MANAGEMENT PLAN
FOR
HEMLOCK RAVINE SCIENTIFIC AND NATURAL AREA

Portions of
SE1/4, Section 3
Township 48 North, Range 16 West
Esko Quadrangle (L20a)
Carlton County
Minnesota

Prepared by
Scientific and Natural Areas Program
Section of Fish and Wildlife
Minnesota Department of Natural Resources

March 1985

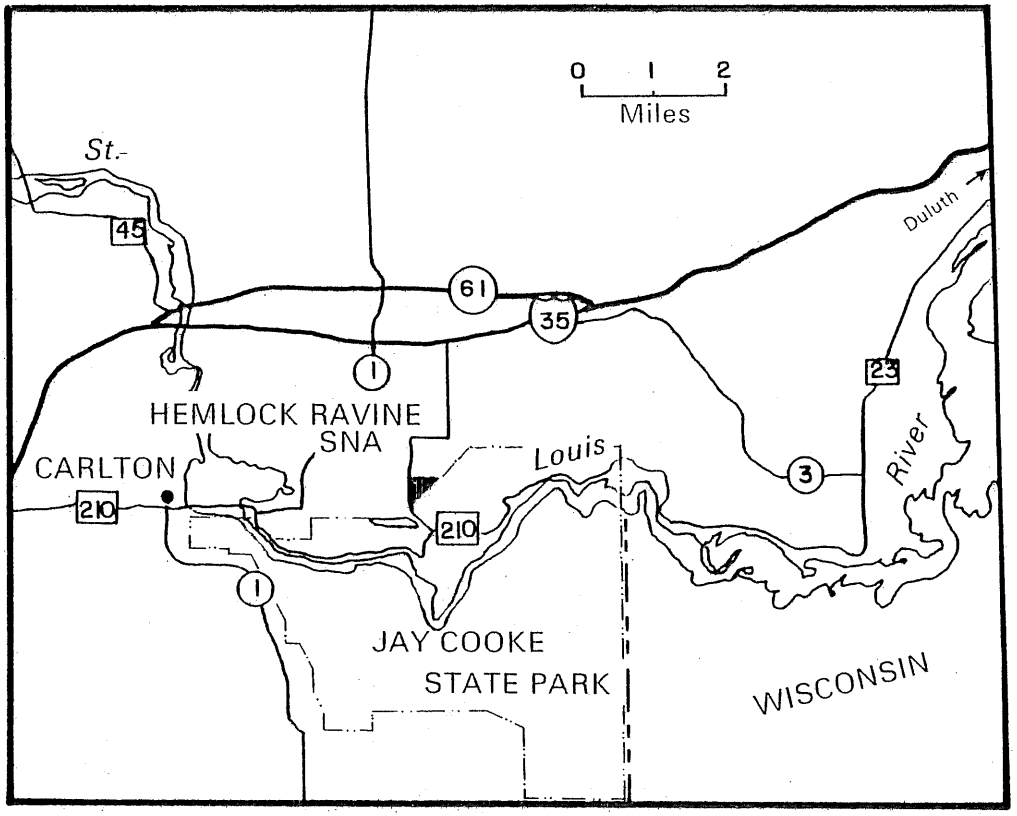
This SCIENTIFIC and NATURAL AREA was established to protect and perpetuate Minnesota's rare and unique natural resources for nature observation, education and research purposes.

Principal activities which are UNLAWFUL in the use of this area are listed below: Further information is available at Department of Natural Resources Offices.

- Collecting plants, animals, rocks or fossils.
- Camping, picnicking and swimming.
- Horses, dogs and other pets.
- Snowmobiles and other motorized vehicles.
- Hunting, trapping, fishing and boating.
- Entry into restricted areas and sanctuaries.

