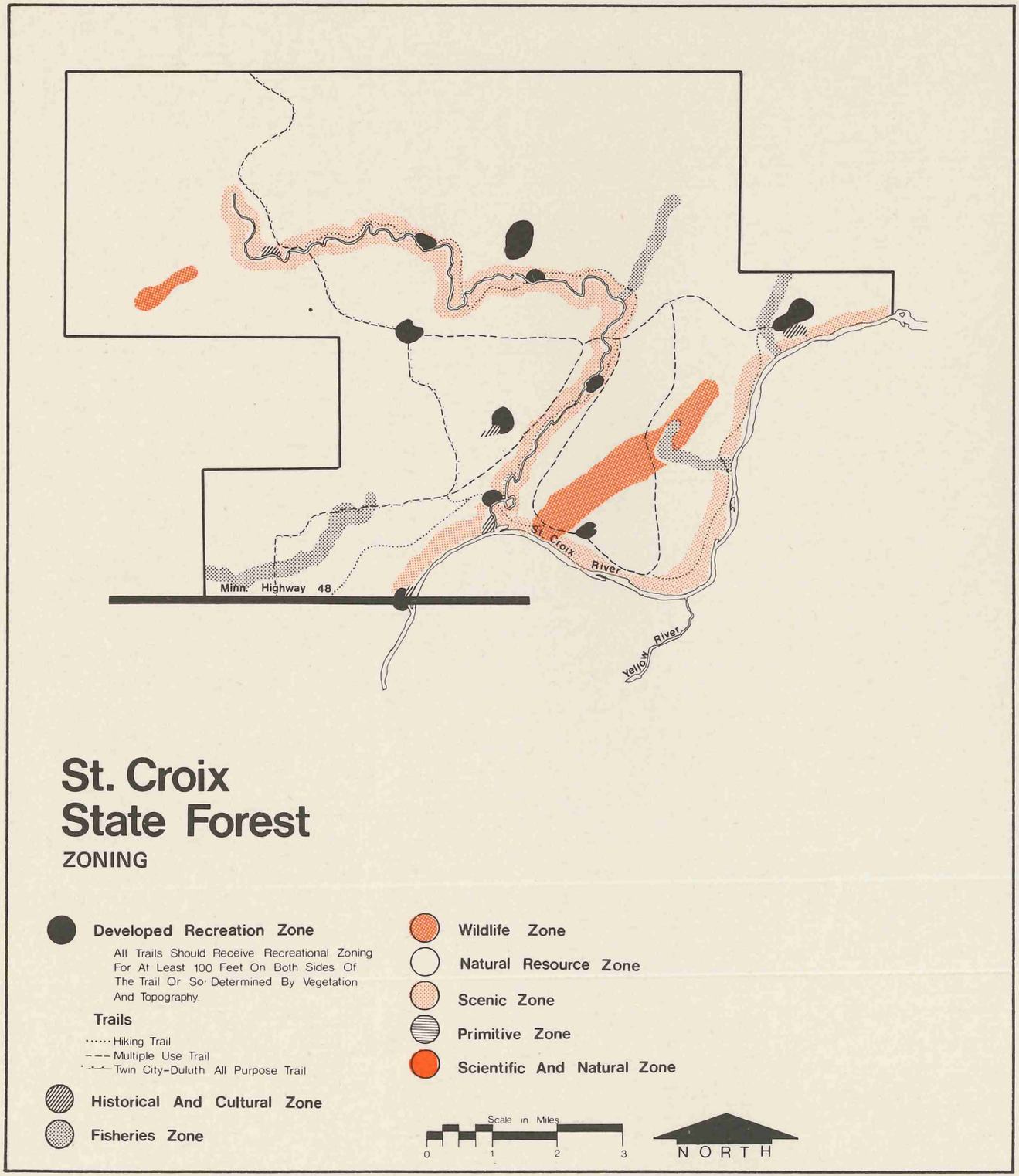
Physical Requirements - Water area with a potential for intensive management in maintaining or improving fish populations.

Location - Wherever the resource conditions are amenable to improvements which can be maintained efficiently. This zone will not only contain lakes and streams but a sufficient buffer to protect the resource as determined by vegetation, topography, and land forms.

Activities - Fishing may occur in season or be restricted as management dictates.

DIAGRAM 1





Development - May include but is not limited to impoundments, vegetative planting, beaver control, stocking and stream bed improvements. Limited public access should be provided. These areas are designated for the purpose of intensified fish production using highly specialized techniques.

General Management - Forest management will be directed toward erosion control and plantings to insure desired degree of shade to maintain stream temperatures. Wildlife habitat projects which are not detrimental to fisheries activities will be permitted. Beaver control for designated trout water is desirable.

Fisheries technology will be employed to maintain the quality of trout streams and warm water areas. Recreational development will be restricted primarily to foot trails for fishermen and limited primitive campsites.

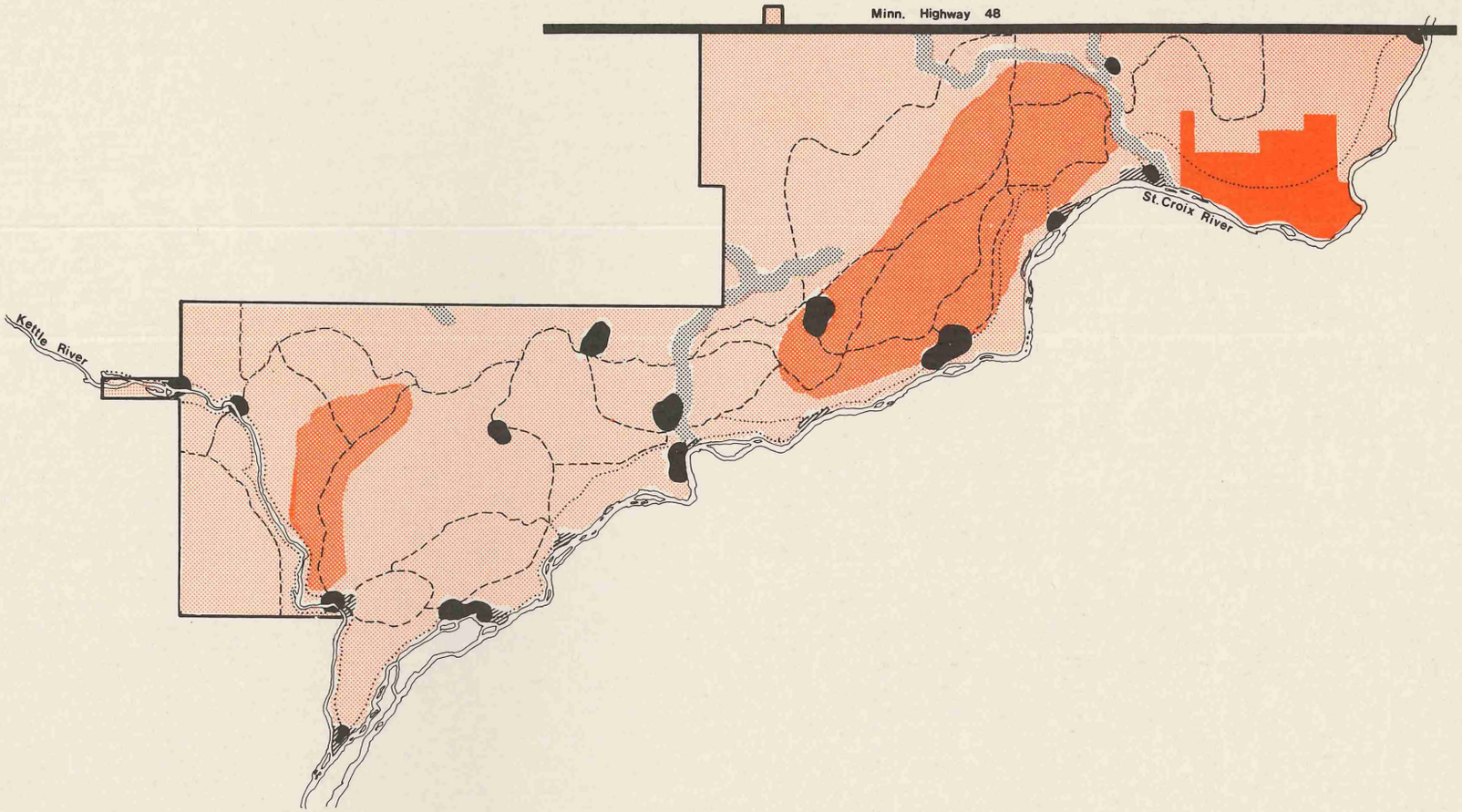
Zone IV - Wildlife Habitat Zones

Physical Requirements - Areas desirable for maintaining or improving wildlife habitat and populations.

Location - Priority in management should be directed to areas with the greatest potential in perpetuating wildlife numbers.

Activities - Game species may be harvested during hunting seasons or protected as management dictates.

Development - May include but is not limited to impoundments, controlled burns, clearing, and vegetative planting and development of accesses for hunters.



St. Croix State Park

ZONING

Developed Recreation Zone

All Trails Should Receive Recreational Zoning For At Least 100 Feet On Both Sides Of The Trail Or So Determined By Vegetation And Topography.

Trails

- ····· Hiking Trail
- – – – Multiple-Use Trail
- ·–·–· Twin City-Duluth All Purpose Trail

Historical And Cultural Zone

Fisheries Zone

Wildlife Zone

Natural Resource Zone

Scenic Zone

Primitive Zone

Scientific And Natural Zone

Scale in Miles

0 1 2 3

NORTH

Chengwatana State Forest

ZONING

Developed Recreation Zone

All Trails Should Receive Recreational Zoning For At Least 100 Feet On Both Sides Of The Trail Or So Determined By Vegetation And Topography.

Trails

- Hiking Trail
- Multiple Use Trail
- Twin City-Duluth All Purpose Trail

Historical And Cultural Zone

Fisheries Zone

Wildlife Zone

Natural Resource Zone

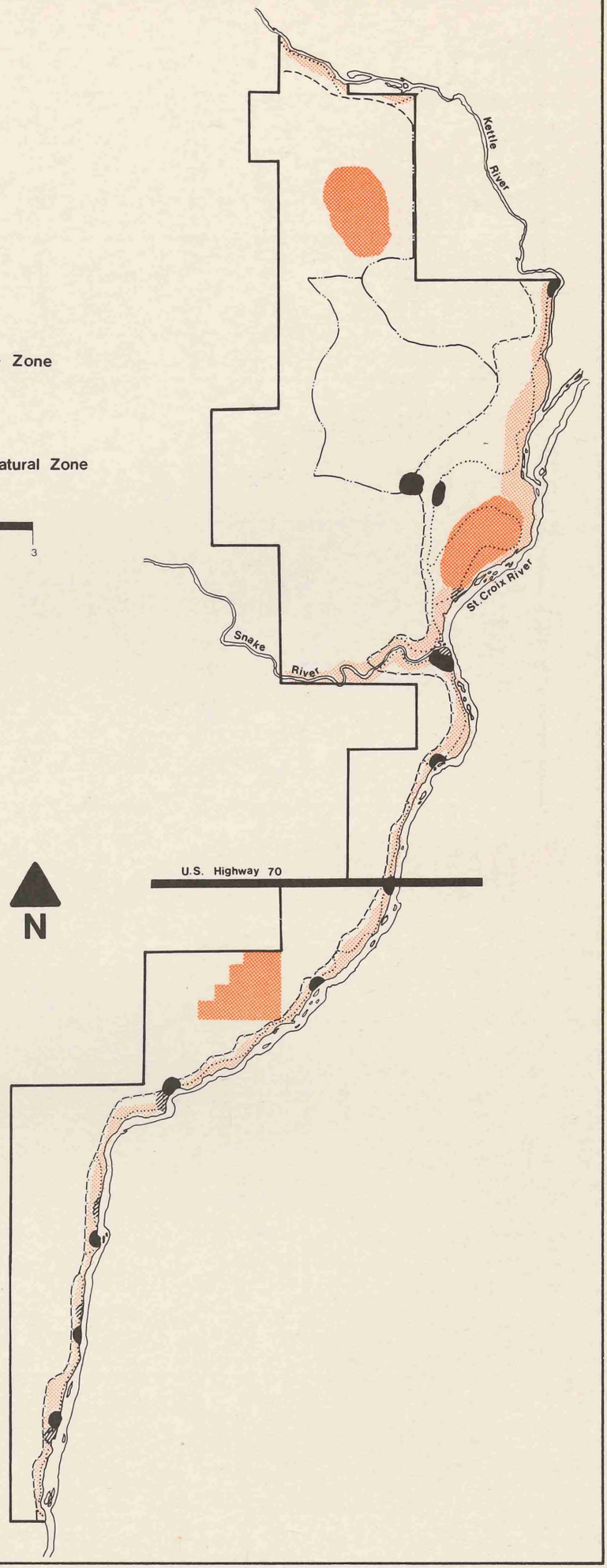
Scenic Zone

Primitive Zone

Scientific And Natural Zone

Scale in Miles

0 1 2 3



General Management - Forest management shall promote and regulate timber harvesting which results in a greater edge affect, irregular cutting patterns, regeneration of desired browse species and a greater variety in over-all vegetative cover. Wildlife management will optimize game populations for the hunter and non-hunter. Recreational activities will be limited to hiking trails and multiple-use trails where they currently exist. Efforts should be made to phase out multiple-use trails in the future.

Zone V - Natural Resources Zone (Dispersed Use)

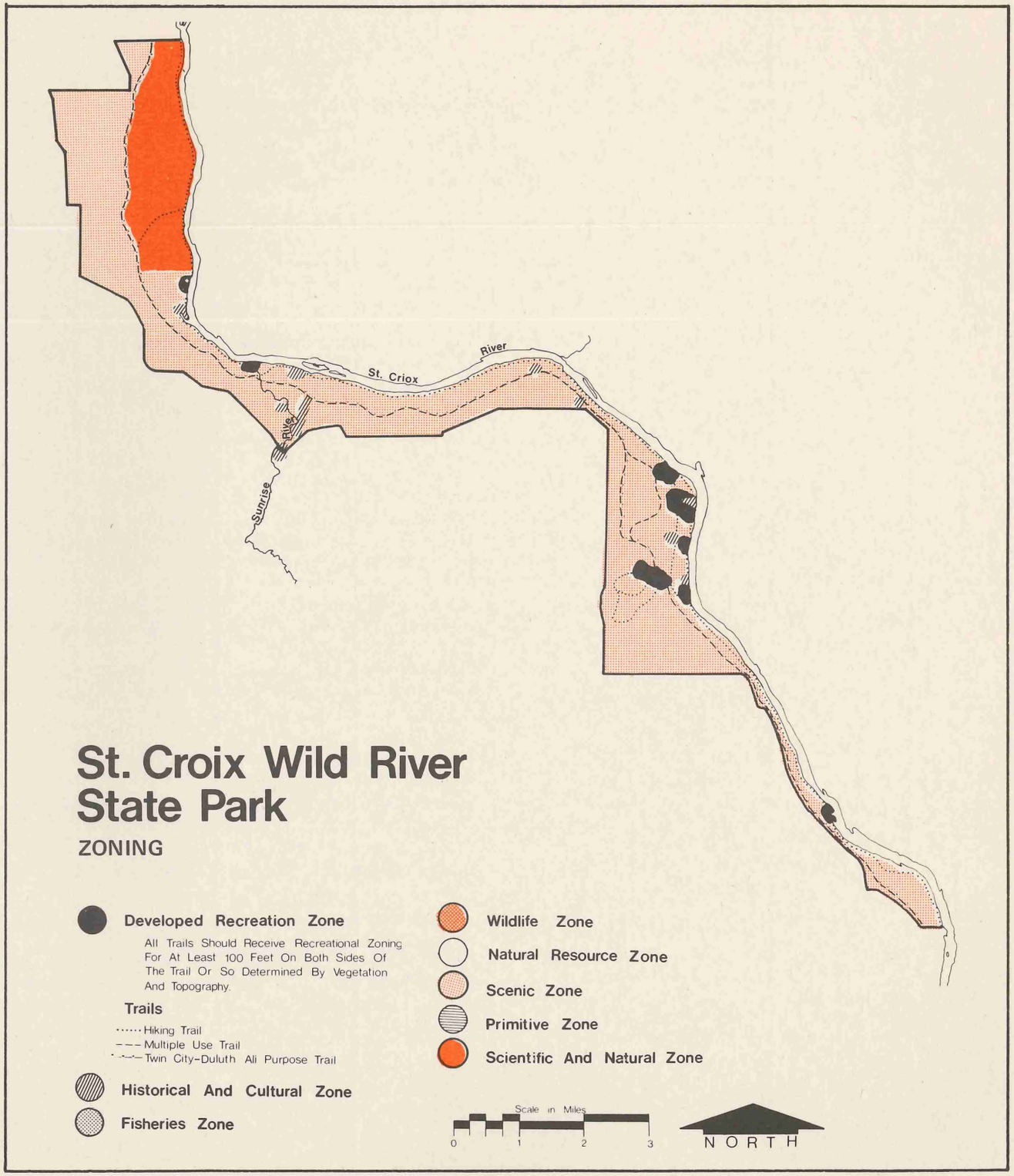
Physical Requirements - Any type of land form or vegetative cover.

Location - Wherever the resources exist.

Activities - Primary objective is multiple use management - timber production, watershed protection, wildlife production, mining, and dispersed use activities such as hunting, fishing, hiking, nature study, etc. Users will be encouraged to enjoy resources "as is" in this zone.

Development - Access roads, trails, minimum sanitary facilities and primitive camping, if necessary.

General Management - Timber harvest and production is the primary objective with consideration given to other multiple uses such as watershed protection, fish and wildlife management, mining and recreational uses.



Zone VI - Scenic Preservation Zone

Physical Requirements Natural features that merit special attention and care through management to insure their preservation.

Location - Any place where such features are found. Could include but not limited to river corridors, trail corridors, lakeshore areas, scenic vista lands, or other areas where management is necessary to protect esthetics.

Activities Kinds and intensity of use are limited to enjoyment and study of the natural amenities.

Development - Limited to minimum management required for public health and safety while maintaining natural esthetics.

General Management - Forest management will be limited to maintaining or improving esthetics. Game management will be directed at maintaining and perpetuating wildlife populations for the visitor's enjoyment. Normal fish management practices should be applied to this area.

Zone VII - Primitive Zone

Physical Requirements - Extensive natural, wild and undeveloped natural amenities far removed from the sights, sounds, and smells of civilization. The natural environment must not be disturbed by commercial utilization. Development must be kept to the minimum necessary for public health and safety. Area must be large enough and located so as to provide the user with a "wilderness experience."

Location - Generally, an area remote from population centers and roads.

Activities - Hiking and camping without mechanized transportation, permanent shelter or other automated conveniences.

Development No development of public roads, permanent habitations or recreation facilities except hiking trails.

General Management - Forest management will be limited to fire control and disease prevention. Management will be directed at increasing fish and wildlife populations.

Zone VIII - Scientific and Natural Zone

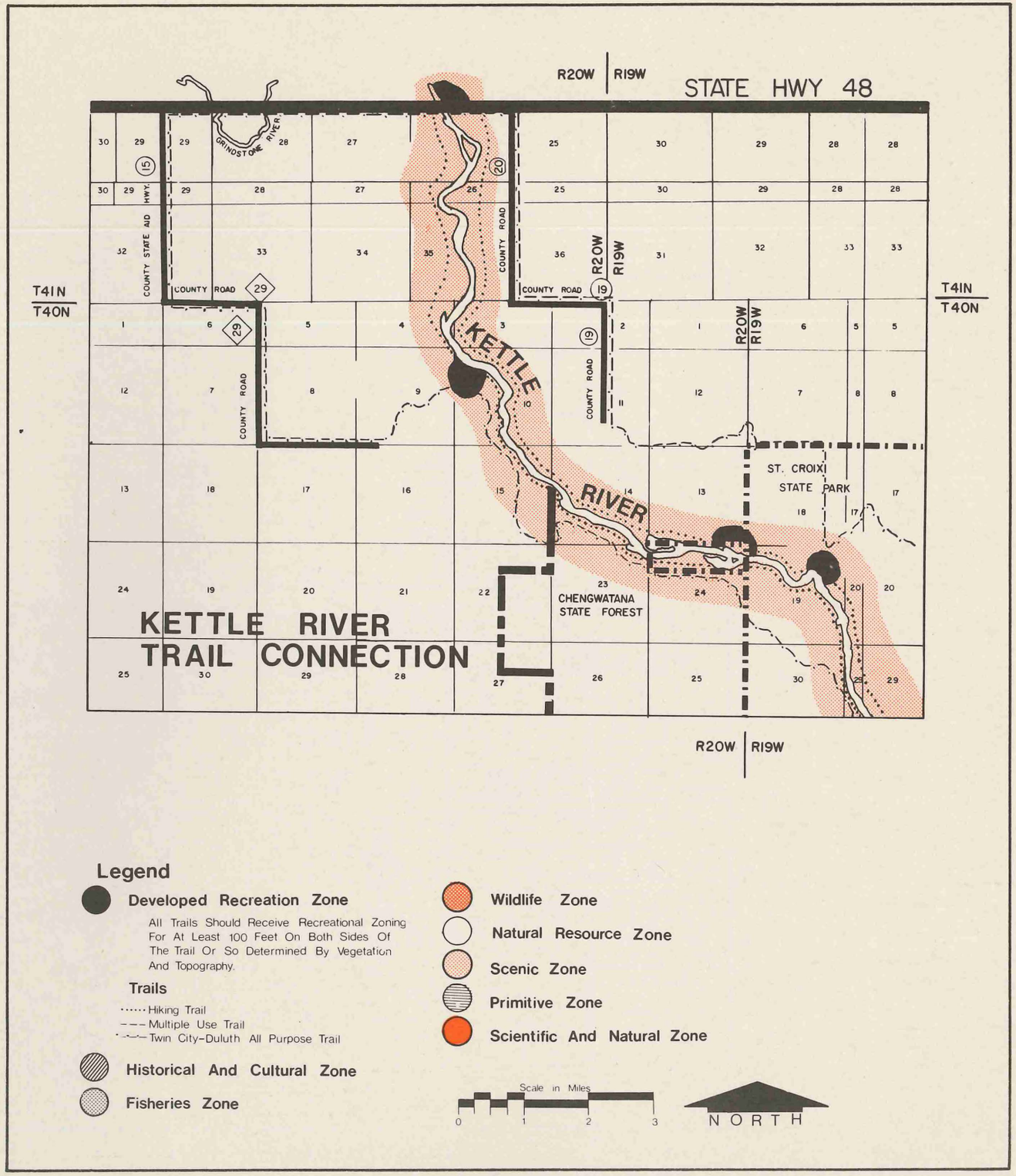
Physical Requirements - Outstanding natural features having particular ecological, geological, physiographic, paleontologic, and/or scientific value, which need special protection to insure preservation.

Location - Wherever such features are found. May be within a larger administrative unit.

Activities - Activities will be limited to those which permit viewing and studying of natural features, so far as is compatible with preserving the features and maintaining a natural setting.

Development - Generally, no developments will be permitted; however, other uses may be allowed with special permission such as nature study and interpretation. Facilities necessary to accomodate visitors should be located outside of, or on the perimeter of the designated area.

General Management - All management practices will be restricted to protecting the areas natural life cycle. Absolutely no activities will be permitted that may alter or have any affect on natural characteristics unless authorized by the Commissioner of Natural Resources.



Wildlife Management Plan

Proposed wildlife habitat projects are oriented primarily toward larger mammals and birds; primarily the White-Tailed Deer and Ruffed Grouse. However, songbirds, reptiles and other wildlife species will benefit from such programs.

Proposal

Forest openings are extremely important to wildlife in addition to enhancing esthetics of a forest. Many openings, whether in a sod condition or low brush, provide different types of living space and necessary elements in the life cycles of most animals.

Small openings in the forest canopy are created by timber sales, clear-cutting, dozing, shearing or crushing in primarily aspen type forests. Some openings will be maintained or managed as grass clearings. Others will be allowed to revert to brush and trees to provide a continuous change and variety in tree and undergrowth species age and composition.

Hunting will continue and possibly be expanded where it will not conflict with other forms of recreation. Hunting will not conflict with other outdoor activities except possibly during the November firearms deer season. Hunting accidents, it should be noted, usually involve injuries to people in a common party. Most concern about hunting injuries results from fear rather than fact.

Description of Environment

Forest management will be primarily concerned with the aspen forest complex because of its pioneer characteristics and its value to

wildlife. Aspen stands 40 to 60 years of age have lost much of their value for timber and are not merchantable. In addition, they only provide living space and food for a fraction of the wildlife which could exist in a younger forest of similar size.

Ideally, a forest should contain a mixture of trees with all age groups and species. Variety is esthetically pleasing, provides living space for more wildlife and it prevents spreading of forest diseases that are typical or large monotypes of forest growth. Forest lands managed in this fashion will provide living space for all wildlife from the tiny Ovenbird to the Bald Eagle or the Meadow Mouse to the White-Tailed Deer.

Environmental Impact of Proposed Action

Clearing or logging projects result in an immediate loss in forest esthetics. These projects are beneficial to wildlife and to the forest itself. Logging usually takes place in winter or fall, long after birds and mammals have nested and raised their young. Cutover areas provide many new food sources for wildlife such as rabbits, deer and grouse. Normally, fire provides the same results, but it has been suppressed and as a consequence, these natural changes have not taken place. Controlled burning is a valuable and economical tool that can benefit wildlife and stimulate vegetative growth such as blueberries, wild raspberry and many other plants.

Hunting is oriented toward species of wildlife that can reproduce at high rates. Wildlife populations are only as high as their natural habitat (food and cover) will allow. Migrant species leave when food sources are scarce or when cold weather prevails. Resident wildlife that are prolific must rely on available food and cover or be faced with mass starvation or disease.

Hunting is a form of recreation that enables a person to enjoy nature and to escape the pressures of day-to-day living. Hunting of game species is not damaging to wildlife because of restrictions placed on hunters and the biological characteristics of game species.

History of Wildlife

Wildlife populations along the St. Croix River Basin prior to the arrival of white settlers were sparce. Uplands were characterized by widely-spaced tall pines. Wildlife was not abundant in these forests because food and cover was in short supply. Following a period of heavy logging, young succulent trees and shrubs emerged, and wildlife flourished.

Pine County and the St. Croix River Valley were known for their abundance of wildlife, especially White-Tailed Deer. However, populations slowly declined until a low was reached in the late 1960's. Mature forests, lack of fire, severe winters, and greater hunting pressure have resulted in a decline of some resident wildlife species, particularly deer.

The aging forest or ecological succession will keep wildlife populations low unless trends are reversed to increase wildlife numbers.

Wildlife Habitat Requirements

Wildlife habitat requirements vary from species to species. Some animals search in the shrub layer below or on the ground while others search to the treetops for food. All wildlife are dependent upon certain plant and animal associations.

One of the most significant aspects in the life of any animal is variety. Among the natural variations are differences in the characteristics of woodlands. Too often, openings or old farmland areas have been converted to pine plantations or have been allowed to revert to wooded areas that eventually lose their value to wildlife.

A forest which contains a good distribution of forest openings, several tree types and different age groups in a small area will attact and provide the best habitat for most wildlife species. A monotype is not pleasant to the human eye nor is it capable of sustaining a variety of wildlife.

Forest Wildlife

Forest wildlife habitat improvement projects are designed to create openings in areas of low timber value and where habitat improvements are desirable. Some projects are followed by a controlled burn to release nutrients from the soil and stimulate growth of shrubs and herbs which provide food and cover for wildlife. Maintaining these grass openings is also important.

Logging and shearing projects commonly assist wildlife during a severe winter. Succulent tree tops are made available to deer and rabbits by cutting selected trees that have grown out of reach. Where selected cutting occurs, new sources of food and cover are provided in successive years.

Roads are built to provide loggers access to lands where timber is becoming over-mature and of low value to wildlife. These roads also provide access to people who hunt and others who enjoy skiing, hiking or other forms of recreation.

Waterfowl and Other Wetland Wildlife

Waterfowl and other aquatic-oriented wildlife benefit by the placement of impounding structures in lowland areas. Flooded areas that provide a large amount of edge or an irregular shoreline provide valuable wildlife habitat. Water depths should average less than three feet to allow for ample food growth readily available to waterfowl. More important for ducklings and shorebirds is water less than one foot deep which contains large amounts of emergent vegetation such as cattails or other tall grasses.

Water cannot be impounded in most low-lying areas of the St. Croix River area because existing slopes would require very high, and thus impractical, dams. In addition, soils containing bog or peat materials are abundant in the St. Croix area. This material floats when flooded, making most sites impractical to develop.

Dugouts provide habitat similar to waterfowl impoundments, but are not as desirable. Dugouts are useful as breeding and mating sites for waterfowl, but usually are not large enough to provide food and protection to newly-hatched broods.

Wildlife potholes are blasted only when no other method of construction is available. Usually a blasted hole in a marshy area has very steep slopes, making vegetation establishment difficult. All dugouts or blastouts should be placed in close proximity to larger, permanent bodies of water that provide additional food and cover.

Several other methods of improving waterfowl habitat can be effective, including:

Placing wood duck nesting boxes within one-half mile of good waterfowl areas.

Planting legumes and tall grasses in fields surrounding wetlands.

This provides upland nesting areas for puddle ducks such as mallards and teal.

Evaluation of Data

Basic data on overstory and understory vegetation (cover types) was gathered and interpreted for their potential in timber production. Many cover types contain mixtures of trees with groups of species too small in area to measure or record. A tree stand yielding few board-feet per acre may not be ideal for a timber management, but may provide valuable wildlife habitat.

Understory elements such as water, soils, micro-climate and slope are the primary factors influencing species make-up of the overstory, or canopy of trees. The kinds of plant and animal species growing in and utilizing the forest is determined by the type of overstory. (The evaluation of data for particular wildlife species will be discussed in association with particular species.)

Deficiencies in the data include a lack of identification of upland or lowland brush growing in the understory or in marshes, and its density. It is not known weather shrub species are predominantly hazel or mountain maple. Further studies should include this data, for it is necessary for comprehensive evaluation of various wildlife habitats.

The following is an attempt to evaluate habitat conditions for several species of wildlife. Much of the data is inadequate for wildlife study, but it does provide a generalized view of existing habitat characteristics.

Aspen-Conifer Relationships

The aspen-conifer relationships are intended to show several important aspects of wildlife habitat. Several gray tones of aspen are shown as they relate to the age conditions of these stands. In general, the older the stand (darker color), the less value it has for songbirds and other wildlife. The aspen community provides the greatest variety and quantity of different species of brush. Other forest types such as maple-basswood or jack pine contain a limited shrub layer or a general lack of plant variety. Thus they have a limited value for wildlife.

Some coniferous areas provide shelter during the winter seasons. However, they normally do not provide enough food sources within the stands to support large species such as deer. Therefore, it is the aspen-conifer relationship that is important.

White-Tailed Deer

Good deer habitat is normally beneficial to other forest wildlife species such as black bear, coyotes, gray and red fox, squirrels, racoon, many warblers, sparrows, flycatchers, wrens, thrashers, and numerous other birds and mammals.

Deer, as well as many other wildlife species, find some of their best food sources in aspen forests. Varieties in cover types do not have to be limited to small areas. Deer migrate for miles to wintering areas, though they normally spend most of their time in small areas.

The formula used to evaluate deer habitat is: Overstory vegetation size and density + age + understory vegetation + size and density + slope.

Cedar swamps, aspen forests, oak forests, and upland brush areas are rated higher because of the kinds of foods associated with these forest types. Pole-size timber or lower density is rated higher than large timber with higher densities because of greater sunlight penetration and increased plant growth. Understory brush and aspen is rated higher and less emphasis is placed on understory conifers than is the case with grouse. The 1 to 20 age groups were rated highest. Slope orientation was also considered.

Light tone symbols of dots and pluses show locations of better year-around habitat. Clear areas reflect south-facing slopes in conjunction with a more desirable vegetative condition. Darkest areas reflect the bottom-land hardwoods or less desirable conditions, thus poorer habitat.

These maps show general habitat areas but it must be stressed that other factors not available in the original data should be considered. "Edge" can partially be determined by noting the difference between the various tones on the habitat maps.

Deer Yards

When deep snow begins to restrict their movement, deer will concentrate in wintering areas called yards. Such areas vary considerably in size from year to year depending upon the number of deer, severity of weather, and types of trees. Usually a yard is located in a conifer area (either upland or lowland) with a dense overstory so the animals' heat loss is minimal. During severe winters, an ample food supply must be available within or near the deer yard. Deer improvement projects in many cases are designed to provide this food source before starvation occurs.

Ruffed Grouse

This upland game bird requires a considerable variety of vegetation within its habitat.

Extremely important in the life cycle of Ruffed Grouse are aspen of different age classes, alder lowlands, open understories and small openings within a 40-acre area.

An aspen forest provides the best habitat and the proper mixture of plant species for grouse. The proper age aspen woods with some conifers in the right proportion are ideal habitat conditions.

To evaluate the Ruffed Grouse habitat, the formula used is: overstory site condition and age + overstory vegetation + size and density + understory vegetation + size and density (a mathematical formula).

Aspen 11 to 20 years old are most favorable for grouse; trees over 50 years are least favorable. Dense stands of pole timber sized aspen are given the highest rating and large saw timber rated lowest. Understory vegetation of sapling sizes and low density are rated high.

The difference between light and dark tones on the composite maps give a clue to "edge" effects that provide good habitat for grouse and other wildlife. Of particular importance are aspen edges next to older lowland stands. These areas contain dense growth which provides an abundance of food in the form of insects, berries and leaves.

Waterfowl Habitat

Information on waterfowl needs and requirements is not available from the data obtained; it therefore cannot be considered or analyzed. Factors such as grass types, farmland crops, water depth, and emergent/submerged vegetation, therefore, cannot be evaluated.

Waterfowl Ponds and Marshes

Ponds are normally small bodies of water usually bordered by some emergent vegetation. A pond's value to wildlife varies with the amount of vegetation growing in and around it. More vegetation usually means greater value. A good waterfowl wetland is composed of extensive areas of emergent vegetation in shallow water depths with numerous small areas of open water for waterfowl activity. Moreover, a wetland (pond or lake) of this type abounds with many other forms of wildlife.

Marshes as classed in this report are usually water-logged sedge or cattail areas containing little or no open water. They do not provide waterfowl habitat, but do provide important sources of food for many birds, rodents and other wildlife that are dependent upon aquatic plants and insects.

ST. CROIX STATE FOREST

Introduction

Wildlife populations within St. Croix State Forest have fluctuated in relation to habitat and weather conditions. Populations have increased following fires, but many wildlife species, particularly deer, have decreased during severe winters because of starvation or poor birth success the following spring by animals in poor condition.

St. Croix State Forest is normally open to deer hunting. Deer populations were high, but a series of severe winters in the middle and late '60s have reduced numbers drastically.

Ruffed Grouse populations reflect weather and food conditions. Much of the aspen and good grouse habitat areas are unaccessible by road. As a result, many surplus birds have not been harvested.

Aspen-Conifer Relationships

The map shows a moderate variety in aspen age classes. In St. Croix State Forest 47 percent of the aspen is 40 years or less while in St. Croix State Park only 26 percent is of this age class. This shows the effect of regeneration of aspen stands and the beneficial efforts of timber harvests on forest lands.

The acreage of aspen is not high compared to other forest types. Though conifers are present, they do not supply food requirements for wintering deer. However, high deer populations may develop in Jack Pine stands.

Several small White Cedar areas are present. Normally Cedar is an excellent food source for deer.

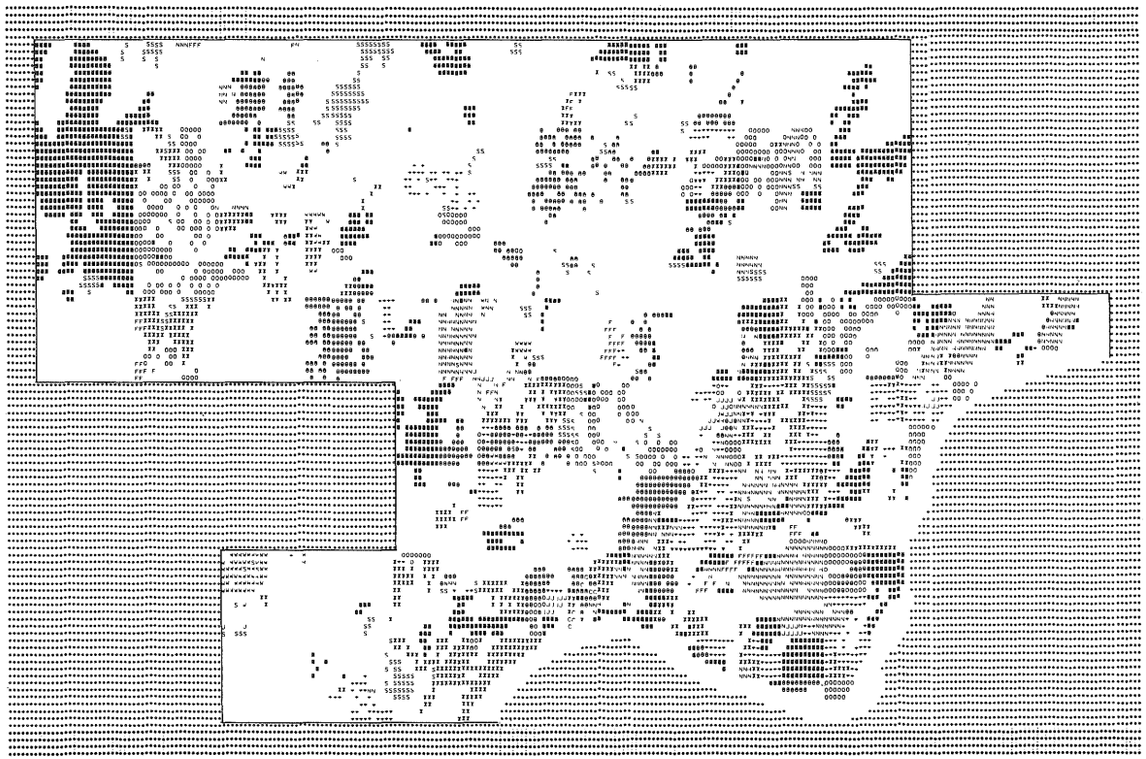
Deer Habitat

The map of general deer habitat shows a variety of edges, different ages and timber types, but the overall rating of habitat value is not high. However, good habitat areas are evident as shown by light shaded areas. Most of the clear areas reflect younger aspen stands.

Ruffed Grouse

Grouse habitat is about average with only a few good sites. However, very few areas are rated poor.

Censusing projects to determine population trends have not been made in St. Croix State Forest, but it should contain bird numbers which parallel population trends in other areas of the state. It cannot be determined if populations are above average.



