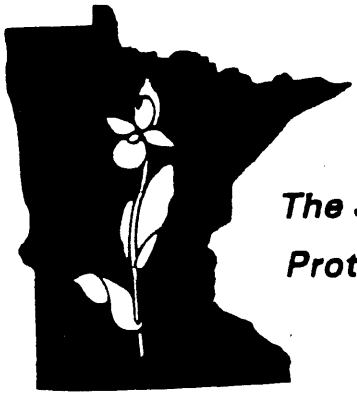
RIPLEY ESKER
SCIENTIFIC AND NATURAL AREA

MANAGEMENT PLAN
AND
RESOURCE INVENTORY



The Scientific and Natural Areas Program...
Protecting and Managing the Best of Minnesota's Natural World

RIPLEY ESKER
SCIENTIFIC AND NATURAL AREA

MANAGEMENT PLAN
AND
RESOURCE INVENTORY

A Public Use Unit

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Division of Fish and Wildlife
Minnesota Department of Natural Resources

RIPLEY ESKER

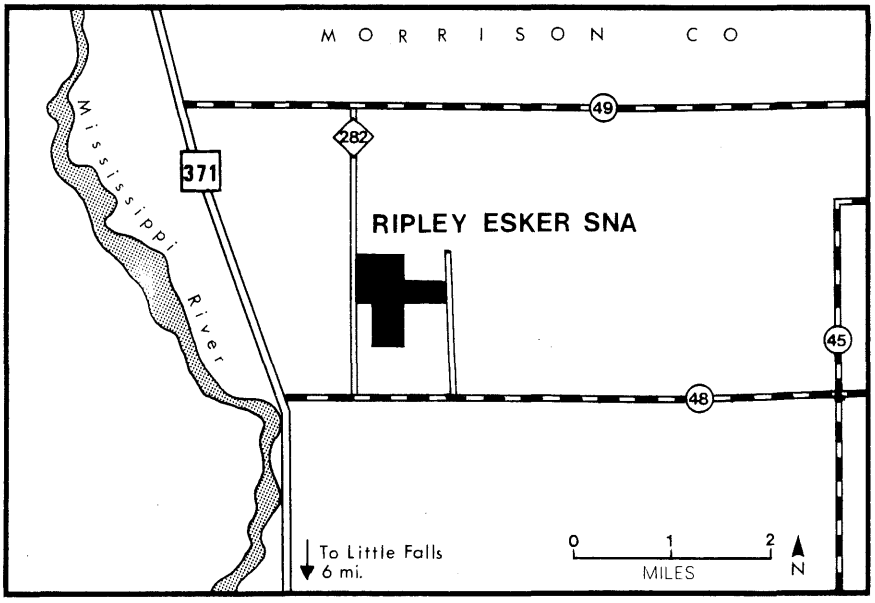
MANAGEMENT PLAN

MINNESOTA CHAPTER OF

THE NATURE CONSERVANCY

October, 1979

Draft Copy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INTRODUCTION

Ripley Esker was acquired by the Nature Conservancy (TNC) because knowledgeable individuals reported that the esker and other features contained on the tract were important elements of Minnesota's natural heritage. The 1977 Ripley Esker inventory has documented the occurrence of these elements and provided the basis for developing a site management plan.

The purpose of this management plan is to describe the specific actions which will be taken in managing Ripley Esker. Section I describes the general considerations which affect the management of the tract. First, TNC management guidelines are outlined. Then the Minnesota Scientific & Natural Area (SNA) Program, its policies, rules and regulations are described. State laws affecting management are also briefly outlined. Section II describes the site-specific detailed actions to be implemented on Ripley Esker. Finally, guidelines for modifying and reviewing the plan are noted in Section III.

MANAGEMENT CONSIDERATIONS

Introduction

Presently Ripley Esker is being managed by TNC staff and volunteers. TNC's strategy for Ripley Esker is to explore mechanisms by which public agencies and institutions can be included in management implementation. Our goal here is not to relinquish active TNC stewardship, but rather to develop a cooperative alliance consisting of TNC, local citizens, and one or more public agencies or institutions. This combination, we believe, provides maximum assurance that proper stewardship will be provided in perpetuity for Ripley Esker.