WALK GENTLY

MINNESOTA DEPARTMENT OF NATURAL RESOURCES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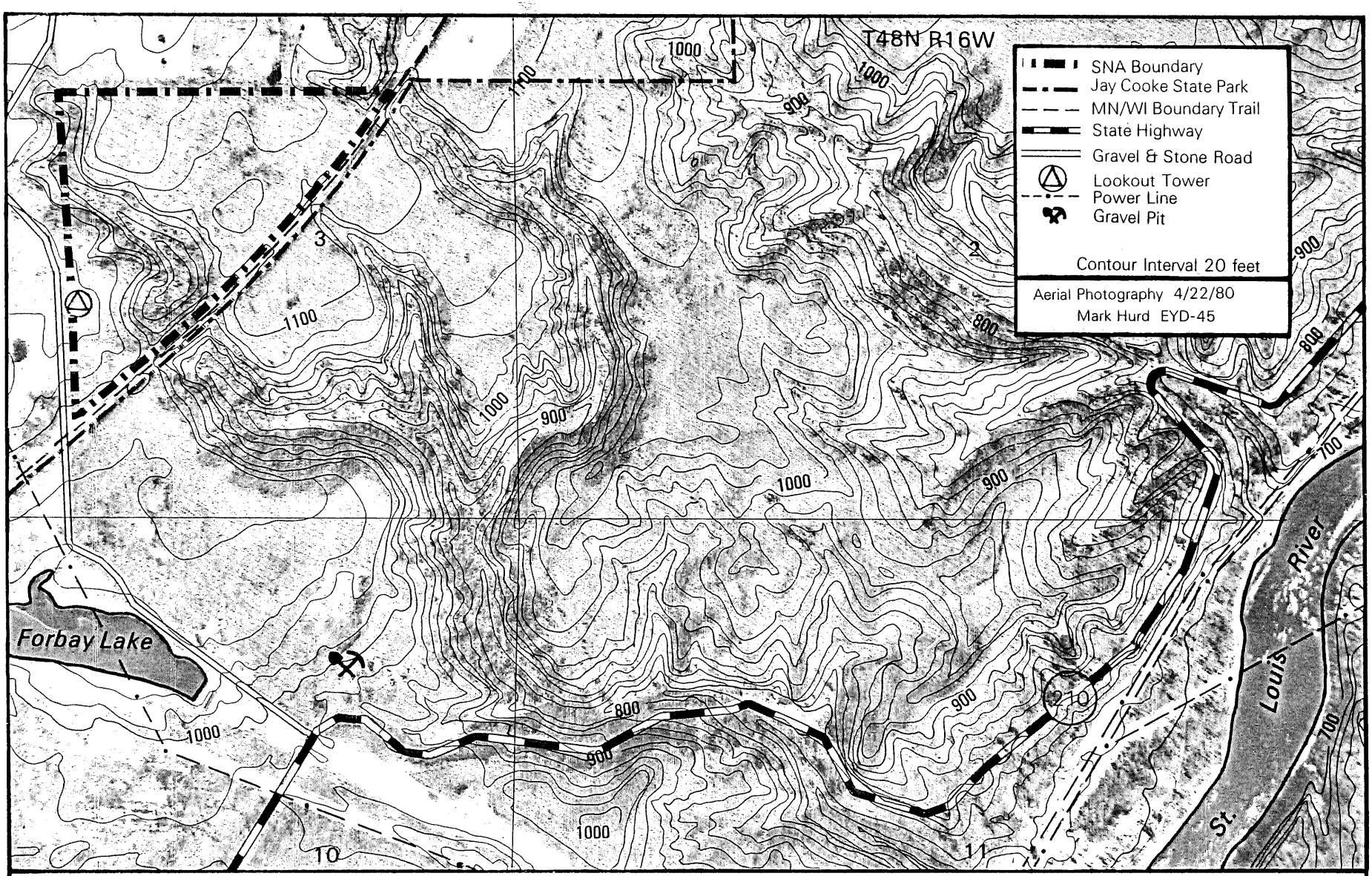
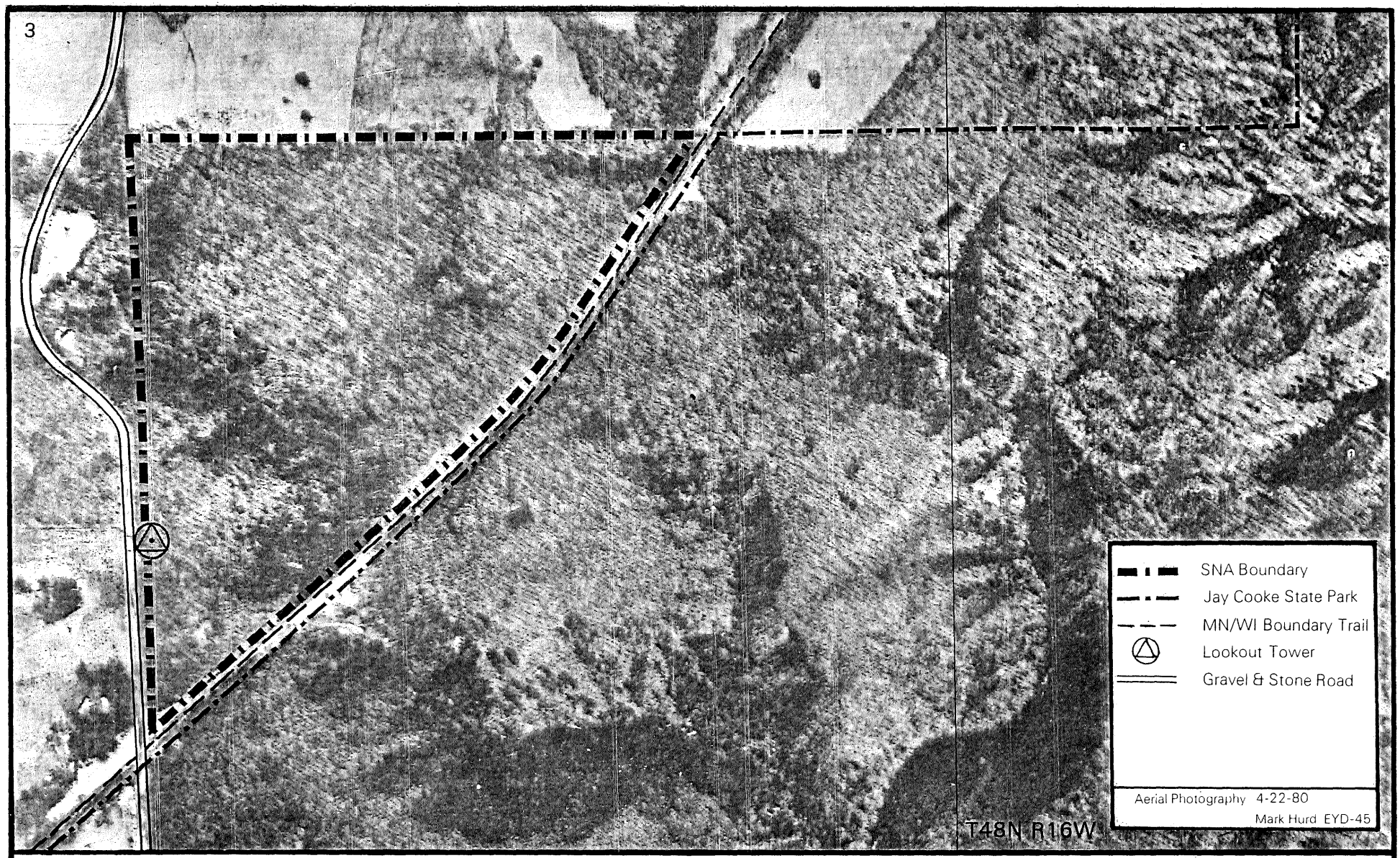