St. Croix State Forest

Aspen - Conifer Relationship

	Other Veg & Water Areas	White Pine	Norway Pine	Spruce	Cedar	Spruce Balsam	Jack Pine
Symbol	Blank Areas	W	N	S	C	F	J
No. of Acres	28422	258	1729	896	21	205	128
% of Total Area	63.8%	.6%	3.9%	2.0%	0%	.5%	.3%

Aspen

	0-20 yrs.	20-30 yrs.	30-40 yrs.	40-50 yrs.	Over 50 yrs.
Symbol	+	0	X	θ	▦
No. of Acres	1567	1870	2601	2152	4703
% of Total Area	3.5%	4.2%	5.8%	4.8%	10.6%

Recommended Wildlife Management

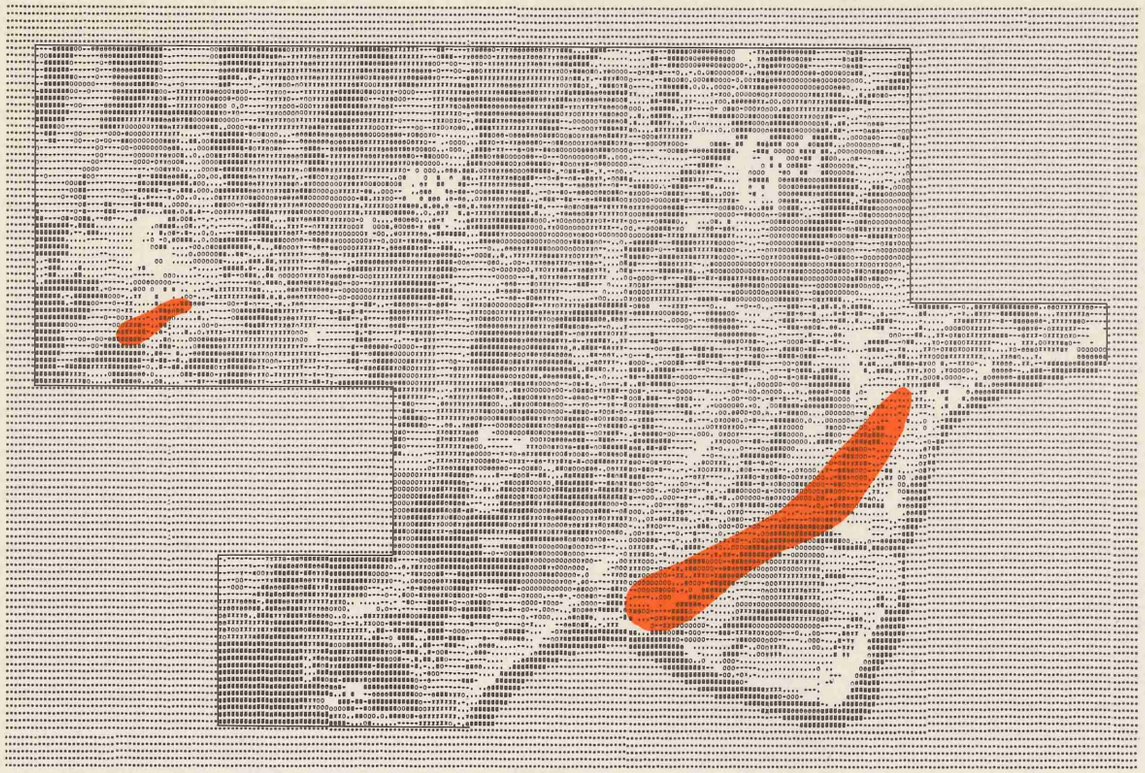
Forest wildlife habitat projects are underway on state-owned lands in the forest. Commercial timber sales should be the first method of regenerating vegetation. Shearing or crushing trees which have no commercial value or limited value to wildlife may also be employed. Habitat projects are designed to create openings necessary for most wildlife species.

Openings should be about five acres in size. Cutting of larger sites depends upon topography and economics in constructing such openings. Openings should be allowed to regenerate naturally into brush and trees. Some openings should be planted in permanent grasses and herbs.

An additional network of trails for general recreational and hunting use should be incorporated. These accesses are also essential to timber harvests.

Ideally, the forest should be managed so that 45 to 60 percent of land area is deciduous, shade-intolerant types, i.e. aspen, birch or oak. Of this, 25 percent to 35 percent should be aspen, of which 25 percent should be 10 years or younger.

Ten percent of the forest should be grass and upland brush areas and five percent in sodded grassy openings. Fifteen to 20 percent should be in conifers to provide winter cover and interspersed with the above combinations to provide maximum edge effect. Edges between two distinct forest types or openings are normally exposed to the sun. Thus, more brush is created for shelter and food.



St. Croix State Forest

Deer Habitat Map

— Known deer yard areas.

— Computer maps, lightest tones highest potential for deer yards.

Controlled burns should be incorporated wherever possible to improve wildlife living space.

ST. CROIX STATE PARK

Introduction

A mature forest exists in the park. Many stands of Jack Pine and aspen are older than 50 years. These areas are of low value to wildlife with little or no regeneration to replace the mature trees.

Food conditions in the park have been poor for many years while deer populations were extremely high. In 1945, the park was open to deer hunting because the herd was destroying its own habitat. That year, 76 deer per square mile were taken, followed by 60 deer per square mile the following year. Twenty to 30 deer per square mile is considered the normal "carrying capacity" of their habitat.

By 1945, two plants, New Jersey Tea and Blood-Root, had been eliminated altogether by deer. By 1949, only ten species of deer browse comprised 62 percent of the food available. Willow was the most important food plant. By 1966, only four species made up 65 percent of the food available. None were considered good deer foods.

Poor food conditions exist today, but the deer herd apparently continues to increase. Reproduction of new trees is limited and shrubs have grown too tall. Most browse plants are of poor quality or are considered starvation foods.

Blood samples of eight deer taken in the

spring of 1972 revealed that the animals are on an extremely poor protein diet with low amounts of magnesium. Magnesium is important for proper fetal development. As a consequence, a high mortality of fawns can be expected to continue for many years.

The St. Croix Island Game Refuge is a series of islands on the St. Croix River along the southern boundary of the park. These lowland islands contain floodplain vegetation which is not conducive to most species of wildlife. In general, this refuge is not assisting wildlife populations, particularly deer.

Aspen-Conifer Relationships

The composite map shows the conifer locations and the various age classes of aspen cover types in St. Croix State Park.

Only about 100 acres of aspen is less than 20 years of age. This age group can provide excellent habitat for most wildlife species. The almost complete lack of this age group reflect the impact great numbers of deer have on their habitat. There has been a lack of natural fires that could regenerate vegetative conditions which would provide better food and shelter for wildlife of all types.

Aspen stands exceeding 50 years, have generally lost most of their value to wildlife. However, because of overgrowth, all age groups of aspen stands provide little food for wildlife.

There is a great variety of aspen complexes in the western portion of the park. Here, the largest

St. Croix State Forest

Grouse Habitat

populations of Ruffed Grouse occur along with an abundance and variety of songbirds and other wildlife. The east portion contains extensive monotypes of vegetation which have a limited variety of wildlife species, but have their own unique forms.

The large Jack Pine area in the east-central portion and the Norway Pine stand to the west are yarding areas for wintering deer, because of the shelter these conifers provide. The Jack Pine stand is quite old and has little aspen growth within it. The Norway Pine stand has a large amount of associated aspen. However, the majority of trees in these stands are over 50 years of age and are dying. Pine stands do not regenerate in the absence of fire.

White-Tailed Deer Habitat

St. Croix State Park contains high concentrations of deer. But as mentioned earlier, deer numbers at times have exceeded the carrying capacity of their range.

Younger age groups of aspen provide good habitat for deer, but such areas are few. Because the map shows year-around habitat conditions, the effect of deer on the understory quality and quantity of browse species cannot be determined. Areas can be noted where good habitat exists and where habitat could be improved.

Ruffed Grouse Habitat

Populations of grouse within the park have for years fluctuated in relation to other areas of the county. Spring drumming counts have been performed to compare the park's grouse populations with other areas. Lack of hunting has resulted in a waste of a valuable recreational source.

The clear areas on the map noted with dots do provide good drumming sites for male birds.

Recommended Wildlife Management

Management of the deer herd in St. Croix State Park is step number one. Deer should be harvested to keep the population in line with the carrying capacity of their range. Bows and arrow and rifle hunting have been used previously and have provided considerable amounts of recreation. Harvesting should be performed annually or bienially to insure stable, healthy populations.

Management of habitat should be the second step. Efforts should be made toward improving Ruffed Grouse and songbird populations, and this will benefit deer in most cases.

Aspen stands should be modified to create openings and brush areas and to rejuvenate aspen growth. Five to ten-acre clearings should be made in forest monotypes to provide "edge", more food species, and openings that are esthetically pleasing. These openings should not be planted to pine seedlings but allowed to revert to natural forest types. Some openings should be planted to herbaceous vegetation. Controlled burning is an extremely useful tool and, where possible, should be used to improve vegetative conditions.

As part of the recommended management, north-south cuttings or shearings should be made

St. Croix State Park

Aspen - Conifer Relationship

	Other Veg & Water Areas	White Pine	Norway Pine	Spruce	Cedar	Spruce Balsam	Jack Pine
Symbol	Blank Areas	W	N	S	C	F	J
No. of Acres	19647	0	662	553	0	11	4088
% of Total Area	50.6%	0%	1.7%	1.4%	0%	0%	10.5%

Aspen

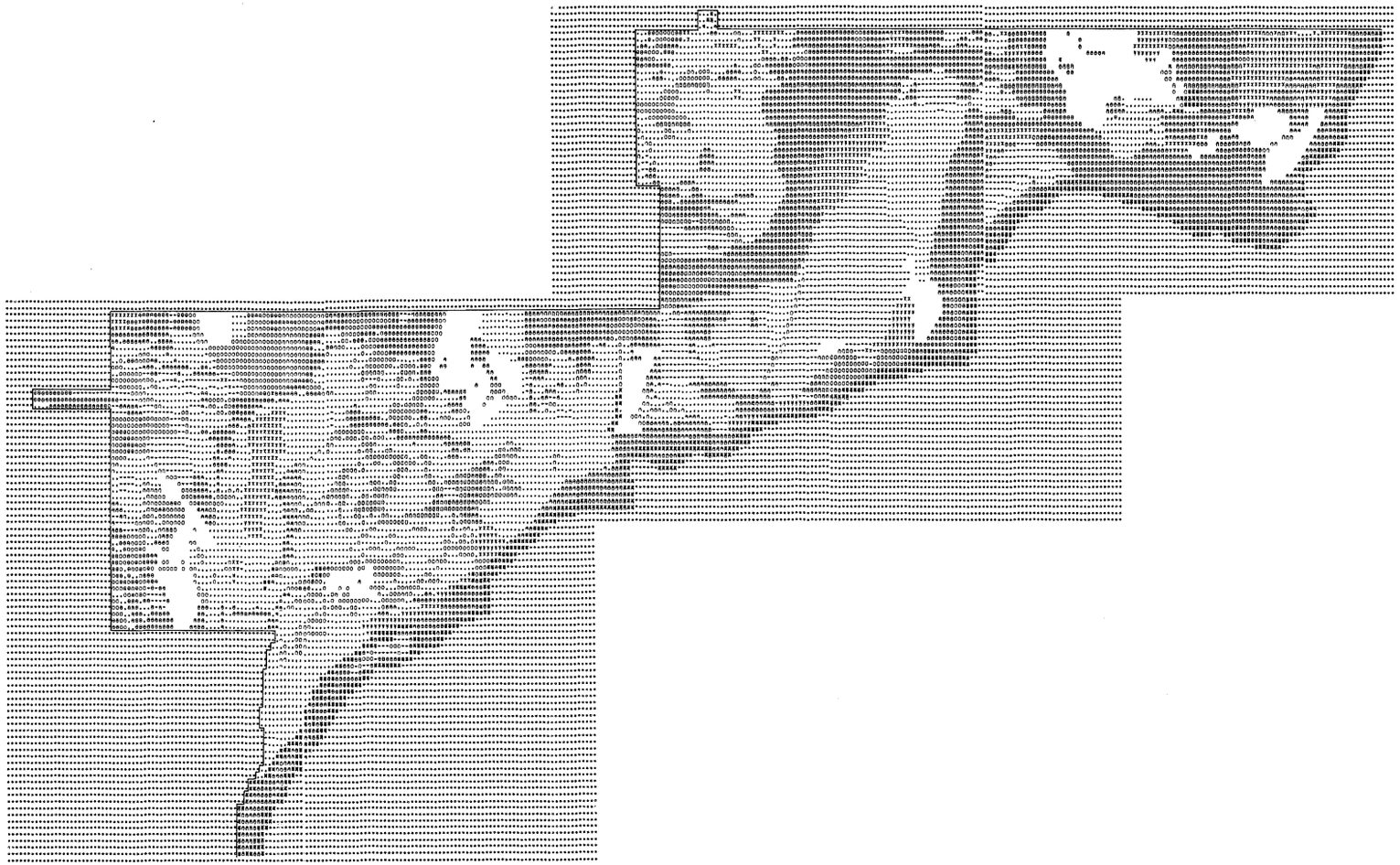
	0-20 yrs.	20-30 yrs.	30-40 yrs.	40-50 yrs.	Over 50 yrs.
Symbol	+	0	X	θ	▩
No. of Acres	101	95	3487	7496	2732
% of Total Area	.3%	.3%	9.0%	19.3%	7.0%

St. Croix State Park

Deer Habitat Map

– Known deer yard areas.

– Computer maps, lightest tones highest potential for deer yards.



St. Croix State Park

Grouse Habitat

about 330 feet wide by 660 feet long or more. Usually two openings should be created in each 40-acre parcel at ten-year intervals to obtain a constant turnover in tree ages.

Areas more remote from regular traffic patterns and adjacent to conifer areas which are presently deer yards, or potentially so, should be larger in size. Some clearings may be near trails or roads for equipment usage and to provide public access to view these demonstration areas. Snowmobile trails should not be allowed in these areas where deer are concentrated.

CHENGWATANA STATE FOREST

Introduction

This is the closest major forest complex to the Twin City Metropolitan Area. It, therefore, receives heavy use by Twin City hunters and other recreationists.

As in St. Croix State Park and State Forest, aspen is the prevalent upland tree species. White-Tailed Deer and Ruffed Grouse maintain good populations, and they provide a considerable amount of recreational experience for hunters. As mentioned previously the populations of deer, grouse, and other wildlife are dependent upon habitat and weather conditions in this area.

Rock Wildlife Management Area is primarily managed for the production of waterfowl and to provide for hunting. It contains 600 acres of land predominantly in Section 27, Township 38 North, Range 20 West. The tract was purchased by the Division of Game and Fish.

The Sandhill Crane has been known to inhabit some areas of the Chengwatana State Forest. It is about three feet tall, and similar in size to the Great Blue Heron. The bird normally nests in wet marshlands or on low prairie areas where it makes its nest of sedges and grasses.

Formerly the Sandhill Crane was a common summer resident in the prairie regions of Minnesota. However, as settlement, farming, and market hunting increased, its numbers declined. A few pairs still pass the summer in Jack Pine barrens and marshes along the St. Croix River in Pine County and adjoining portions of Wisconsin.

Aspen-Conifer Relationships

In Chengwatana Forest, 35 percent of the aspen is 40 years old or less compared to 26 and 47 percent for St. Croix State Park and State Forest, respectively. Lack of adequate road systems and state ownership in the southern segments of the forest resulted in many stands of aspen remaining uncut. Absence of fire has caused a lack of aspen regenerations. About 45 percent of the aspen is over 50 years of age compared to 20 percent in St. Croix State Park.

Several coniferous areas are in the northern portion. These areas afford protection to deer during the winter storms, and some are deer yards. Older aspen stands are associated with these pine areas. It should be noted that younger aged aspen stands are prevalent in the north-central area which provides good habitat.

Deer Habitat

Overall, deer habitat could be rated as fair to poor. Upland bluffs overlooking the St. Croix River bottoms show numerous areas of good habitat. The bluffs contain large amounts of good upland vegetation and the slope orientation to the south and southeast increases the value for deer habitat. Large expanses of poorer habitat are present along the western edges of the forest.

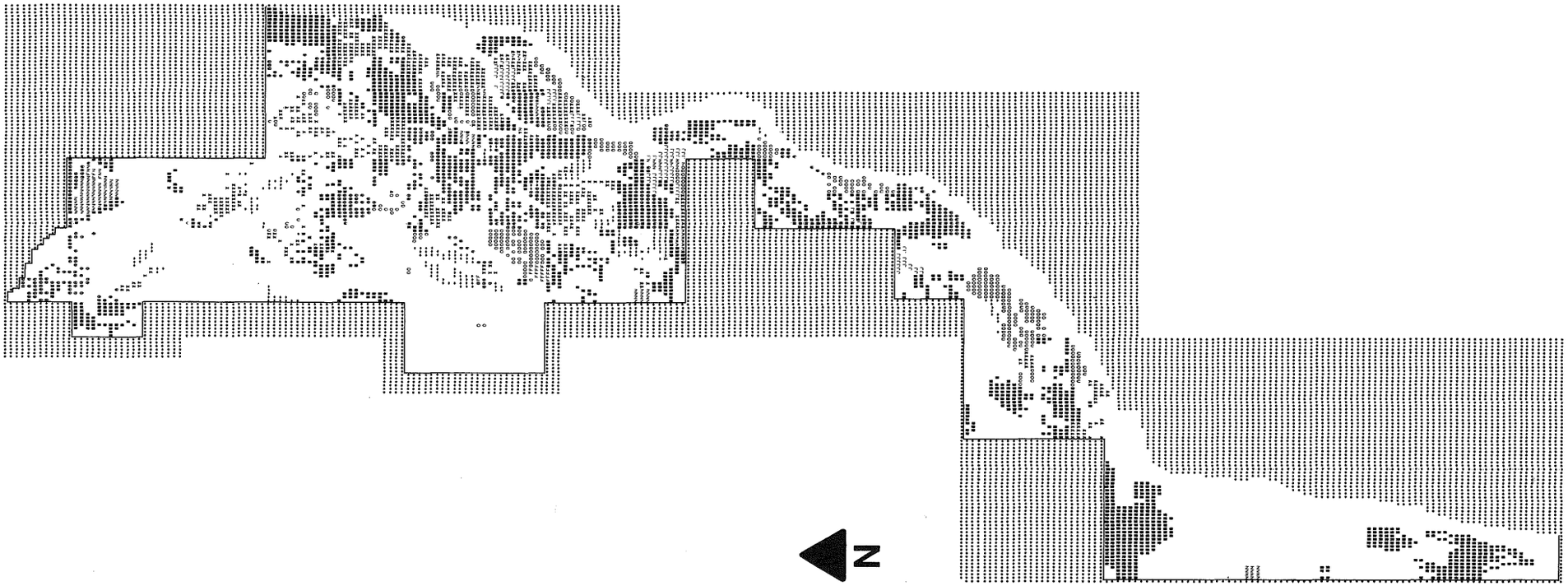
Deer habitat improvement projects and logging are being planned and carried out as new road systems are developed. These practices will benefit wildlife populations to a great degree in future years.

Recommended Management

Forest wildlife projects are underway on state-owned lands within the forest. The computer data maps do not pinpoint habitat improvement projects, however. Commercial cutting of mature timber should be encouraged to provide more and better habitat for wildlife.

Clearings should be allowed to regenerate toward native brush and tree species. Where possible, some openings should be treated to encourage grassy conditions which are beneficial to wildlife. Additional unmaintained trails for hiking, logging, and hunting should be provided for access into the forest and to provide openings.

(Refer to the Wildlife Recommendations within the St. Croix Forest for additional clarification).



Chengwatana State Forest

Aspen - Conifer Relationships

	Other Veg & Water Areas	White Pine	Norway Pine	Spruce	Cedar	Spruce Balsam	Jack Pine
Symbol	Blank areas	W	N	S	C	F	J
No. of Acres	19606	29	340	0	0	58	287
% of Total Area	63.5%	.1%	1.1%	0%	0%	.2%	.9%

Aspen

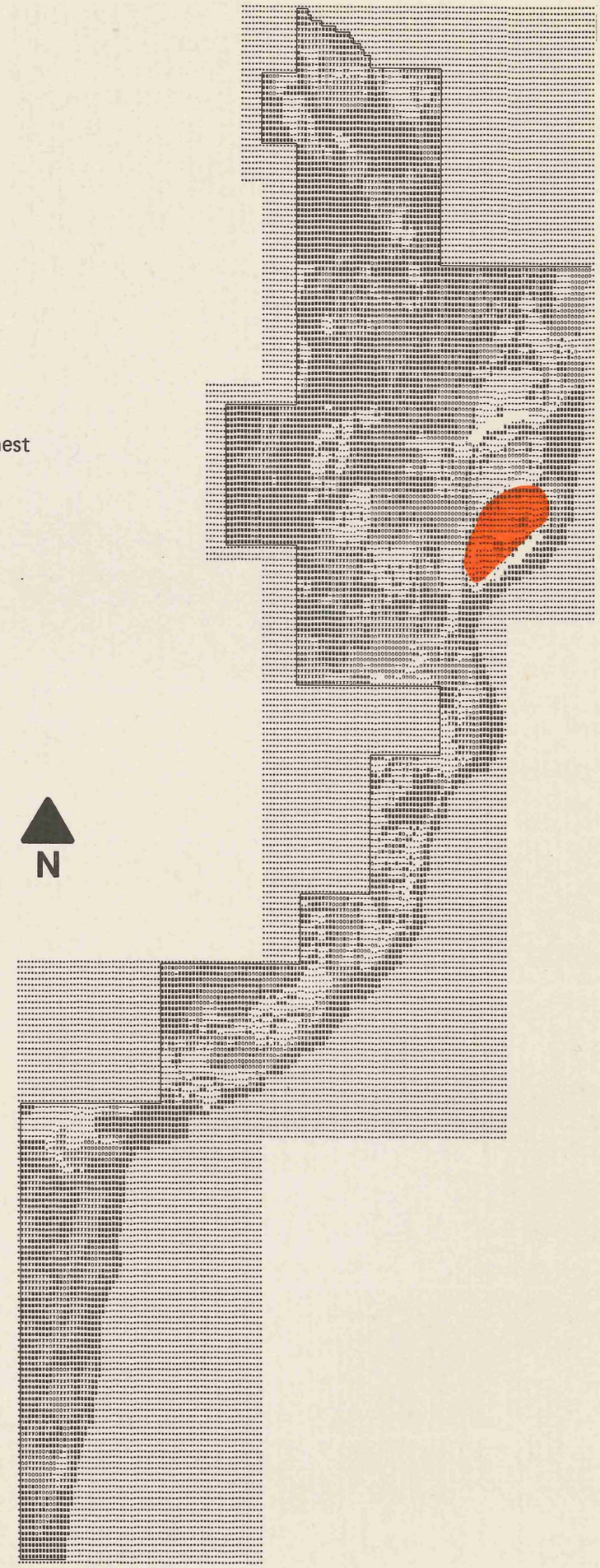
	0-20 yrs.	20-30 yrs.	30-40 yrs.	40-50 yrs.	Over 50 yrs.
Symbol	+	0	X	θ	▦
No. of Acres	577	1170	1968	2054	4788
% of Total Area	1.9%	3.8%	6.4%	6.6%	15.5%

Chengwatana State Forest

Deer Habitat Map

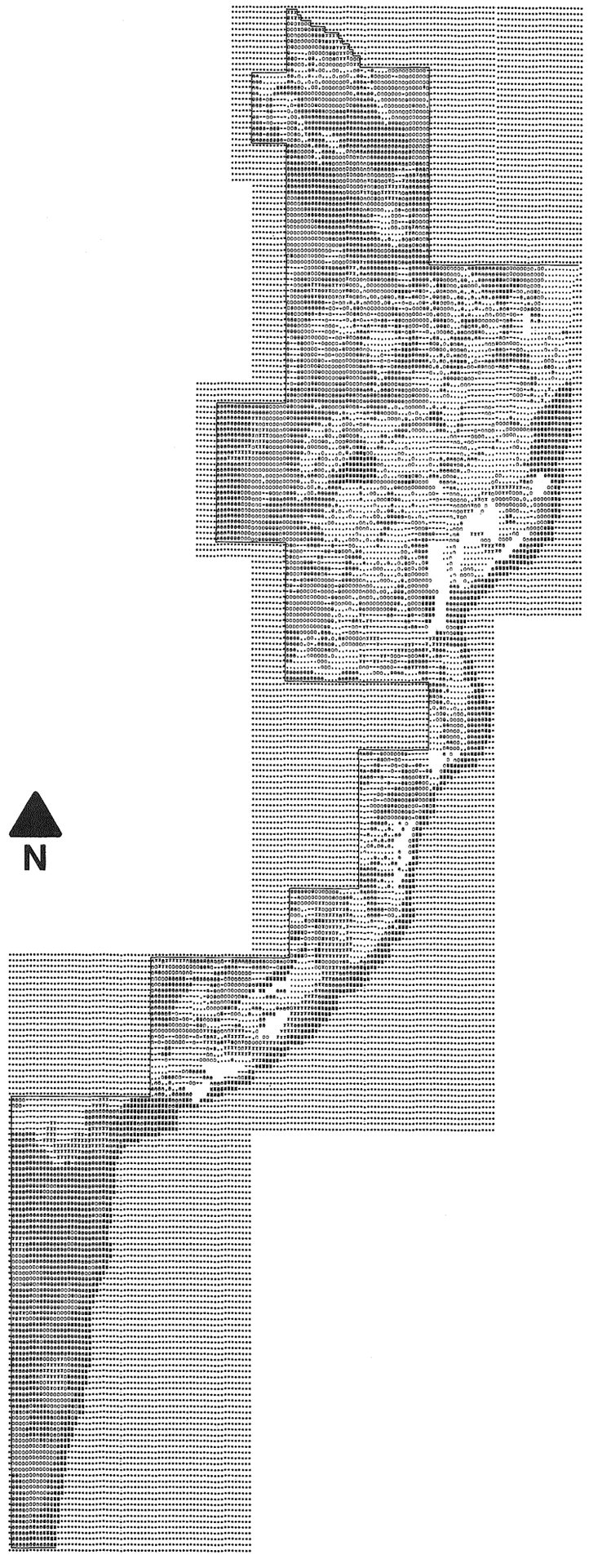
– Known deer yard areas.

– Computer maps, lightest tones highest potential for deer yards.



Chengwatana State Forest

Grouse Habitat



Ruffed Grouse Habitat

The northern portion of this forest contains more variety and distribution of both good and poor habitat than in either St. Croix State Forest or Park. The resulting interspersion of habitat may result in more edges and thus a higher value. Data or census information is not available to measure the acreage of edges.

Harvesting of Ruffed Grouse has been good in relation to population numbers with a great number of recreational hours provided to sportsmen.

ST. CROIX WILD RIVER STATE PARK

Introduction

This state park contains a large variety of land though most is a characteristic floodplain forest. Most of the park is in private ownership, with no land being managed specifically for wildlife.

White-Tailed Deer are common because of various cover types and associated agricultural crops.

Ruffed Grouse potentials are high as in other areas along the St. Croix River. Grouse are dependent on aspen stands; however, in this area the stands were too small to be recorded in the forestry classification of timber types. In addition to the aspen overstories, food for grouse is provided in birch and oak stands and the associated hazel undergrowth.

Aspen-Conifer Relationships

The map shows a definite lack of aspen complexes which are more prevalent in uplands north of the park. The lack of aspen most likely resulted from the lack of either fires or logging operations. In addition, this area of the state contains a transition zone between the northern boreal forest and the southern climatic influences which tend to benefit other forest types rather than aspen.

Twenty percent of the park is in oak compared to five percent in Chengwatana State Forest and four percent in St. Croix State Park. Maple and Basswood have increased slightly in abundance from two percent in Chengwatana Forest to five percent in Wild River State Park.

The lack of aspen forest has been offset to some degree by the higher incidence of oak. Oak provide food for deer, grouse and other animals such as Gray Squirrel. Populations of Gray Squirrel are usually high and depend heavily on mast production and adjoining crops for food.

Coniferous areas are limited to plantation complexes with marginal wildlife usage. They may provide protective cover to some wildlife species during severe winter storms.

Deer Habitat

Deer habitat within the park is poorer than average. Deer in this area depend on agricultural crops as their main diet rather than what is available in wooded areas (except in years of good acorn crops).

Lowland hardwoods are prevalent along this portion of the St. Croix River. This lowland area does not provide good deer browse.

Ruffed Grouse Habitat

Grouse habitat is generally good within this area, with small clumps of aspen providing breeding and feeding sites. Also, Birch and Oak within the area provide for food sources.

Recommended Management

Deer populations are high during fall and winter because the valley wooded areas provide protection from severe storms and the area is near farmlands where animals can find food. Management should include continued harvests of deer and other game species because of the previously high hunting recreation this area has provided.

Ruffed Grouse populations, according to drumming counts, have maintained population levels as high as anywhere in the state. The clearing of small tracts of land in over-mature woodlands for aspen regeneration would increase habitat for grouse, deer and other wildlife.

Squirrel populations are usually very good in the area. Squirrels and deer take advantage of standing corn for winter food source and would benefit from a system of food plots in this area.

Management of oak woodlands is important for deer, squirrels, and grouse. Most Oak stands

should be thinned to increase acorn production.

Wood Duck populations along the St. Croix are at moderate levels. Hollow or den trees should be left standing along the waterways.

Fox, Mink and Raccoon populations often are very high in the St. Croix Wild River Area. Fair numbers of Muskrat, Beaver, and Otter are present.

Pine plantations should not be established in existing open areas and especially in woodland openings. Any plantings should be designed to provide food and cover for wildlife and to provide an esthetic appearance to the landscape.

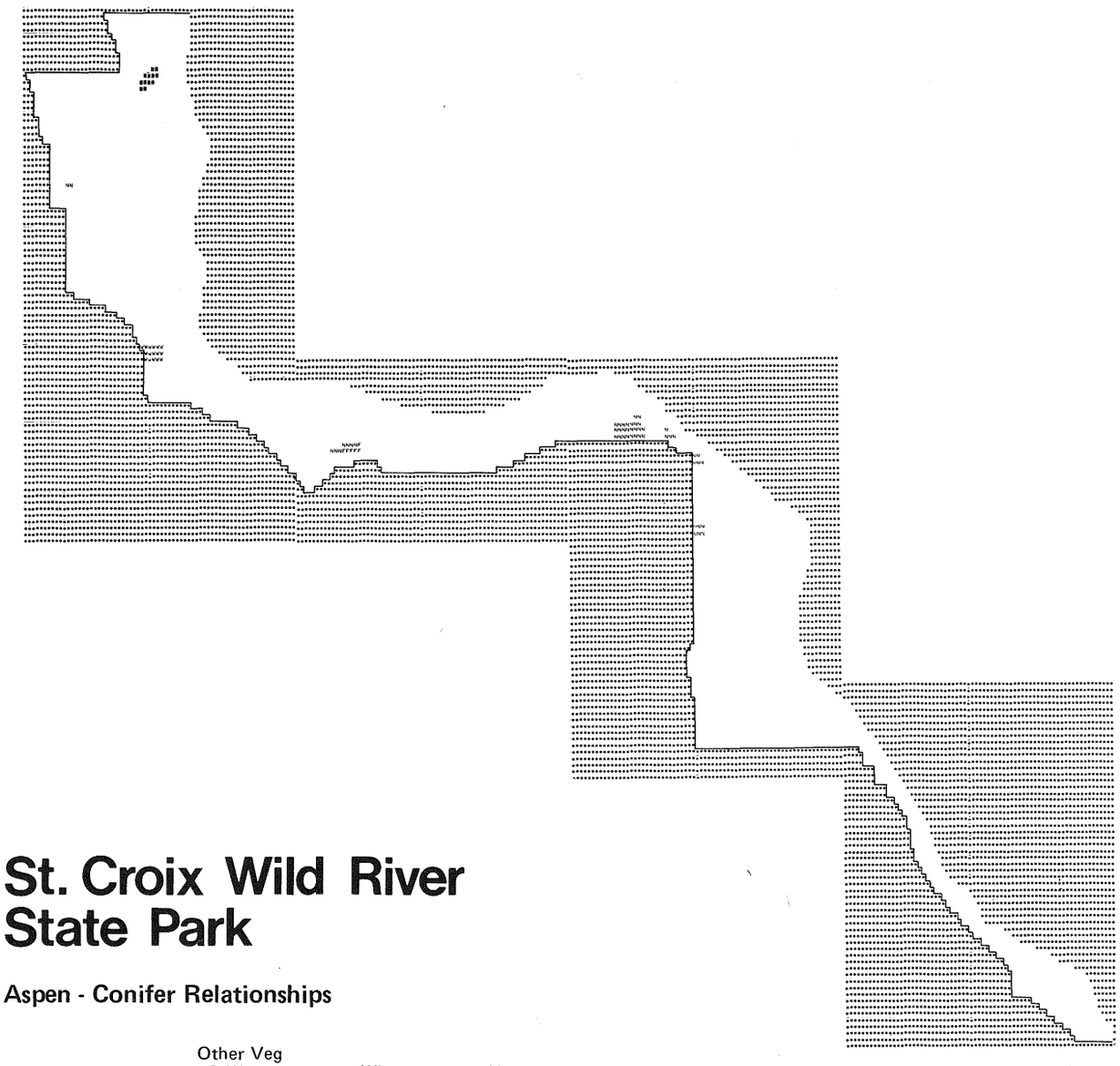
Recommended management is oriented toward game species. However, the same habitat improvement practices apply equally well to many wildlife species, from songbirds to chipmunks.

Hunting should be allowed to continue to prevent excessive game populations. This has occurred in St. Croix State Park. Harvesting game animals prevents damage to the forest and insures healthly wildlife populations.

WILDLIFE HABITAT RECOMMENDATIONS AND COST PROJECTIONS FOR THE UPPER ST. CROIX RIVER STUDY

Introduction

An excellent potential for wildlife habitat improvement and preservation exists in the St. Croix River Corridor. Aspen forests are in good proportions, however, their median age exceeds 50 years. According to the basic data, the aspen stands



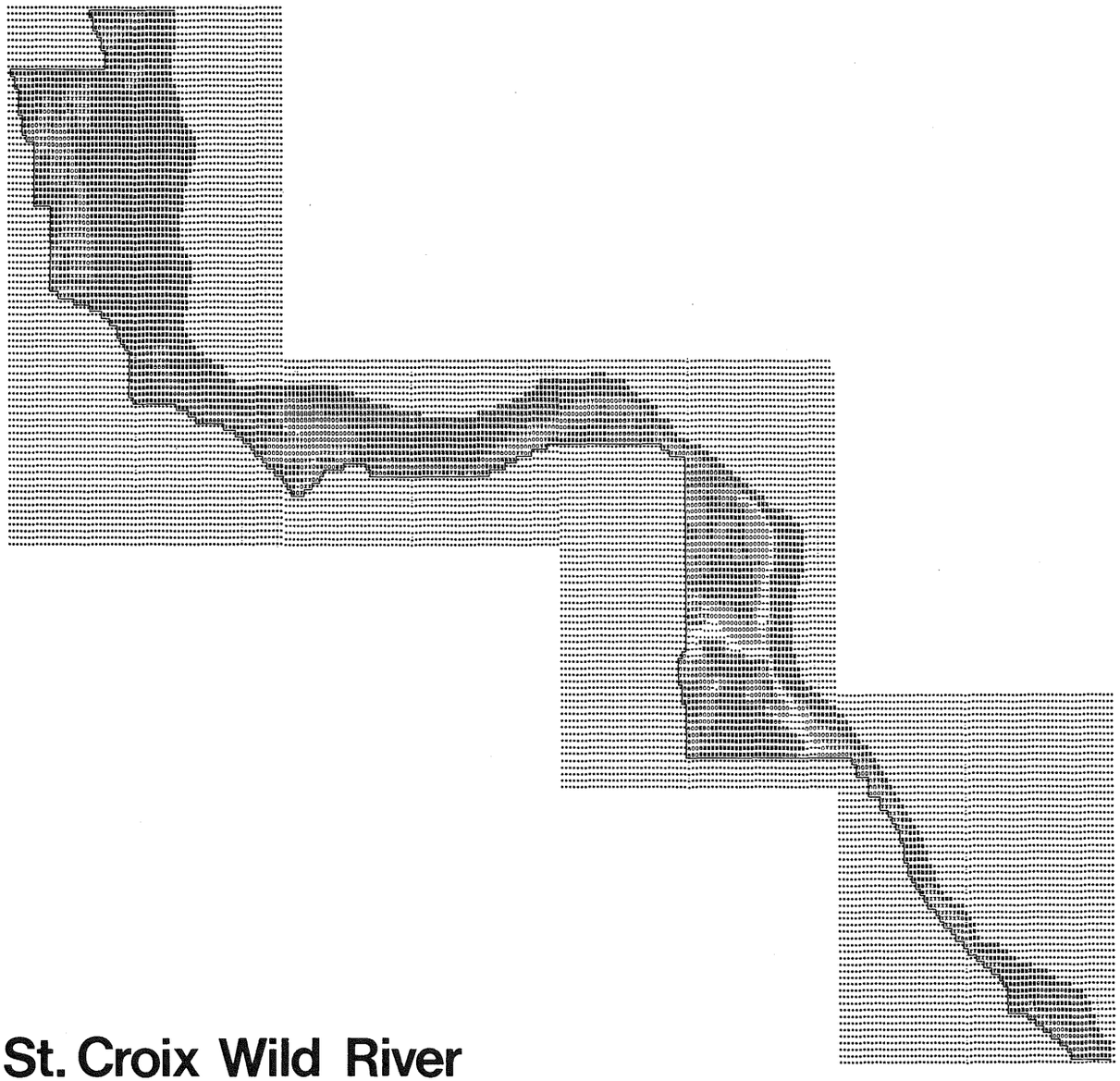
St. Croix Wild River State Park

Aspen - Conifer Relationships

	Other Veg & Water Areas	White Pine	Norway Pine	Spruce	Cedar	Spruce Balsam	Jack Pine
Symbol	Blank Areas	W	N	S	C	F	J
No. of Acres	12656	42	133	0	0	16	0
% of Total Area	98.3%	.3%	1.0%	0%	0%	.1%	0

Aspen

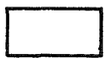
	0-20 yrs.	20-30 yrs.	30-40 yrs.	40-50 yrs.	Over 50 yrs.
Symbol	+	0	✕	θ	▥
No. of Acres	0	0	0	0	32
% of Total Area	0	0	0	0	.3%



St. Croix Wild River State Park

Deer Habitat Map

— No known deer yard areas.



— Computer maps, lightest tones highest potential for deer yards.

have over-matured because of a lack of logging, fires and other natural or man-made disturbances.

"Recycling" of aspen stands may entail several methods of artificial disturbance to stimulate regeneration. These may include timber sales, shearing, crushing, wood chipping, hand cutting, or controlled burning.

If steps are not taken to regenerate these stands, wildlife can be expected to decrease, fewer variations within the forest will occur, esthetics will decrease, the total environmental quality of the forest will decline.