The Scientific & Natural Area (SNA) Program of the Minnesota Department of Natural Resources (DNR) was created by legislative statute in 1969. Its goal is to:

> Preserve and perpetuate the ecological diversity of Minnesota's natural heritage, including landforms, fossil remains, plant and animal communities, rare and endangered species, or other biotic features and geological formations for the scientific study and public edification as components of a healthy environment.
>
> (DNR Policy on Scientific & Natural Areas, July, 1979)

(The SNA Program is decribed in detail below.)

Since the SNA objectives and philosophy so closely parallel those of TNC it is appropriate to involve the SNA Program as one member of the cooperative alliance in the stewardship of Ripley Esker. In order to enable state and federal funds to be expended for evaluating and managing Ripley Esker a ten year renewable lease was signed by TNC on 25 July 1979 and by the DNR on 9 August 1979. This lease calls for the Minnesota Natural Heritage Program to review the tract for possible designation as a SNA. If Ripley Esker is not designated

a SNA within two years of the signing of the lease either party may terminate the agreement. If Ripley Esker is designated a SNA it will be managed in accordance with SNA policies, rules & regulations. The lease also specifies procedures for the review and approval of a management plan as well as other aspects of administering and operating the property.

Presently the Minnesota Natural Heritage Program is in the preliminary stages of reviewing Ripley Esker as a possible SNA. A decision will not be made on the site unitl at least June, 1980. Since it is not presently known whether Ripley Esker will be designated a SNA, and since implementation concerns are dependent on this decision, this plan does not examine the means of implementing specific management actions. Until such time as public resources are made available management actions will be undertaken by TNC staff and volunters, and funded out of the Minnesota Chapter's preserve management account. All annual reports, survey data, research proposals, registration sheets, informational requests, etc., should be directed to:

Mr. Mark Heitlinger
Minnesota Coordinator of Preserve Management
The Nature Conservancy
328 East Hennepin Avenue
Minneapolis, MN 55414 (tel.: 612-379-2134)

If Ripley Esker is designated a SNA, implementation responsibilities will be specified in a letter of agreement between TNC and the DNR, as called for in the lease. If the preserve is not designated as a SNA then other disposition and management options must be explored by TNC.

The Nature Conservancy's Management Guidelines

TNC's management guidelines govern what management actions will be implemented on Ripley Esker. The two primary TNC stewardship objectives are as follows:

> The primary objective is to maintain areas so that they sustain species, communities, and natural features that make significant contributions to the preservation of natural diversity. The secondary objective is to determine and promote land uses compatible with the preservation of natural diversity on the preserve, in order to foster local support for individual preserves and recognition by the general public of the values of natural diversity preservation.
>
> (Stewardship guide for preserve committees, 1978)

The primary or ecological objective is closely tied to determining which of the preserve's resources are most significant for preservation. The Minnesota Natural Heritage Program will play a major role in identifying which elements of the preserve are most significant. This assessment in turn determines how the preserve will be managed. For example, if an endangered species is the most significant element on the tract and that species requires a successional plant community, then management should be directed at perpetuating this successional stage in order to preserve the endangered species. If, on the other hand, the most significant element on the tract is a climax community then a different management program is necessary.

Management may be directed at species, communities, natural features, etc. In January, 1978 the Minnesota Chapter of TNC developed a Manual for stewardship of Nature Conservancy lands in Minnesota. The following guidelines are taken from this document.

If the occurrence of one or more species are determined to be significant on a preserve TNC will:

1. MAINTAIN POPULATION LEVELS SO THAT THE SPECIES' CHANCES OF LONG TERM SURVIVAL ON THE TRACT REMAIN STABLE OR ARE IMPROVED.

Management to increase the population of any species should be integrated with perpetuating other native species and maintaining the tract as a diverse and naturally functioning system. There may be important ecological

factors regulating the population size of significant species and it may not be desirable in all cases to attempt to increase populations.