HEMLOCK RAVINE SNA

VICINITY



HEMLOCK RAVINE SNA

SITE

PREFACE

Scientific and Natural Areas are established to protect and perpetuate natural features which possess exceptional scientific or educational value. Nominated areas must substantially satisfy a set of rigorously drawn criteria to qualify for designation. Scientific and Natural Areas serve many purposes. They are places for the quiet appreciation and study of nature. They serve as outdoor classrooms for teachers. They are areas against which the effectiveness of resources management techniques employed elsewhere can be evaluated. They also serve as control areas for scientists engaged in furthering our knowledge of natural processes.

However, acquisition alone does not assure long term preservation of natural areas and their endangered species. Many natural areas are declining in quality because they are not properly managed. Management of vegetation, control of foreign species, and management of visitors are important concerns.

Comprehensive planning is the key to effective and successful management. In 1975 the Minnesota legislature passed into law the Outdoor Recreation Act (86A), establishing the Outdoor Recreation System. This act directed managing agencies to prepare master plans for units of the system. This document is part of a planning effort to satisfy the mandates of that act. The goal of this plan is to coordinate a strategy for stewardship that addresses biological management, obligations of ownership, and visitor management.

This plan was prepared by the Department of Natural Resources, Scientific and Natural Areas Program with the assistance of the Commissioner's Advisory Committee on Scientific and Natural Areas. It was based on a resource inventory prepared by the Scientific and Natural Areas Program and the Natural Heritage Program. Funding was provided by the Legislative Commission on Minnesota Resources.

SUMMARY OF MANAGEMENT PROGRAMS

General Management Considerations

Hemlock Ravine Scientific and Natural Area (SNA) is located adjacent Jay Cooke State Park and the Minnesota/Wisconsin Boundray Trail. The level of management activity on the SNA will be moderate. Regular contact with park staff and the trail manager will assure close coordination with those programs. The ravine harboring the hemlocks on the west side of the SNA will be designated as a "Restricted Area" to prevent erosion from occurring due to visitor use. Access to this area will be by permit only.

Structures and Facilities

DNR Forestry no longer uses the fire tower next to the road on the west side of the SNA. Facilities not directly necessary to preserve the natural features of a site or provide for basic user needs are discouraged on SNA's. Since none of the other DNR divisions were interested in using and maintaining the tower, it will be removed from the site.

Parking is provided by the pulloff for the tower. This is adequate for user needs. An existing footpath going southeast from the parking area to the state trail will be designated a unit trail. It will provide visitors a suitable route across the ravine to the east side of the SNA. Entering the ravine within the SNA is prohibited.

Signing needs for the unit include an entrance sign, interpretive sign, posting of the western boundary, and relocating the rules and regulations sign.

Vegetation Management

A set of permanent plots or transects will be established and maintained. Priority areas are cover types associated with the hemlocks, and the northern hardwoods-conifer cover type. Historical stand development will also be studied. A deer exclosure will be constructed in the northern-hardwoods-conifer cover type.

Rare plant management activities include monitoring the hemlock population, and monitoring white baneberry. A deer/hare exclosure will be constructed around one of the hemlock sites. The SNA will be surveyed regularly for forest tree insects and pests.

Additional Inventory Needs

A physical and biological survey will be conducted of the stream which flows in the large ravine on the wst side of the SNA. The floral inventory, begun in 1983, will be completed. The fauna will be systematically surveyed with priority given to herpetofauna, small mammals or invertebrates that might be dependent on environmental conditions or host plants restricted to the SNA.

Adjacent Lands

Suitable habitat within the park will be surveyed for hemlocks. SNA visitor information will be coordinated with both state park and state trail materials. There are no conflicts anticipated with private land use adjacent to the SNA. Development actions described in management plans for both the state park and state trail will not result in any negative impacts to the SNA.

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OVERVIEW

Introduction

Hemlock Ravine SNA is located adjacent Jay Cooke State Park in the northeast corner of Carlton County. The site is less than 10 miles from Duluth and easily accessible from Trunk Highway 210. The Minnesota/Wisconsin Boundary Trail forms the southeast boundary of the SNA.

This 50 acre tract of land is predominantly mature northern hardwoods. It is situated on the crest of a deeply dissected escarpment leading down to the rocky gorge of the St. Louis River. Vistas from the SNA overlook the Nemadji River basin, the North Shore Highlands, and out to Lake Superior.