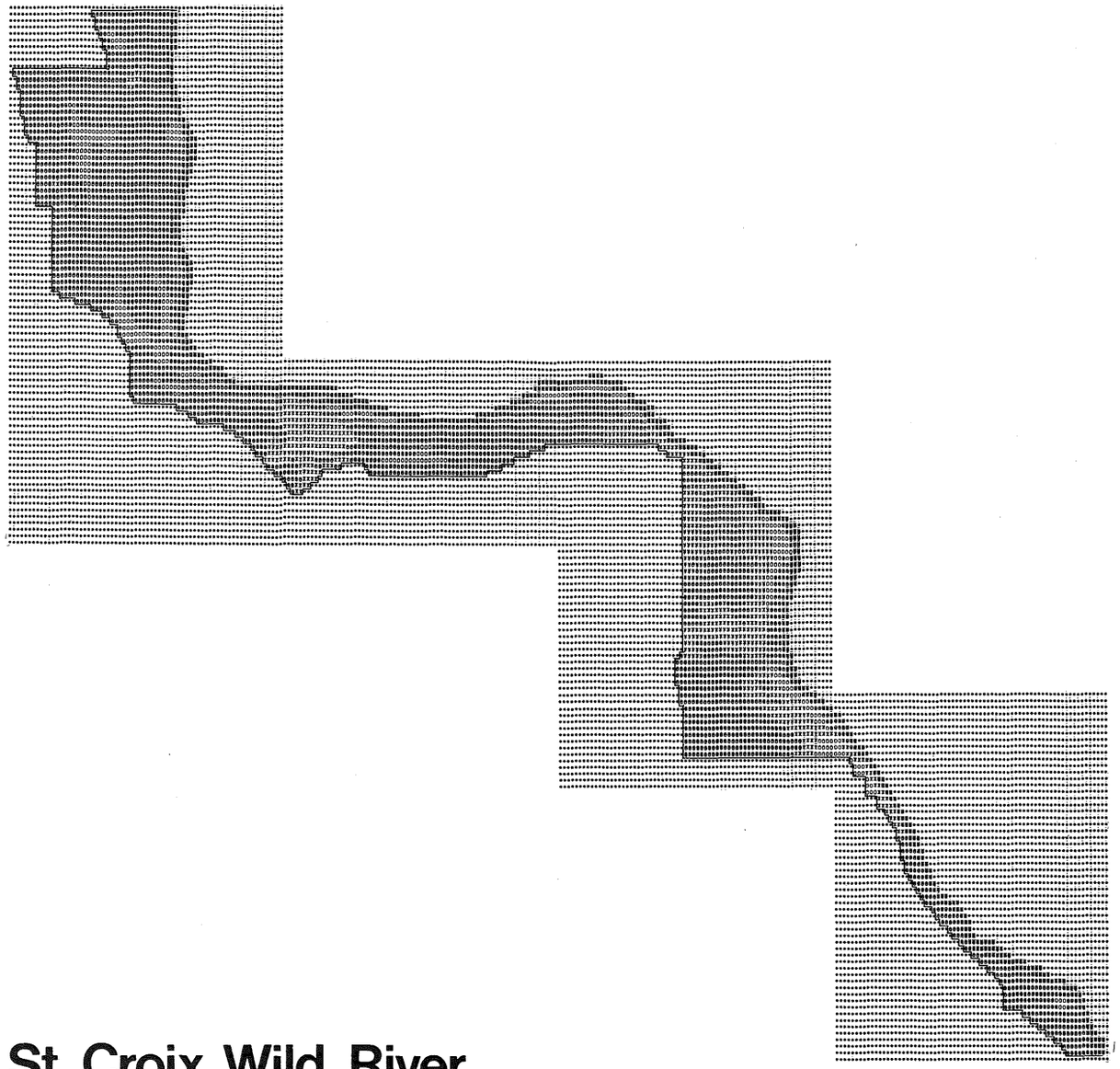
Similarly, grassy or brush openings in the forest floodplain are severely lacking. They should be inventoried, maintained and increased in number. Openings are showing an ever increasing importance. They provide important foods for wildlife, areas to escape from insects, songbird nesting sites, and wildlife viewing areas. Probably no other forest area has been abused more.

Forest Wildlife Management

Recycling of aspen forests is considered to be of prime importance to the welfare of many wildlife species. An estimated 1,250 acres of aspen should be manipulated annually for the next 10 years to establish a 40-year rotation.

Five thousand acres of forest lands should be converted to permanent openings with existing areas maintained.

Northern hardwoods are commonly called Maple-Basswood vegetative communities. This is



St. Croix Wild River State Park

Grouse Habitat

one of the climax communities for southern Minnesota, and so it will probably remain static. A Spruce-Fir community is a climax community in northern Minnesota and could also be a static community. The type of wildlife species to be managed will determine the type of forest management. Normally, a harvest of northern hardwoods is desirable at a 100-year rotation.

Oak woodlands increase in abundance in the southern portion of the river valley. Oak provides food and denning holes for many species of wildlife. It should be managed to maintain a continuing supply of 40 to 80-year old, vigorous, fully-crowned trees. Oak trees should be thinned to about 10 to 15 large oaks per acre.

General Recommendations

The acreages and recommendations refer to the study areas as a whole and take into account private, county, and state lands within these project areas.

1. Acreages with good aspen stands should be maintained and managed for proper age rotation.

2. Forest clearings should be maintained and created to the required amounts.

3. Other forest types should be maintained or managed to provide desirable wildlife habitat, timber production, esthetic conditions, and be consistent within the existing forest ecosystem.

4. Sites capable of producing hardwoods with desirable browse species should be properly managed. Artificial conifer plantings should be designed to aid wildlife.

5. Manipulation of forest areas would occur primarily outside of the maximum protection zones. However, management in many cases is necessary and desirable within protected zones.

SPECIFIC RECOMMENDATIONS

St. Croix State Forest

An over-abundance of mature aspen is present and should be manipulated. Forest openings are lacking and should be created. Natural conifer areas are few; some management should be provided for them. Northern hardwoods are common and should be managed more extensively.

St. Croix State Park

An over-abundance of mature aspen is present with little or no younger age classes present. Forest openings are limited and need to be created. Jack Pine are over-abundant because of the sandy soil. Management in Jack Pine areas should provide for more opening, more aspen regeneration and more variations in age classes of aspen to benefit wildlife. Most other forest types are in good proportion. Surplus deer should be harvested.

Chengwatana State Forest

An over-abundance of mature aspen is present with some younger age classes present. Permanent forest openings are in short supply and need to be created. A large percentage of lowland vegetative types occur because of moist soil conditions. These areas have some value for wildlife but are difficult to manage.

St. Croix Wild River State Park

Because the transition between the northern boreal forest and the more southern climatic forests occur in this area, there is a lack of aspen except for small clumps. Oak, however, has increased in dominance and is a reflection of this transition zone. Bottomland hardwoods are also common in a large portion of the area because of wet soil conditions and existing topography. Grass openings are lacking and should be increased in number even though 25 percent of the land is former farmland in the park. The field should be interspersed with plantings of native species with some pine. A majority of the fields should be maintained in grasses, and preferably native prairie grasses.

Estimated Costs

Rotating 1,250 acres of aspen annually for the first 10-years would cost approximately $50,000 based on a 40-year rotation or until the demand for commercial timber interests is met. The creation of permanent openings is expected to cost up to $30,000 per year for a ten-year program. About $800,000 would be necessary for a ten-year program of improving and maintaining wildlife and esthetic habitat along the Upper St. Croix.

SUMMARY OF WILDLIFE HABITAT RECOMMENDED MANAGEMENT

ASPEN COVER TYPE

Location	Existing Acreage	Percent of Total Area	Existing Median Age	Ideal Median Age	Required Recycling of Aspen			Est. Cost 10 yrs.	
					0-10 yrs.	10+ yrs.	Cost/yr. for 10 yrs.		
St. Croix Forest	12,500	29%	40-50 yr.	20 yr.	450 ac.	200 ac.	$18,000	$180,000	
St. Croix Park	13,600	36%	50+ yr.	20 yr.	300 ac.	400 ac.	$12,000	$120,000	
Chengwatana Forest	10,600	34%	50+ yr.	20 yr.	400 ac.	200 ac.	$20,000	$200,000	
Wild River Park	Below transition zone (no appreciable aspen present)								

Retain and maintain existing acreage of aspen cover type with even distribution of age classes 0-40 years.

FOREST OPENINGS

Location	Type	Existing Acreage	Percent of Total	Required Acreage	Percent Required	Upland Brush, Farms		Lowland Brush, Marsh	% Water
						% of Total	% Required	% of Total	
St. Croix Forest	Grass	315 ac.	1.1%	2,200	5%	7.6%	10-15%	15%	3.8%
St. Croix Park	Grass	710 ac.	1.8%	1,950	5%	6.7%	10-15%	12%	5.9%
Chengwatana	Grass	330 ac.	1.1%	1,550	5%	13.9%	10-15%	29%	8.0
Wild River Park	Grass	60 ac.	0.5%	650	5%	26.0%	10-15%	6%	13.0%

Create and maintain 6,450 acres of grass openings. $30,000/year for 10 years.

Fisheries Management Plan

Fishing is an extremely popular outdoor activity in the upper St. Croix region. Accordingly, angling on both lakes and on rivers and streams must be considered in the overall plan for the study area.

Of course, not all recreational activities are compatible. Therefore, to develop a diverse recreational base maximizing human outdoor experiences, many natural resources must be developed where they exist and public use facilities established around the resource. It would be too costly, and in some cases physically impossible to bring the resource to existing public use facilities.

Various types of fishing available require different management techniques to produce maximum recreation. The following review is a general breakdown of the types of fishing and management considered in the entire study area followed by a more detailed account of the fishing resources in each of the four major subdivisions.

Lake Fishing

Lake management includes both warm water and cold water fisheries. Access for the public must be provided before extensive management is carried out.

Warm water fisheries includes such species as bass, panfish, walleye, northern pike, etc. Most of the lakes within the study area are small and relatively infertile. Thus, normal management would be expected to produce only poor to fair fishing when compared to other regions in Minnesota. Fishing success and total production of desirable warm water game fish species could probably be improved by intensive management. However, since intensive warm water fisheries management is still in the research and development state, it will probably be several years before specific recommendations can be made along those lines.

Cold water fisheries include various species of trout and salmon, but rainbow trout would be the primary species stocked in lakes. Stocking trout in lakes is a proven form of intensive fish management. Lakes thus managed can be expected to support up to 10 times the normal fishing pressure experienced on similar warm water lakes.

Potential rainbow trout lakes have all of the following characteristics: They have adequate oxygen in the deeper cold water strata; they do not have an outlet or may be headwater lakes with intermittent outlet flow that can be altered to prevent fish from moving upstream into the lake; and they can be successfully treated with fish toxicants to eliminate all existing warm water species.

River fisheries fall into the same categories of warm water and cold water species management. Public access and DNR development rights are essential to a successful long term management program.

Examples of streams supporting **warm water** species fishing are the St. Croix, Snake, Kettle, Sunrise and Tamarack. Other than establishing seasons and limits, there is very little management effort directed toward these rivers.

The **cold water** fishery is located in designated trout streams. Brook trout and brown trout are managed by maintaining cool temperatures and improving habitat to maintain a high carrying capacity in these streams.

Water temperatures are an important consideration in stream trout management. Brown trout populations cannot survive in streams where water temperatures exceed 75° F over a prolonged period. Brook trout requirements are lower still, 68° F being maximum water temperature allowed over an extended period. Any obstruction, i.e. man-made dam, beaver dam, log jam, etc. must be guarded against as it may raise summer water temperatures to lethal levels within the resultant impoundment.

Management recommendations include acquisition of public access rights and DNR development rights along trout streams, including that portion of any stream originating outside the St. Croix Scenic River Study Area. Each trout stream must be considered as a management unit regardless of political boundaries.

In-stream structures should be installed to improve trout habitat. Trails along streams should be cut and brushed out annually. Several select fish barriers should be installed to reduce the influx of northern pike in trout streams. Stream surveys and electric shocking should be conducted when and where needed.

Beaver control is important to trout stream management in this region of Minnesota. Managed trout streams comprise only five percent of the total stream miles in Pine County. Beaver and trout must be considered incompatible resources. The limited amount of beaver control necessary to protect the trout stream resource does not endanger the beaver resource. Lack of beaver control, on the other hand, would drastically reduce and endanger the trout resource.

Many small streams have very little fish management value, they are too warm to sustain trout populations and too small to support a warm water fisheries. Beaver populations should flourish on many of these streams.

Non-Fish Management Development Consideration

Of the four fish management classifications, the two cold water species categories are the most fragile and sensitive to other forms of recreational development.

Any development that would speed up eutrophication of potential rainbow trout lakes would also shorten the life expectancy of trout since deep cold water strata would become devoid of oxygen.

Trout streams must be protected against natural and man-made impoundments. Since ATV's, snowmobiles, and other motorized vehicles can have a degrading effect on trout habitat (bank cover, bottom fauna production, water clarity, etc.), their use in and near these streams should be restricted. On the other hand, properly planned fishing access trails could be used during the summer as hiking trails, and during the winter as snowshoe and cross-country skiing trails.

Upper St. Croix - Resource Management Plan

Part I - St. Croix State Forest

I. COLD WATER FISHERIES

A. TROUT STREAMS:
The following trout streams are either in the St. Croix State Forest or close enough to be considered of value to the overall management program.

1. **Bangs Brook:** 7.3 miles of trout water. Brook trout is the only species stocked or reproduced. This is considered one of the better streams in the area.

2. **Crystal Creek:** 2.7 miles of trout water. Brook trout. Natural reproduction found while electro-fishing.

3. **Trout Brook:** Considered as border-line or poor trout water. Might be dropped from designated list. Brook trout.

4. **Albrechts-Meekers Creek:** Brook trout. Considered as border-line or poor. Might be dropped from designated list.

B. TROUT STREAM WORK SUMMARY:
In 1971 and 1972, electro-fishing gear was used to determine the population status of Bangs Brook, Crooked Creek (Main Branch), Wolf Creek, and Crystal

Creek. High water conditions the past two years has hampered this type of work.

Beaver control in the form of trapping and dam removal was carried out on the above mentioned trout streams in 1971. In the Spring of 1972, beaver control was limited.

C. FUTURE MANAGEMENT OF ALL TROUT STREAMS IN THIS AREA WILL BE DETERMINED BY:

1. Easement acquisition.

2. Future survey and shocking information.

3. Amount of beaver control granted by approved authority.

4. Personnel available.

Current easements are near expiration. Acquisitions of easements should receive top priority.

II. WARM WATER FISHERIES

A. LAKE FISHING

5. **Big Tamarack Lake:** 74.9 acres. Good populations on northern pike, largemouth bass, and panfish. A small access exists but is not large enough or official.

The lake provides good to exc. fishing. Land acquisition for a public access should receive a top priority. Survey in 1972.

6. **Little Tamarack Lake:** 60 acres. Good population of northern pike, largemouth bass, and panfish. Provides good to excellent fishing. Public access needed. Surveyed in 1972.

7. **Grace Lake:** 53.4 acres. Has official public access. Dense bullhead population. Small populations of northern pike, largemouth bass and panfish. Subject to periodic winterkill. Probably more value as a game or waterfowl lake than for fish.

8. **Kenny Lake:** 14.8 acres. Surveyed in 1967. Panfish lake. Connected to McGown Lake.

9. **McGown Lake:** 21.1 acres. Lake has small public access donated by a local farmer. Panfish lake. Northern pike and largemouth bass present in small numbers. Surveyed in 1967.

10. **Razor Lake:** 100 acres. Needs public access. Surveyed in 1967. Has good populations of northern pike, largemouth bass and panfish. Surrounded by private property.

11. **Greigs Lake:** 58 acres. Surrounded by private property. Good northern pike population with some largemouth bass and panfish. Light fishing pressure. A Boy Scout Camp is on the lake.

12. **Stevens Lake:** 14.9 acres. Small populations of northern pike, largemouth bass and panfish. Was considered for stream trout management but water conditions proved unsuitable. Little fishing pressure.

13. **Benjamin Lake:** 7.9 acres. Bog stained and has low oxygen levels. Little fisheries value.

14. **Hay Creek Flowage:** 87.9 acres. Surveyed in 1967. Good northern pike fishing. Good populations of panfish. According to local reports, fishing pressure has increased in recent years.

This area provides some excellent waterfowl hunting. Management of both game and fish should be explored as this area could contribute more to recreation.

The following lakes are shallow, winterkill lakes and are considered to be of little fisheries value: Mallard, Lena, Keene, Churchill, Billys, Sutton, Dollar, Crooked, Chain, Kramer, Wilbur, Buck, Makie, Bullhead, Alma, and Lake Five.

The two Tamarack Lakes and Hay Creek Flowage provide the most public fishing. Land acquisition for public access on these and other private water could provide more fishing recreation.

PART II - St. Croix State Park

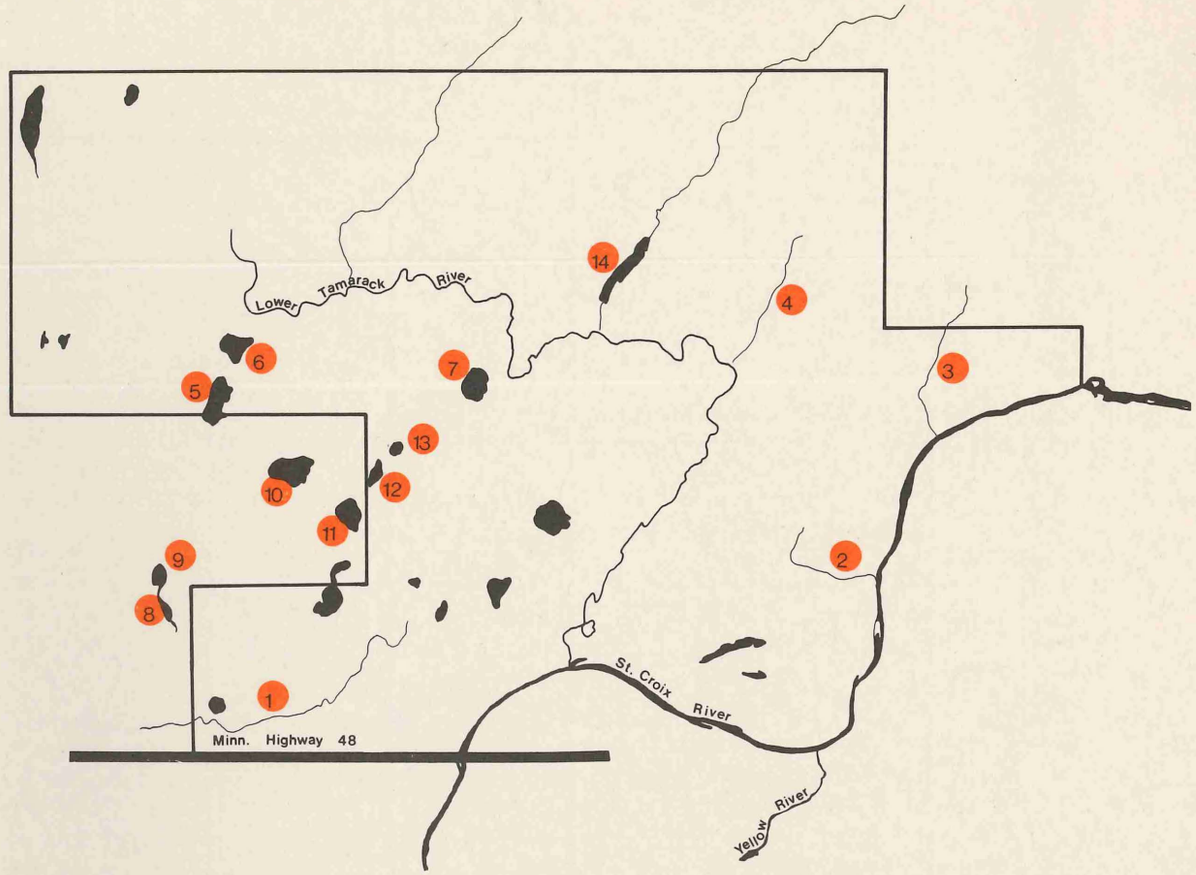
I. COLD WATER FISHERIES

1. **Hay Creek (Clover Creek):** 21 miles of trout water. Recognized as best brook trout stream in Pine County. Stream is stocked annually but quota may be reduced because of good natural reproduction.

2. **Little Hay Creek (Tributary to Hay Creek):** 3 miles of trout water. Good natural reproduction.

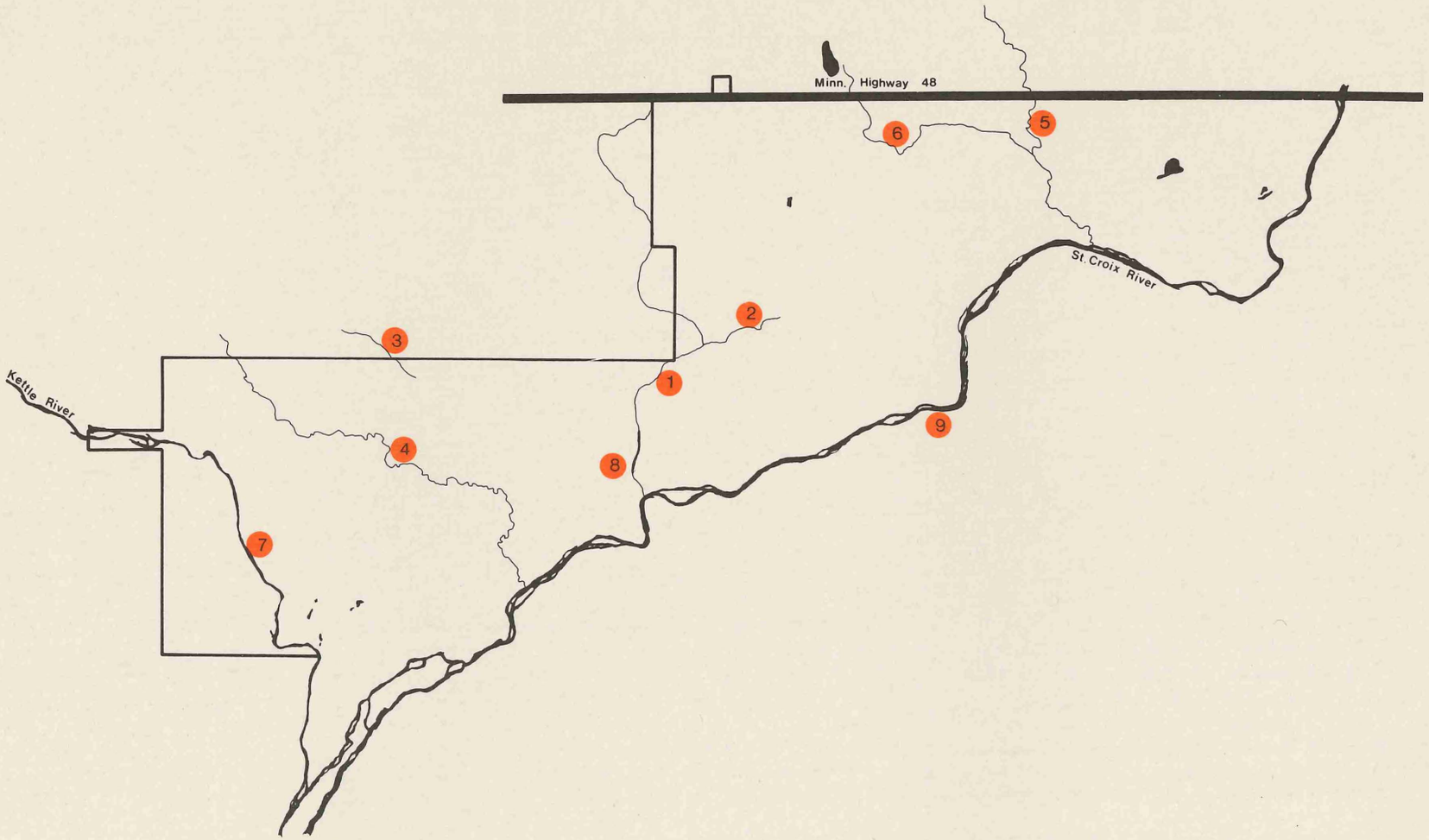
3. **Upper Lost Creek:** 1.7 miles of trout water. Brook trout reproduction noted while electro-fishing.

4. **Bear Creek:** Dropped from the designated trout stream list because



St. Croix State Forest

FISHERIES



St. Croix State Park

FISHERIES

of unsuitable water.

5. **Crooked Creek:** 9 miles of trout water. Rainbow and Brown trout stocked. Future management could possibly call for a fish barrier south of Highway 48 to prevent migration of northern pike upstream into trout water.

6. **Wilbur Brook:** 7 miles of trout water. Tributary to Crooked Creek. Needs intensive beaver control. Brook trout stocked.

II. WARM WATER FISHERIES

7. **Kettle River:** Little stocking needed. Local reports say fishing is good.

8. **Muskellunge Rearing Pond:** Seven-acre gravity fed and controlled pond. Pond would not be of much value as a children's fishing pond. Drainable ponds are not common and the Section of Fisheries can always make use of this pond.

9. **St. Croix River:** Little stocking needed. Some muskellunge fingerlings may be stocked.

Part III - Chengwatana State Forest

A. WARM WATER FISHERIES

1. **Snake River:** Leaves Cross Lake at Pine City and enters the St. Croix River 9 miles to the east.

The Snake provides excellent fishing for most species of game fish and is also known for good sturgeon fishing. A fish ladder at the base of the Cross Lake dam allows migration.

The Snake River also provides some outstanding recreation for canoeing and camping.

2. **St. Croix River:** Here, as in other areas, no expected change in fisheries management. Possible stocking of muskellunge fingerlings.

Within close vicinity of Chengwatana State Forest

Cross Lake: Provides fair to good fishing. Walleye pike is the principal management species.

Rush Lake: East and West Rush Lakes combine for almost 2800 acres of good fishing water. Although some distance from the area concerned, it could contribute to the recreational value of the project.

Rush Lake has good game fish populations and should provide some excellent trophy fishing for muskellunge in the near future.

The state maintains a rough fish barrier on the outlet of East Rush Lake.

Cedar Lake: 69 acres. Surrounded by private property. Surveyed in 1967 and had a good northern pike population at that time. Bullheads and yellow perch were the only other species taken in the test nets.

The lake has a good stand of wild rice. Management plan should include waterfowl. Located 5 miles east of Beroun.

Mud Lake: 12.3 acres located 4 miles east of Beroun. Surveyed in 1967. Brown and black bullheads were the only species taken in the test nets. Has winterkill tendencies. No public access and no fisheries value at present.

Part IV - St. Croix Wild River State Park

A. WARM WATER FISHERIES

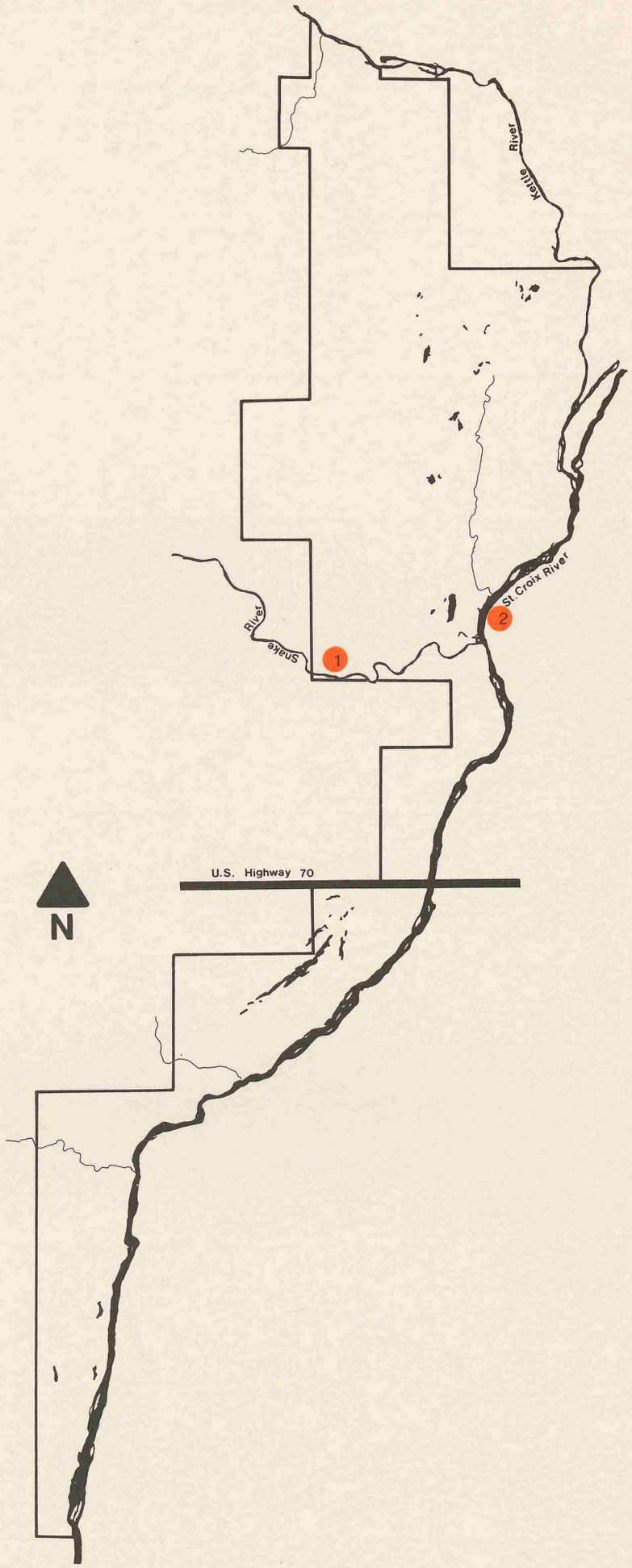
1. **Sunrise River:** Research data is lacking but seems to have little value for fisheries recreation. Possible in high water to canoe the Sunrise River but average depth is less than 1½ feet of water.

Within close vicinity of St. Croix Wild River State Park

Sunrise Addition: In 1964 and 1965, after the construction of two dams, the

Chengwatana State Forest

FISHERIES



Sunrise Addition was opened after flooding 2500 acres. This project was a Section of Game operation but has provided some fisheries value also.

Northern pike fishing is good. These fish are also rescued in late fall and winter and used to stock other lakes.

Game Fish Lakes: The following are known game fish lakes and provide most of the fishing recreation in this area. All located within 15 miles south of Wild River State Park: Chisago, South Lindstrom, North Lindstrom, North Center, South Center, Green and Little. All have public accesses and most have good game fish populations.

FUTURE MANAGEMENT PLANS

1. Easements expiring on all trout streams. Land acquisition for easements is top priority.
2. Intensive beaver control if possible.
3. More electro-fishing for population evaluations.

TOTAL COST OF FISHERIES MANAGEMENT FOR THE UPPER ST. CROIX STUDY AREA

The following figures are based on a 10-year projected program.

Trout Stream Easements: There are about 73 miles of designated trout streams including nursery areas, etc., in the area. Estimated at $5,000 per mile, total comes to $365,000 for the purchase of easements.

Local Rehabilitation (Trout): Three lakes could possibly be rehabilitated for trout (rainbow) management. Estimated cost for chemicals per lake is $4,000; total of $12,000.

Note: Costs for trout, accesses and development follow in their proper classifications.

Public Accesses: Land could be acquired for public accesses on five lakes. Estimated cost per access including development is $7,500.
Note: As many as three of these accesses would be on rehabilitated trout lakes.

Trout Stocking Costs (Stream only): Based on 7,600 yearling trout at 30 cts. per fish and 2,000 fingerlings at 10cts. per fish, annual total amounts to $2,480. Ten-year total is $24,800. This includes present quotas and recommended future quotas.

Rehabilitated Lakes (trout) Stocking Cost: The exact quotas would be determined by acreage but $500 per year is estimated for each of the three potential lakes in this classification. Totals are $1,500 annually and $15,000 for the ten-year total.

Fish Barrier: A barrier on Crooked Creek south of Highway 48 to prevent migration of warm water game fish and rough fish into designated trout water. Estimated cost - $25,000.

Warm Water Fish Stocking: Muskellunge would probably be the only fish in this classification. A total of 500 should be stocked north of Taylors Falls. The annual cost would be about $1,000; for ten years, $10,000.

Annual Management: Based on two parttime employees working nine months a year in the recreation area, $12,000 annually would be a reasonable estimate. Total for 10 years would be $120,000.

Estimated Totals

Trout Stream Easements	$365,000
Lake Rehabilitation	12,000
Public Accesses	30,000
Trout - Stream Only	24,800
Trout - Lake Only	15,000
Fish Barrier	25,000
Warm Water Stocking (Musky)	10,000
Annual Management	120,000
GRAND TOTAL --	$601,800

St. Croix Wild River State Park

FISHERIES

Recreational Development Plan

The proceeding projections were developed prior to the current energy crisis, all of the ramifications of which, at this point, are impossible to forsee.

There are two possible effects. First, recreational use of the St. Croix area may not reach projected levels due to the current situation. On the other hand, recreational use may exceed projections, because of transfer of activity from areas further from the metropolitan area, especially northern Minnesota, to the St. Croix Area.

Minnesota is blessed with a bountiful supply of natural resources. Its 15,000 lakes, fish and wildlife, lush green forests and ever-changing terrain offers an exciting experience for all types of recreation.

Specific agencies on the municipal, county and state levels will control, manage, and perpetuate recreation in the State. At the State level, the Department of Natural Resources provides what is known as large-scale recreation developments. These include extensive state parks, large recreation areas, state forests, wildlife management areas, wildlife refuge areas, scientific and natural areas, public accesses, and other similar areas.

The Upper St. Croix River Corridor and its adjacent state-owned lands are vital to the Minnesota recreational system. Thousands visit the Upper St. Croix area each year in search of an exciting outdoor experience. At present, the environment of the Upper St. Croix River can withstand this usage. However, the demand for recreation on the Upper St. Croix River will continue to grow, and the impact on its natural resources will increase proportionally. To control this intensified activity, this plan has been developed with a ten-year recreation management program.

Recreational Facilities and User Demands On the Upper St. Croix

To determine the type, number and location of recreation facilities to be provided, consideration was given to the natural resources, popular demand, and existing usage.

The natural resource itself determines what type facility or activity can exist within a particular area. The ability of a resource to support a facility or activity depends upon its physical features and esthetic qualities. The Upper St. Croix River with its wild and scenic character should provide only those facilities that are compatible with this fragile environment. Recommended facilities include:

Campgrounds	Horseback Trails
Canoe Campsites	Snowmobile Trails
Picnic Areas	Trail Centers
Boat and Canoe Launches	Information Centers
Hiking Trails	Hunting Provisions
Cross-Country Ski Trails	Fishing Provisions

To determine priority for facilities each activity was investigated in relation to the number of users, existing facilities, and the relation of the activity to the St. Croix River. Currently, little information exists along these lines; thus recommendations can only be of a generalized nature. The following paragraphs summarize this data and determine the demands and needs of specific activities.

CAMPING

Camping is one of the fastest growing outdoor recreation activities both nationally and in Minnesota. The 1967 User Study, conducted for the 1968 Minnesota Outdoor Recreation Plan, indicated that 19 percent of the State's population participated in tent camping, while 12 percent participated in trailer or vehicle camping.[1] Average per capita participation is 4.0 times per year. An estimated 14.5 million activity occasions will occur in 1975.

Camping in Minnesota's State Parks has increased at an annual average rate of more than 10 percent since 1967, and now totals more than 900,000 occasions. Recreational camping vehicles are increasing tremendously. Recreation vehicle registrations in Minnesota increased from 4,800 in 1970 to 9,233 in 1972, while recreational trailers increased from 19,200 in 1968 to 57,000 in 1972. About one-third of the pickup trucks sold nationally are used for recreational purposes.

A 1971 national survey revealed this breakdown of camping vehicles types: travel trailers, 33 percent; tents, 21 percent; truck campers, 17 percent; collapsible camping trailers, 15 percent; others including motor homes, 12 percent. Campsites increased from 20,000 sites in 1967 to 27,000 in 1972. About 20 percent of the sites were designated for tents only; the remaining 80 percent for vehicle camping.

The camping boom is reflected in the number of private campgrounds in Minnesota, which has increased from 488 in 1967 to 888 in 1972. Private sites account for 60 percent of the total.

[1]Outdoor Recreation Trends, U.S. Department of Interior, Bureau of Outdoor Recreation 1967.

Projection

Camping participation should increase proportionally as income, leisure time and mobility accelerate.

Higher disposable incomes permit more

people to invest in equipment such as motor homes, trailers and pickup campers which require relatively high initial investments. The trend away from tents to vehicle camping has been accelerating.

Increased leisure time, especially a shorter work week or longer vacations, will significantly stimulate camping. Camping is an activity which is best carried on during periods of time longer than a two-day weekend. Investments in camping vehicles will be more easily justified by having more time available to use them. Also, because most of the state's camping areas are in the northern part of the state (a two to four-hour drive from the metropolitan area), a longer weekend would justify the long drive required for most camping trips.

The composite effect of all these factors is a projected 100 percent increase in the per capita participation rate between 1975 and 1990. Total annual activity occasions will probably double during this period, totaling more than 29 million by 1990.

Analysis of Campgrounds Within the St. Croix Area

Family Campground

Existing family campgrounds within St. Croix State Forest, St. Croix State Park, and Interstate State Park are overused. Week-day use is high and weekend use is at capacity. These campgrounds are often filled by Friday evening and many campers are turned away to search for a less desirable campground or an unmarked campsite along the roadside.

To reduce the pressure on existing campgrounds and to meet the anticipated demand within the next ten years, three new family campgrounds are proposed for the St. Croix Study Area. Hopefully, these campgrounds will better distribute the camping-recreational impact along the St. Croix thereby protecting its natural resources.

Canoe Campsites

There is a sufficient number of canoe campsites along the St. Croix River but these are unmarked and unorganized into any form of canoeing system. This has resulted in the better located sites receiving maximum usage while others remain vacant except on high-use weekends. These heavy-use areas are deteriorating because of overuse, which causes heavy compaction, erosion, and solid waste pollution.

To alleviate this situation this study, in conjunction with the National Parks System, proposes a designated canoe system along the St. Croix River with signed campsites, rest stops, waste disposal areas, and canoe launches. These sites will be designed to blend in with the environment and will be properly managed and enforced.

Group Camps

No new group camps have been proposed for the St. Croix area because current attendance figures show a decrease in usage. Private enterprise should be able to carry this form of recreation in the future.

Hiking Primitive Camps

These campsites will be developed in conjunction with proposed hiking trails. The sites will be distributed to best accommodate the hiker and will receive maximum management and enforcement.

PICNICKING

Picnicking is one of the most popular outdoor recreation activities in Minnesota, with some 87 percent of the populace participating at least once a year. Picnicking is associated with many other outdoor recreation activities such as swimming, boating, driving for pleasure, etc.

Minnesotans picnic an average of 5.4 times per year per person for a total of 19 million activity occasions.

Projection

Since picnicking is often done in conjunction with other outdoor activities, future participation should fall in line with trends of related activities. However, because of the current high level of participation, picnicking will not show as rapid a rate of increase as most other activities. It is not likely that a much greater portion of the population will participate than the present 87 percent. Any increases in the participation rate per capita will come from more frequent participation by those who already picnic. Increase in leisure time, especially longer weekends, might have the greatest impact on picnicking.

It is projected the participation rate will

increase from the 1973 level of 5.4 to 5.7 in 1980 and 6.3 in 1990. Combined with projected increases in population this will result in more than 21 million activity occasions by 1980 and 26 million activity occasions by 1990.

Analysis of Picnic Areas Within the St. Croix Area

There are very few designated picnic areas within the Upper St. Croix Study Area. These picnic areas receive an average amount of day use and seem capable of meeting future demands.

The newly established St. Croix Wild River State Park is in close proximity to the metro area. It is expected to receive a higher amount of day use than other facilities in the study area and will need a new picnic area to meet this demand.

CANOEING

Canoeing is more popular in Minnesota than in any other state because of the availability of our vast network of lakes and streams. Minnesota's Boundary Waters Canoe Area is internationally known and is a major attraction for those seeking a wilderness canoe-camping experience.

There are two types of canoeing in Minnesota. Lake canoeing is experienced by cottage owners, resort vacationers and urban canoeists, especially in the Twin Cities area. Metropolitan area lakes provide a significant number of canoeing opportunities, particularly with the availability of rental canoes on many lakes. Lake canoeing is popular in the Boundary Waters Canoe Area, where one may travel from lake to lake through some 1,200 miles of interconnecting waterways and portages.

The state has an estimated 25,000 miles of rivers and streams, including over 2,000 miles of designated canoe routes. Many rivers, such as the St. Croix, have canoe rental facilities which make such rivers both desirable and accessible. The Department of Natural Resources and many interest groups are promoting rivers as a total recreation experience of which canoeing is an important part.

There are some 100,000 canoes in Minnesota. Nearly 450,000 people enjoy at least one canoe experience each year. Total state-wide participation in canoeing is .78 occasions per capita. Sub-adults (under age 19) participated at a per capita rate more than twice that of adults (1.1 vs. 0.5). According to the 1967 demand study, only 6.6 percent of Minnesota's adults canoed compared to 21 percent of the sub-adults. Canoeing participating is estimated to be 2,823,000 activity occasions by 1975.

Projection

Canoeing is being "discovered" by more people each year. Only about 12 percent of the State's population participated in the activity in 1967, but at least 15 percent do so now. This is estimated to increase substantially in the future. Increased leisure time and ability to travel will permit participants to take more and longer canoe trips.