A steep ravine cuts through the western portion of the SNA. This ravine harbors the state's largest population of hemlock trees. The uplands surrounding the preserve are primarily pastureland, hayfields, woodlands and inlcude light residential development.

Logging occurred very early in the vicinity of the SNA. Lumber mills were established in Thompson in the 1870s and by 1890 most of the pine had been cut out of the surrounding townships. White pine was the primary species sought by early logging operations, along with white cedar. Some cut pine stumps occur in the SNA.

Preservation Value

Hemlock Ravine SNA is situated on the boundary between the North Shore Highlands and the Mille Lacs landscape regions. Several highly significant natural features have been identified on the SNA by the DNR's Natural Heritage Program. The Natural Heritage Program maintains the most comprehensive data base available on Minnesota's rare plant and animal species, and natural communities. These biological entities (species and communities) are known as "elements" and are ranked according to their endangerment in the state. Hemlock Ravine SNA contains at least 2 rare plant species and one state endangered natural community.

Natural Communities

1. Northern Hardwood-Conifer - state endangered

The Northern Hardwood-Conifer Forest of Minnesota occurs on mesic loamy sites and is dominated by hardwoods or a mixture of hardwoods and conifers. Sugar maple, yellowbirch and basswood are the dominant hardwoods; the subdominant conifers include white spruce, balsam fir, white cedar and white pine. This community was originally restricted to a narrow zone bordering Lake Superior with scattered stands occurring inland as far as Cass Lake. Today very few intact stands larger than 15 acres exist.

The Northern Hardwoods-Conifer community at Hemlock Ravine SNA has been lightly disturbed by selective logging for white pine approximately 80 to 90 years ago. It is a particularly significant example of this community type because it is one of the very few stands remaining in Minnesota where hemlock is a component of the forest.

Rare Plants

1. Hemlock (Tsuga canadensis) - special concern

Hemlocks are a relatively recent addition to the Minnesota flora, arriving probably less than 1000 years ago. The Minnesota populations may represent outposts of a general westward progression of the species that took place since the last period of glaciation.

There are 16 fairly reliable reports of hemlock stands from the state. Many of these are historical records. Only 4 have been relocated and a few are known to have been destroyed. The population within Hemlock Ravine SNA is the largest extant population in the state.

2. White Baneberry (Actea pacypoda) - unofficial "watch" category

The majority of extant populations of this species occur in mature northern hardwood sands. It occurs as scattered individuals within the SNA.

ORA Classification

The Hemlock Ravine SNA fully meets the designation criteria for a scientific and natural area as outlined in the Outdoor Recreation Act of 1975 (86A.05 subd. 5). The preserve includes (1) natural features which significantly illustrate an undisturbed plant community, (2) habitat supporting the following rare, endangered or restricted plants: Tsuga canadensis and Actea pacypoda, (3) an area large enough to permit effective research and educational functions and to preserve the inherent natural values of the site.

Management Philosophy

The two most important attributes of Hemlock Ravine SNA are (1) the population of hemlocks at the edge of the species' range, and (2) the old growth, northern hardwood-conifer natural community. The primary management goal for this SNA is to protect these features by investigating natural community and species population dynamics. This hemlock population serves as an ecological barometer of the species' response to present-day environmental conditions. The northern hardwood stand is a summation of long-term (>100 yrs) community development following moderate disturbance. The major management problem in the SNA is to prevent human disturbance of the sensitive ravine slopes.

Section 1

GENERAL MANAGEMENT CONSIDERATIONS

A. Level of Management Activity

The amount of management that takes place in an SNA is dependent on need and practicality of implementation. The level of management activity at Hemlock Ravine will be moderate. Some of the considerations are presented blow:

a. Distance from St. Paul and other DNR offices or facilities

Hemlock Ravine SNA is approximately 150 miles north of St. Paul based SNA staff. The Region II Nongame Specialist is located in Grand Rapids (80 mi). The Area Wildlife Office and District Forestry staff are in Cloquet (15 mi) and additional assistance may be available from Jay Cooke State Park staff. The SNA is adjacent the park and park offices are slightly less than 2 miles away. The SNA is also adjacent the Minnesota/Wisconsin Boundary Trail. The Area Fisheries office is located in French River (30 mi).

b. Proximity to University and College Campuses

The University of Minnesota-Duluth campus is approximately 20 miles northeast of the SNA. The University of Minnesota Forestry Center is located in Cloquet. This is a research and educational field station. The SNA Program should be able to solicit some research attention to Hemlock Ravine through these and other educational institutions.

B. Surveillance and Enforcement

Inappropriate uses or overuse can damage natural conditions and the aesthetic appearance of natural areas. Because of the fragility of nature preserves, their continued protection and maintenance requires systematic surveillance and enforcement.

Enforcement is the responsibility of the DNR conservation Officer, other DNR staff, and local law authorities. Additional protection can be provided by developing local support and recognition of the SNA. Local residents and visitors are encouraged to report any problems or inappropriate uses to the Area Wildlife Manager in Cloquet, SNA staff in St. Paul or other DNR official.

Action 1.1 Regularly contact Jay Cooke State Park staff and MN/WI Boundary Trail Manager.

Considerations:

Purpose - To keep informed of use levels and problems, and local development activities that might affect the SNA.

Frequency - At least annually

C. User Restrictions

The hemlock trees are predominantly located in the steep ravine on the west side of the SNA. The relief from the ridgetops to the stream ranges up to 100+ feet. The soils on these slopes are highly erodible. There is considerable natural sliding and creeping downslope, even on the tree covered slopes, Ground coverage is predominantly litter, moss and bare soil. Herbaceous groundcover is generally less than 50%.

Visitor activity on these steep slopes, especially group use, could accelerate erosion and threaten the hemlocks. The litter and moss cover is easily dislodged by visitor traffic. Hemlock seedlings require a dependably moist rooting environment and loss of surface cover could result in more xeric or fluctuating soil moisture conditions.

Action 1.3 Post the ravine as a Restricted Area.

Considerations:

Purpose - To protect existing hemlocks and maintain natural seedbed conditions.

Signing - The perimeter of the ravine will be posted with "Restricted Area" signs.

Use - Use will be allowed by permit only. Permits will be restricted to uses which:

1. cannot be facilitated elsewhere,
2. are part of an approved research project, or
3. are necessary for implementing management activities prescribed in this plan, or amendments to this plan.

Section 2

STRUCTURES AND FACILITIES

A. DNR Forestry Fire Tower

The fire tower on the west boundary of the SNA is no longer used and will be surplused. The tower can either be transferred from Forestry to the SNA Program or it will be removed from the site. Without a purposeful use the tower may be considered an "attractive nuisance" and hence a liability concern.

Department policy on SNAs discourages uses of facilities not directly necessary to preserve the natural features of the site or provide for basic user needs. The tower does not serve either of these functions. None of the other DNR divisions (Parks and Recreation, Trails and Waterways, Forestry Recreation) were interested in using and maintaining the structure.

Action 2.1 Request Forestry to remove the tower.

B. Parking

There is parking for 2-3 vehicles in the existing pull-over for the fire tower. This is adequate space for the desired use level, with or without the tower.

C. Unit Trail

There is an existing footpath going southeast from the parking area to the state trail, just west of the ravine. Access to the east side of the SNA from the parking area can be effectively directed along this footpath to the state trail, from where visitors can cross the ravine and then reenter the SNA. Visitors are prohibited from crossing the ravine within the SNA (see Action 1.3).

Action 2.2 Use the existing footpath as a unit trail.

Considerations:

Uses - Hiking only

Development - On the southern end steps may be necessary up the cutbank. Fencing will be necessary here to prevent horse access. No surfacing, widening, or further development of the unit trail within the SNA will be allowed.

D. Signing

The purposes of signing are to (1) identify the area, (2) provide basic visitor information, and (3) identify any special use areas. Signing needs for the SNA are an entrance sign, boundary signs, relocation of rules and regulations sign, interpretive sign, and posting of "Restricted Area" signs (see Action 1.3).

Action 2.3 Post entrance sign.

Considerations:

Location - At the parking area

Action 2.4 Relocate Rules and Regulation sign.

Considerations:

Location - Move from present location, just north of pullover, to adjacent the entrance sign (Action 2.3).

Action 2.5 Develop and post interpretive sign.

Considerations:

Content - To include a map of the SNA, overview of site, and explanation of its significance.

Action 2.6 Post boundary signs on western boundary.