Total activity occassions will increase by 1980 to 15 percent over the 1975 level - up 53 percent by 1990.

Analysis of Canoeing within the St. Croix Area

The St. Croix River is one of the more heavily-used canoe rivers in the state. Its close proximity to the Twin Cities and its scenic character draws thousands of canoers each year. In most cases the River is used for weekend canoe trips or longer. However, the St. Croix Wild River area, as mentioned previously, is expected to receive higher day use.

The Department of Natural Resources is cooperating with the National Park Service in selecting new canoe campsites and rehabilitating old facilities. These sites will be spaced to best accommodate the canoer with better signing, maintenance and enforcement. Boat accesses are also being selected to assist the canoer. Many of the old access points to the river will be closed because of control, spacing, maintenance, and enforcement problems.

SNOWMOBILING

Snowmobiling has been one of the fastest growing outdoor activities in Minnesota. In 1967, there were 20,000 snowmobiles; in the spring of 1973, over 350,000. Assuming two users per machine, over 700,000 Minnesotans take part in the sport.

A snowmobile survey conducted by the Department of Natural Resources in 1970 indicated the average snowmobile was used 52 times a season, which would result in about 18.2 million activity occasions per year.

The survey indicated that 86 percent of the

snowmobiling took place in the home county. Only in the metro area did a large number (32 percent) of the users leave their home county to snowmobile. Of the snowmobilers surveyed, 62 percent used primarily cross-country trails rather than open fields and lakes, 77 percent preferred trails.

Projection

The number of snowmobiles may reach 500,000 by the end of the 1975-76 season, but the rate of increase is slowing (see table 5).

Contributing to a leveling off of the snowmobile boom are restrictions or prohibitions on the use of snowmobiles in many communities, especially in the metropolitan area, which have discouraged many participants. Mild, rather snowless winters during 1971-1972 and 1972-73 seasons may have held down snowmobile sales to some extent.

The future of snowmobiling is highly unpredictable. The sport has grown so fast in such a short period of time and its rate of increase is now declining so rapidly, that it is difficult to measure future growth beyond the dates shown in Table 5 . Therefore, no attempt has been made to project snowmobile trail requirements for the years 1980 and 1990.

Analysis of Snowmobiling Within the St. Croix Area

The number of miles and overall condition of snowmobile trails in relation to user demand in this area is very inadequate. Many Twin Citians and area residents who snowmobile in the area find the trails congested and badly maintained.

TABLE 5
SNOWMOBILE REGISTRATION TRENDS

Season	No. of Snowmobiles	% Increase Over Previous Year
1969 - 70	115,000	--% (1st year of registration
1970 - 71	181,000	57%
1971 - 72	262,000	45%
1972 - 73	350,000	34%
1973 - 74*	430,000	23%
1974 - 75*	480,000	12%
1975 - 76*	509,000	6%

*Projected

To help satisfy present and future demands, the Legislature has passed a bill for a Minnesota-Wisconsin Boundary Trail that will interrelate with the proposed Upper St. Croix Area snowmobile trail system.

The St. Croix System generally will be a multiple-use trail with snowmobiles in winter and horseback riders in summer. The trail system will extend from just above Taylors Falls to the Minnesota - Wisconsin border.

There will be two trail centers, one in St. Croix Wild River State Park and the other in St. Croix State Park. The centers will have modern facilities with recommendations for camping.

In both State Forests trail parking areas are proposed. These parking areas will be quite simple, blending with the general primitive character of the surrounding area. The trail centers and parking areas will have smaller trail loops for day use.

HORSEBACK RIDING

Horseback riding is another fast-growing activity. There were some 157,000 saddle horses in Minnesota in 1971, compared to 55,000 in 1958 (a 285 percent increase). About one-third of the horses are owned by residents of Twin City suburbs.

About one of every five Minnesotans participate in horseback riding -- about 760,000 people. A total of nearly 8,700,000 activity occasions will probably occur in 1975.

Projection

The rapid growth of saddle horse ownership and horseback riding in the past 15 years will probably remain as important influences in perpetuating growth of this activity.

Increased leisure time, disposable income, and the continuing trend toward suburban living and hobby farms will permit great involvement in horseback riding activities.

Analysis of Horseback Riding in the St. Croix Area

The only public riding trails in the entire region are in St. Croix State Park. To meet demand, a multiple-use trail has been proposed with adequate facilities (previously mentioned in

the snowmobile section).

In some cases, however, the horseback trail will deviate from the snowmobile trail because of need for more suitable routes. For example, in Changwatana State Forest, marshy conditions have forced the proposed horeseback trail to run along existing road rights-of-way rather than joining with the proposed snowmobile trail.

CROSS-COUNTRY SKIING AND SNOWSHOEING

Cross-country skiing and snowshoeing demonstrate the explosive and unpredictable growth a recreational activity can make in a short period of time. The recent interest and rapid growth of these sports are a result of the new awareness for the environment, and for physical fitness.

There is insufficient data to determine the number of snowshoers in Minnesota or the number of times participated. It is known that 20 times as many snowshoes were imported into the United States in 1972 than in 1967. Information relating to cross-country skiing is more revealing. U.S. imports of skis from Scandinavia, most of which are cross-country skis, increased twenty-fold from 1967 to 1972 with twice as many cross-country skis being sold in 1972 as in 1971.

The number of cross-country ski enthusiasts is well in excess of one million nationwide. A major ski touring club in the Metro Area increased its membership ten-fold in recent years. Although an accurate count of cross-country skiers in Minnesota is not available, the total was estimated to be between 50,000 and 75,000 in 1972.

Few trails have been provided specifically for cross-country skiers, although other trails such as snowmobile and hiking trails are used. Skiers also create their own trails in open country, but sufficient stretches of obstacle-free terrain must be available to permit a trek of several miles, preferably in a loop.

Projection

Cross-country skiing will probably continue its rapid climb in popularity, perhaps equalling the phenomenal growth rates (100 to 200 percent a year) of recent years. The number of cross-country skiers will probably reach 100,000 by 1975. The highly unstable growth pattern makes any projection beyond 1975 unrealistic.

Analysis of Cross Country Skiing and Snowshoeing for St. Croix Area

The natural characteristics and close proximity of the Upper St. Croix River to the Twin Cities makes it an ideal location for developing cross-country and showshoe trails. At present, a considerable amount of ski touring and snowshoeing is occurring in this area; however, there are no specially designated trails.

To meet the growing demand for snowshoe and cross-country ski facilities, a total trail system is proposed that would cater exclusively to hiking in summer and snowshoeing and cross-country skiing in winter. This trail would generally parallel the St. Croix River meandering in and out of the maximum preservation zone. Trail centers, parking areas, and primitive camps, while outside the preservation zone, have been located to best accommodate the user.

BACKPACKING (HIKING)

Nationwide some 15 million people (7 percent of the population) go hiking with backpack equipment each year. Hiking is one of the fastest growing activities nationally, although it ranked 15th in popularity.

In Minnesota, there are some 300,000 participants, and the number is growing rapidly. Sales of equipment are reported increasing at unprecedented rates.

Using an average of four outings per year, about 1.2 million activity occasions will occur in 1975 and as many as 1.5 million by 1980. Based on the national (projected) rate of increase, backpacking occasions in Minnesota may increase 25 percent by 1980 to a total of 1.5 million activity occasions.[1/]

Projection

Many factors have contributed to the recent growth of backpacking. They include the desire for an activity which brings one close to nature and a concern for physical fitness. Increased amounts of leisure time available to participants is a significant factor.

[1/] Outdoor Recreation Trends, Department of the Interior, Bureau of Outdoor Recreation 1967.

Analysis of Backpacking Within the St. Croix Area

The St. Croix Area will most likely receive the

highest amount of backpacking pressure in the State. Already this pressure is being seen by backpackers venturing into the St. Croix Area on unmarked trails. As the intensity of backpacking increases, additional problems will occur in the form of management and enforcement.

To meet this demand, a hiking trail system has been proposed, as previously mentioned in snowshoe and cross-country ski section.

HUNTING

Hunting is a form of recreation enjoyed by many. While some people experience nature through hiking or canoeing, others are enchanted by the elusiveness and elegance of game birds or mammals while trying to hunt them.

Hunting originated out of necessity for food, but now it is a seasonal sport. Hunting does not endanger a wildlife resource because of the regulations placed on sportsmen and continuing management of species hunted. Sportsmen hunt for many reasons such as companionship, trophies and meat. But equally important is that hunting gives the sportsman an opportunity to find respite from his hectic technological world.

Projection

Hunting has increased over the years but not in relation to population increases This is partially the result of increases in other outdoor recreational activities such as camping, canoeing and snowmobiling. The St. Croix River Area has provided numerous recreational hours annually in the form of hunting and trapping. It should continue to do so.

Big Game Hunting

More than 307,000 Minnesotans hunted in 1967. During the 1972 season, 258,957 hunters purchased firearms deer licenses in Minnesota. The potential recreational man days could exceed 968,000.

Archery deer hunting is also increasing as indicated by a record sale of 20,680 licenses last year. Other forms of big game hunting include moose and bear hunting; however, the St. Croix River Area is not within the moose range.

Small Game

Small game consists of upland game birds and smaller mammals. Here too, hunting pressure and license sales depends on the size of game populations. In 1958, a record number of 379,667 licenses were sold and in 1971, 288,218 were sold. This lower number reflects a decrease in Ring-necked Pheasant numbers but an increase in Ruffed Grouse when over 1,297,000 grouse were harvested. Hunting of various species of wildlife began in early September and continues through March. The number of recreational hours, applying an average of 12 outings per hunter, would total over 3,458,000 hunter-days of recreation.

Waterfowl

Waterfowl hunting is a popular recreational pursuit with an average 115,000 Minnesota hunters enjoying a tremendous number of recreational hours. Waterfowl habitat along the St. Croix River is limited compared to the prairie pothole region of the state, but it does provide its share of waterfowl hunting.

Analysis of Hunting Within St. Croix Study Area

Because of the close proximity of the Metro area, the St. Croix River has constantly supported an enormous amount of hunting pressure. As the metropolitan populace increases, participation in this sport will increase. Therefore, it is desirable to maintain game populations in this area through habitat development projects. Better habitat conditions will provide more wildlife and allow for more recreational hours.

Management for all forms of wildlife, whether game species or songbirds, should be increased on public lands so as to provide more wildlife for those who enjoy it. At present, management of wildlife populations has been limited because of a lack of funds and personnel available to develop and improve wildlife habitat.

FISHING

Fishing is one of the most popular outdoor activities in Minnesota. About 1,370,000 Minnesotans, or 36 percent of the State's population fish at least once during the year. An additional 400,000 non-residents purchase angling licenses. As a weekend activity, fishing ranks THE most popular.

Fishing is a year-around sport. An estimated 425,000 persons ice fish - 31 percent of the resident fishermen.

About 16 million fishing trips are taken annually. Fifty-eight percent of our state's fishermen angle ten days or more during the year.

Fishing participation has been gradually increasing. In 1960 the number of licensed fishermen was 1,345,000. By 1972, the total had reached 1,424,000.

Projection

Fishing participation per capita will remain at about present levels, or decline slightly, in the near future while total fishing occasions will increase as the population increases. It is projected that fishing activity occasions will increase from the present level of 27.9 million to 29.8 million in 1980 and 34.8 million in 1990.

Analysis of Fishing Within the St. Croix Study Area

The Upper St. Croix Study Area provides fair to good trout fishing within close proximity of the Twin Cities. In the future, these streams will receive higher trout fishing pressure. To protect these trout streams and the few fishing lakes in this area, an intensive fisheries management plan has been developed (refer to pages 155-163).

The Upper St. Croix River will receive little fisheries management aside from improvement of certain boat accesses. Specific accesses will remain open while others will be closed, based upon present usage. Access points left open will be improved and modified in design standards to meet the requirements of the Wild and Scenic Riverway Act.

It is recommended that counties zone the St. Croix River to prohibit motorboating north of the Snake River. Refer to 1973 Legislation.

Order of Importance in Recreational Development

After evaluating recreation user demands, it is readily apparent that all forms of recreation are in strong demand along the St. Croix, particularly in the St. Croix Wild River Area. Existing facilities receive intensive usage and as a result are gradually deteriorating. Therefore, these facilities must be improved before introducing any new forms of recreation.

Once these facilities have been upgraded, new development should begin, especially within St. Croix Wild River State Park. This recommendation is based on the higher user demand for recreation closer to the metropolitan area. All facilities should be developed simultaneously; however, the family campground, picnic area, and the trails should be given preference.

Other recreation facilities along the Upper St. Croix should be developed in relation to user demand. For example, those sites closer to major highways and having easier access should be developed first. Secondly, family campgrounds and trails should be given priority to satisfy higher user demands for these facilities. It is particularly important to complete the St. Croix trail system so it can become part of the Twin City-Duluth Trail.

Design Approach

To devise and implement a comprehensive management plan for the Upper St. Croix, six distinct areas must be evaluated in relation to recreational policies. They are:

1.) The Wild and Scenic Riverway Corridor

2.) The two State Parks, namely St. Croix State Park and St. Croix Wild River State Park

3.) The two State Forests - St. Croix State Forest and Chengwatana State Forest

4.) Wildlife Management Areas

5.) Scientific Natural Areas

6.) Historic Sites

1. The Wild and Scenic Riverway

The Wild and Scenic Riverway is land donated mainly by Northern States Power Company to Minnesota and Wisconsin and the National Park Service. This is an ideal recreation corridor which connects St. Croix State Park, St. Croix Wild River State Park, St. Croix State Forest, and Chengwatana State Forest. The Riverway was sub-divided into two recreation zones by the Cooperative Agreement of 1969 -- the maximum preservation zone and the limited development zone.

The maximum preservation zone, an average of 0-412 feet from the rivers edge, is by policy the highest zone of protection and allows only the most passive forms of recreation. The limited development zone, an average of 412 feet to 1,320 feet (¼ mile) from the rivers' edge, allows more

intensive forms of recreation and is controlled by the State.

The National Park Service will develop boat accesses, canoe launches, and primitive canoe campsites within the maximum preservation zone. Meanwhile, Minnesota will develop a trail system for hiking, cross-country skiing and snowshoeing. A multi-purpose trail will be developed by the State in the limited development zone. The hiking cross-country ski and snowshoe trail will meander in and out of both the maximum preservation and limited development zones.

The all-purpose trail will not enter the maximum preservation zone but may run within the limited development zone and adjacent state owned land. Neither of these trails will function as endless trail systems but will have secondary trail loops interconnecting with recreational facilities in and adjacent to the scenic river corridor.

2. St. Croix State Park and St. Croix Wild River State Park

St. Croix State Park and Wild River State Park follow the same recreational concepts under which all Minnesota State Parks are developed. Minnesota State Parks are recreation-oriented facilities with due consideration for the natural environment, historical amenities and wildlife.

The two parks are designed more intensively than other St. Croix study areas. Existing and planned facilities will cater to both day and overnight use. These parks, with their higher recreational usage, will thus function as centers of activities along the St. Croix River corridor.

St. Croix State Park, already well developed, will have few new facilities. Instead, more concern will be given to improving existing facilities and regenerating vegetation and wildlife as detailed in this management plan. Some facilities at St. Croix State Park will be eliminated or altered to better balance with the environment and changing demands.

St. Croix Wild River State Park was officially designated May 23, 1973. It consists of 6,000 acres stretching from just above Taylors Falls to the Chengwatana State Forest boundary. Proposed recreation facilities are extensive and day-use oriented in an effort to reduce the high user demand on nearby Interstate Park. At present, no specific recreation facilities exist in the park except a few marked boat accesses administered by NSP. Other activities which occur are uncontrolled, contributing to maintenance and enforcement problems.

3. St. Croix State Forest and Chengwatana State Forest

The two state forests, Chengwatana and St. Croix, are managed primarily for forest reproduction. However, consideration is given for other uses. These uses fall into three broad categories: watershed, wildlife, and recreation.

The two forests are to be kept as primitive as possible. Only trails and primitive forms of camping are proposed. In most cases, recreational facilities will be located in the river corridor and will conflict little with forest production. The only other form of recreation that will be within the forests will be hunting.

4. Wildlife Management Areas

Rock Wildlife Management Area is managed primarily for the production of wildlife and waterfowl. Hunting and trapping are popular while hiking is considered a complementary recreational use. Other forms of recreation are not considered compatible and would result in damage to habitat and wildlife.

5. Scientific and Natural Areas

Scientific and Natural Areas are managed to preserve and protect unique natural values. This includes soils, waters or sediments, sites of scientific value, habitats of rare or endangered species of plants and animals, places of historic or prehistoric interest, scenic beauty, and areas uniquely suitable for teaching natural history and environmental awareness.

Rules and regulations for a scientific and natural area are very restrictive and exclude all forms of recreation such as hunting, camping, snowmobiling, etc., except for hiking trails to aid in interpreting the resource. These hiking trails are laid out so as to avoid specific features of the area. Refer to Chapter Fourteen, Natural Resources 300-319, Scientific and Natural Areas Rules and Regulations.

6. Historic Sites

Historic sites were of utmost concern in formulating a recreation plan for the St. Croix project. Known historical sites were located and reviewed by the Archeological Department of Minnesota Historical Society.

Only those forms of recreation having little environmental impact would be allowed on or near a historical site. Facilities allowed will consist of primitive campsites and trails. These facilities will be located and constructed so as not to destroy or alter the site. This historical value of the site will be interpreted, giving the recreational user full knowledge of the site.

Proposed and Existing Facilities

Two major forms of facilities were considered in this recreation plan: Those that are specifically recreational and those that support outdoor activities including roads and bridges. The following is a detailed description of these facilities and estimated costs:

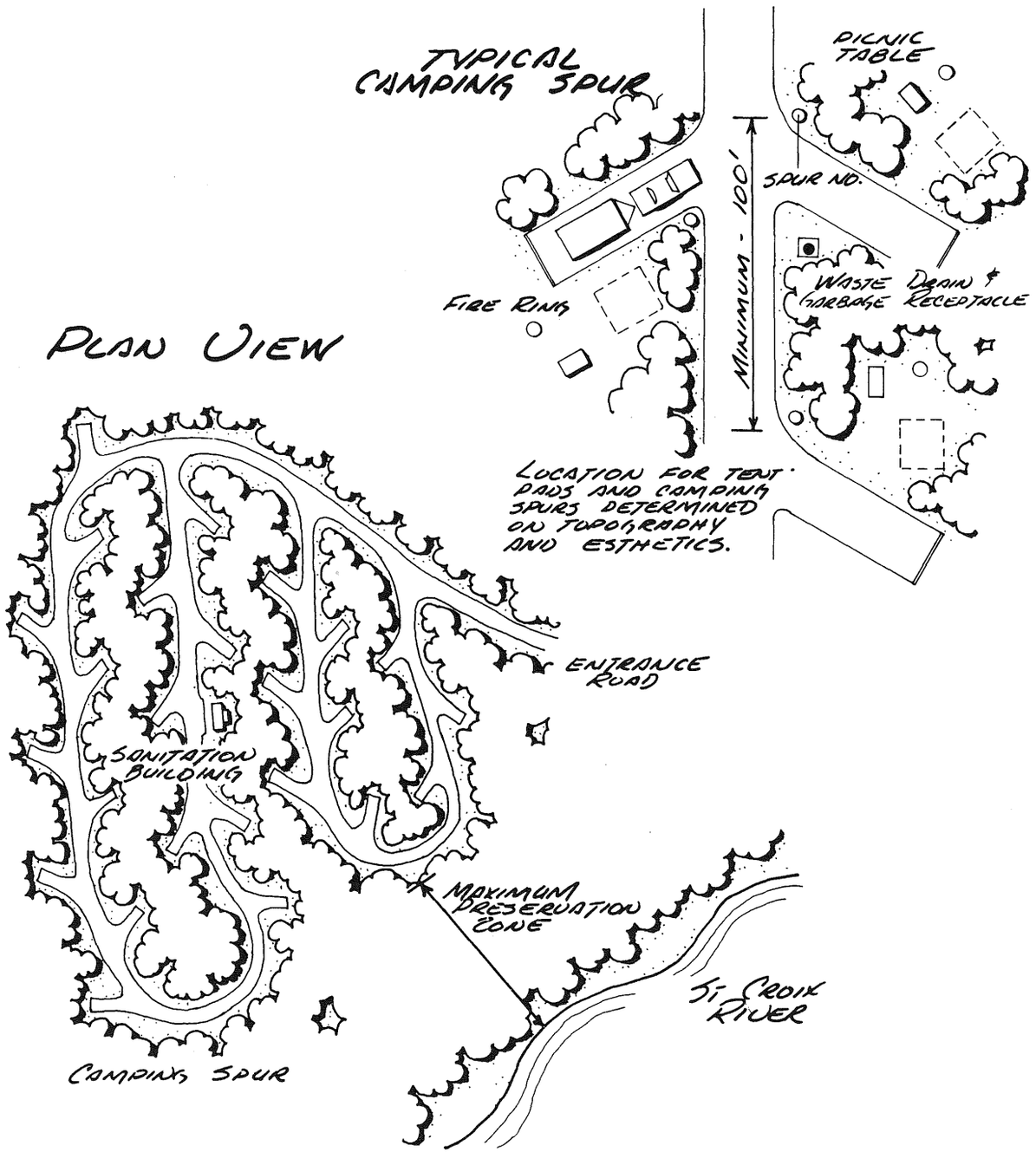
Campgrounds

Three major forms of campgrounds either exist or are proposed for the Upper St. Croix. These are family campgrounds, group camps, and primitive campsites. (Hiking)

FAMILY CAMPGROUNDS

Family campgrounds will cater to tent, trailer, or recreational vehicle camping. In most cases, these campgrounds are developed with camping spurs and modern sanitation facilities. At present, there are three existing, one to be abandoned, and four proposed in this plan. The following are recommendations for those sites:

Family Campground



Existing

St. Croix State Forest

Township 42 North, Range 16 West, Section 30, existing family campground located beside Hay Creek Flowage. This campground is operated and maintained by the East Pine Conservation Club for public use. The Conservation Club and the Minnesota Department of Natural Resources agree that the site is overused and is showing evidence of erosion and compaction.

East Pine Conservation Club has proposed to convert their site to a smaller day-use picnic area. Accordingly, the Department of Natural Resources has proposed a new primitive family campground on the northwest side of Hay Creek Flowage. This facility will have a handpump, camping spurs (approximately 25), pit privies, fire rings, and picnic tables. The State will also work closely with the Club on a final design for this primitive family campground, so that one cohesive recreational system is developed. Estimated cost of development - $70,000.

Township 41 North, Range 16 West, Section 7, existing forestry family campground beside Rock Lake. This site is in good condition having handpump, camping spurs, fire rings, pit privies and boat access. No improvements are recommended; site should remain in its primitive character.

St. Croix State Park

Township 40 North, Range 18 West, Section 21, existing family campground in fair condition. It needs the following improvements:

1. Better vegetation management by rotation of camping spurs and regeneration of new vegetation.

2. New electrical outlet system for trailers.

3. New water system.

Estimated cost of improving campground $30,000

Proposed

St. Croix State Park

Proposed Township 40 North, Range 18 West, Section 13, proposed primitive form of family campground adjacent to Sand Creek. This site should be for vehicle tent camping only. No camping spurs are recommended. Instead, several smaller parking areas are proposed with walk-in tent camping. Facilities will consist of handpump, pit privies, fire rings, and tent pads. Estimated cost of development - $25,000.

Chengwatana State Forest

Township 39 North, Range 19 West, Section 31, proposed family campground along the Snake River. This site has an existing entrance road, trail system and boat access within close proximity of the mouth of the Snake River. Proposed facilities consists of camping spurs (approximately 40), handpumps, pit privies, fire rings and picnic tables. Estimated cost of development - $75,000.

St. Croix Wild River State Park

Township 35 North, Range 19 West, Section 5 proposed family campground overlooking St. Croix River. This site has a good entrance road and trail system leading to a natural beach at the site of Old Nevers Dam. Residential homes within close vicinity of this site should be purchased to improve esthetic and functional relationships. Proposed facilities include a modern sanitation building, camping spurs (about 60), picnic tables, garbage receptacles and fire rings. Estimated cost of development - $110,000.

GROUP CAMPS

The Upper St. Croix Study Area has three group camps, all located in St. Croix State Park. These camps have not received the recreational usage as expected in recent years and are becoming a maintenance problem. Consideration is being given to phasing out some camps or converting them to a different use. For example, it may be more beneficial to phase out Head of the Rapids Group Camp, convert Norway Point Group Camp to nature interpretive station, and modernize St. Johns Group Camp to meet present and future demand for group camping. Locations of the three group camps are:

Township 41 North, Range 17 West, Section 32 - St. Johns Group Camp - St. Croix State Park

Township 40 North, Range 19 West, Section 34 - Head of the Rapids Group Camp - St. Croix State Park

Township 40 North, Range 19 West, Section

19 & 20 - Norway Point Group Camp - St. Croix State Park

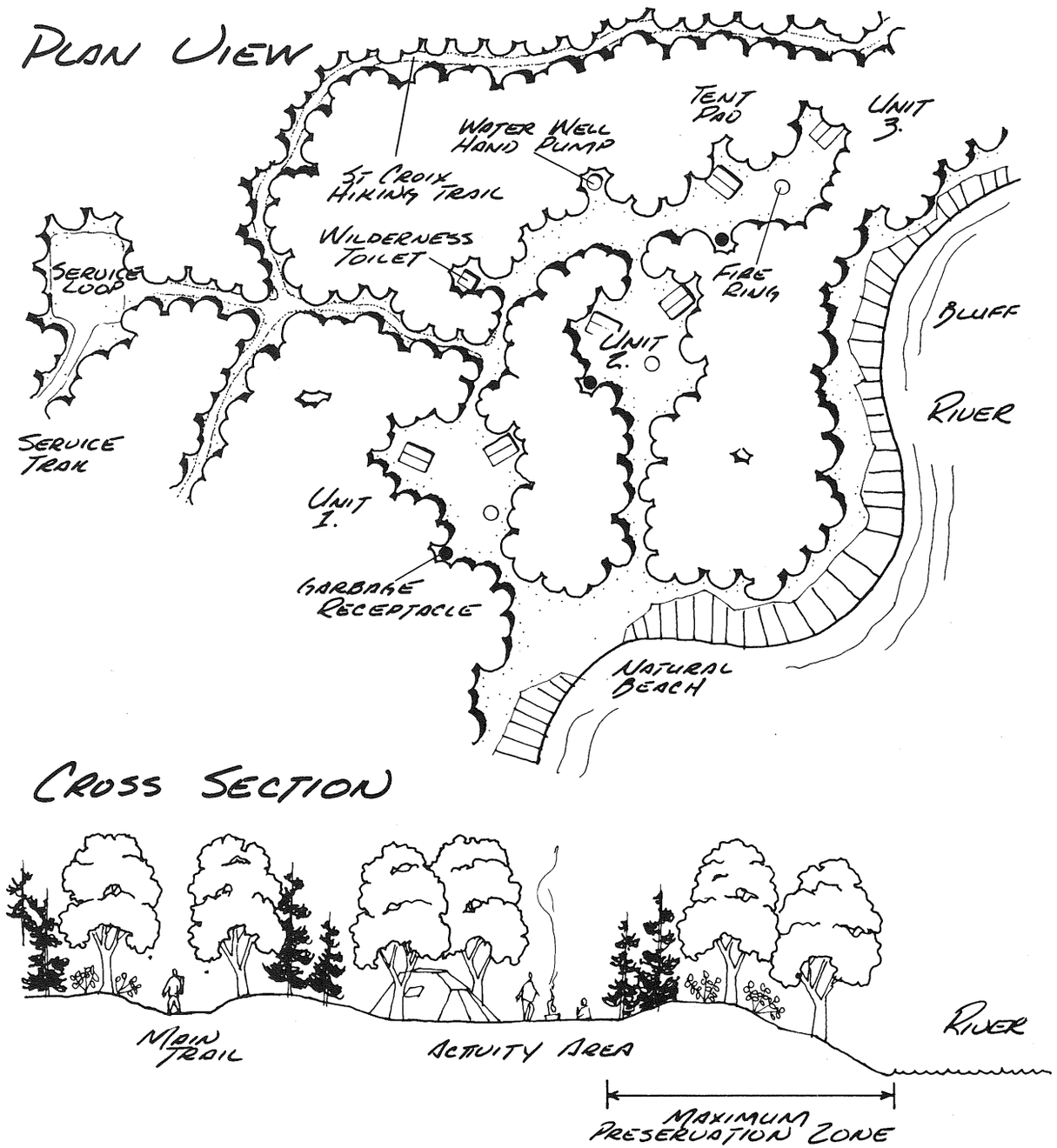
PRIMITIVE CAMPS

Primitive campsites will cater primarily to hikers. The National Park Service, responsible for designing and managing the St. Croix River Canoe System, will select the campsites with approval of the Minnesota and Wisconsin Departments of Natural Resources and Northern States Power Company. Construction and maintenance of canoe sites on the Minnesota side will be the responsibility of both the Minnesota Department of Natural Resources and National Park Service. MDNR will be responsible for those sites within the two state parks, while the remaining canoe campsites will be the responsibility of the National Park Service.

Primitive campsites along the hiking corridor will be spaced from 4 to 8 miles apart. In most cases, the sites will be within the maximum preservation zone but will be screened from the river and signed for hikers only. This signing will prevent any canoeist-hiker conflict.

Hiking camps will be designed in clusters, each with three small campsite units. Each unit will have two tent pads, garbage receptacle and a fire ring. There will be a wilderness pit toilet for each cluster. The cluster design will provide for maximum privacy and minimize environmental degradation through rotation of alternate campsites, if necessary. The hiking camps will be serviced by a trail accessible only to authorized personnel in a four-wheel drive vehicle. Refer to schematic of primitive hiking camp.

Primitive Campsite



A brief description of each camp, and estimated development cost, includes:

St. Croix State Forest

TOWNSHIP 42 NORTH, RANGE 16 WEST, SECTION 35

This primitive campsite, in conjunction with a proposed parking center, will be the termination point for the St. Croix System. The objective is to provide a camping facility for anyone just completing the trail. The campsite is directly adjacent to Trout Brook, trout stream. The site will be brushed to establish campsites. Estimated cost of development - $6,500.

TOWNSHIP 41 NORTH, RANGE 16 WEST, SECTION 17

Proposed primitive hiking camp overlooking Mallard Lake. This site is an ideal primitive setting with exceptional topography and vegetation. It will receive typical primitive campsite development with some brushing to establish campsites. It is recommended that the existing multiple-use trail be improved and used as a service access. Estimated cost - $7,000.

Lower Tamarack Trail

This smaller trail system interconnects with the St. Croix Trail System and is mainly for weekend use. Campsites will be spaced closer together and smaller in size with only two campsite units per cluster. Each unit will have two tent pads and a fire ring, and share the same pit toilet. No hand pumps or service trails are proposed. Instead, maintenance will be done by foot from an existing road about one mile away.

The following is an estimated cost and location of campsites within the trail system:

Township 41 North, Range 16 West, Section 18 - $ 1,100.00

Township 41 North, Range 16 West, Section 5 - - $ 1,100.00

Township 42 North, Range 16 West, Section 31 - $ 1,100.00

Township 42 North, Range 17 West, Section 25 - $ 1,100.00

Total= $4,400.00

St. Croix State Park

TOWNSHIP 41 NORTH, RANGE 17 WEST, SECTION 32

Proposed primitive hiking camp beside Crooked Creek, a trout stream. This site will receive typical primitive campsite development and possibly an increase in brushing to establish campsites. It is recommended the service trail for this site be extended from St. Johns Group Camp. Estimated cost - $5,000.

TOWNSHIP 40 NORTH, RANGE 18 WEST, SECTION 19

Proposed primitive camp beside Sand Creek, a trout stream. This will be an exceptional site because it will be used both by hikers and canoeists, with a canoe launch adjacent to it. Size of the camp will be increased by adding two more campsite units. The camp and canoe launch will be serviced from an existing access road. Estimated cost - $5,500.

TOWNSHIP 39 NORTH, RANGE 19 WEST, SECTION 3 & SECTION 2

Proposed primitive hiking camp within the vicinity of Head of the Rapids along the St. Croix River. This is one of the most beautiful locations along the St. Croix with picturesque White Pines and fast-moving rapids. To develop this site, a service trail can be extended from Head of the Rapids Group Camp. The campsite will be of typical design, however, existing campsites can be used with the need of little improvement. Estimated cost - $6,000.

TOWNSHIP 39 NORTH, RANGE 19 WEST, SECTION 9

Primitive hiking camp at mouth of Kettle River. This is an existing site but will need some improvement with regard to screening and organization. Maintenance should be by foot from the Kettle River Overlook near Kenny Brook. Estimated cost - $3,500.

TOWNSHIP 40 NORTH, RANGE 19 WEST, SECTION 19

Proposed primitive hiking camp at Big Eddy next to the Kettle River. This site is presently used as a canoe access which will be closed off. The entrance road will be converted to a service trail

for the camp. Brushing will not be needed but some screening is needed between the campsites and the river. Typical primitive camp development. Estimated cost - $5,500.

Kettle River Trail Connection

The St. Croix Trail System will not cross the Kettle River between Chengwatana State Forest and St. Croix State Park because of the environmental impact a bridge would have on the Kettle River. Instead, the trail will run adjacent to the River and cross at the existing Highway 48 bridge. There are two proposed primitive hiking campsites along the trail connection. Following is a brief description of these sites and estimated costs:

TOWNSHIP 41 NORTH, RANGE 20 WEST, SECTION 23

This proposed primitive camp will be a combination hiking and canoe campsite with a boat access to the Kettle River. This site is presently on private property and the Highway 48 right-of-way. This land should be acquired. The campsite will have five units, each with two tent pads, garbage receptacle and a fire grill. A wilderness pit toilet and handpump will be shared by all five units. This site will need a more extensive vegetation management plan to sustain the natural characteristics. Estimated cost - $7,000.

TOWNSHIP 40 NORTH, RANGE 20 WEST, SECTION 10

This proposed primitive hiking camp is located on private property and its purchase is recommended. The site is well established with an entrance road that could be converted to a service trail. Development would only consist of those facilities necessary for a primitive campsite. estimated cost - $4,000.

Chengwatana State Forest

TOWNSHIP 39 NORTH, RANGE 19 WEST, SECTION 19

Proposed primitive hiking camp beside Redhorse Creek. This site has ideal primitive characteristics with exciting terrain and vegetation. Presently, there is no development. A service trail should be constructed from the proposed trail parking center approximately 1/4 mile away. Estimated cost - $5,000.

TOWNSHIP 38 NORTH, RANGE 20 WEST, SECTION 7

Proposed primitive hiking camp within vicinity of old Scout Camp, presently leased from N.S.P. An old Scout Camp road will be utilized as a service trail. Estimated cost - $5,000.

TOWNSHIP 38 NORTH, RANGE 20 WEST, SECTION 35

Proposed primitive hiking camp next to the St. Croix River. This site will be developed with a service trail access from a farmers field directly adjacent and presently leased from N.S.P. Estimated cost - $4,500.

TOWNSHIP 38 NORTH, RANGE 20 WEST, SECTION 33

This site is presently a boat access which will be closed and converted to a primitive hiking camp. The old access road will be utilized as a service trail. Typical primitive camp development though the site may need an increased amount of screening from river. Estimated cost - $6,000.

TOWNSHIP 37 NORTH, RANGE 20 WEST, SECTION 17

This site is well-screened located along a ridge high above the river. It should be serviced by foot from the old railroad grade. Estimated cost - $5,000.

TOWNSHIP 37 NORTH, RANGE 20 WEST, SECTION 31

This proposed primitive hiking camp is located on private property; purchase is recommended. It has a natural beach and an access trail from an adjacent farm. The site should be developed the same as the typical and will need little brushing and screening. Estimated cost - $5,000.

St. Croix Wild River State Park

TOWNSHIP 36 NORTH, RANGE 20 WEST, SECTION 30

Proposed primitive hiking camp within close vicinity of mouth of Goose Creek. This site has a natural beach and will be serviced by closing off existing access road and converting it to a service trail. It will be developed the same as typical. Estimated cost - $6,500.

TOWNSHIP 35 NORTH, RANGE 19 WEST, SECTION 16

Proposed primitive camp next to a small creek. This site has extremely nice features with an existing service trail. Very little brushing or screening will be needed. Estimated cost - $4,000.

TOWNSHIP 35 NORTH, RANGE 19 WEST, SECTION 2

This site is presently an unimproved boat access leading to the mouth of Dry Creek. The site should be closed as an access and converted to a primitive camp utilizing the old access road as a service trail. Estimated cost - $6,000.

Picnicking

Picnicking for the study area has been limited to state parks. The reasoning for this is to consolidate all forms of intensive, day-use recreation to State Parks, allowing the rest of the study area to remain primitive with only camping and recreational trails. In this recreation plan there are only two picnic areas: One in St. Croix State Park and the other, a proposed facility for St. Croix Wild River State Park.

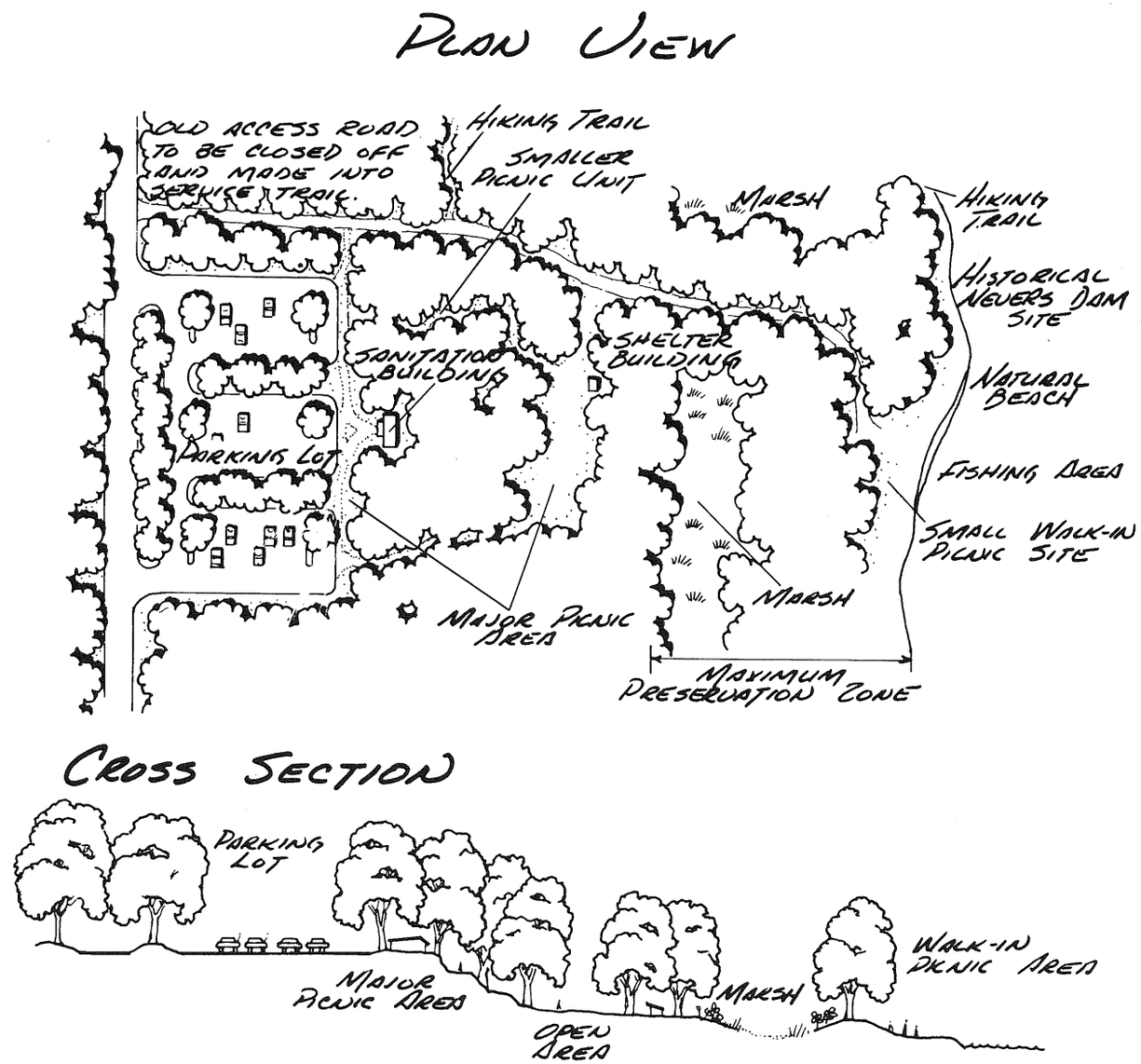
The following is a description of these picnic areas and a description of another to be eliminated in St. Croix State Park.