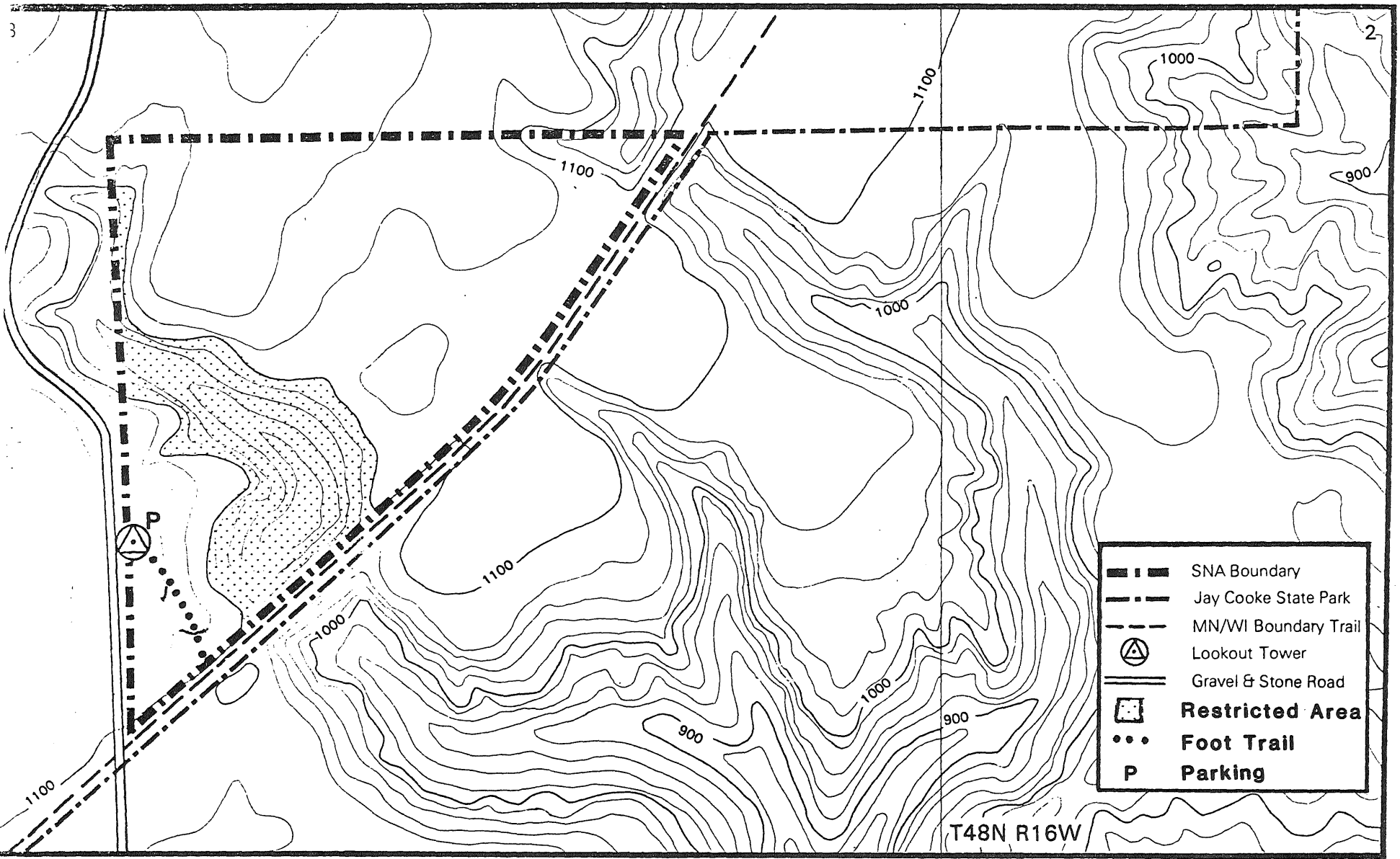

FIG. 1 Facilities and Use Areas

SITE

Section 3

VEGETATION MANAGEMENT

A. Plant Communities

Old-growth forests differ significantly from young-growth forests in species composition, function and structure. Old-growth forests have important ecological roles as well as special values for the wood products industry and recreationists.

The primary objective of community research and monitoring activities in this SNA is:

> to identify the ecological characteristics of old-growth northern hardwood forests and how they differ from young-growth and/or managed forests.

Other practical research questions include: What characteristics should be sought by foresters attempting to recreate such ecosystems? What size tracts are essential to maintain a viable ecological unit? What types of old growth-wildlife relationships exist?

Action 3.1 Establish and maintain a set of permanent reference plots or transects.

Considerations:

Objective - To generate and maintain data suitable for ecologically oriented successional research. At a minimum this should include a baseline description and mapping of composition, cover, and structure.

Standardization - Sampling design and data collection should, to the greatest extent possible, be standardized for similar habitat types on other SNAs. Information should also be compatible with standard forestry data sets.

Priorities - 1st Priority: Cover type(s) associated with the hemlocks, 2nd Priority: Northern hardwood-conifer cover type, 3rd Priority: other

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Action 3.2 Investigate historical stand development.

Considerations:

Purpose - to supplement investigation of hemlock population dynamics (see Action 3.5).

Action 3.3 Construct deer exclosure in northern hardwoods cover type.

Considerations:

Justification - Numbers of white-tailed deer greatly increased in northern Minnesota following timber cutting, forest fires and settlement. Deer browsing can significantly alter regeneration establishment, species composition, and density.

B. Rare Plant Management

The conservation of rare species is a primary management objective for SNAs. Monitoring studies that contribute towards a complete understanding of the biology of rare species are the basis for conservation management. Successful management of a rare plant population implies the ability to manipulate the size and structure of that population. If monitoring is to contribute significantly to this ability, it must yield predictive understanding of population structure and functioning.

As a minimum, censusing of those species with the highest conservation priority is necessary on Hemlock Ravine SNA. The objective would be to document numbers of individuals in a population over time. This might provide guidance for future management decisions and practices.

Major deficiencies in a censusing approach are a) one is monitoring the end result without knowing precisely how it was arrived at, and b) generally only one phenological stage is considered. Both of these difficulties may be overcome by intensive monitoring that studies autecological information on life history, phenology, population flux, survivorship and causes of mortality. This level of information is highly desirable but requires an intensive effort.

Two rare plants occur on the SNA: Hemlock (Tsuga canadensis) and white baneberry (Actea pachypoda).

a. Hemlock (Tsuga canadensis)

Extremes of the controlling environmental factor(s) most frequently exceed the ecological tolerance of a species on the margins of its range. Selective pressure is considered greatest in this situation. Disjunct or marginal populations potentially contribute significantly towards the genetic diversity of a species and provide useful opportunities for investigating natural population dynamics. The goals for hemlock management in this SNA are:

1. to allow the population to respond to present environmental conditions,
2. to provide opportunities for investigating natural population dynamics, and
3. to preserve the genetic stock represented by this population.

Action 3.4 Monitor the hemlock population.

Considerations:

Objectives - Monitor the size and abundance of the population.

- Describe and quantify certain aspects of life history including survivorship, mortality, plant growth rates, and recruitment.

- Determine or estimate the structure of the population in regards to distribution, abundance and mortality of age/size and reproductive classes.

Downed trees - In cases of mortality, the specimen may be made available for scientific examination, including sectioning. Researchers will be contacted to inform them of the opportunity.

Action 3.5 Construct deer and hare exclosure at one hemlock site.

Considerations:

Justification - Animal browse on seedlings is often cited as a limiting factor to hemlock regeneration. Browse sign in the SNA indicates at least moderate deer browsing in most of the hemlock sites.

Site - Choose a hemlock site for exclosure that is fairly typical of other sites in the SNA (top to midslope, N exposure, 100-150° slope, average dbh and height, healthy canopy tree, and having seedlings). Sites 1, 2, and 3 are potential exclosure areas (see Resource Inventory). This will be outside of exclosure described in Action 3.3. Construction will be difficult on these steep slopes. If impractical, a small enclosure around a small group of seedlings may be used to determine browse impacts on seedling growth and survival.

Action 3.6 Survey SNA for insects and pests.

Considerations:

Frequency - Every 2 to 3 years, or more frequently to monitor a particular outbreak or condition.

b. White baneberry (Actea pachypoda)

This species occurs as a few scattered individuals in the northern hardwoods-conifer cover type. It flowers in early summer and has a conspicuous fruit cluster in fall.

Action 3.7 Monitor Actea pachypoda.

Considerations:

Survey - Map and permanently mark locations where the species occurs. Complete a rare plant record sheet for each location. If many locations are found sample a representative portion of the area.

Monitoring - Resurvey every 1 to 5 years.

Section 4

ADDITIONAL INVENTORY NEEDS

A. Stream Survey

The stream in the bottom of the ravine on the west side of the SNA appears to be fed by upland runoff and seepage from the base of the ravine slopes. The watershed is a mixture of woodland, pasture and hayfields. The stream flows through a culvert under County Road 151 (Jay Cooke Rd) on the north end of the SNA, and through a box culvert under the railroad fill on the south end of the unit. Both culverts have drop outlets.

No resource inventory has been done on the stream. Survey work to characterize physical, biological and water quality habitats is necessary to assess their quality and establish baseline conditions for future research.

Action 4.1 Conduct a stream survey.

B. Flora and Fauna

The floral inventory of Hemlock Ravine SNA is not complete. In addition no systematic inventory of Hemlock Ravine's faunal groups has been done.

Action 4.2 Complete the floral inventory.

Action 4.3 Systematically survey the fauna.

Considerations:

Priorities - Herpetofauna, small mammals or invertebrate groups that might be dependent on environmental conditions or host plants restricted to the SNA; other vertebrate groups (i.e., birds) which might have critical or optimal habitat in old growth forest; potential pest species (i.e., porcupines, yellow bellied sap suckers).

Section 5

ADJACENT LANDS

Lands adjacent Hemlock Ravine SNA may be important to the protection and management of the SNA if:

1. its vegetation is contiguous and of a quality similar to that being protected on the SNA,
2. it contains significant natural features,
3. development would restrict SNA management activities, or
4. use or development would have a significant environmental or recreational impact on the SNA.

A. Jay Cooke State Park

Quality: The forested park land immediately adjacent the SNA does not support the old-growth northern hardwood cover type. Ravines in the northeast portion of the park could potentially harbor additional hemlocks, however none have been reported to date. One native hemlock tree occurs at the Oldenberg Point picnic area in the park and several seedlings (from Canadian stock) have been planted by park staff both here (5 trees) and near River Inn (10 trees).

Threat: Activities outlined in the park management plan do not present any significant conflicts with SNA management objectives.

Relationship to the SNA: Jay Cooke State Park is the fourth largest in the state, covering over 11,000 acres. It is in the top ten for visitor use averaging approximately 150,000 visitors per year. The primary attraction of the park is the spectacular, rocky gorge of the St. Louis River. Hemlock Ravine SNA is adjacent a relatively accessible but lowly used area of the park. If promoted to park visitors the SNA would receive increased use. Visitor management has been addressed in actions 1.3, 2.1 and 2.2.

Action 5.1 Survey park land for hemlocks.

Considerations:

Search Area - Several of the ravines in the northeast part of the park have habitat characteristics similar to Hemlock Ravine. North facing slopes are generally moister and most likely to have suitable habitat.

Timing - Fall or spring.

Action 5.2 Coordinate SNA visitor information with State Park materials.

Considerations:

Purpose - to provide visitors who might pass by the SNA boundaries with information to understand the purposes and appropriate use of the SNA and Restricted Area.

Constraints - Materials should not attract high levels of public use which could damage the SNA. For example materials given to a visitor might describe the SNA, and types of use, but only give a general description of the location.

B. Minnesota/Wisconsin Boundary Trail

Relationship to the SNA: This is a multiple-use state trail being developed between St. Paul and Duluth. The segment between Carlton and West Duluth will be an 8' wide bituminous treadway for bicycling, hiking and snowmobiling. An additional treadway for horseback riding is proposed between Carlton and Seven Bridges Road (approximately 3 miles northeast of the park). A horseman's area and access is proposed in the park 1/4 mile south of the SNA; across from Forbay Lake on County Road 151. Construction of the Carlton to West Duluth segment is the next major development project scheduled for the MN/WI boundary Trail (tentatively summer, 1986). Visitor use of this trail segment is anticipated to be high. The SNA may receive additional visitor use from the trail.

Action 5.3 Coordinate SNA visitor information with MN/WI Boundary Trail materials

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Considerations:

Purpose - to provide visitors who might pass by the SNA boundaries with information to understand the purposes and appropriate use of the SNA and Restricted Area.

Constraints - Materials should not attract high levels of public use which could damage the SNA. For example materials given to a visitor might describe the SNA, and types of use, but only give a general description of the location.

Timing - Fall or spring.