St. Croix State Park

TOWNSHIP 40 NORTH, RANGE 18 WEST, SECTION 19

Existing picnic area located at Clayton Lake. This picnic area is in good condition. It consists of:

Picnic Area



40 - 50 picnic tables, fire grills, vault type toilets, shelter, parking lot and swimming beach. The only improvement needed is an extensive vegetation management plan to regenerate the natural character of the site. Estimated cost of improvement - $2,000.

Picnic Area to be Eliminated

TOWNSHIP 40 NORTH, RANGE 18 WEST, SECTION 15

Small day-use picnic area located near St. Croix State Park's Lodge and family campground. It should be eliminated so all picnicking will be located at the major picnic area beside Clayton Lake. This would eliminate the camper-picnicker conflict and reduce maintenance.

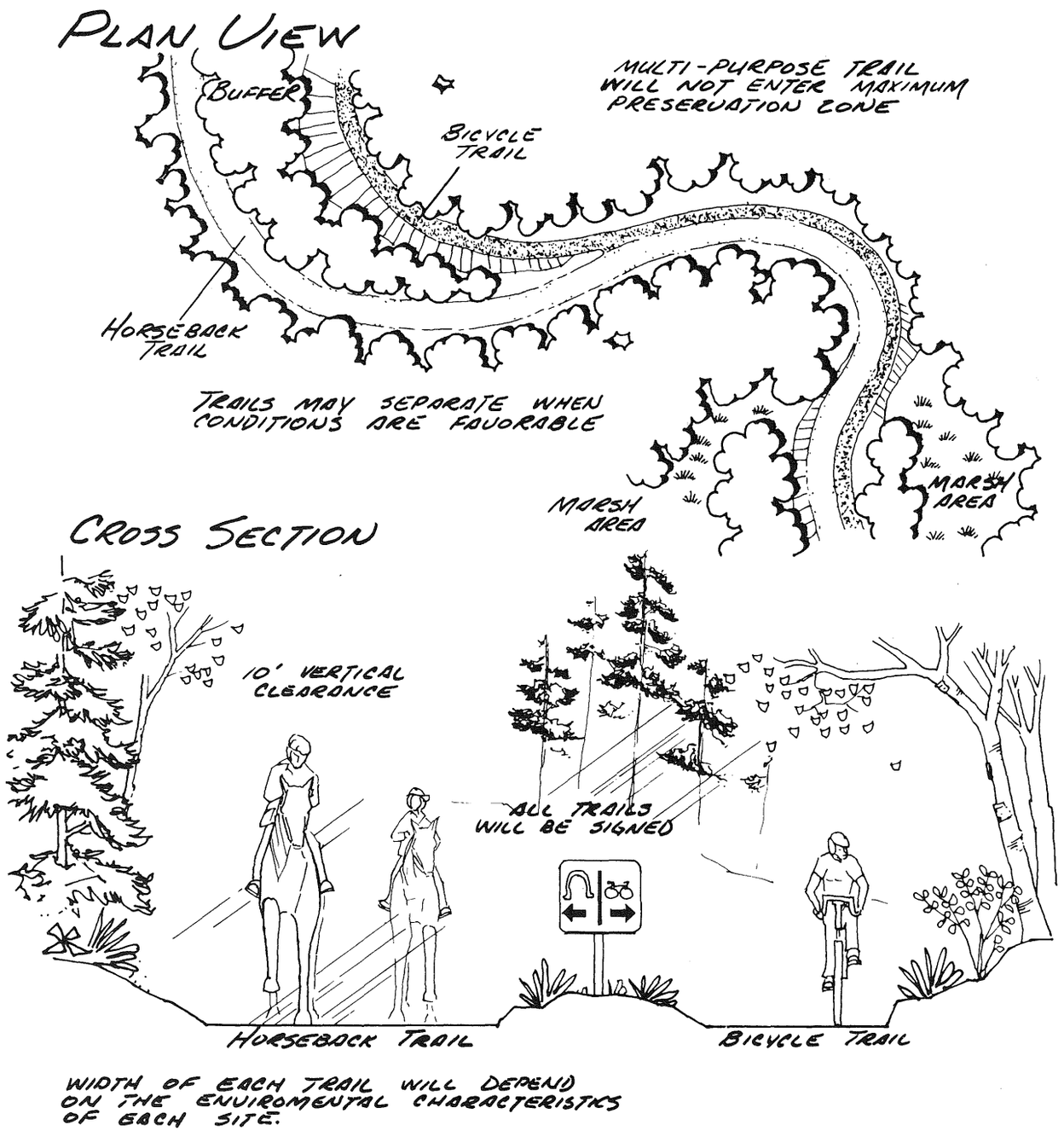
St. Croix Wild River State Park

This proposed large picnic area will have a unique site on a high ridge directly above the floodplain. Walk-in picnicking is also proposed at the Old Nevers Dam Site by converting the old entrance road into a hiking and service trail. Parking will be on the ridge behind the larger picnic area and south of the old entrance road to Nevers Dam. This area will have about 150 picnic tables, 2 shelters, 50 fire rings and a modern sanitation building. The smaller walk-in picnic area at Nevers Dam will have only 10 picnic tables and pit privies. Estimated cost of development - $100,000.

Recreational Trails

The St. Croix Trail System will consist of two

Multi-Purpose Trail



major segments; multi-purpose trail and a hiking-cross country ski and snowshoe trail.

The multi-purpose trail will be used for all forms of recreation **except motorcycles and all-terrain vehicles.** This trail will receive its heaviest use from horseback riders and bicyclists in summer and snowmobiles in winter. The trail will exist only within the limited development zone and adjacent state-owned lands. It will also link with the Twin Cities to Duluth multi-purpose trail and be used as a connecting system between Duxbury and Taylors Falls.

If practical, the multiple purpose trail could be designed to allow horseback riding on one side and bicycle riding on the other. When feasible the trail could divide with separate alignments for each use. These trails would stay within the same corridor but would be buffered from each other be vegetation and topography. It is recommended that the major trail be completed before attempts are made to separate the two types of uses. Refer to schematic, page 178.

The hiking, cross-country ski and snowshoe trail will run primarily within the maximum preservation zone. It will be limited to hiking in summer and cross-country skiing and snowshoeing in winter. The trail will be buffered from the multi-purpose trail by natural features of vegetation and topography.

Both trails have been designed to meander through St. Croix River Valley. Often both trails will abandon the St. Croix and follow a smaller tributary with extraordinary vegetation and terrain to provide more variety for the user. Smaller trail loops have been proposed within close proximity of the trail centers, trail parking areas and nature centers to provide for short, day-use trips.

Following is an explanation of the trail system in each study unit and estimated development costs:

St. Croix State Forest

St. Croix State Forest now has a snowmobile trail consisting of two major loops. This trail will remain and be utilized as a part of the multi-purpose trail within the forest. The multi-purpose trail will divide, with one trail leading to Duxbury and interconnecting with the Twin Cities to Duluth Trail. The other segment will continue along the St. Croix River and terminate at the trail center, TOWNSHIP 42 NORTH, RANGE 16 WEST, SECTION 35.

The hiking, cross-country ski and snowshoe trail will enter the forest and run along the higher ridge next to the St. Croix River. The trail will also terminate at the trail center, TOWNSHIP 42 NORTH, RANGE 16 WEST, SECTION 35.

Hopefully, these trails will be extended in the future to meet the Wisconsin Trail System. This would be the final link in a trail system extending from the Head Waters of the Namekagon River to Taylor Falls on the St. Croix.

A hiking trail has been proposed in St. Croix State Forest along the Lower Tamarack River. It has been specifically designed for weekend use. The trail will start and terminate at the trail center, TOWNSHIP 42 NORTH, RANGE 17 WEST, SECTION 26, taking advantage of the unique primitive characteristic of the Lower Tamarack.

Several trout fisherman trails are proposed. These are short, rough trails giving access and running adjacent to major trout stream. Each trail will have a small parking area at one or both ends.

Following is an estimate of the miles of existing and proposed trails, and their cost of development or improvement:

EXISTING TRAILS	MILES	COST
Snowmobile Trails (to be converted to multi-purpose trails)	18	$27,000
Hiking, Cross-country ski, Snowshoe Trail	0	
PROPOSED TRAILS		
Multi-purpose Trails	11	22,000
Hiking, Cross-country ski Snowshoe Trail	18	18,000
Trout Fisherman Trail	4	4,000
Trout Fisherman - parking areas	3	3,000

St. Croix State Park

St. Croix State Park has a trail system that is quite complex, consisting of a multitude of trails forming several irregular loops. Objectives of this

plan are to better organize these trails into a more unified system, to blend them into the natural environment and to connect these trails with the overall St. Croix Trail System. The following changes have been made to achieve these goals:

1. Existing multiple use trails within deer yards have been reduced in number with no others to be developed.

2. All multiple use trails within the maximum preservation zone will be eliminated or converted to hiking trails.

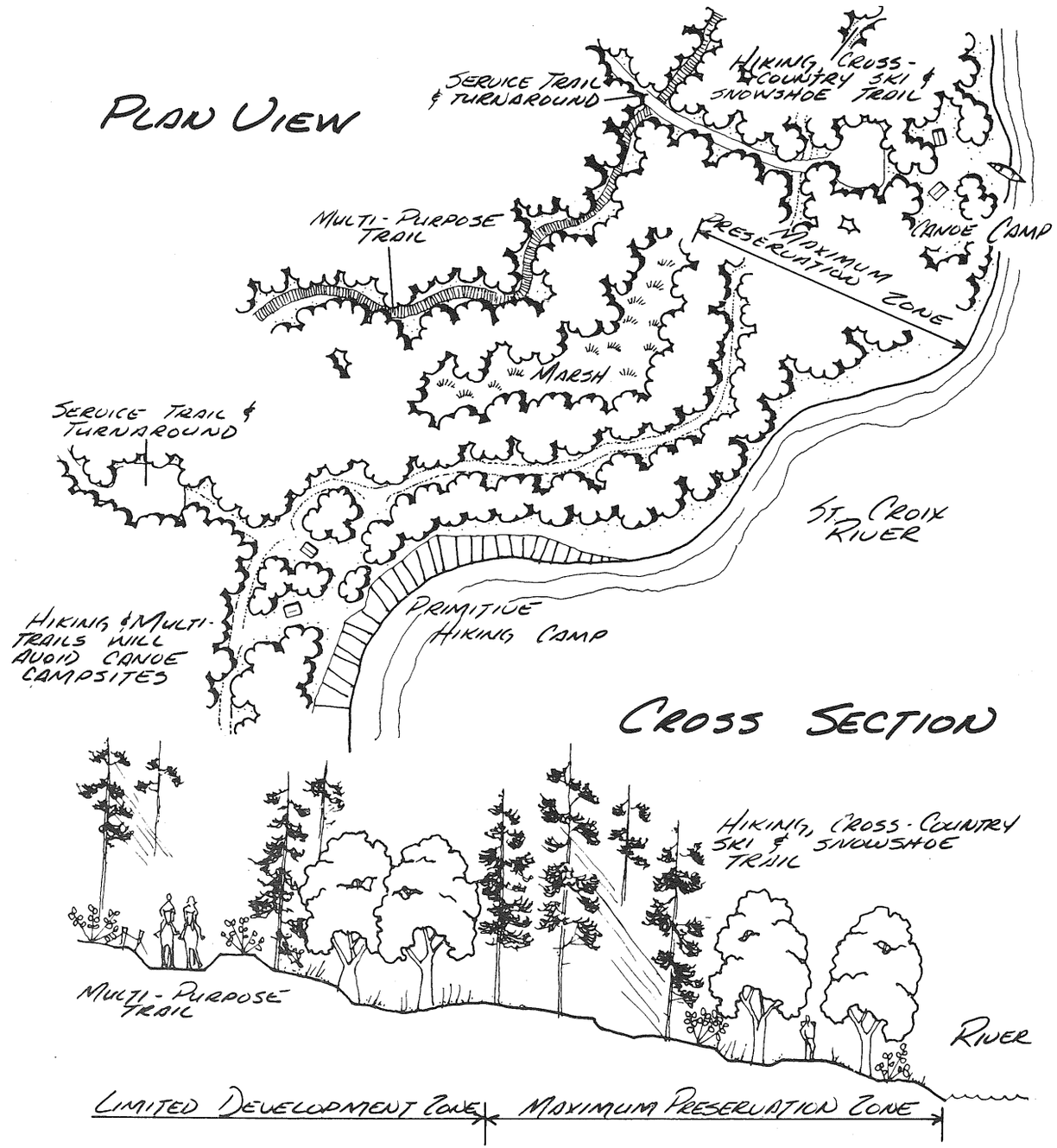
3. Trails proposed to interconnect the park trail system with the overall St. Croix River Trail system will be located in areas with negligible environmental impact.

4. The two major St. Croix Trails, the multi-purpose trail and the hiking, cross-country ski and snowshoe trail, will be identified to eliminate any confusion between these trails and smaller trail loops.

5. Several trout fishing trails running along the major trout streams have been proposed. Each trail will have a small parking area located at one end.

Total miles of existing and proposed trails in St. Croix State Park and estimated cost for improvement or construction includes:

Trail System



EXISTING TRAILS	MILES	COST
Multi-Purpose Trail	58	$41,000
Hiking-Cross-country ski and Snowshoe	15	7,500

PROPOSED TRAILS		
Multi-Purpose Trail	9	18,000
Hiking - Cross-country ski and Snowshoe	17	17,000
Trout Fisherman Trails	2	2,000
Trout Fisherman - Parking Areas	2	2,000

Kettle River Trail Connection

As mentioned in the primitive campsite section, the St. Croix Trail System will not cross the Kettle River between St. Croix State Park and Chengwatana State Forest because of the environmental impact another bridge would have on this river.

Instead, both the multi-purpose trail and the hiking, cross-country ski and snowshoe trail will run semi-adjacent to the Kettle River crossing at the existing Highway 48 bridge. The multi-purpose trail within this stretch will run along county roads, one or two miles away from the Kettle River to avoid marshy and privately owned land. The hiking, cross-country ski and snowshoe trail will run directly adjacent to the Kettle River along its ice ridge. Trail easements will be needed to cross private land. Total proposed miles of trails and estimated cost for St. Croix - Chengwatana Trail Connections:

PROPOSED TRAILS	MILES	COST
Multi-Purpose Trail	18	$36,000
Hiking, Cross-country ski and Snowshoe	11	11,000

Chengwatana State Forest

The northern portion of Chengwatana State Forest has extremely marshy conditions making trail development difficult. Both trails will take advantage of high, solid ground and attempt to avoid marshes. Even them, they will occasionally wind through wet areas where some form of docking or corduroy trail construction will be needed. These conditions will limit each trail to a single corridor with no smaller loops except for snowmobiles. The southern end of Chengwatana State Forest is limited to a narrower corridor because of private property.

Proposed and existing trail in Chengwatana State Forest and estimated cost for improvement or construction includes:

EXISTING TRAIL	MILES	COST
Multi-Purpose Trail	0	0
Hiking, Cross-country ski and Snowshoe trail	0	0
Snowmobile Trail	7	$6000

Five miles of existing snowmobile trail have been converted to multi-purpose trail.

PROPOSED TRAILS	MILES	COST
Multi-Purpose Trail	27	$54,000
Hiking, Cross-country ski and Snowshoe Trail	27	27,000
Snowmobile Trail	4	6,000

St. Croix Wild River State Park

The multiple purpose trail and the hiking, cross-country ski and snowshoe trail are designed in a linear pattern along the St. Croix River caused by the narrow statutory boundary of the park. The cross-country ski and snowshoe trail will run along the ice ridge. It will be buffered from the multi-purpose trail by natural marshes and the higher ridge that the multi-purpose trail follows overlooking the St. Croix River. Smaller day-use trail loops within the activity areas will link the total system.

The two major trails will continue along the river, hooking up with the Twin City to Duluth Trail somewhere between Wild River State Park and Taylors Falls. Exact location of the hookup point is still undetermined. This is why the two trails are shown continuing along the river until they reach the study's southern boundary.

Proposed and existing trails in Wild River State Park and estimated costs for improvement or construction include:

Existing Trails

Presently, there are no signed trails within St. Croix Wild River State Park.

PROPOSED TRAILS	MILES	COST
Multi-Purpose Trails	27	$54,000
Hiking, Cross-country ski and Snowshoe Trail	23	12,200
Nature Trail (Refer to Nature Center, page 184)	3	1,500

The North Country Trail

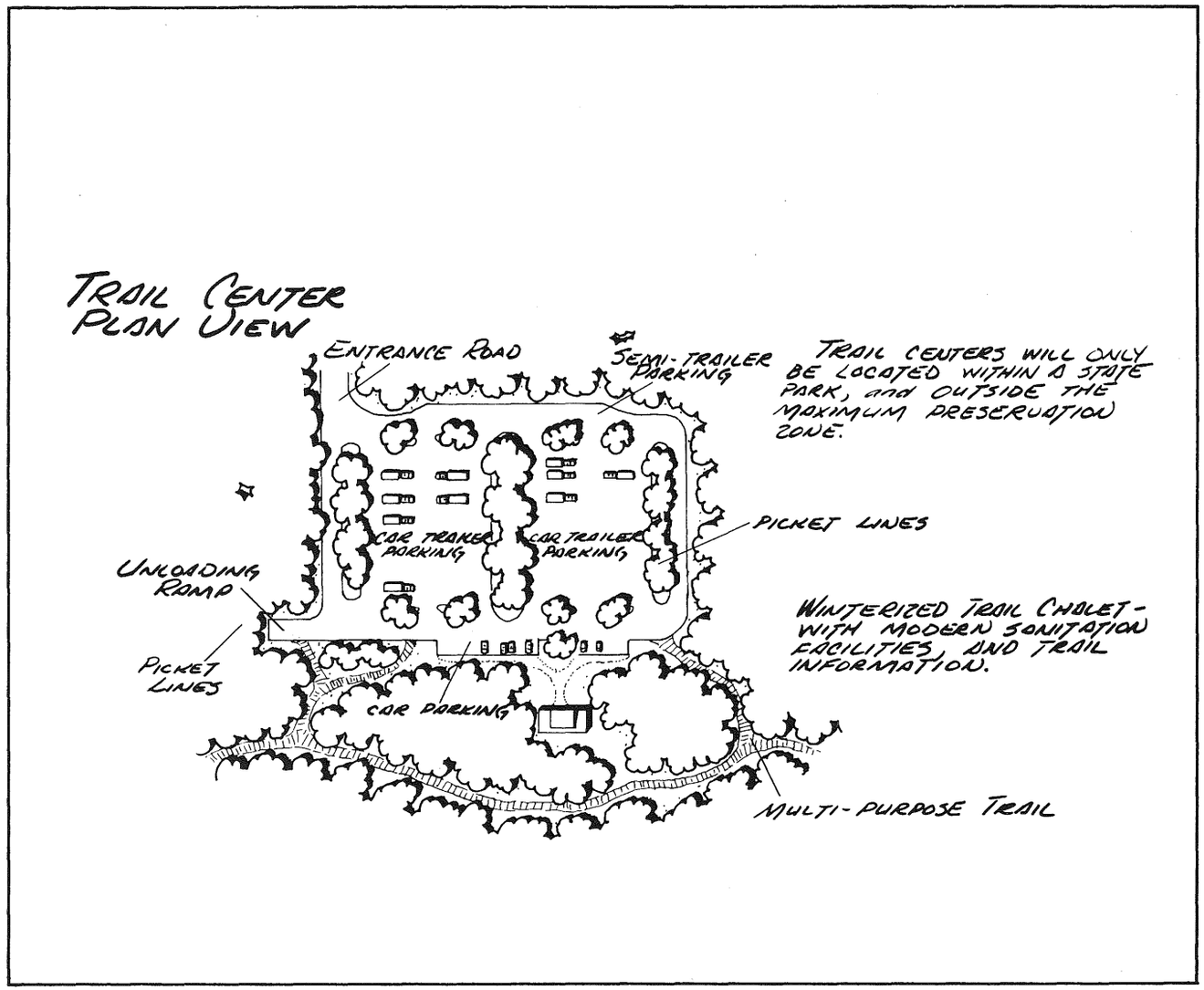
The future North Country Trail is also proposed to intersect with this study area at St. Croix State Forest. It will be a national, non-motorized scenic trail extending from Vermont to North Dakota, a distance of some 3,400 miles. The trail will enter St. Croix State Forest from Wisconsin at Danbury, and follow partial alignments of the proposed St. Croix River and Twin City Duluth Trails, eventually leaving St. Croix State Forest and winding north toward Nemadji State Forest. The exact trail alignment will be determined in the future.

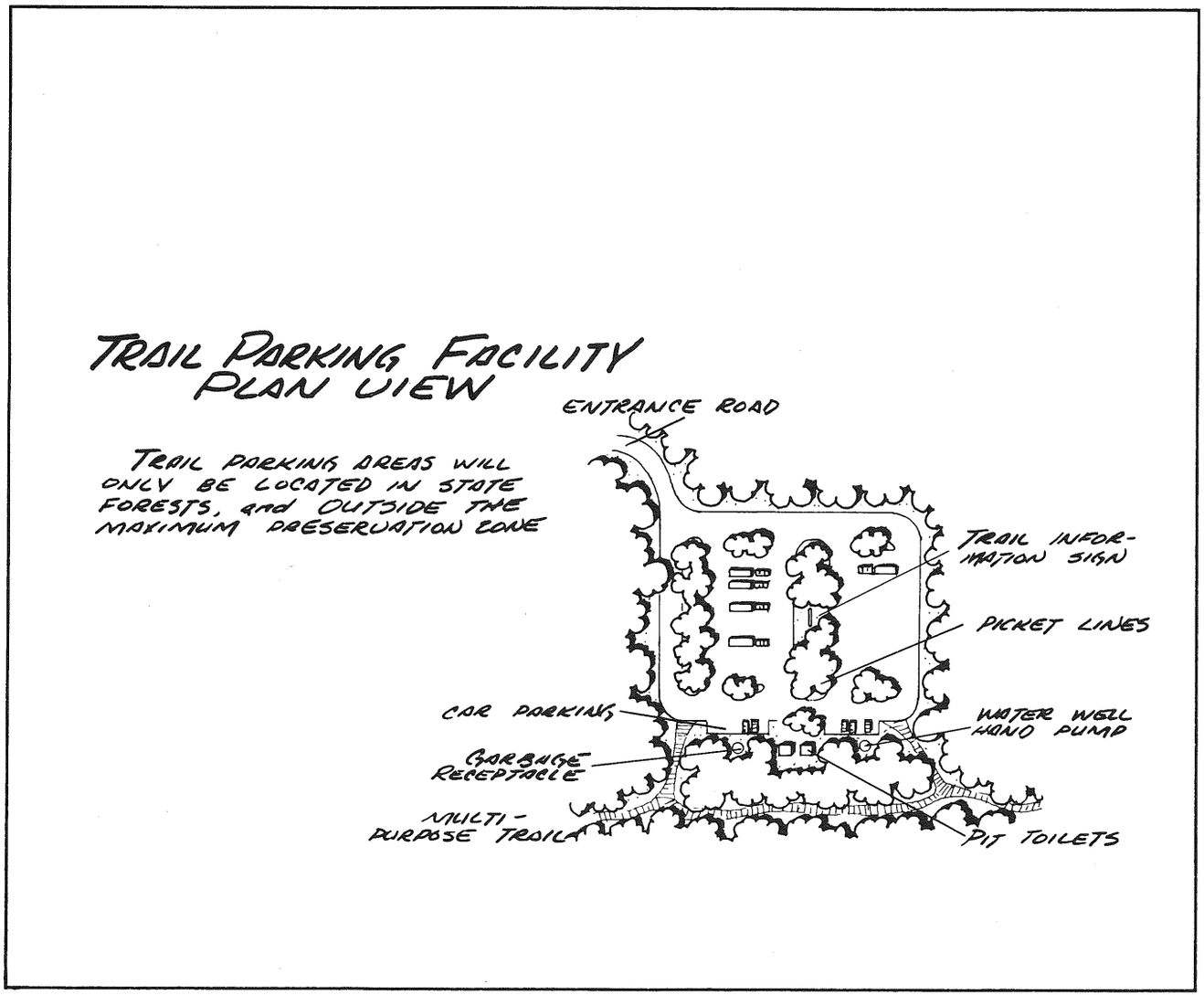
Trail Centers and Trail Parking Areas

Both forms of development have been proposed for easy accessibility to trails. At least one trail center or parking area will be located within each study unit. Such spacing of sites will better disperse trail users thus reducing environmental impact on any specific area. It will also permit users to commence at one trail center or parking area and terminate at another, making shorter day-use trips.

TRAIL CENTERS

Trail Centers will be constructed only within





the two state parks. They will be extensively developed to support the amount of trail use within the St. Croix Area,

St. Croix State Park

St. Croix State Park has a trail center located within SECTION 16, TOWNSHIP 40 NORTH, RANGE 18 WEST. The center has the following facilities: unloading ramps, picket lines, show ring, electric outlets for overnight camping, and a snowmobile warm-up and novice area. It is recommended that an all-season trail chalet with modern sanitation facilities along with additional parking area be added to the center. Estimated cost - $100,000.

St. Croix Wild River State Park

St. Croix Wild River State Park will have a trail center with SECTION 17, TOWNSHIP 35 NORTH, RANGE 19 WEST. When fully developed, it will contain an all-season chalet with modern sanitation facilities, unloading ramps, picket lines, show ring, and electric outlets for overnight camping. Estimated cost - $175,000.

TRAIL PARKING AREAS

Trail parking areas are proposed only for St. Croix and Chengwatana State Forests. These parking areas will remain as primitive as possible with little development other than pit privies, handpump, a routed sign with trail information and the lots. Following are proposed and existing trail parking areas and estimated costs:

St. Croix State Forest

TOWNSHIP 42 NORTH, RANGE 16 WEST, SECTION 35

Proposed trail parking area to be the terminating point for the north end of the St. Croix Trail System. Estimated cost - $14,000.

TOWNSHIP 42 NORTH, RANGE 17 WEST, SECTION 36

Existing trail parking area used only by snowmobiles. This site will need pit privies, handpump, a new trail information sign, expanded parking lot, garbage receptacles, and vegetation planting. Estimated cost - $14,000.

Chengwatana State Forest

TOWNSHIP 39 NORTH, RANGE 19 WEST, SECTION 19

Existing trail parking area used by snowmobilers. This site will also need pit privies, a handpump, a trail information sign, expanded parking lot, garbage receptacles, and vegetation plant. Estimated cost - $14,000.

Nature Center

A nature center is proposed that will be located in Wild River State Park near Dry Creek, TOWNSHIP 35 NORTH, RANGE 19 WEST, SECTION 17. This site was selected because of the large amount of day-use project for that park. The proposed location has a unique variety of vegetation and topography -- an excellent area for nature interpretation. Proposed facilities include: an interpretive education building with modern sanitation facilities, nature trails, trail displays and a small picnic area. Estimated cost - $100,000.

Information Center

Information centers will be located at the following vital motor vehicle crossings:

Highway 70

The National Park Service recently developed an information center here and through a cooperative agreement, will distribute information on historical, archaeological and recreational facilities for the State of Minnesota.

Highway 48

The State of Minnesota is proposing an information center and boat access at this location. Estimated cost - $85,000.

River Access Points

There are numerous access points along the Upper St. Croix River. Many are unmarked with little maintenance or enforcement. The National Park Service, Northern States Power Company, and the State of Minnesota have arrived at the following agreements:

1. A large number of the access points should be eliminated to control the distribution of watercraft on the river and consolidate maintenance and enforcement efforts.
2. Access points that remain open will be maintained, enforced, and improved by the National Park Service, except when an access is within a State Park. The access will be maintained and improved by that State Park.
3. The State of Minnesota will perform the work of eliminating access points. Other access points will be converted into primitive hiking camps and their roads utilized as service trails.

Access facilities will include garbage receptacles, a pair of single-pit toilets and a parking area located outside the maximum preservation zone. Specific design for an access will depend on type of usage (boat or canoe). Refer to schematics pages 185 and 186.

It is recommended that motor boating on the St. Croix be prohibited north of the Snake River. Presently, little fishing takes place north of the Highway 70 bridge.

ACCESS POINTS TO BE RETAINED

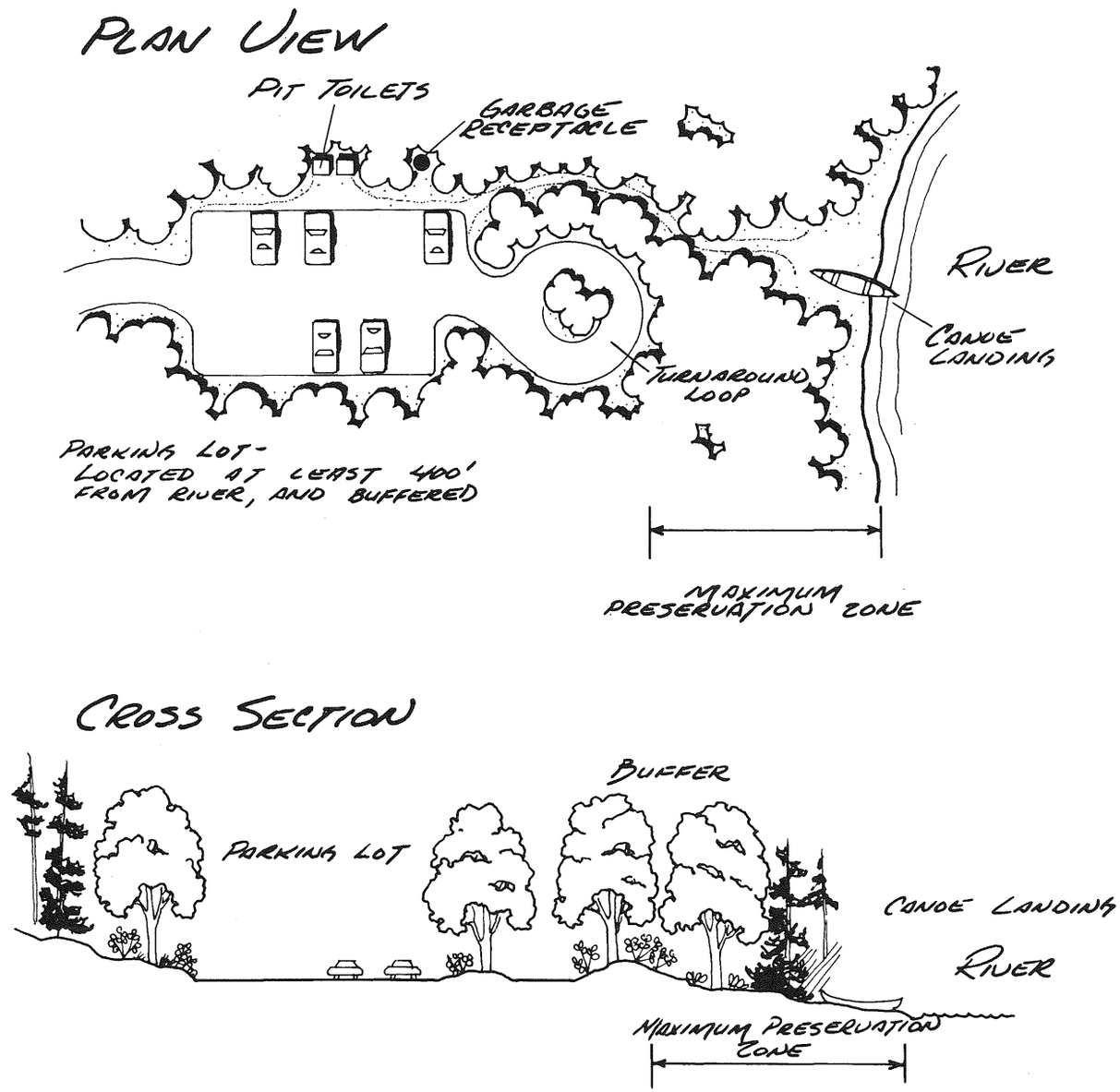
The following access points should be retained and improved. Most have historical significance or receive heavy use at present.

St. Croix State Forest

TOWNSHIP 41 NORTH, RANGE 17 WEST, SECTION 26

Proposed combination information center and canoe launch at Highway 48 bridge. Estimated cost of development already covered by information

Canoe Landing



center.

St. Croix State Park

TOWNSHIP 40 NORTH, RANGE 17 WEST, SECTION 1

Canoe launch and campsite at Yellow Banks on the St. Croix River. Estimated cost - $2,000.

TOWNSHIP 40 NORTH, RANGE 18 WEST, SECTION 19

Canoe launch to serve as the major public access for St. Croix State Park. Estimated cost - $4,000.

TOWNSHIP 40 NORTH, RANGE 19 WEST, SECTION 34

Canoe launch at Head of the Rapids on the St. Croix River. This is the last access point before seven miles of rapids. Estimated cost - $2,000.

TOWNSHIP 40 NORTH, RANGE 19 WEST, SECTION 24

Canoe launch near Maple Island. Estimated cost - $5,000.

Chengwatana State Forest

TOWNSHIP 39 NORTH, RANGE 19 WEST, SECTION 31

Boat access will be adjacent to the proposed family campground next to the Snake River. Improvement of access to be made by National

Park Service.

TOWNSHIP 37 NORTH, RANGE 20 WEST, SECTION 19

Semi-private access to be converted to public boat access and contact station. Improvement of access and development of contact station to be made by National Park Service.

St. Croix Wild River State Park

TOWNSHIP 36 NORTH, RANGE 20 WEST, SECTION 32

Boat access directly accessible from Town of Sunrise. Estimated cost - $2,000.

TOWNSHIP 35 NORTH, RANGE 19 WEST, SECTION 16

Boat access to serve as the major public access for Wild River State Park. Estimated cost - $7,500.

ACCESS POINTS TO BE ELIMINATED OR CONVERTED

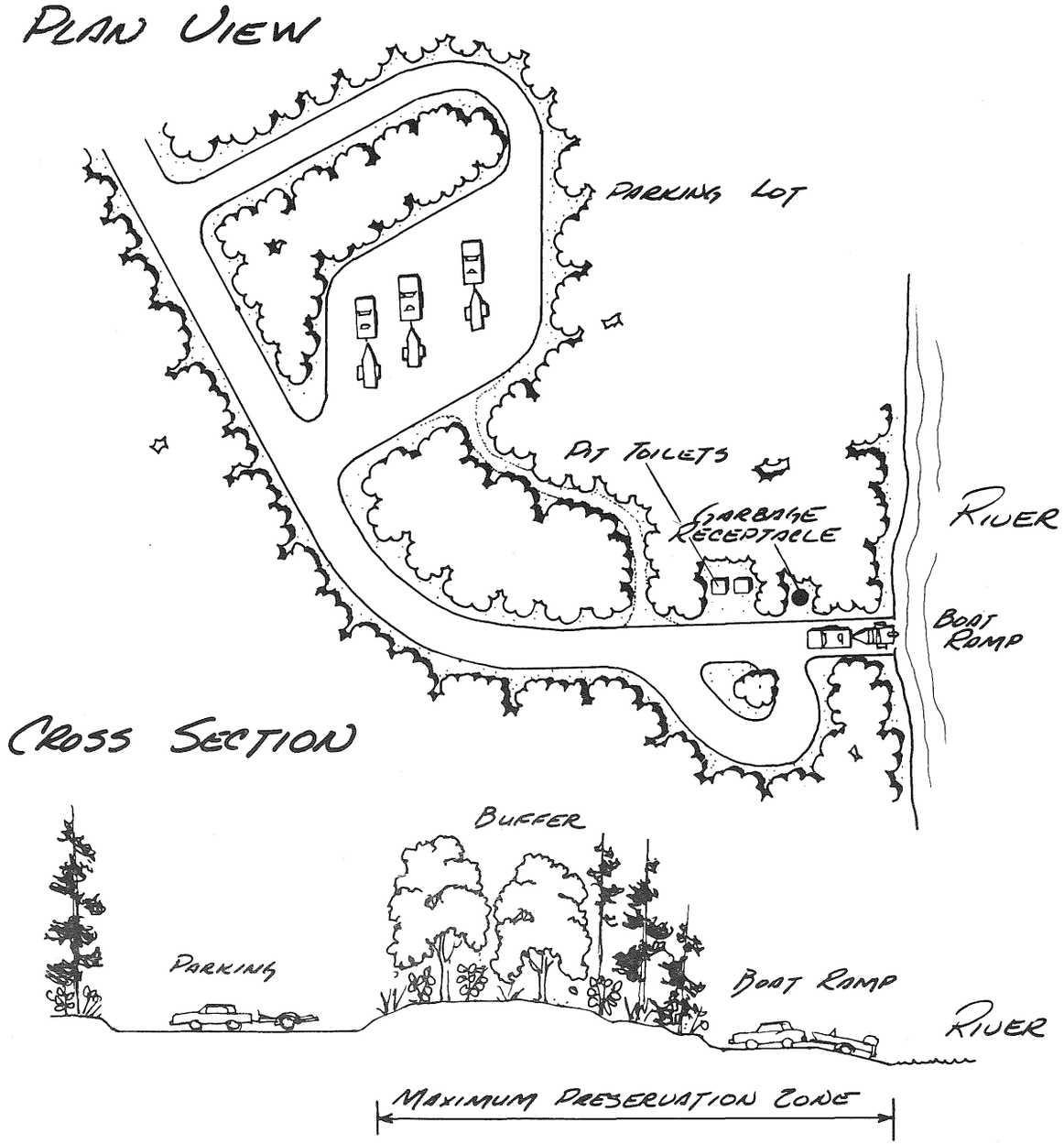
The following are access points that should be eliminated or converted to primitive hiking campsites:

St. Croix State Forest

TOWNSHIP 41 NORTH, RANGE 16 WEST, SECTION 1 - To be eliminated.

TOWNSHIP 41 NORTH, RANGE 16 WEST, SECTION 21 - To be eliminated.

Boat Landing



TOWNSHIP 41 NORTH, RANGE 16 WEST, SECTION 18 - To remain as private access only.

St. Croix State Park

TOWNSHIP 41 NORTH, RANGE 17 WEST, SECTION 32 - To be used by St. John's Group Camp only.

TOWNSHIP 40 NORTH, RANGE 18 WEST, SECTION 14 - To be eliminated and used for walk-in, day-use only.

Chengwatana State Forest

TOWNSHIP 38 NORTH, RANGE 20 WEST, SECTION 24 - To be eliminated.

TOWNSHIP 38 NORTH, RANGE 20 WEST, SECTION 26 - To be converted to primitive hiking camp

TOWNSHIP 38 NORTH, RANGE 20 WEST, SECTION 33 - To be converted to primitive hiking camp.

TOWNSHIP 38 NORTH, RANGE 20 WEST, SECTION 5 - To be eliminated.

TOWNSHIP 37 NORTH, RANGE 20 WEST, SECTION 5, To remain as private access only.