C. Private Land

Quality: Most of the private land adjacent the SNA is either in pasture or hay. Some is developed for homesites. None of the priority natural elements being protected on the SNA are known to occur on adjacent private lands.

Threat: None at present. Changes in land-use could potentially increase runoff and subsequently accelerate erosion and headcutting in the ravine. This can be prevented through proper soil conservation measures.

Relationship to the SNA: No changes in surrounding land-use are anticipated in the foreseeable future. If developed, minimum lot size is 5 acres. The County Highway Department has no major improvements planned for County Road 151 which borders the west side of the SNA.

Section 6

EFFECTS OF MANAGEMENT ON SIGNIFICANT RESOURCES

A. Hemlock (Tsuga canadensis)

No habitat or species manipulation is proposed. Monitoring the population (Action 3.4) will provide a sound basis for future management decisions. Monitoring of potential pests (Actions 3.5, 3.6) and investigating stand development (3.2) will allow detailed evaluation of trends and events affecting the hemlocks.

B. White Baneberry (Actea pachypoda)

This species is characteristic of undisturbed conditions. No habitat or species manipulation is proposed. Monitoring activities (Action 3.6) will provide some information for identifying major population trends.

C. Northern Hardwood-Conifer Natural Community

This is an old-growth community type. No manipulation on this cover type is proposed. A system of permanent plots or transects (Action 3.1) will identify ecological characteristics and dynamics of the community.

Section 7

MANAGEMENT COSTS AND IMPLEMENTATION

Actions recommended in this plan have been separated into two categories: Administrative and Operational. The costs of administrative actions are difficult to itemize because they are included in an SNA staff member's salary. Operational actions are on-site activities. These often have both capital and labor costs. Capital costs have been listed. Estimates of labor needs are provided where possible.

Administrative and operational actions are often funded out of different sources. This makes it difficult to present an implementation schedule that equates both types of actions. To accommodate budget planning, separate implementation schedules are outlined for each category.

It is important, however, to have a mechanism that does allows comparison between all actions in this plan, and between actions from different plans. The system outlined below distinguishes between a) actions needed to improve or maintain the integrity of a site's most important features, b) legal or moral obligations of ownership or land management by SNA, and c) all other actions important for reasons other than above.

Group I Actions: These are actions that prevent or reduce the vulnerability of the element to destruction or serious degradation. That is, in the absence of these actions the preservation of the element is threatened on this site. Research, ecological survey and monitoring may be included here if, without such information, it is not known that actions are necessary to maintain the element.

Group II Actions: Actions necessary because they constitute an obligation of land managementownership by the Department. These may be legal obligations, departmental requirements, or SNA program policies.

Group III Actions: Actions taken for all other reasons. For example, actions taken to provide for public use, acquire supplementary resource information, administrative coordination, etc.

The following chart illustrates the scheduling of actions described in the text, and the immediate and on-going capital costs of implementation. The scope of this plan covers a ten year period. The plan should be reviewed every five years to evaluate progress, reassess priorities and refine management techniques. Actions listed under the category "Begin Immediately" need immediate attention. "Phase I" is the first five year period. "Phase II" is the second five year period. Implementation of many actions is dependent on availability of materials, equipment and labor. An action may be initiated sooner than scheduled if circumstances so dictate and earlier scheduled actions will not suffer as a result.

ADMINISTRATIVE ACTIONS		Stewardship Group	Begin Immediately	Phase I	Phase II	Comments
Action 1.1	Contact Park staff annually.	II	x			SNA*
Action 2.1	Remove fire tower	II			x	FOR
Action 2.5	Develop interpretive sign	II		$100		SNA Preparation costs
Action 5.2	Coordinate visitor info with State Parks	III			x	SNA Addition to existing brochure
Action 5.3	Coordinate visitor info with Trails	III	x			SNA New brochure being made
OPERATIONAL ACTIONS						
Action 1.3	Post ravine as Restricted Area	I		110		W 20 signs @ $5.50 per sign and post
Action 2.2	Develop unit trail	I		x		SNA concurrent with 1.3
Action 3.1	Establish reference plots or transects	I		x	x	SNA ongoing maintenance
Action 3.4	Monitor hemlocks	I		x	x	SNA ongoing
Action 3.5	Construct exclosure around hemlock stand	I		500		W
Action 3.7	Monitor white baneberry	I		x		SNA
Action 2.3	Post entrance sign	II		100		W

Action 2.4	Relocate rules and regulations sign	II	x		W concurrent with 2.3
Action 2.6	Post western boundary	II	15		W 5 posts
Action 3.2	Investigate historical stand development	II		x	SNA
Action 3.6	Survey for pests	II	x		FOR
Action 3.3	Construct exclosure in northern-hardwoods-conifer cover type	III		500	W Materials cost for std 8' high woven wire fence.
Action 4.1	Survey stream	III		x	F request from DNR Area Fisheries manager
Action 4.2	Complete flora survey	III	x		NHP
Action 4.3	Survey fauna	III		x	SNA
Action 5.1	Survey park for hemlock	III		x	SNA

Labor: Work crews required for Actions 3.3 and 3.5

Inventory team required for 4.3, 5.1

* indicates DNR division or section to implement action.
SNA = Scientific and Natural Area Program
W = Area Wildlife Manager
FOR = Division of Forestry
NHP = Natural Heritage Program
F = Area Fisheries Manager