TOWNSHIP 37 NORTH, RANGE 20 WEST, SECTION 8 - To be eliminated and used for walk-in, day-use only.

TOWNSHIP 37 NORTH, RANGE 20 WEST, SECTION 17 - To be eliminated.

TOWNSHIP 36 NORTH, RANGE 20 WEST, SECTION 6 - To remain as private access only.

St. Croix Wild River State Park

TOWNSHIP 35 NORTH, RANGE 19 WEST, SECTION 9 - Nevers Dam Access to be eliminated and used for walk-in picnicking only.

TOWNSHIP 35 NORTH, RANGE 19 WEST, SECTION 22 - Access road to Dry Creek already closed off by N.S.P.

TOWNSHIP 35 NORTH, RANGE 19, SECTION 27 - To be eliminated and used for walk-in, day-use only.

TOWNSHIP 35 NORTH, RANGE 19 WEST, SECTION 2 - To be eliminated and converted to primitive hiking camp.

In order to close these accesses, a type of structural gate or fence may be needed. However, when possible, vegetative plantings and earth features should be used to provide a natural look. Those accesses converted to primitive camps will be closed off. A gate will provide access only to maintenance crews. Estimated cost for closing of accesses - $28,000.

Related Facilities

Bridges

At present, no bridges are necessary except those for the proposed trail system. Therefore, this section will deal with trail crossings and estimated costs of construction. (See sketches)

To evaluate the type of bridges needed and to arrive at cost estimates, several structures will be examined. Each bridge crossing will be designed relative to the particular trail and water body being traversed. In most cases, the Multi-Purpose trail and the Hiking, Cross-country Ski and Snowshoe Trail will cross at the same location at major streams and rivers thereby reducing construction costs and consolidating maintenance operations.

Following is a brief description of the two categories of water crossings and their typical bridges:

SMALL STREAMS AND CREEKS

Hiking, Cross-country Ski and Snowshoe Trail

This type of bridge will be primitive in character and structurally designed for hiking, cross-country skiing and snowshoeing only. Specific design will depend on environmental and physical features of the site. For example, a simple split log bridge could be used constructed from trees located on the site. (See adjacent sketch)

Multi-Purpose Trail

Bridge design for this type of use will require substantial, structural composition to support both horses and snowmobiles. General character of this crossing should remain as esthetically pleasing as possible with an organic design. Recommended is a wood bridge, 10-feet wide. (See sketch on page 189)

Bridges to be Constructed

The following is a list of small stream and creek crossings and the style of bridge proposed.

St. Croix State Forest

Simple Foot Bridge

Lower Tamarack River

Township 41 North, Range 16 West, Section 18

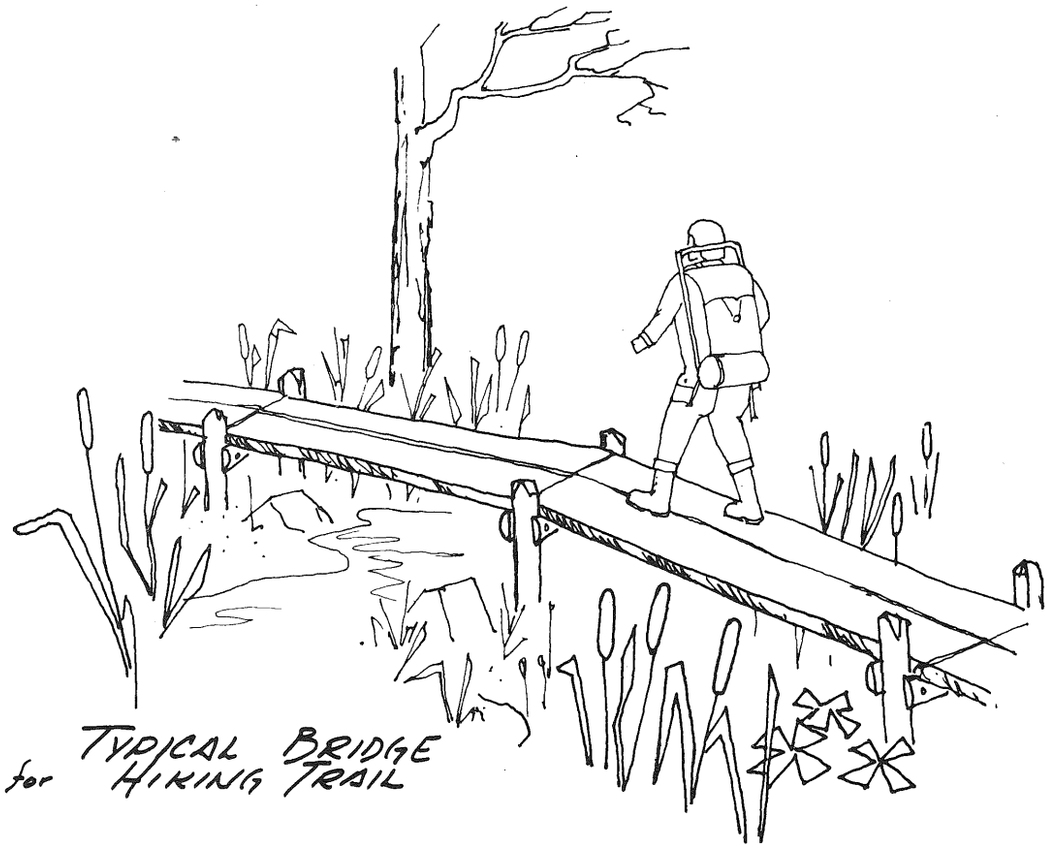
Township 41 North, Range 16 West, Section 5

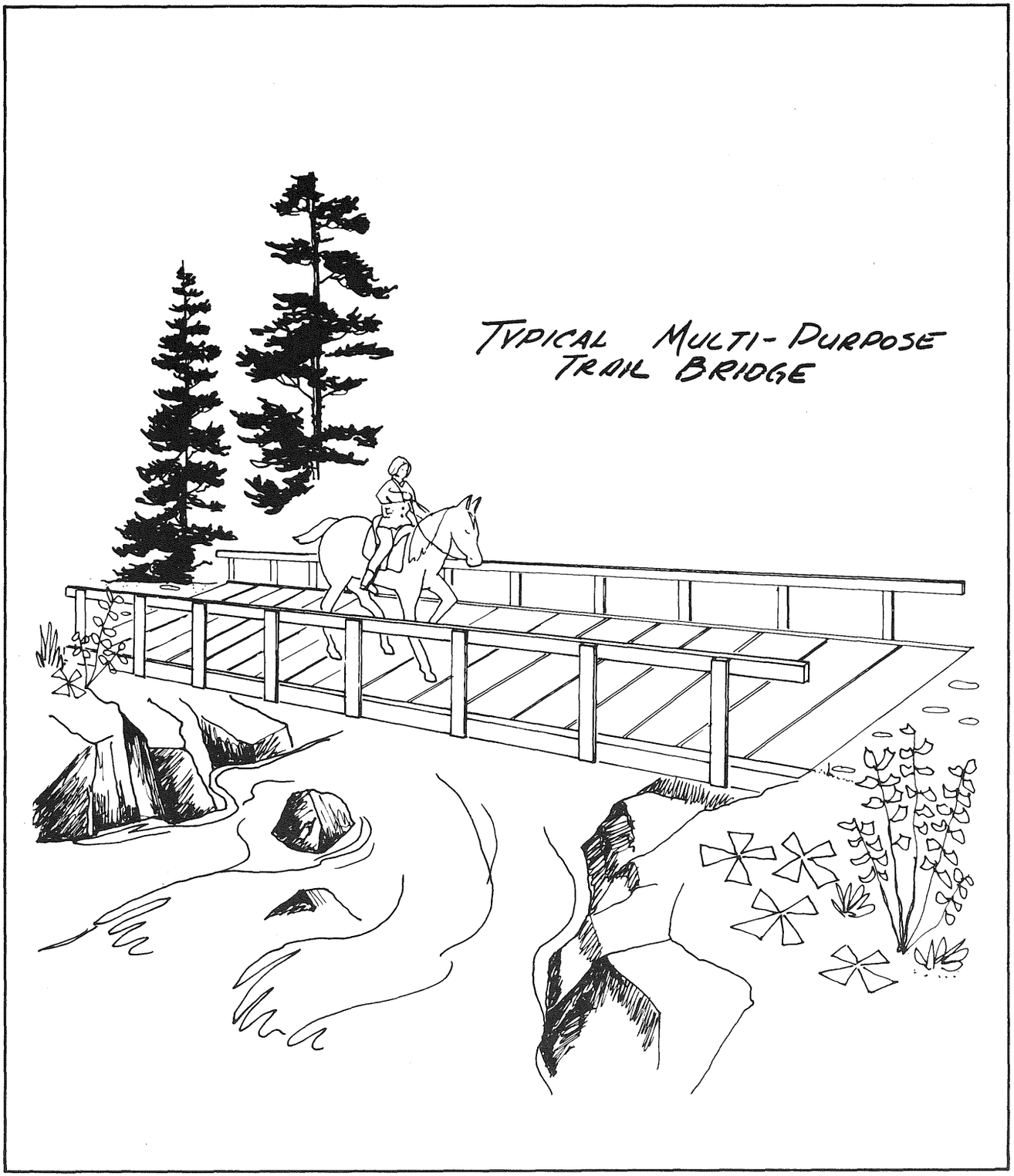
Township 41 North, Range 16 West, Section 31

Township 42 North, Range 17 West, Section 19

Albrechts Meekers Creek

Township 42 North, Range 16 West, Section 33





McDermott Creek

Township 42 North, Range 17 West, Section 27

Crystal Creek

Township 41 North, Range 16 West, Section 10

Multiple Purpose Bridge

Lower Tamarack River

Township 42, Range 17 West, Section 27

Trout Brook

Township 42 North, Range 16 West, Section 35

Sengeta Creek

Township 41 North, Range 16 West, Section 17

Bangs Brook

Township 41 North, Range 17 West, Section 14

St. Croix State Park

Simple Foot Bridge

Crooked Creek

Township 41 North, Range 17 West, Section 32

Bear Creek

Township 40 North, Range 19 West, Section 35

Temporary Creek

Township 40 North, Range 19 West, Section 24

Township 41 North, Range 20 West, Section 35

Multiple Purpose Bridge
Willow Brooks

Township 41 North, Range 18 West, Section 26

Chengwatana State Forest

Simple Foot Bridge

Cedar Creek

Township 40 North, Range 20 West, Section 14

Temporary Creek

Township 39 North, Range 19 West, Section 8

Township 39 North, Range 19 West, Section 17

Redhorse Creek

Township 39 North, Range 19 West, Section 19

Township 39 North, Range 19 West, Section 30

Township 39 North, Range 19 West, Section 30

Temporary Stream

Township 37 North, Range 20 West, Section 5

Rock Creek

Township 37 North, Range 20 West, Section 8

Multiple Purpose Bridge

Temporary Creek

Township 39 North, Range 19 West, Section 8

Township 38 North, Range 19 West, Section 7

Township 38 North, Range 20 West, Section 26

Stevens Creek

Township 38 North, Range 20 West, Section 33

Township 37 North, Range 20 West, Section 4

Temporary Stream

Township 37 North, Range 20 West, Section 17

Township 36 North, Range 20 West, Section 6

Rush Creek

Township 37 North, Range 20 West, Section 31

St. Croix Wild River State Park

Simple Foot Bridge

Goose Creek

Township 36 North, Range 21 West, Section 30

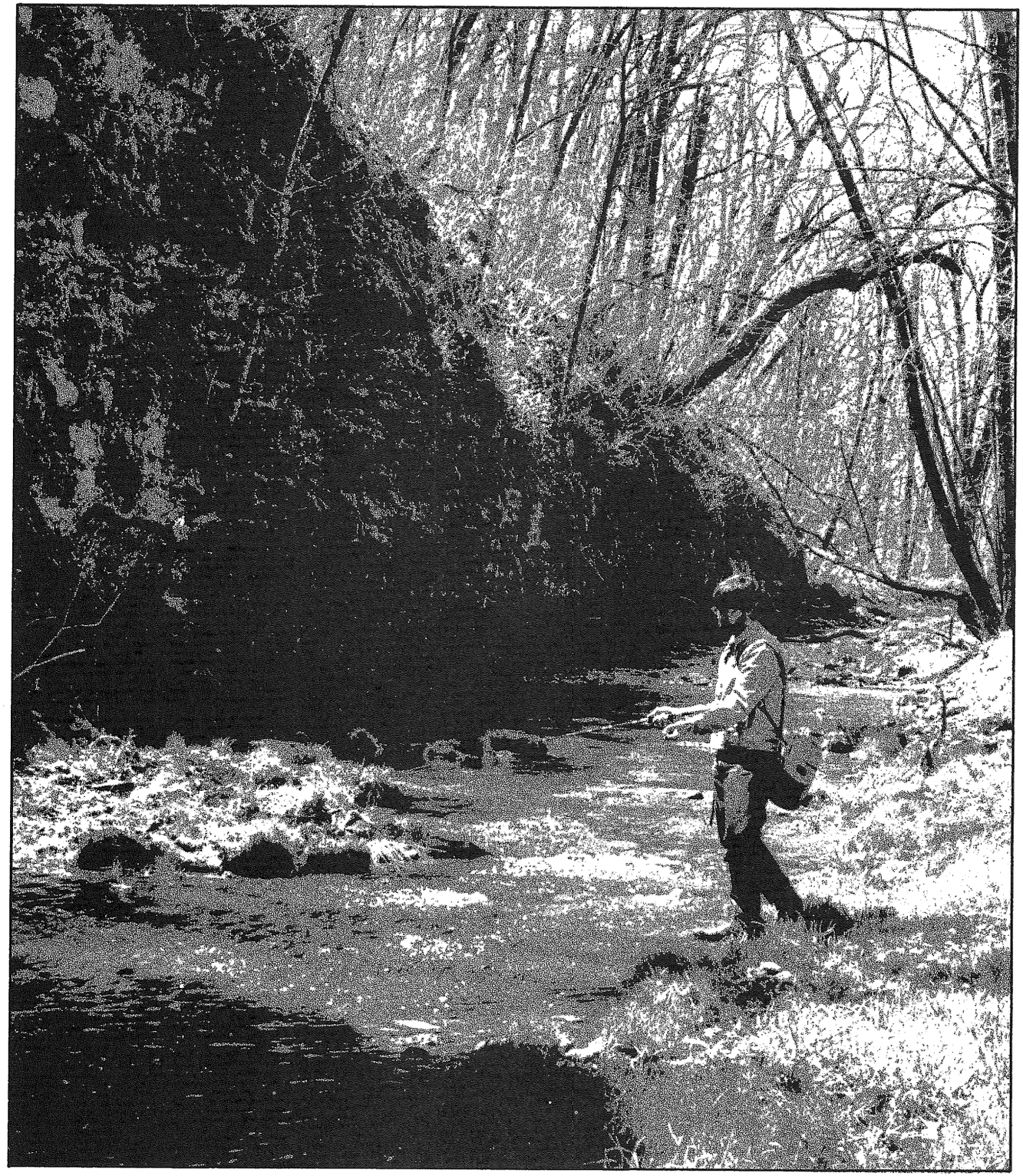
Township 36 North, Range 20 West, Section 30

Temporary Stream

Township 35 North, Range 19 West, Section 16

Dry Creek

Township 35, Range 19 West, Section 16



Township 35 North, Range 19 West, Section 2

Deer Creek

Township 35 North, Range 19 West, Section 21

Multiple Purpose Bridge

Goose Creek

Township 36 North, Range 21 West, Section 13

Sunrise River

Township 36 North, Range 20 West, Section 32

Temporary Stream

Township 36 North, Range 19 West, Section 31

Dry Creek

Township 35, Range 19 West, Section 17

Total Cost of bridge construction over small streams and creeks is: $148,500.

MAJOR RIVER CROSSINGS

Only two major river crossings are proposed. These two crossings are on the Kettle River and the Snake River. In both cases, the Multi-Purpose Trail and the Hiking, Cross-country Ski and Snowshoe Trail will cross at the same location.

Kettle River Crossing

The Kettle River will be crossed at the Highway 48 bridge. The side of the highway bridge should be extended an additional 10-feet for the trail crossing. This would eliminate an extra bridge crossing on the Kettle River, thus preserving its esthetic and primitive character. Estimated cost - $125,000.

Snake River Crossing

This crossing will demand more extensive development, possibly spanning the river 100-150 feet, depending upon the exact location. The site will be determined in the field following further investigation. Design could possibly be an arch bridge, which would reduce the degree of obtrusion the bridge would have on the river. Estimated cost - $175,000.

Signing

This recreation plan requires an extensive information and interpretive signing program. Sign types and quantity are unknown at present. However, signing will be needed for many recreational activities and facilities including historical sites, roads, trails, campgrounds, information centers, etc. Because of many unknown factors, only a rough cost estimate could be made -- $150,000.

Roads

Only a few recommendations have been made regarding roads and motor vehicle circulation. They include:

Major Circulation Route to Wild River State Park

The major circulation route to the entrance of Wild River State Park should be Trunk Highway 95, leaving Interstate Highway 35 North, and heading to the City of Almelund. Just before Almelund, a new section of highway is proposed that will carry traffic to County State Aid Highway 12 leading directly to the park entrance. This primary route into the park will be signed and upgraded in quality. Refer to map, page 195.

New Alignment for County State Aid Highway 16

It is recommended that County State Aid Highway 16 be realigned, moving the highway away from the scenic corridor of the St. Croix River. This would improve the esthetics along the river and reduce maintenance and enforcement problems. This change would allow the Multi-Purpose Trail to utilize the old road alignment. Refer to map, page 194.

Proposed Park Roads for Wild River State Park

This particular area has been investigated further and specific roads proposed. The circulation pattern will include a controlled access and take advantage of some existing roads. Design for these roads should preserve the natural setting, respect ecological processes, and insure the user of an esthetically pleasing roadway. Refer to Development Plan, St. Croix Wild River State Park. Estimated cost - $100,000.

Buildings

In addition to recreation facilities, other buildings will be needed for the recently established park. They include a new park manager's residence, assistant park manager's residence, maintenance shops and garages, and control station. Estimated cost - $150,000.

Conservation Training Camp

The Youth Correction Camp in St. Croix State Forest, TOWNSHIP 42 NORTH, RANGE 17 WEST, SECTION 28, should be converted to a training center for Department of Natural Resources employees. The camp is now closed and available. It is in extremely good condition and its location in the State Forest and close proximity to St. Croix State Park make it especially suitable as a training grounds for conservation projects.

Summary of Recreation Management Plan

This recreation plan is the first phase in the comprehensive management of the Upper St. Croix River. Hopefully, the future will bring more monies to finance design and construction of proposed facilities.

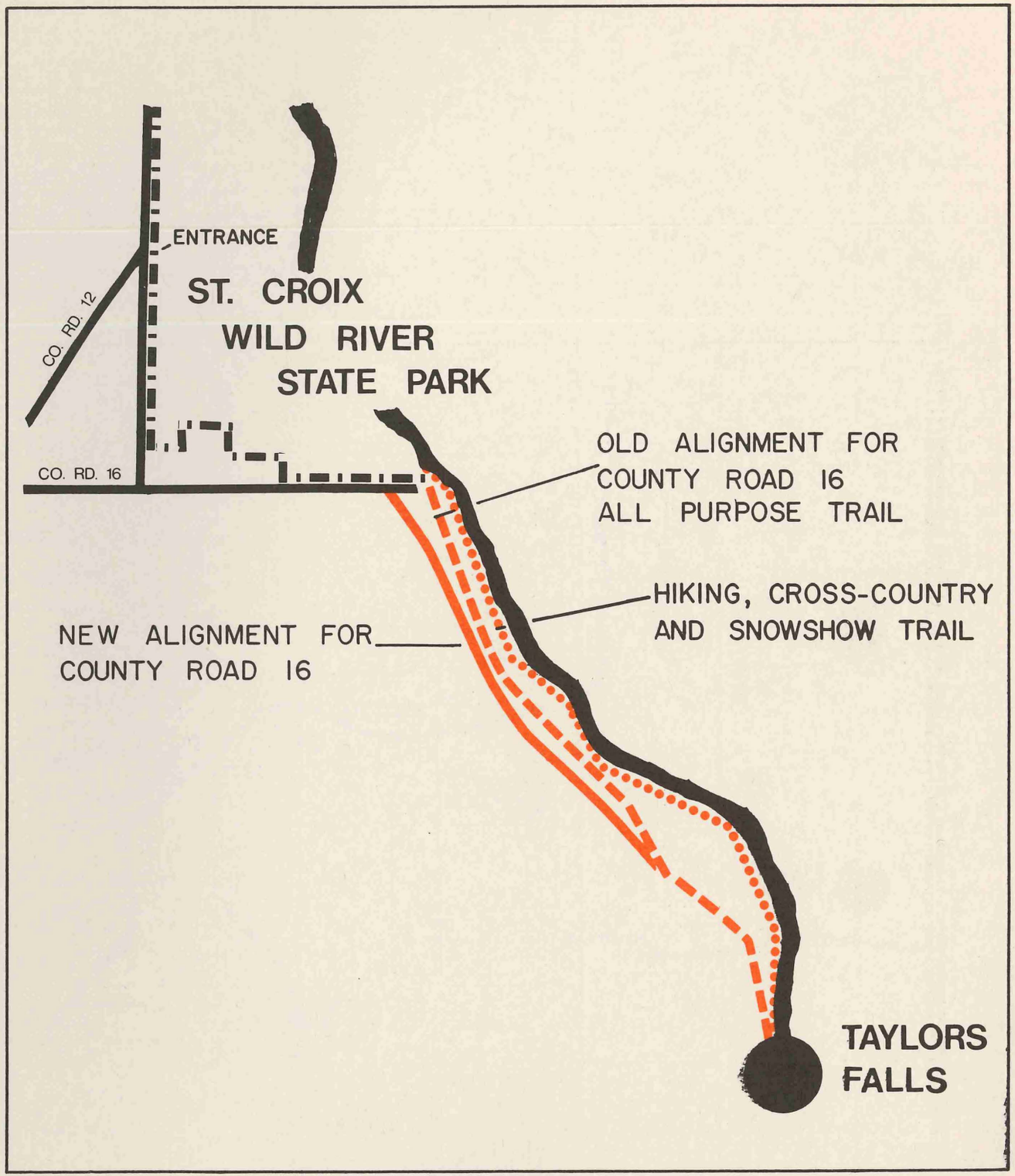
It must be remembered that this management plan can be altered as future investigations and needs dictate.

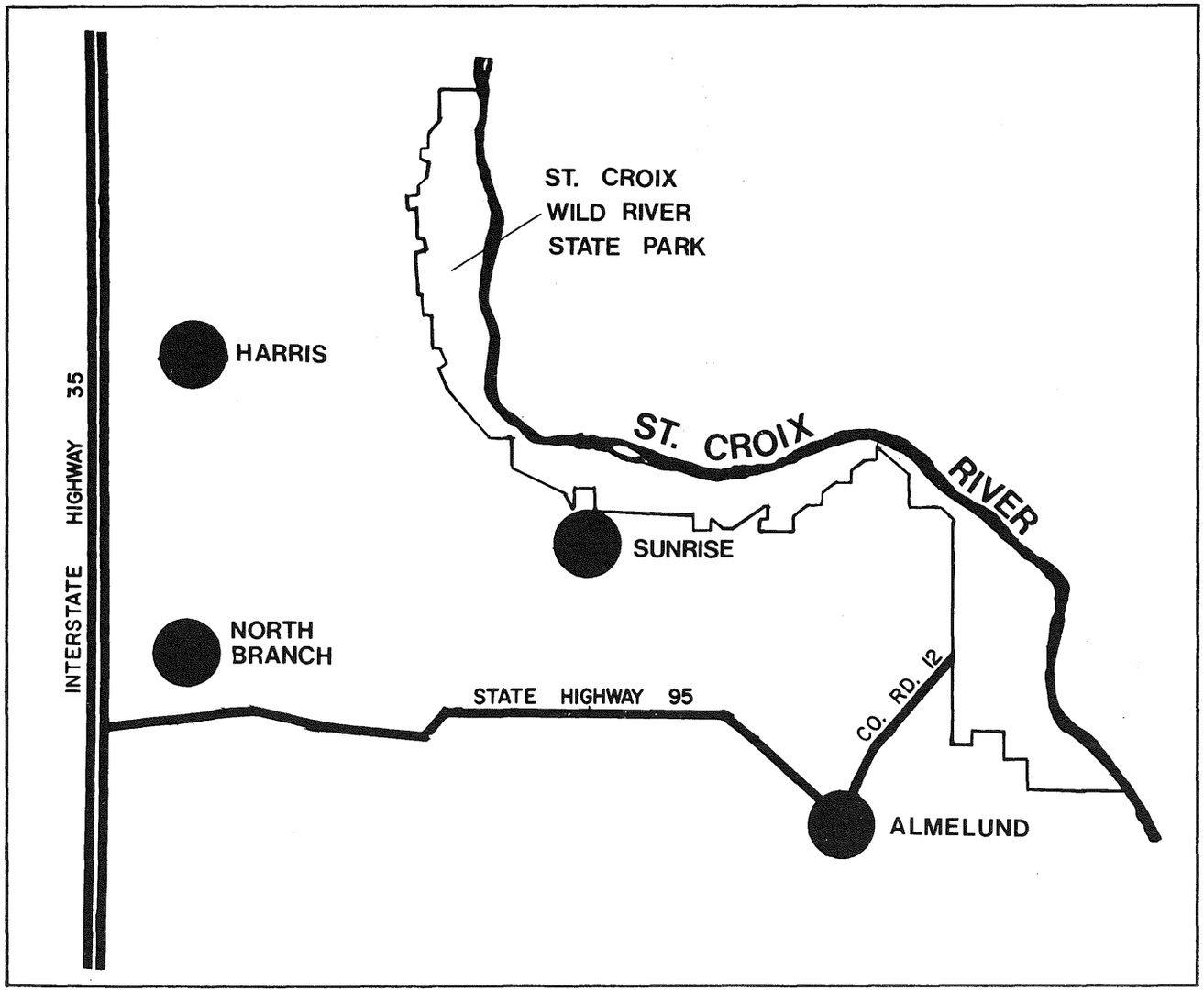
Estimated Total Cost for Recreation Facility Development

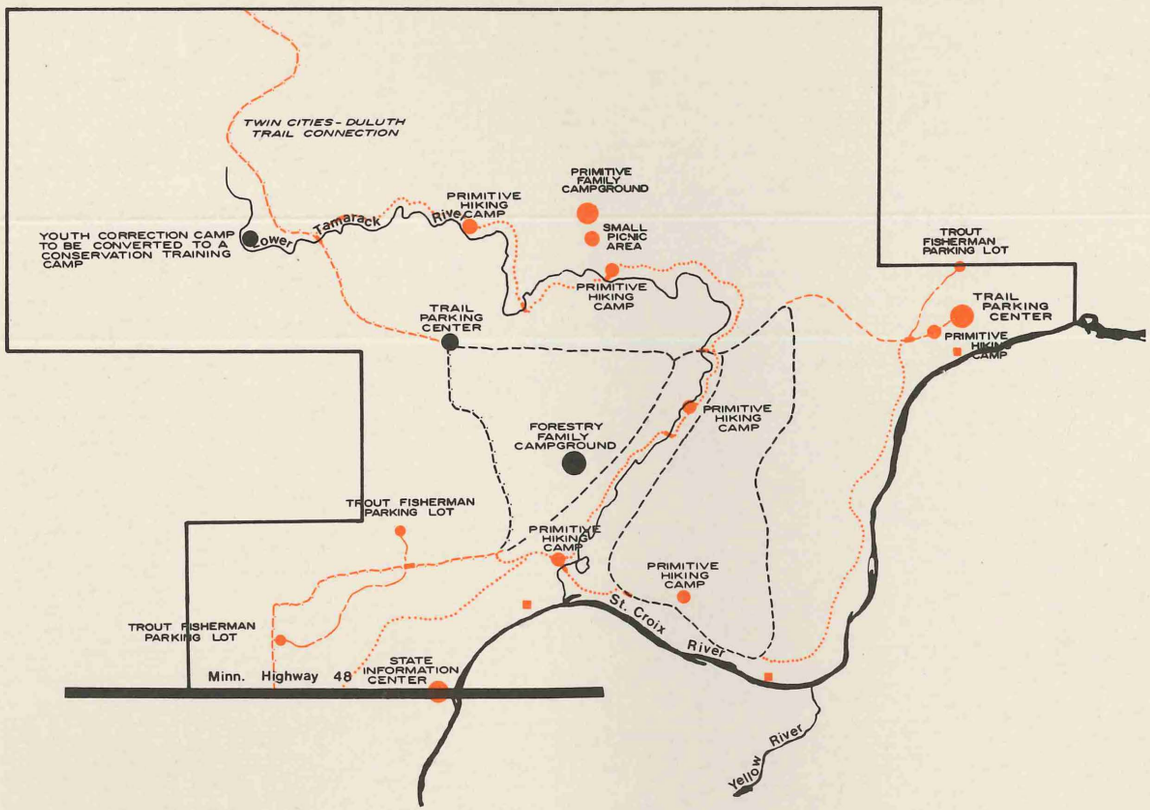
In addition to development costs, consideration should be given to the increase in personnel needed to maintain the proposed recreational facilities. St. Croix Wild River State Park will need a staff consisting of a park manager, assistant park manager, secretary, two laborers and a naturalist.

St. Croix State Park, already well staffed, will need more personnel to assist in the increased maintenance of recreational facilities along the St. Croix River. Estimated cost for this increase in personnel is unknown and can only be determined as demand justifies, and use of the area and facilities increases.

Recreation Facilities	Cost
Campgrounds	
Family Campgrounds	$ 310,000
Primitive Campsites	$ 101,400
Picnic Areas	$ 102,000
Recreational Trails	$ 378,500
Trail Centers	$ 275,000
Trail Parking Areas	$ 42,000
Nature Trails	$ 100,000
Information Centers	$ 85,000
River Accesses	$ 50,500
TOTAL COST -	$1,444,400
Related Facilities	
Bridges	$ 448,500
Signing	$ 150,000
Roads	$ 100,000
TOTAL COST -	$ 698,500
TOTAL COST OF ALL DEVELOPMENT -	$2,142,900


ENTRANCE
ST. CROIX
WILD RIVER
STATE PARK
CO. RD. 12
CO. RD. 16
OLD ALIGNMENT FOR
COUNTY ROAD 16
ALL PURPOSE TRAIL
HIKING, CROSS-COUNTRY
AND SNOWSHOW TRAIL
NEW ALIGNMENT FOR
COUNTY ROAD 16
TAYLORS
FALLS


ST. CROIX
WILD RIVER
STATE PARK
HARRIS
ST. CROIX
RIVER
SUNRISE
INTERSTATE HIGHWAY 35
NORTH
BRANCH
STATE HIGHWAY 95
CO. RD. 12
ALMELUND



St. Croix State Forest

RECREATION

Legend

Existing Proposed

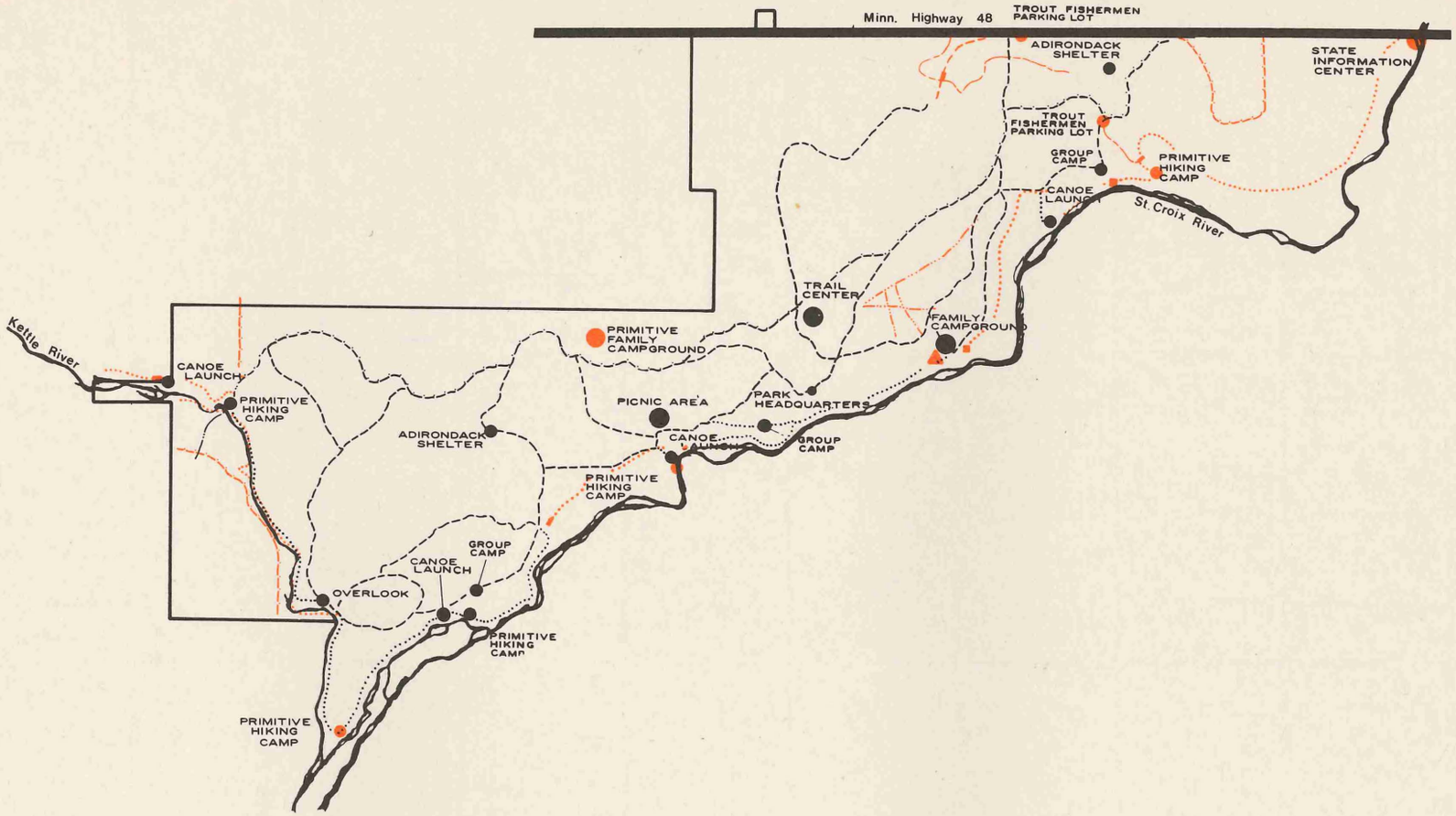
- Recreation Facility
- Multiple Use Trail
- Snowmobile Trail
- Hiking, Cross-Country Ski And Snowshoe Trail
- Trout Fisherman Trail
- Twin City-Duluth All Purpose Trail
- Bridge
- Road

Facilities To Be Eliminated

- Boat Access
- Picnic Area
- Trails

0 1 2 3

NORTH



St. Croix State Park

RECREATION

Legend

Existing Proposed

- Recreation Facility
- Multiple Use Trail
- Snowmobile Trail
- Hiking, Cross-Country Ski And Snowshoe Trail
- Trout Fisherman Trail
- Twin City-Duluth All Purpose Trail
- Bridge
- Road

Facilities To Be Eliminated

- Boat Access
- Picnic Area
- Trails

0 1 2 3

NORTH

Chengwatana State Forest

RECREATION

Legend

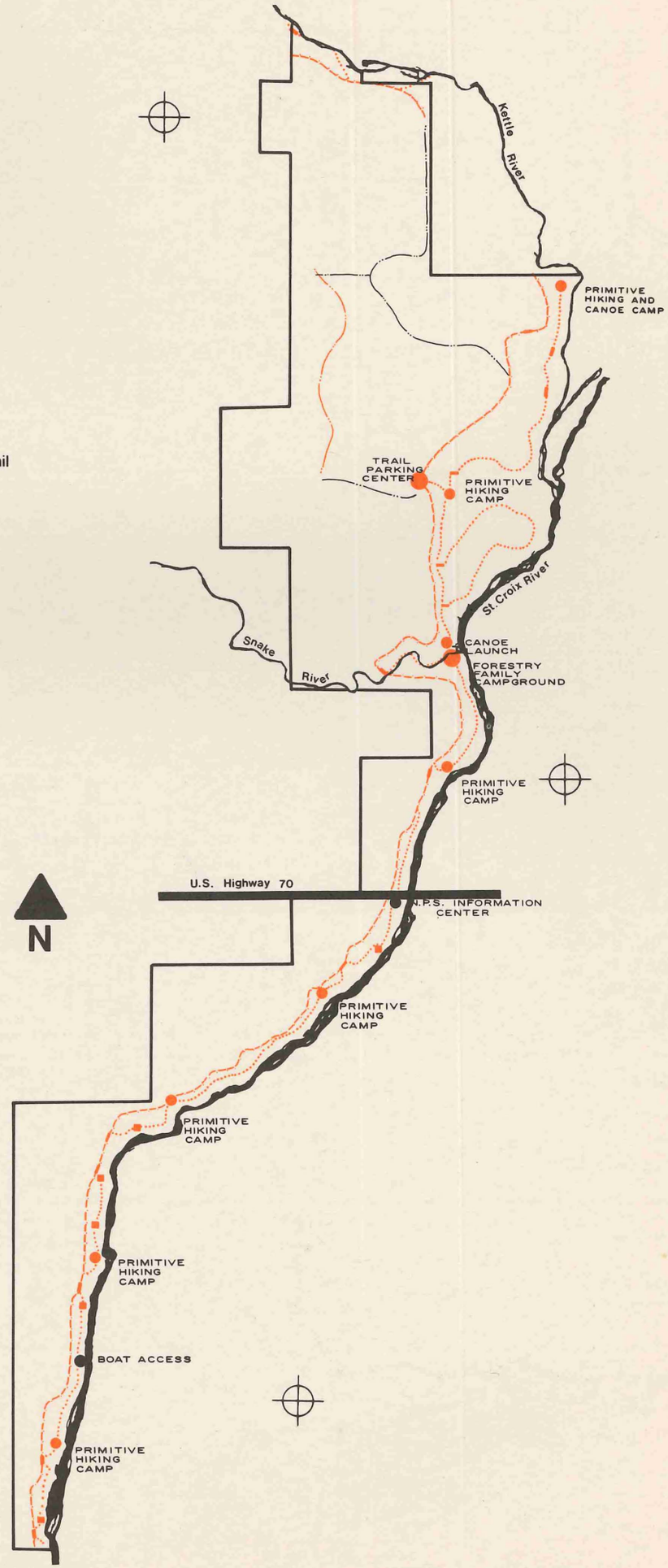
Existing Proposed

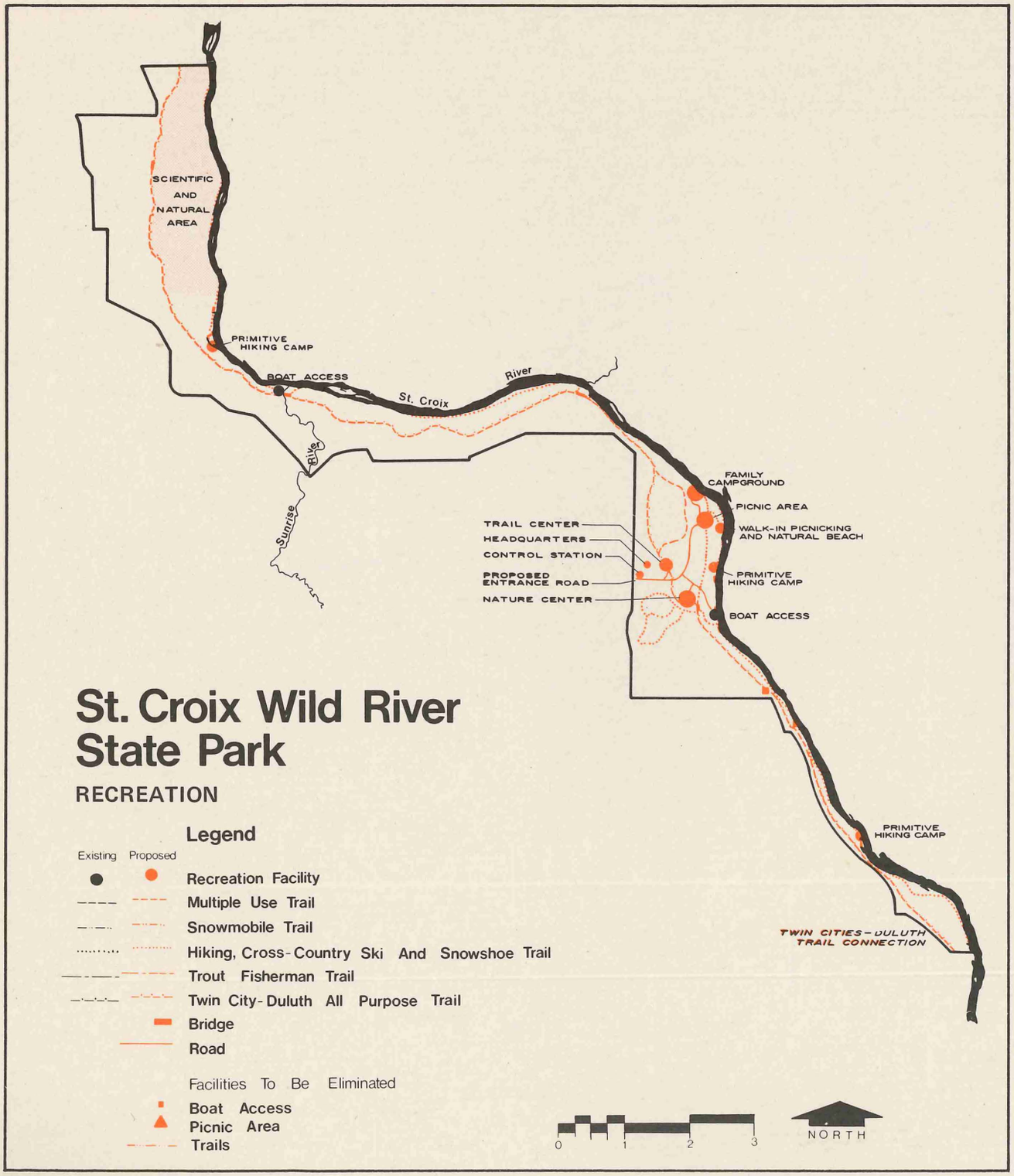
- Recreation Facility
- Multiple Use Trail
- Snowmobile Trail
- Hiking, Cross-Country Ski And Snowshoe Trail
- Trout Fisherman Trail
- Twin City-Duluth All Purpose Trail
- Bridge
- Road

Facilities To Be Eliminated

- Boat Access
- Picnic Area
- Trails

0 1 2 3




SCIENTIFIC AND NATURAL AREA
PRIMITIVE HIKING CAMP
BOAT ACCESS
St. Croix River
Sunrise River
FAMILY CAMPGROUND
PICNIC AREA
WALK-IN PICNICKING AND NATURAL BEACH
TRAIL CENTER
HEADQUARTERS
CONTROL STATION
PROPOSED ENTRANCE ROAD
NATURE CENTER
PRIMITIVE HIKING CAMP
BOAT ACCESS
PRIMITIVE HIKING CAMP
TWIN CITIES-DULUTH TRAIL CONNECTION
St. Croix Wild River State Park
RECREATION
Legend
Existing
Proposed
Recreation Facility
Multiple Use Trail
Snowmobile Trail
Hiking, Cross-Country Ski And Snowshoe Trail
Trout Fisherman Trail
Twin City-Duluth All Purpose Trail
Bridge
Road
Facilities To Be Eliminated
Boat Access
Picnic Area
Trails
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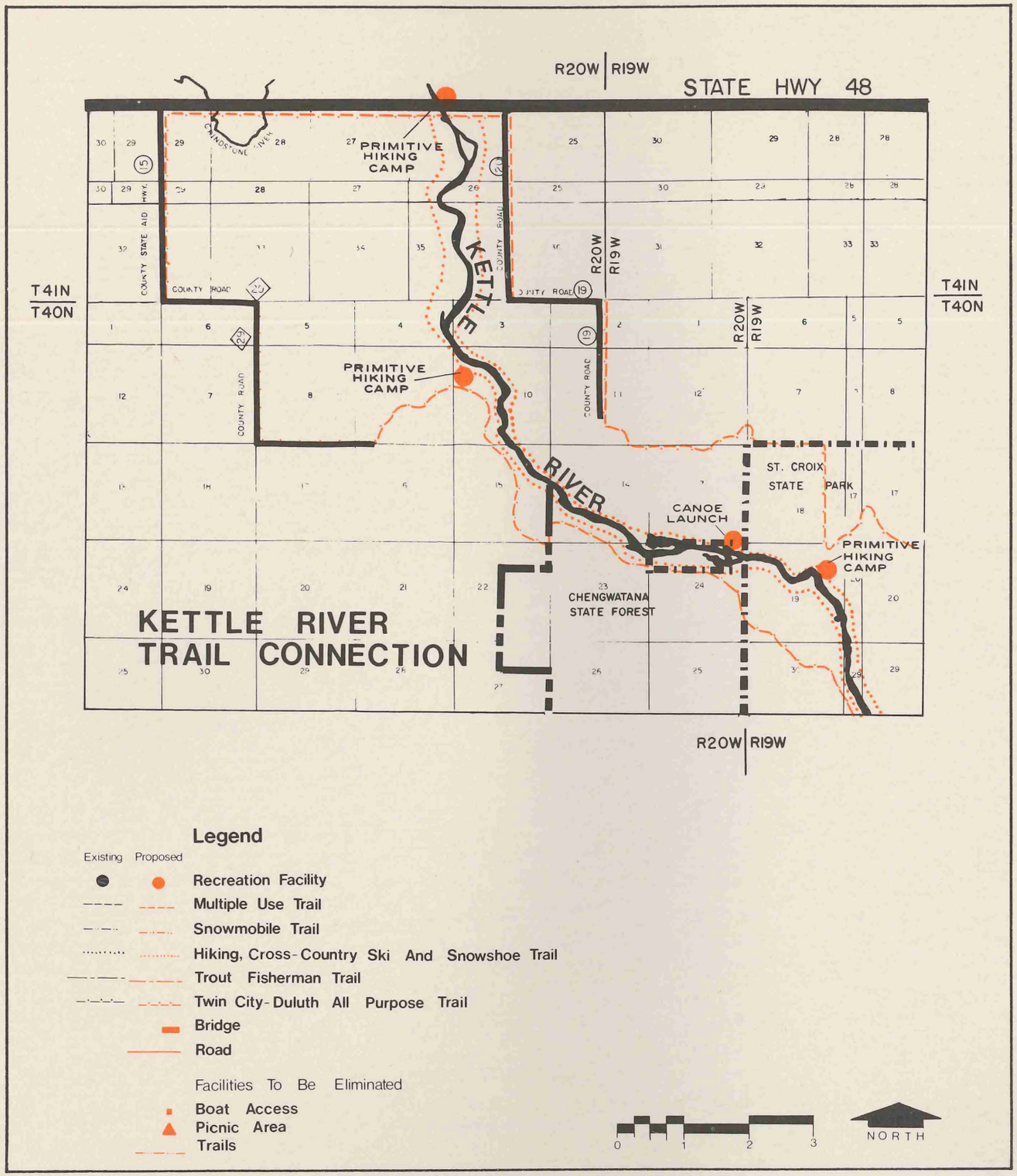
NORTH


R20W | R19W
STATE HWY 48
PRIMITIVE HIKING CAMP
KETTLE
RIVER
COUNTY STATE AID HWY.
COUNTY ROAD
T41N
T40N
PRIMITIVE HIKING CAMP
ST. CROIX STATE PARK
CANOE LAUNCH
PRIMITIVE HIKING CAMP
CHENGWATANA STATE FOREST
KETTLE RIVER TRAIL CONNECTION
R20W | R19W
Legend
Existing
Proposed
Recreation Facility
Multiple Use Trail
Snowmobile Trail
Hiking, Cross-Country Ski And Snowshoe Trail
Trout Fisherman Trail
Twin City-Duluth All Purpose Trail
Bridge
Road
Facilities To Be Eliminated
Boat Access
Picnic Area
Trails
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NORTH

Forest Management Plan

INTRODUCTION

The objective of this forest management plan is to coordinate sustained forest management programs with other multiple use activities.

Within a timber management program, most multiple use activities can be placed into three general categories: Watershed, Wildlife, and Recreation. As recreational demands continue to increase on public lands, careful long-range planning becomes necessary in order to reduce the frequency of conflicting uses and programs. The philosophy "Highest and Best Use" is the main consideration given when planning future forestry, watershed, wildlife, and recreation activities.

Statutory Units of public land considered in this plan are: St. Croix State Forest, Chengwatana State Forest, St. Croix State Park, and St. Croix Wild River State Park. Within each unit the highest and best use zone will be established. These zones will be used to regulate the intensity of forest management as well as intensity of other multiple use programs.

Three Management Units have been established made up of the following land use zones, refer to Zoning section page 125.

UNIT I Developed Recreation Zone
Historic Cultural Zone
Fish Wildlife Zone
Primitive Zone
Scientific & Natural Zone

Definition

This unit includes areas which are designated by legislative bodies, the Department of Natural Resources or the Division of Lands and Forestry for specific purposes or management which limits or modifies usual multiple use objectives.

Management Objective

Management objective must be consistent with purposes and goals of the area. Where latitude is allowed within the framework of the unit, the objective shall include multiple use practices consistent with the resources of the area.

UNIT II Scenic Preservation Zone

Definition

Scenic Preservation Zone is an area which can be observed from selected public roads, developed trails, recreational facilities, lakes, streams, etc. This zone may extend for a few feet to a considerable distance. One of the main factors influencing the width of this zone is the topographic features. A hillside can be observed from a considerable distance, consequently the zone must be extended. In level topography, this zone may be quite narrow. The zone will also be extended when a site disturbance exposes the background. No attempt will be made to define an exact width in these guidelines. This decision will have to be made when site disturbance plans are formulated.

Management Objective

The foremost objective of management in this unit will be the preservation or enhancement of esthetic qualities. This by no means implies that

management activities should be avoided. In fact, esthetic qualities can often be improved by planned site disturbances. It will be the District Forester's responsibility to plan and conduct site disturbances on state land. This, where possible, should be done in cooperation with other land management agencies to enable long range planning for the improvement of esthetics.

This management unit also includes water areas in the district. The objective of management here will emphasize water protection as well as esthetic qualities. Many of the guidelines to be presented will apply to water areas.

UNIT III Natural Resources Zone
(Dispersed Use)

Definition

Management Unit includes all lands on which the Division of Lands and Forestry will practice multiple use land management. It contains the greatest opportunities to improve watersheds, timber quantity and quality, wildlife habitat and to meet dispersed recreational needs. It generally includes lands not classified in Unit II, Outstanding Natural and Scenic Zone.

Management Objective

Principle objective is multiple use land management. This does not preclude the necessity of designating certain areas for specific uses such as recreation or game habitat. Examples are recreational trails and deer concentration areas.

GUIDELINES FOR CONTROL OF SITE DISTURBANCES

Timber Sales - Unit I

Sales may be conducted with special care when consistent with management objectives of the unit.

Timber Sales - Unit II

Timber harvesting activities are frequently viewed by the public and utmost care shall be exercised in their administration. Whenever feasible, specialized techniques and equipment shall be a part of the timber sale contract in order to fulfill the management objective. In certain instances stumpage price reduction can be made where excessive costs are imposed on the contractor. However, cost of this reduction should be weighed against other methods of completing the job. In some instances the cost of stumpage price reduction may exceed the cost of hiring the operation. Usual good forest management practices such as complete clearcutting should become standard practice on a sale and not be reflected in stumpage prices.

Timber Sale Landings

Landings are of prime consideration in this management unit. When possible they should be concealed from view. In unavoidable situations where it is necessary that forest products be loaded from a landing which is directly adjacent to a road, every possible attempt shall be made to make them esthetically pleasing. Detailed guidelines will be given in the General Management Zone Section.

Cutting Methods

Clearcuts, when necessary because of silvicultural requirements, should not be avoided. Special attention should be given to have them conform to general environmental characteristics. In general, good management techniques will be esthetically appealing. Clearcuts should be **complete** removing all merchantable timber and felling non-merchantable trees. Slash can be offensive when close to roads and other public areas and special treatment may be necessary. Methods will vary, but some suggestions are:

1. Lop and scatter slash close to the ground.
2. Pile and burn slash.
3. Prescribe burn.
4. Walk down slash with crawler tractor.
5. Use brush chopper or similar method for disposal.

Large clearcuts cause adverse public opinion. Discretion in planning sales or groups of sales to avoid or lessen the effect will be necessary. Clearcuts on opposite sides of the road should be avoided. Other guidelines will be given in the General Management Zone section.

Partial cuts and thinnings can lead to conditions unappealing to the eye. This is due, in part, to the timber types which are harvested by this method. In the view area, it is essential this condition be alleviated. Tops and large branches should be removed or lopped and scattered. Unmerchantable logs should be out of sight. Tops which are lodged in standing trees and felled trees leaning into other timber should be removed.

SPECIFIC TIMBER TYPE MANAGEMENT CONSIDERATIONS

Aspen-Birch

This type is usually managed on a clearcut basis. Screens are generally not recommended, but in special instances may be necessary. One technique which can be used is a foreground screen. A relatively narrow clearcut is made parallel to the road. When this has regenerated, through planting or natural means, the normal clearcutting can progress behind this foreground screen. This technique will require advance planning. The screen must be developed before the main stand reaches maturity.

Cedar

This type is particularly difficult to manage in this unit because of the reproduction problem. This type should be held past its economic or silvicultural rotation age. Esthetics and pathological guides will frequently have to be substituted. When this type is harvested, clearcuts should be used followed by treatment to improve esthetic qualities.

Bottomland and Northern Hardwoods

This is one of the most difficult types to manage. Partial cuts generally will be made. Care shall be taken to dispose of debris and unmerchantable wood. The area should not appear disturbed after harvesting. In this type, esthetic and pathological guides may be substituted for silvicultural guides.

Jack Pine

This type will be managed on a clearcut basis. Screens are a possibility but their use will depend on the age and general condition of the Jack Pine. A screen has little use if it will not stand until the type has regenerated and become visible in the background.

Norway and White Pine

This type is harvested by selective cuts. Esthetic and pathological guides should frequently be used in place of silvicultural guides.

Black Spruce

Clearcut management will be used. Generally, screens will not work because of windthrow. However, they can be useful where prevailing winds will not strike unprotected stands. Black spruce will usually stand long past its site index rotation age. This can be used to advantage in large, even-aged types. Cuttings can be spaced over a number of years to improve esthetics.

Spruce-Balsam

This type should be clearcut when possible to help eliminate problems associated with partial cuts. Screens can sometimes be useful though timber should be young enough so the screen will last until reproduction is obtained.

Tamarack

This type will be clearcut. Screens usually do not prove useful. Esthetic and pathological guides should be substituted for silvicultural guides where esthetics can be improved.

Timber Sales - Unit III

Landings are of particular importance in timber harvest operations. Roads and trails are invitations for public use. Laxly administered landings can create an objectional image to the total sale.

Landings should be kept as small as possible but still large enough for an efficient operation. The operator must plan for the best use of the available space. Where necessary, the timber sale contract should specify the landing location. Existing openings should be taken advantage of.

In creating a landing, all debris (slash, upturned roots, tipped trees) should be pushed to the center for disposal. Debris and refuse should not be in the landing area. All sales shall be inspected for this before closing.

Post sale treatment for landings will be considered. Can the landing be used for another purpose such as a forest/wildlife opening, recreational use, future landing site?

Logging Roads

The District Forester will be responsible for the design and location of roads. Debris resulting from road construction will be minimized. Merchantable timber will become part of the timber sale contract. Leaning trees and upturned roots should be removed or disposed of by other methods. Future site plans will be made

before each sale.

Timber Harvest Area

Considerations will be given to environmental aspects. Many of the esthetic guidelines which apply to sales within the Outstanding Natural and Scientific Zone will be effective within this unit.

Good forest management and utilization will reduce problems. Practices such as felling trees away from the sale boundaries, avoiding tipped trees, etc. should be instituted. Sales will frequently be viewed by the recreating public and they should leave with a favorable impression. Future plans and treatment, if necessary, are equally as important as the sale.

Forest Development - Unit I

Forest development will normally not be an activity in this zone.

Forest Development - Unit II

Land Clearing and Other Site Preparation

Land clearing for reforestation or game habitat should be handled with extreme care in this unit. Reserve areas should be maintained along water. Clearing at the edges of roads, trails, etc., should be designed so it does not visually open large areas.

Windrows are unsightly, and, if possible, should be burned. Methods such as brush choppers or crushers can be used in place of windrows. Windrows should be perpendicular to roads with openings every 300 to 500 feet. Clearings should not be created on opposite sides of roads and trails nor along road curves. The latter can make openings appear larger than they really are.

Other activities can improve esthetics. Furrowing adjacent to the road, if not properly conducted, can be unsightly. However, in many cover types and situations it can be effective and inconspicuous. If it appears that a site disturbance will be unsightly, it should be avoided or a substitute method found.

Release

Release activities will require care in this unit. Any activity which will kill trees and leave them standing can be esthetically harmful. Girdling will not be used and should be replaced with felling and appropriate slash disposal. Refer to the Forest Development Manual, Page C-1.6 for herbicide guidelines.

Forest Development - Unit III

See UNIT II - Outstanding Natural and Scientific Zone. The buffer areas, etc. need not be observed as closely in this unit as in the Outstanding Natural & Scientific Zone, UNIT II.

ESTHETIC IMPROVEMENT OF MAINTENANCE - ALL MANAGEMENT UNITS

Resource management practices must be consistent with soil capabilities and provide adequate erosion and pollution control. For example, if excessive soil damage will result from a site disturbance, it should be delayed until this damage can be minimized.

Disturbance shall be planned to benefit game when possible. All disturbance adjacent to water will consider fish habitat and adjustments made, when necessary, to protect it.

Drainage patterns should not be unduly disturbed. If disturbance cannot be avoided, patterns will be restored.

Public opinion may not agree with management practices, however, our management responsibilities may necessitate application. For example, herbicide application is controversial but adverse public opinion may be lessened by avoiding blueberry patches and roadside foliage. It may be possible to generate favorable opinion by noting increased game habitat from clearcutting, improved blueberry crops as a result of prescribed burning, etc.

LEASES - ALL MANAGEMENT UNITS

All leases should be fit into the general policy and requirements of the particular area. When leases are terminated, the sites should be restored as near as possible to original condition or adjustments made to maintain current environmental standards and regulations.

Where feasible, companies desiring utility leases should be encouraged to use combined strips of land. Utility companies should be encouraged to place power and telephone lines underground. County Planning and Zoning Ordinances and Shoreland Regulations will usually serve as basic

guidelines for recreational leases, with additional regulations to fit the specific site. A lease for some type of ground disturbance such as road and utility right-of-way, gravel pits, etc. should be issued only after special consideration has been given to watershed protection and management. On occupancy leases such as summer homesites and hunting sites, sewage disposal methods must meet statewide or county shoreland management regulations or county ordinances, whichever is more restrictive.

STATE PARKS

Parks by statute are in the specialized zone, their primary purpose being preservation of a natural environment for esthetic appreciation, recreation and education.

Although a forest unit may be governed under a complete preservation doctrine, this is no guarantee that parts of the forest eco-system will not deteriorate.

All tree species have optimum life cycles and different regeneration requirements. Primary species such as aspen and Jack Pine require full sunlight for regeneration, intermediate species such as oak and basswood can regenerate in partial shade, and climax species such as sugar maple can regenerate in a shaded overstory.

If natural regeneration of existing mature stands is desired, then site disturbances must be created. Two methods are recommended: prescribed burning and timber harvesting.

Although fire is natural, it has many disadvantages. Burning of over-mature types is next to impossible and even if a crown fire could be carried, it could not be controlled. Prescribed burns require exacting weather conditions. Ideal burn conditions do not occur often, thus a programmed schedule of site regeneration using fire is not a realistic one.

Timber harvesting, however, aside from introducing man-made disturbances, is easily planned, controlled, and results are predictable. If forest evolution is to be checked and new stands rejuvenated, then planned disturbances will be necessary.

The healthiest, most productive forest is one which has diversity and contains a wide variety of size classes, thus providing optimum habitat for wildlife.

Large, mature monotypes, although esthetically pleasing, are generally unproductive for wildlife and are prime targets for insect and disease epidemics.

St. Croix Wild River State Park

Two main forest types (upland hardwoods 46 percent and bottomland hardwoods 51 percent) are found in the park. The remaining 3 percent is conifer plantations.

In the upland hardwoods, oak predominates with varying mixtures of northern hardwoods. The bottomland hardwoods, primarily elm, ash, and soft maple, are evenly mixed on the lower sites. Both types are in the small sawtimber size class, and in good growing stage. These types will not show appreciable signs of deterioration for many years. Soils are generally sandy loam which are poor-medium sites for hardwoods in well-drained areas. Conifers will achieve medium-good site indexes on these soils. No cutting is recommended except to improve wildlife habitat where needed.

A reforestation program should be implemented on the unused open portions to improve esthetics, provide wildlife habitat, and to eventually screen unsightly objects from the river. Both tree and shrub arrangements should be considered.

Where firebreaks are needed, natural strips of hardwoods spaced between conifers provide excellent buffers. Access is another point that should be considered in order to provide adequate fire protection.

St. Croix State Park

The St. Croix State Park is 75 percent forested. Aspen (48 percent), bottomland hardwoods (25 percent), and Jack Pine (14 percent) accounted for 87 percent of the forested area. The remainder is comprised of Norway Pine, spruce, tamarack, northern hardwoods, oak and birch.

The general growth phases are: Aspen (mature), Jack Pine (mature), Bottomland hardwood (immature), and remaining species generally immature.

Both aspen and Jack Pine are mature and need regeneration. The aspen will degenerate first

St. Croix Wild River State Park
Forest Cover Type Data Sheet

I Forested Types	2 2/3 AC. Cells	% Within Area
1. Hardwood species	2,572	53.12
2. Conifer species	85	1.77
All Species Total:	2,657	54.89
II Non-Forested Types		
1. Grass	22	.45
2. Farm	1,187	24.51
3. Upland Brush	45	.93
4. Marsh	0	0
5. Muskeg	0	0
6. Lowland Brush	275	5.68
7. Industry	16	.33
8. Water	639	13.20
9. No data	0	0
Refer to Data Map on Page 49		
III Forest Type Size Distribution (All Species)		
1. Merchantable (5" DBH+)	2,574	53.16
2. Non-Merchantable (Under 5" DBH)	84	1.73
	2,658	54.89

and presents an immediate problem. Next in consideration should be regeneration of Jack Pine. In order to maintain healthy aspen and Jack Pine, clear cuts will be necessary. Fire is not a safe regeneration tool in large mature types.

The remaining types are primarily in small sawtimber and pole-size stages and need very little culture. The northern and bottomland hardwoods have relatively long cycles and will stand for many years before deterioration becomes a serious problem. However, cutting in these types may be initiated for wildlife purposes.

Well-drained sand and sandy loam soils predominate. Conifers will achieve medium to good site ratings and hardwoods poor to medium ratings.

Following site disturbances on mature types, natural regeneration should be encouraged and proper site preparations needed to aid regeneration. This could involve discing of mineral soil or post treatment burns of slash and residue. Other reforestation practices could be initiated for wildlife, buffer screens and esthetic improvement.

Forest Protection

In large pine stands, natural hardwood buffer strips should be planted separating more flammable timber types.

St. Croix State Park is in a fire hazard area because of sandy soils with large conifer types. An intensive fire prevention plan should be continued and updated.

Continued surveillance for insect and disease epidemics should be part of the forest protection program.

St. Croix State Park
Forest Cover Type Data Sheet

I Forested Types	2 2/3 AC. Cells	% Within Area
1. Hardwood Species	8,921	61.04
2. Conifer Species	2,069	14.15
All Species Total:	10,990	75.19
II Non-Forested Types		
1. Grass	268	1.83
2. Farm	649	4.44
3. Upland Brush	62	.42
4. Marsh	449	3.07
5. Muskeg	0	0
6. Lowland Brush	1,329	9.09
7. Industry	8	.05
8. Water	859	5.88
9. No Data	0	0
Refer to Data Map on Page 47		
III Forest Type Size Distribution (All Species)		
1. Merchantable (5" DBH+)	9,419	64.45
2. Non-Merchantable (Under 5" DBH)	1,572	10.76

STATE FORESTS

State forests by statute are in the Natural Resource (Dispersed-Use) zone. Sustained yield

forest management is the primary goal in conjunction with recreation, wildlife and watershed amenities. Recreation facilities are modest and favor wilderness activities including hunting, fishing, camping, hiking, etc. Wildlife habitat is an important consideration.

Reforestation, timber stand improvement, protection from fire, insects and diseases are important parts of state forest management.

State forest lands are managed by the "highest and best use" land management philosophy.

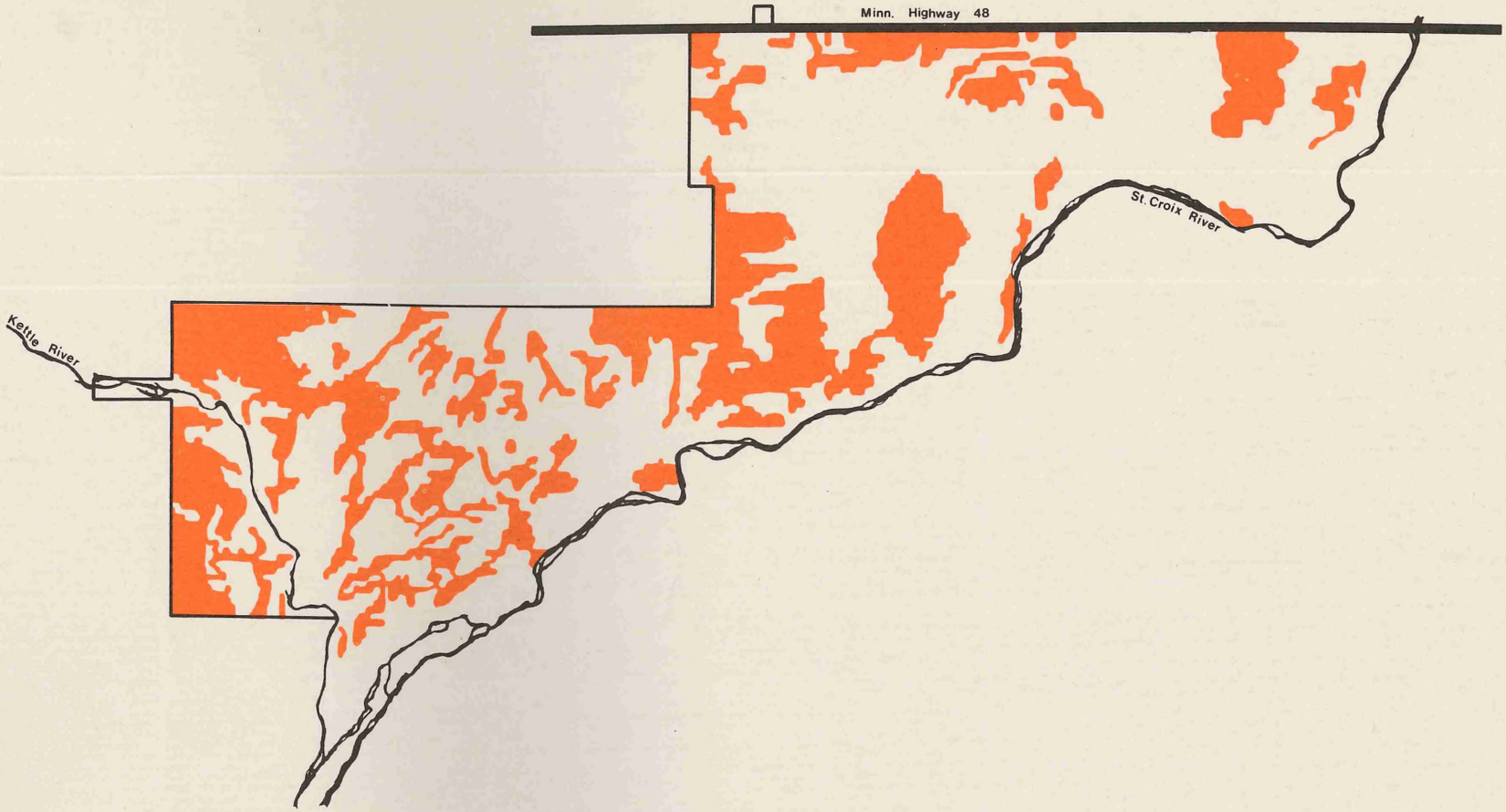
Chengwatana State Forest

Land ownership patterns within this unit are: State land (55 percent), Private (37 percent), and water surface (8 percent).

The topography is predominately level with moderate slopes near the river channels. Large portions of the forest (31 percent) are marsh and lowland brush. Access is difficult because the island-like pattern of the higher ground.

Soils are a mixture of poorly-drained and well-drained sandy loams. Rocky clay types can be found in the northern sector. The soils support poor-medium site hardwoods and medium-good site conifers.

Major forest types in this unit are: Aspen (34 percent), Bottomland hardwoods (5.44 percent), Oak (4.94 percent), and Conifers (3 percent).



St. Croix State Park

FORESTRY

Forest productive types

Non-Forest productive types

Sixty percent of the forest types (all species) are classed as young merchantable pulp or small sawtimber. The remainder is in the non-merchantable size class (less than 5 inches DBH).

General condition of the timber is good. With improved markets, it may soon be possible to harvest a sustained yield.

Aspen is the largest forest type and clearcutting is recommended for regeneration. Clearcutting, group shelterwood and selective cutting will be considered for other types. The majority of conifers are in plantation stage and no cultural activity is planned until thinning becomes necessary.

Sales areas will be kept as small as economics will permit. Winter sales will be encouraged to provide winter browse for deer. Sales will be dispersed as per Pine County Wildlife Management Plan recommendations.

Reforestation activity will primarily favor natural regeneration of hardwoods on medium-good sites. Post sale treatment will be prescribed where necessary to insure a future high quality stand. In low site non-merchantable hardwood stands, conversion to bettersuited conifers will be made. Wildlife plantings will be scheduled when recommended by a game manager.

Grass and upland brush account for 6 percent of the unit and are candidate areas for reforestation or wildlife projects.

Due consideration will be given to the other accepted forest uses, including both present and future needs for recreation, wildlife and watersheds.

Chengwatana State Forest
Forest Cover Type Data Sheet

I Forested Types	2 2/3 AC. Cells	% Within Area
1. Hardwood Species	5,392	46.43
2. Conifer Species	327	2.81
All Species Total:	5,719	49.24
II Non-Forested Types		
1. Grass	125	1.08
2. Farm	889	7.66
3. Upland Brush	599	5.16
4. Marsh	1,856	15.99
5. Muskeg	0	0
6. Lowland Brush	1,487	12.80
7. Industry	10	09
8. Water	888	7.65
9. No Data	37	.32
Refer to data map page 48		
III Forest Type Size Distribution (All Species)		
1. Merchantable (5" DBH)	4,074	35.08
2. Non-Merchantable (Under 5" DBH)	1,640	14.12

Access to the main portions of this unit is by the Chengwatana forest road. This is a multiple use road by necessity and future planning must reflect this situation.

Environmental consideration for forest development activities will be by the standards set forth in the Division of Lands & Forestry, Environmental Manual.

St. Croix State Forest

Land ownership patterns within this unit boundary are: State (60 percent), Private (33 percent), County (4 percent), plus remaining water surface area (3 percent) for a cumulative total of 16,752 cells.

Topography is generally moderate to well-drained and gently rolling. Soils are of two broad classes: Well-drained sandy loam (86 percent) and poor-moderate drained clay loams (14 percent). Both soil types are over gravel. Peat pockets are scattered throughout. Heavier sand loams support medium-good site hardwoods and conifers. Clay loam supports poor-medium site hardwoods and medium-good conifers.

Access is good, although many areas do not have road systems. Logging opportunities are fair to good.

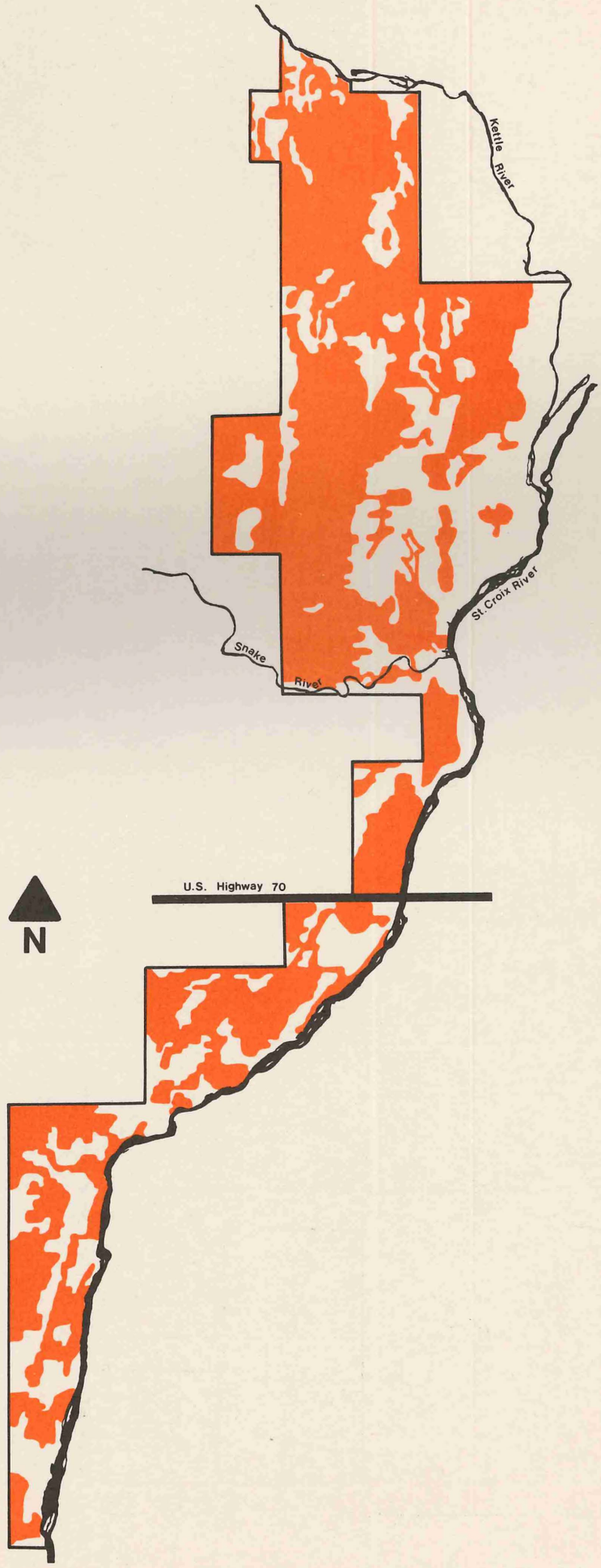
Mixed hardwoods ranging in age from 45-55 years comprise 64 percent of the unit. Aspen and northern hardwoods each total 24 percent with bottomland hardwoods 4 percent. Conifer types, the majority of which are in the plantation stage, total 8 percent.

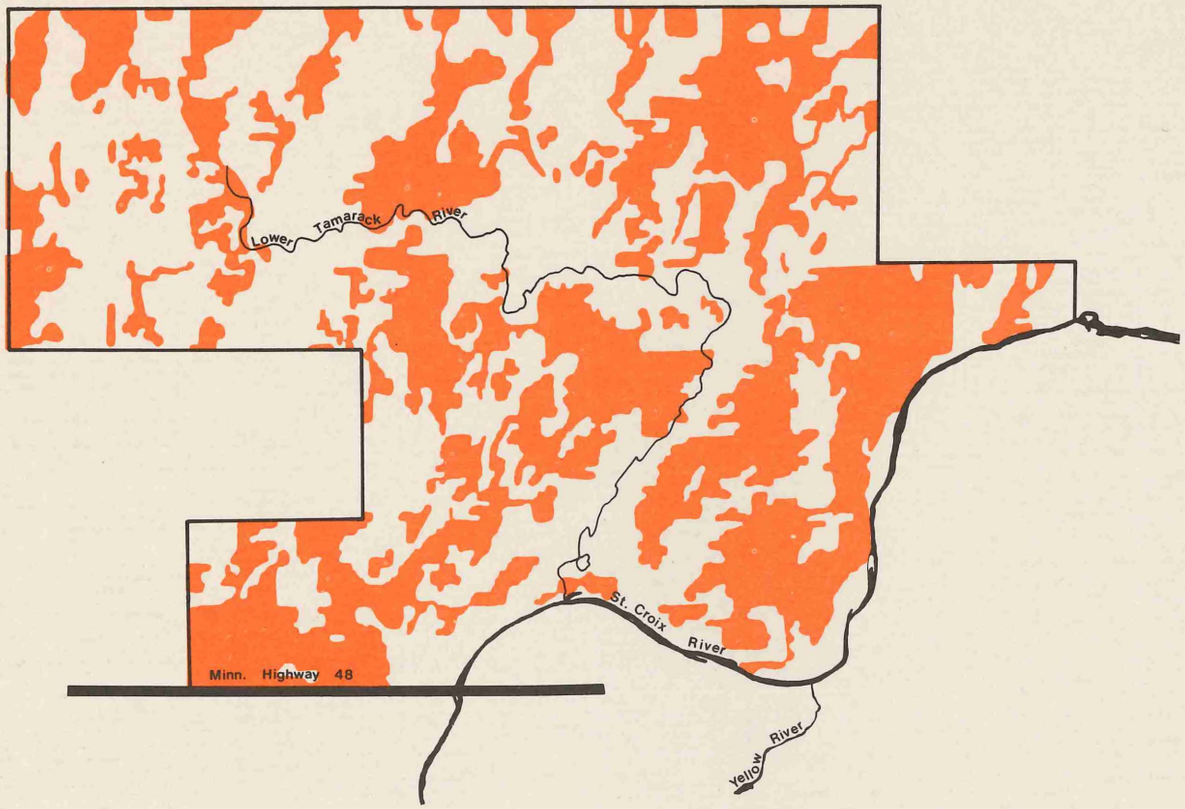
Chengwatana State Forest

FORESTRY

Forest productive types

Non-Forest productive types





St. Croix State Forest

FORESTRY

Forest productive types

Non-Forest productive types

Aspen is presently in fair to good condition and could be termed mature. To minimize losses from over-maturity, the larger portion of aspen should be harvested within the next 10 to 20 years. Northern hardwoods are in the intermediate, young sawtimber size class and presently only small acreages are scheduled for harvest.

Management Recommendations

Harvest all aspen on clearcut schedule before over-maturity causes excessive losses.

Harvest northern hardwoods using group shelterwood and selection systems when mature.

Prune and thin conifer plantations when suppression is evident from crowding.

Encourage natural regeneration in hardwood types (sprouting) on medium-good sites. Conifers will be encouraged on low hardwood sites.

Keep sales as small and dispersed as economics will permit.

Time sales to provide critical browse during late winter months for deer.

Protection

Continue intensive fire prevention and suppression programs. Conduct necessary surveillance and action to prevent and control insect and disease epidemics.

All forestry activities will adhere to Division of Lands and Forestry Environmental Standards as

per manual.

THE PINE COUNTY FORESTRY AND WILDLIFE HABITAT MANAGEMENT PLAN

The Pine County Forest/Wildlife Habitat Management Plan is designed to maintain or improve wildlife habitat, primarily through the balanced distribution of site disturbances on state land. All state land in Pine County will be incorporated into this plan.

The objectives of this plan are:

1. To aid the Division of Game and Fish in planning wildlife projects on all ownerships. General guidelines for habitat improvement in state parks will be prepared separately.

2. To optimize the benefits of commercial timber sales in wildlife habitat.

3. To plan long and short range projects specifically designed to improve wildlife habitat.

a. The major objectives in habitat development are:

1. To provide forage growth in and around deer wintering areas.

2. To provide and maintain forest openings.

3. To provide an optimum distribution of disturbed areas in conjunction with commercial cuttings and other forest management practices. Disturbed areas are where man's activites alter the vegetative succession of species composition. Disturbances may be created by timber sales, forest development activities, wildlife projects, prescribed burnings, etc.

4. To build or improve forest access roads to stimulate commercial harvest in areas where the practices will benefit game and where timber harvests are not economically feasible without the improvement of roads.

4. To protect critical Wildlife areas.

Summary:

This management plan is based on the premise that a planned timber sales program is the best tool for wildlife habitat management. It is the best tool because the cost per acre for created habitat is low and the number of acres affected is high. Special project work in this plan is limited to filling special habitat requirements and as a method of making previously unproductive areas suitable for some wildlife species. The principle of sustained yield in timber management is a widely accepted principle which is incorporated in most timber management plans. This same principle should also be incorporated in any wildlife management plan. To provide sustained browse production it is necessary to plan site disturbances in each habitat unit. Priority considerations should be given to the following:

1. Cut stands threatened by successional change.

2. Cut stands before they deteriorate to the point that they are nonmerchantable.

3. Cut in scattered areas.

4. Cut in small clearcut patterns when silvicultural techniques and economics permit.

St. Croix State Forest
Forest Cover Type Data Sheet

I Forested Types	2 2/3 AC. Cells	% Within Area
1. Hardwood Species	10,710	63.94
2. Conifer Species	1,383	8.26
All Species Total:	12,093	72.20
II Non-Forested Types		
1. Grass	184	1.10
2. Farm	445	2.66
3. Upland Brush	560	3.34
4. Marsh	747	4.46
5. Muskeg	442	2.64
6. Lowland Brush	1,321	7.88
7. Industry	5	.03
8. Water	642	5.70
9. No Data	232	1.38
10. Mineral Land	78	.46
	4,656	24.52
Refer to Data Map on Page 46		
III Forest Type Size Distribution (All Species)		
1. Merchantable (5" DBH+)	9,213	54.98
2. Non-Merchantable (Under 5" DBH)	2,850	17.00

The Division of Lands and Forestry's Environmental Guidelines Manual shall be referred to in planning all timber sales and projects. For further information on this procedure, see Forest Wildlife Habitat Management Plan Development Manual, May 1972. Department of Natural Resources.

For further specific information on the Pine County Forest Wildlife Habitat Management Plan, contact the Department of Natural Resources, Division of Lands and Forestry.

Estimated Forest Management Costs for Upper St. Croix River

1. Roads - Annual maintenance and major repairs		$ 2,000
2. Forest Development		
Regeneration:		
1. Natural	-100 acres	2,000
2. Artificial	-100 acres	6,000
Timber Stand Improvement	-50 acres	500
3. Timber Sales	-530 acres	5,000
4. Forest Protection (all land within 4 unit boundaries)		
Fire		6,200
Insect & Disease		1,500
Annual Cost		$ 23,200
10 Year Cost		$232,000

Waters, Soils & Minerals Management Plan

A comprehensive management plan for the waters, soils and minerals of the Upper St. Croix River has yet to be formulated. Therefore, only general objectives will be discussed. Eventually, recommendations and regulations will be developed that will conform to and complement future regional or state plans.

Surface Water:

Recreational amenities of the St. Croix River are directly affected by activities and development occurring on tributary streams. To protect and maintain the existing qualities of the St. Croix, the management of larger tributaries such as the Kettle, Snake, and Sunrise rivers should be designed to preserve stream flows and improve water quality. Some of the potential dangers from existing and future development in the major tributary watershed include:

1. **Kettle River** - The watershed of the Kettle River is largely forested and has a good potential for the development of wood pulp mills and related enterprises. It is not anticipated that industrial and municipal wastes will become a problem. Farming is limited primarily to grazing and raising forage crops because of the shorter growing season and poor soils.

2. **Snake River** - The Snake River watershed is more highly developed as an agricultural area. Farming practices are primarily row crop production and dairy farming. Agricultural sources of enrichment and nutrients emanating from shoreline development along the river and three tributary lakes, Cross Lake, Pokegama Lake, and Knife Lake, could adversely affect water quality. Municipal wastes and storm sewer drainage may increase if the urbanization and industrial development continue in Pine City and Mora. Some tributaries of the Snake River have a potential for commercial wild rice paddies; hence the use of insecticides and fertilizers will have to be controlled.

3. **Sunrise River** - Much of the South Branch and the West Branch of the Sunrise River is protected by Carlos Avery Wildlife Management Area. However, the north Branch and lower part of the South Branch may still be subject to water quality changes because of possible increased enrichment from agriculture and urbanization sources.

Groundwater:

Lava rock formations are found beneath the glacial drift in the study area in Pine County. Because of their impervious nature, the lava flows have a very low potential for groundwater. Consequently, the shallow sand and gravel aquifers in the glacial drift are the sole source of an adequate groundwater supply.

The best aquifers are located in the shallow outwash deposits. These are susceptible to pollution, however, because of the combination of permeable soils and high water tables. Special precautions should be taken to prevent pollution of the groundwater, especially where the water table is less then ten feet from the surface. These areas should be protected from overcrowding; new engineering concepts may have to be developed for sewage disposal rather than using the conventional drain fields.

It is virtually impossible to present a cost estimate for implementing a waters, soils and minerals management plan until further investigation is completed.

Enforcement Management Plan

Enforcement in the Upper St. Croix area is difficult because of its extensive size and the heavy recreational use the area receives.

Existing problems include vandalism, control of access, littering, and enforcement of laws and regulations for game, fish, waters, snowmobiles, and boating. These problems will certainly multiply while new ones materialize as more recreationists flock to the St. Croix River in the future.

To maintain a proper level of enforcement for the future, the following recommendations have been made:

1. An additional number of enforcement officers will be needed to meet the future enforcement problems.

2. An increase in enforcement training and the authority to give citations should go to other Department of Natural Resources personnel, such as park managers, foresters, and game managers. This would increase the Department's enforcement abilities and would allow for on-the-spot citations by other official Department personnel.

3. A more extensive communication system should be established; and better coordination of enforcement duties encouraged between Department of Natural Resource's officers, local officials, and National Park Service personnel.

The Department of Natural Resources has the following enforcement stations in close proximity of the Upper St. Croix River: Sandstone, Pine City, Lindstrom, and Stillwater. Each enforcement station is equipped with patrol cars with two-way radios, snowmobiles, canoes, and motor boats. A jeep and light airplane are also available for their use.

No cost estimate can be given at present for the number of increased enforcement personnel and equipment that will be needed.

Historical & Archaeological Management Plan

This management plan realizes the importance of historical and archeological investigation and interpretation along the Upper St. Croix River.

The Department of Natural Resources hopes to appropriate money to conduct a comprehensive historical and archeological survey of the Upper St. Croix River. Until that time, each proposed development will be investigated to determine if its site has any historical value. This will prevent destruction of unknown historical and archeological sites.

Interpretation of known historical sites is recommended. Each site will receive a routed wooden sign explaining its historical significance. Most of these historical sites have been linked with the recreational system so the visitor can take advantage of historical and archeological amenities of the area.

The following sites will receive historical or archaeological investigation and interpretation:

St. Croix State Forest

1. **Possible Indian Mounds,** T42N, R17W, Sec. 28
   No further information is available.

2. **Archaeological Area,** T42N, R16W, Sec. 36
   No further information is available.

3. **Old Railroad Grade,** T41N, R16W, Sec. 7
   No further information is available.

4. **Indian Cultural Site,** T41N, R16W, Sec. 18.
   Various artifacts have been found which lend evidence that it had been inhabited by members of the Blackduck cultural phase.

5. **Archaeological and Old Ferry Site,** T41N, R17W, Sec. 24
   No futher information is available.

St. Croix State Park

1. **Indian Cultural Site,** T41N, R17W, Sec. 32
   No further information is available.

2. **Logging Camp,** T41N, R17W, Sec. 32
   St. John's Landing was once a logging camp. Also, collections of artifacts made by local people indicate that this area had been inhabited by aboriginal populations.

3. **Historical Indian Site,** T40N, R17W, Sec. 1
   No further information is available.

4. **Geological Site,** T40N, R18W, Sec. 21
   This site is immediately south of the Park headquarters and is known as red ocher cliffs. This outcrop of rock, which has springs flowing over it, was probably known to the Indians of the region, however, no reference to its use by prehistoric peoples has been discovered.

5. **Indian Cultural and Archaeological Site,** T40N, R19W, Sec. 19
   The Minnesota Historical Society has located a series of primitive pictographs along the St. Croix in this area.

6. **Archaeological Area,** T40N, R19W, Sec. 35
   No further information is available.

7. **Indian Cultural Site,** T39N, R19W, Sec. 2.
   No further information is available.

8. **Archaeological Area,** T39N, R19W, Sec. 9
   No further information is available.

9. **Old Mining Operation,** T40N, R19W, Sec. 33
   This area once had two copper mining shafts but they have been filled in by water-carried silt and organic materials.

Chengwatana State Forest

1. **Lumbering Site,** T39N, R19W, Sec. 30
   A series of four depressions have been located. Possibly these depressions are from a small logging community or activity. Site was probably developed around 1890.

2. **Snake River Indian Village,** T39N, R19W, Sec. 31
   A band of Ojibway Indians made the Snake River their home, moving their village location along the river banks as the need arose. In 1832, the village was at the mouth of the Snake River under the leadership of Pe-ghee-Kee (Allen 1834:59). In 1836, it was located on a bare island at the mouth of the Snake (Bray 1970:143).

3. **Archaeological Area,** T38N, R20W, Sec. 4
   No further information is available.

4. **St. Croix River,** T37N, R20W, Sec. 8

This ghost town centered around a spur line of the Northern Pacific from Rush City, Minnesota to Grantsburg, Wisconsin. The town dates from around 1900 to the 1950's when the spur was discontinued. No visible remains exist except those of a farm that has burned down.

5. **Indian Mounds,** T37N, R20W, Sec. 20
No further information is available.

6. **Archaeological Site and Possible Old Indian Campsite,** T37N, R20W, Sec. 31
No further information is available.

St. Croix Wild River State Park

1. **Military Road,** Old military road that once ran adjacent to St. Croix River.
This road played an important role in the development of the Minnesota territory and was a major factor in achieving statehood for Minnesota. The road was to connect the heads of navigation at St. Paul and Lake Superior but was never completed. It did, however, have a strong influence on providing access to the rich timberlands of Northern Minnesota.

2. **Connor's Goose Creek Post,** T36N, R20W, Sec. 30
This fur post was inhabited by the older trader, Thomas Conner and his Indian wife in the spring of 1847. Thomas Conner had a strong influence on fur trading in the St. Croix Valley.

3. **Sunrise - Nashua Ferry,** T36N, R20W, Sec. 32
No further information is available.

4. **Samuels Fur Post,** T35N, R19W, Sec. 33
Maurice Mordecai Samuels, better known as Capt. Samuels, was born in London, of Jewish parentage. He ran the fur post in 1846, trading with the Chippewa and later moving to St. Croix Falls.

5. **Sunrise Cemetery,** T35N, R20W, Sec. 4
Old historical cemetery used by the town of Sunrise.

6. **Town of Sunrise,** T35N, R20W, Sec. 4
The town of Sunrise began as a settlement of Yankee farmers prior to Minnesota's statehood. A sawmill, located at the same spot as the existing power dam, was the town's first business.

Sunrise City, as it was first called, continued to grow after statehood and blossomed when a land office was opened in 1860. This attracted many new settlers and by 1869, the town had 300 residents, a sawmill, two gristmills, four hotels, two stores, a schoolhouse, and a saloon.

In 1868 the land office closed and the town began to dwindle in size. People left to find better jobs and the city was called Sunrise.

7. **Arrow Line Railroad,** T36N, R20W, Sec. 4
No information is available at present time.

8. **Indian Mounds,** T36N, R20W, Sec. 36
No information is available.

9. **Indian Mounds,** T36N, R20W, Sec. 31
No information is available.

10. **Nevers Dam,** T35N, R19W, Sec. 9
Nevers Dam was constructed in 1889-1890 by the St. Croix Dam and Boom Company. It was built to assist the burgeoning lumber business along the St. Croix. The dam was thought to have been the largest wooden pile-driven dam in the World at the time of its construction.

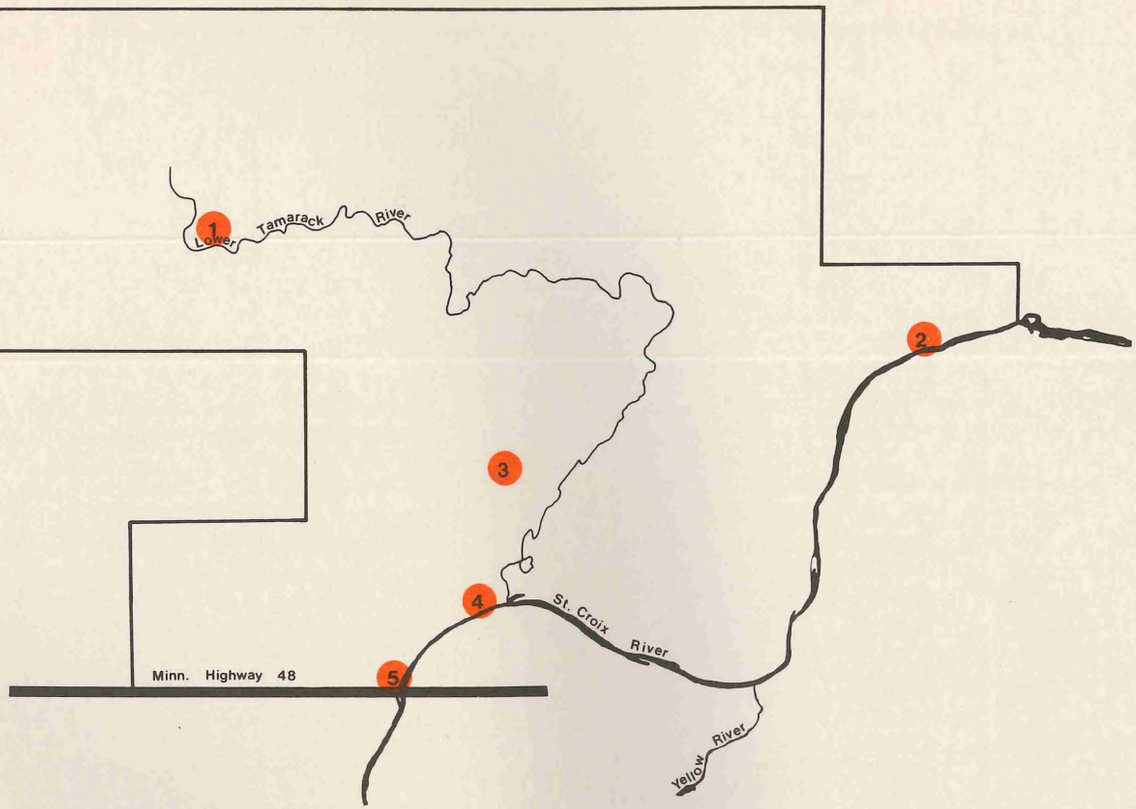
11. **Amador.** T35N, R19W, Sec. 9
Ghost town founded by Dr. Carmi P. Garlick on April 22, 1857. Amador never developed and instead, remained as a small settlement with only a sawmill, hotel, and ferry.

Estimated cost for historical and archaeological investigation and interpretation:

Future Investigation of historic sites	$30,000
Interpretation of existing known sites	$25,000
TOTAL COST---	$55,000

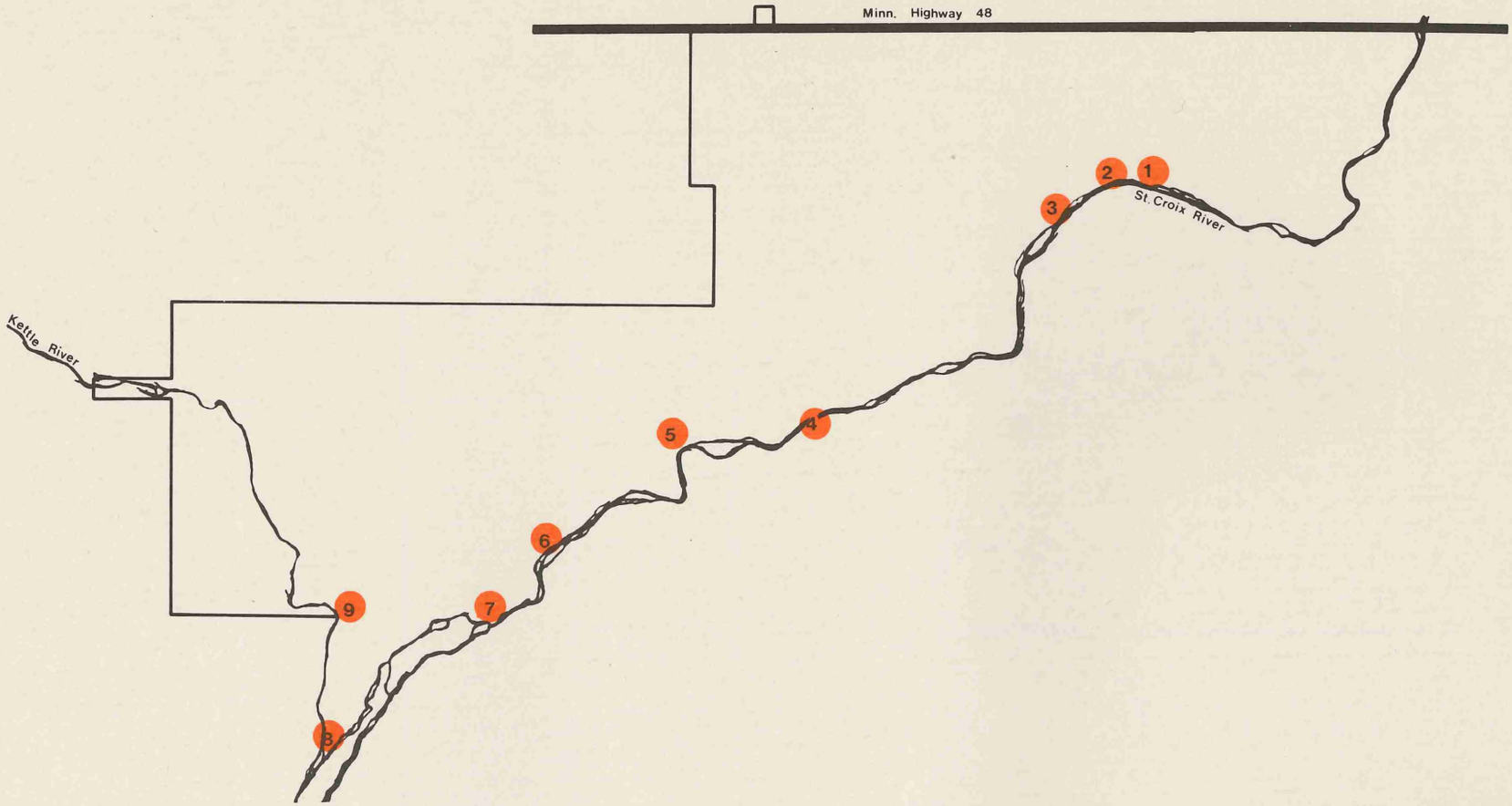
All historical and archaeological information has been obtained from:

1. Sunrise-St. Croix River Survey, 1971, Douglas C. George, Minnesota Historical Society.
2. Eldon Johnson, State Archaeologist and staff.



St. Croix State Forest

HISTORICAL AND ARCHAEOLOGICAL

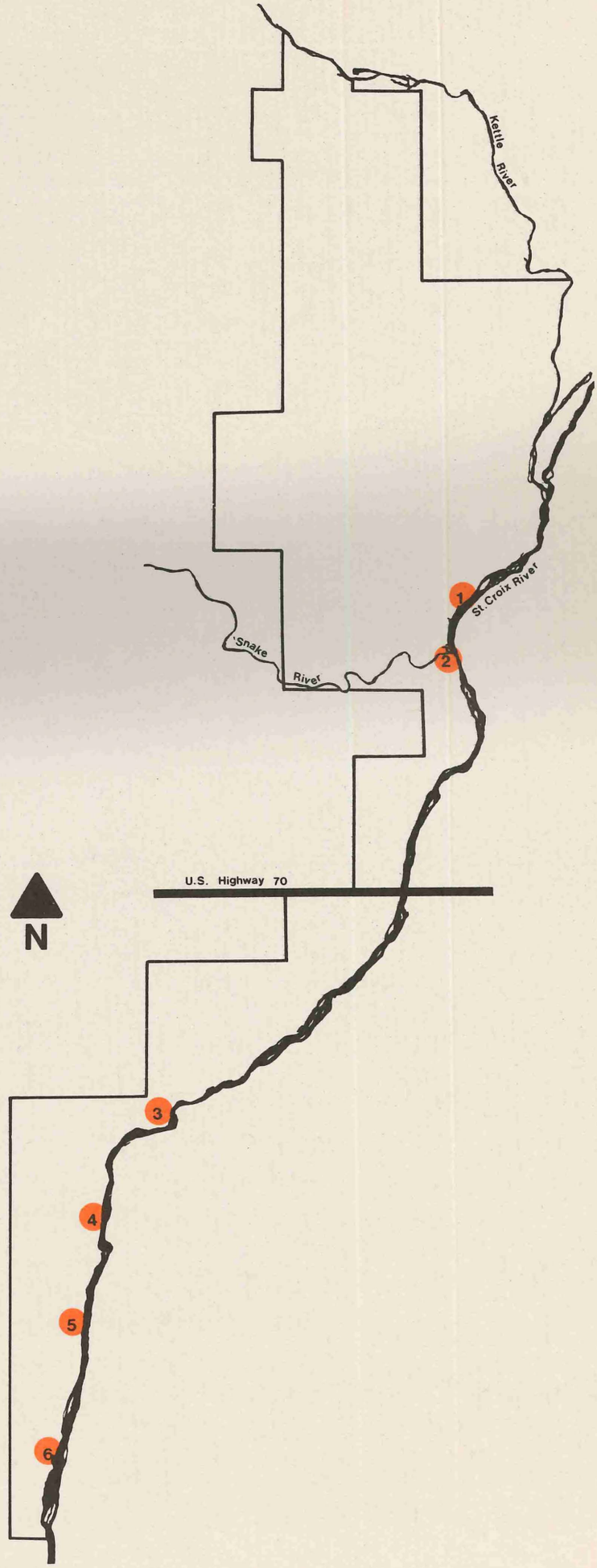


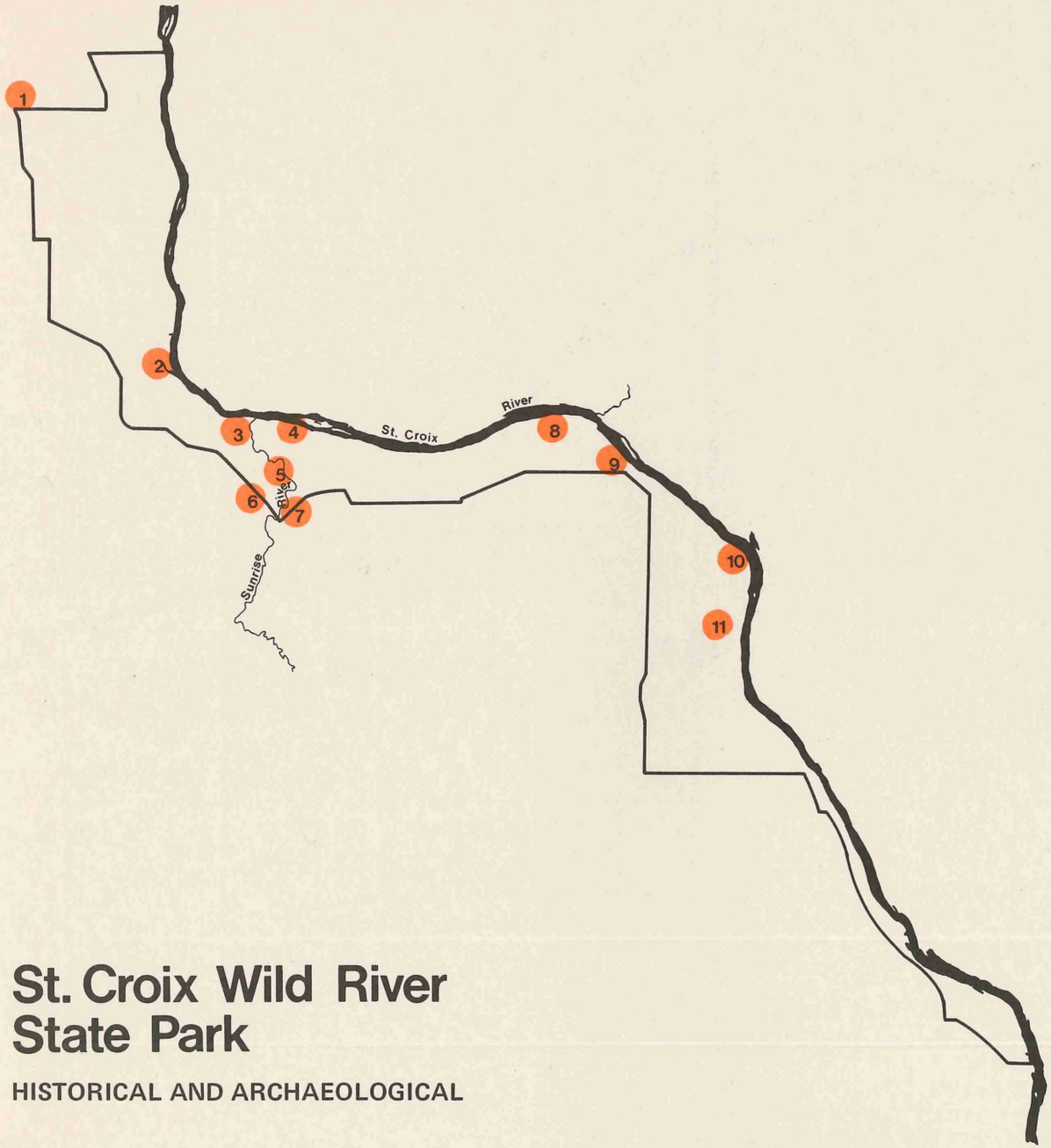
St. Croix State Park

HISTORICAL AND ARCHAEOLOGICAL

Chengwatana State Forest

HISTORICAL AND ARCHAEOLOGICAL





St. Croix Wild River State Park

HISTORICAL AND ARCHAEOLOGICAL

Land Acquisition

The proposal to acquire specific lands within the study area was determined after careful evaluation of development alternatives. These alternatives were formulated from resource-based data with consideration given to existing land ownership patterns.

All proposed acquisition falls within existing statutory boundaries except for the area between St. Croix Forest and St. Croix State Park and the proposed boundary expansion for St. Croix Wild River State Park. These areas are discussed and depicted in the ownership section, pages 70-77.

Fee acquisition is desired for private land proposed for development. If fee title cannot be obtained, easements should be considered. Acquisition will involve only sufficient land to accommodate development.

St. Croix State Forest

Hiking Trail Along Lower Tamarack River

The proposed trail passes through private land in the following sections.(The map on page 196 of the recreation section shows this trail development.)

Section 26&27 T42N R17W

Sections 29,32,&33 T42N R16W

Section 18 T41N R16W

Hiking Trail Along St. Croix River (Refer to Map Page 196).

Section 13 T41N R17W

Trout Streams (Refer to Map on Page 196)

To insure proper management, it is desirable to have control of the entire stream either by fee or easements. This is not always feasible, but should be pursued.

Sections 14, 21, & 22 T41N R17W

Trout stream easements should be obtained on the remaining portion of Bangs Brook which lies outside the forest.

Trout Brook

Trout stream easements should be acquired on this stream in:

Section 26 T42N R16W

St. Croix State Park

Hiking Trail Along St. Croix River (Refer to Map on Page 197)

Section 26 & 35 T41N R17W

Hiking Trail Along Kettle River (Refer to Map on Page 197)

The hiking trail will leave Chengwatana State Forest in Section 15. It parallels the Kettle River to State Highway 48, crosses the river and returns along the river to enter St. Croix State Park in Section 19.

All Purpose Trail (Refer to Map on Page 197)

Section 25 T41N R18W

Section 18 T40N R19W

Kettle River Trail Connection

From the Northwest boundary line of the Chengwatana State Forest in a northwesterly direction, Sections 9, 10 & 15, T40N R20W. It follows roads to state highway 48, then follows state highway 48 in an easterly direction to cross the Grindstone and Kettle Rivers. Then, it travels in a southeasterly direction on county roads, then in an easterly direction through sections 11 & 12, T40N R20W and Section 7, T40N R19W to the northwesterly corner of St. Croix State Park.

St. Croix Wild River State Park - (Refer to map on page 199) With the current boundary and proposed development it is recommended that a vast majority of the private land within the park be acquired.

Section 5, 8, 16, 17, 20, & 21
T 35 N R 19 W

Riverway Acquisition

The following parcels were previously identified for acquisition and the State has been attempting to acquire these lands in fee:

Parcel	Approximate acreage	Location
34.124	127	Sec. 31 T42N R15W
35.102	29	Sec. 36 T41N R16W

45.105	116	Sec. 31 T39N R19W
47.111	36	Sec. 33 T38N R20W
47.120	40	Sec. 26 T38N R20W
49.121	32	Sec. 30 T37N R20W
50.101	25	Sec. 31 T37N R20W
49.140.154	90	Sec. 19 T37N R20W
38.115	63	Sec. 26 T41N R17W
35.105	1	Sec. 2 T41N R16W
35.106	5	Sec. 2 T41N R16W
38.101	121	Sec. 13,24 T41N R17W
38.112	31	Sec. 24 T41N R17W

Total Acres	716
Estimated Cost	$110,000

Estimated Acquisition within management unit (to be published in a subsequent appendix)

Overall Cost Estimate

The Department of Natural Resources has prepared the following cost estimate to cover the 10 year development program as proposed by the Upper St. Croix Resource Management Plan.

This estimate does not cover such unknown costs as potential increases in personnel and operational and maintenance cost increases reflecting new development and additional facilities.

It must be kept in mind that this cost estimate is based on current prices and available information. Throughout the acquisition and development time span as set forth in this plan, it will be reasonable to expect cost increases in management, development and land acquisition.

As new information is made available and as new or modified programs are initiated, revised cost estimates will be prepared to more realistically represent costs and expenses at that time.

10 YEAR COST ESTIMATE

Management Division	**Cost**
Game	$ 800,000
Fish	601,800
Recreation	2,142,900
Forestry	232,000
Water, Soils and Minerals	Unknown
Enforcement	Unknown
Historical and Archaeological	55,000
Acquisition	
Estimated Riverway Acquisition	110,000
Estimated Acquisition within management unit (to be published in a subsequent appendix)	( )
Total Estimated Cost	**3,941,700**

Acknowledgments

The Upper St. Croix Resource Management Plan was prepared by the Minnesota Department of Natural Resources, with the cooperation of the following agencies and organizations:

Minnesota State Planning Agency

Minnesota Department of Administration, Land Division

Minnesota State Highway Department

Minnesota Historical Society

National Park Service

Northern States Power Company

Pine County Advisory Committee

Soil Conservation Service, U.S.D.A.

University of Minnesota

Upper Great Lakes Regional Commission

Wisconsin Department of Natural Resources

Upper St. Croix Interagency Task Force

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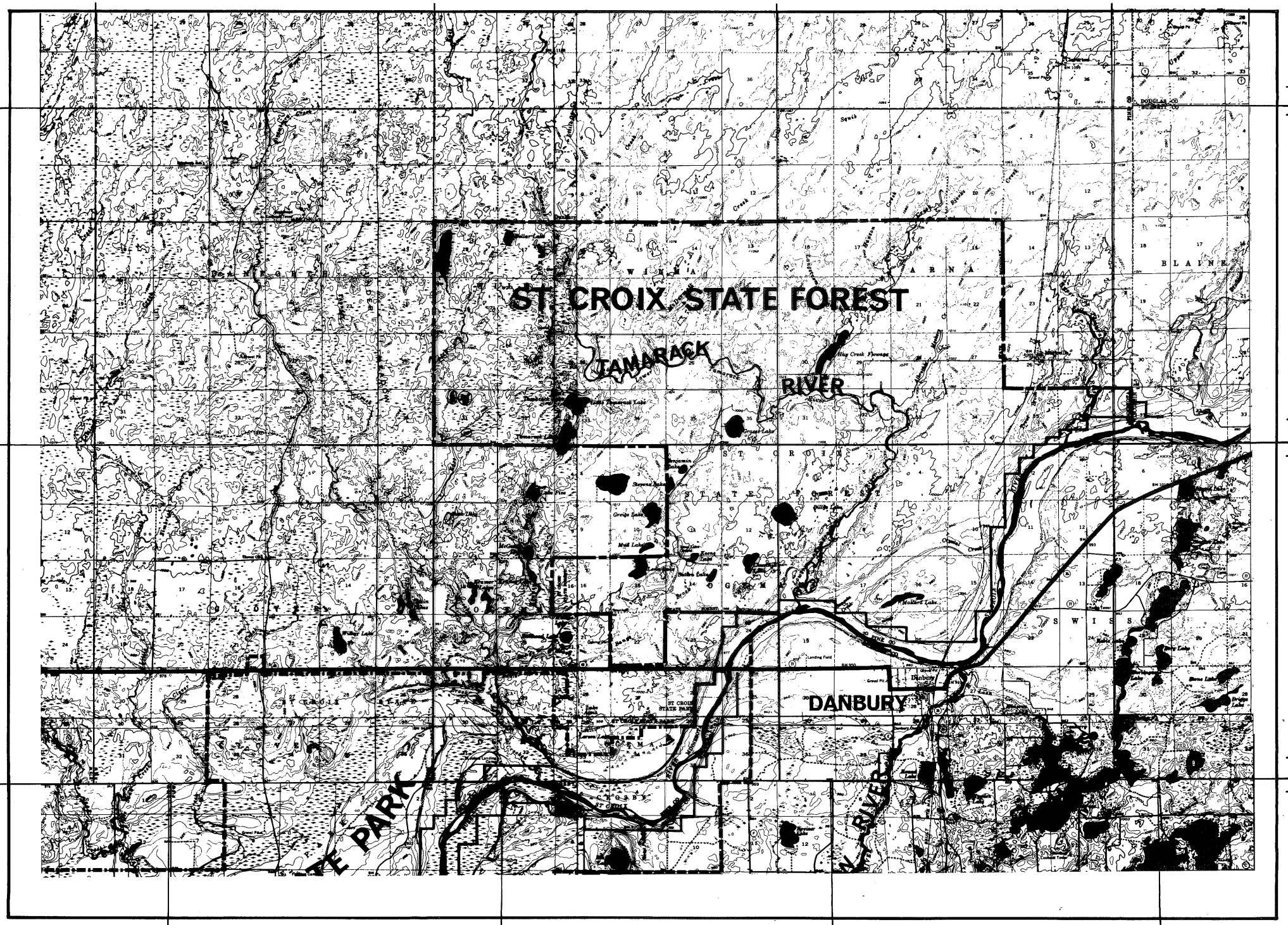
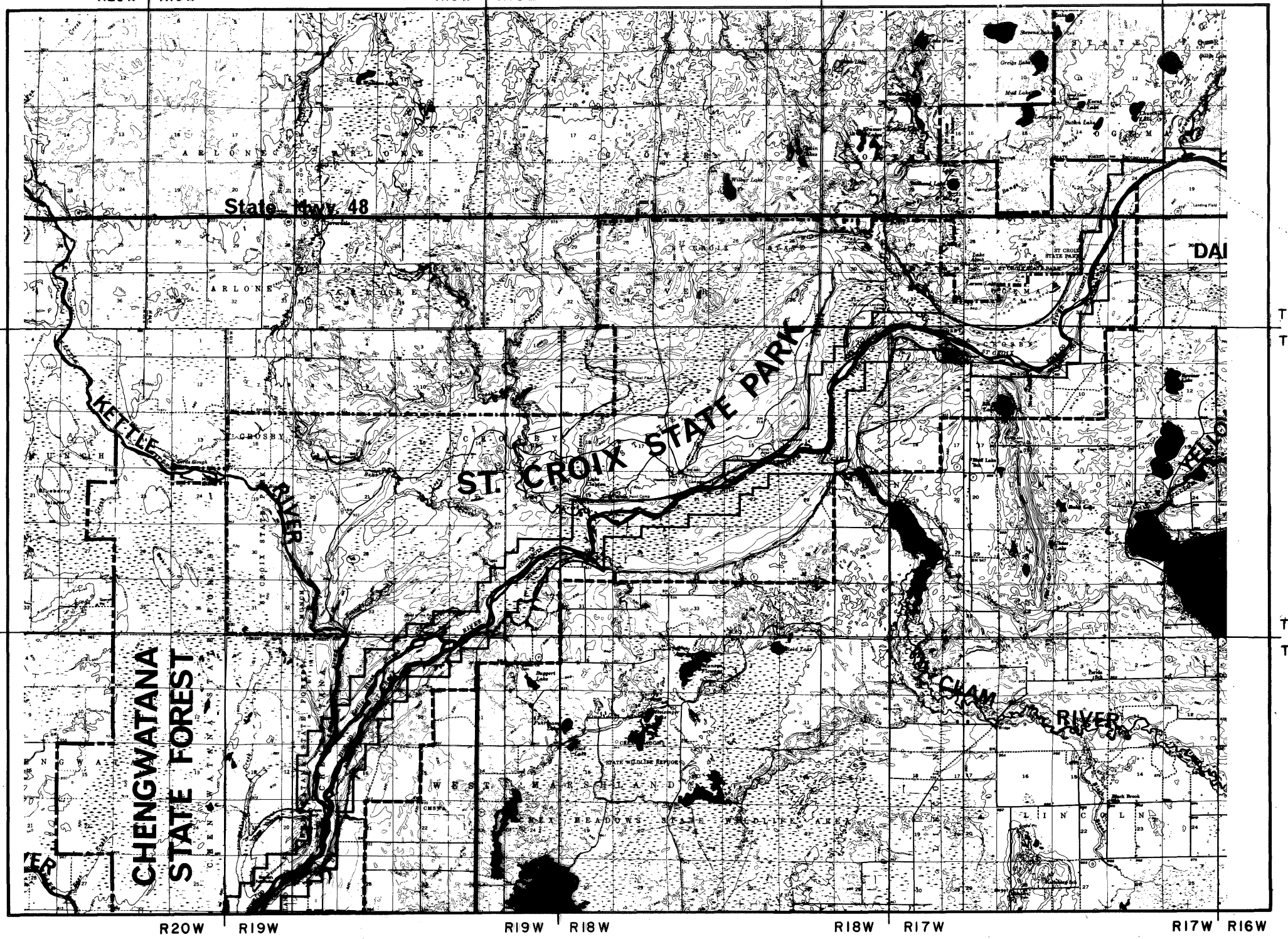
St. Croix State Forest



St. Croix State Park