2. MANAGEMENT OF SPECIES' POPULATIONS WILL BE ACCOMPLISHED PRINCIPALLY THROUGH MANAGEMENT OF THE SPECIES' NATURAL HABITAT AND THROUGH PROTECTION OF THE SPECIES FROM VANDALISM, POACHING AND SIMILAR THREATS.

Thus managers generally will not use artificialmeans, such as direct control of natural predation, manipulation of food supply through food plots, or improvement of nesting habitat through plantings orartificial shelters to manage populations. Exceptions to this guideline should only be made in certain circumstances when special actions are necessary for the survival of a species or to redress an imbalance due to a factor such as predator extinction.

Management of plant communities should also be guided by an assessment of the preserve's communities. Where management is directed toward plant communities TNC will:

3. MAINTAIN OR RESTORE SELECTED PLANT COMMUNITIES AS NEAR AS POSSIBLE TO THE CONDITIONS THEY WOULD BE IN TODAY HAD NATURAL ECOLOGICAL PROCESSES NOT BEEN DISRUPTED. THIS GUIDELINE WILL BE ACHIEVED, TO THE EXTENT FEASIBLE, BY:
   A) PERPETUATING AND AS NECESSARY RE-ESTABLISHING NATURAL ECOLOGICAL PROCESSES; AND
   B) MINIMIZING IMPACTS OF CHEMICAL, MECHANICAL AND SIMILAR ARTIFICIAL PROCESSES ASSOCIATED WITH HUMAN INFLUENCES.

Some preserves will be protected because they contain significant geological, hydrological or other natural features. The same Heritage Program methodology used to evaluate species and plant communities should be used to assess the importance of these features. TNC will:

4. MAINTAIN NATURAL FEATURES IN PRISTINE CONDITION AND PROTECT THEM FROM UNNATURAL CORROSION AND DETERIORATION. THIS WILL BE ACCOMPLISHED PRIMARILY THROUGH REGULATING THE LEVELS AND TYPES OF HUMAN USE AND IMPACTS THAT ACCELERATE CORROSION AND DETERIORATION.

In special instances steps may be taken to prevent or diminish even natural

processes of deterioration in order to perpetuate significant natural features and other natural elements.

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The secondary or social stewardship objective of TNC is to foster local support for preserves and recognition by the general public of the value of natural diversity preservation. The future preservation of natural areas depends upon a constituency of users and supporters. TNC should foster the development of such a constituency by encouraging the appropriate use of preserves by educators, students, researchers and other members of the general public. The management plan should identify appropriate types and levels of use, and specify programs to facilitate such use.

To achieve the above stewardship objective TNC will:

5. INVOLVE LOCAL RESIDENTS, USERS, AND OTHER INTERESTED MEMBERS OF THE PUBLIC IN DISCUSSIONS ABOUT STEWARDSHIP PLANNING AND IMPLEMENTATION.

6. PROVIDE INFORMATION ABOUT THE PURPOSE AND NATURAL QUALITIES OF THE PRESERVE TO THE LOCAL COMMUNITIES AND PRESERVE USERS.

7. KEEP THE PRESERVE AS FREE FROM HAZARDS TO USERS AS POSSIBLE.

8. CONDUCT STEWARDSHIP ACTIVITIES IN A WAY THAT MINIMIZES UNNECESSARY ANNOYANCES AND HAZARDS TO RESIDENTS NEAR THE PRESERVE.

9. UTILIZE PRESERVE DESIGN, SUCH AS THE PLACEMENT OF TRAILS, PARKING AREAS AND SIGNS, TO BOTH OPTIMIZE ACCESSIBILITY OF THE PRESERVE AND MINIMIZE UNDESIRABLE HUMAN IMPACTS TO THE EXTENT THAT SUCH DESIGN MEASURES DO NOT CONFLICT WITH OTHER PRESERVE OBJECTIVES.

10. PROMOTE APPROPRIATE RESEARCH AND EDUCATIONAL USE OF THE PRESERVE.

The two major stewardship goals--ecological and social--may at times conflict with each other. People crush vegetation, erode and compact soil, alter the behavior of wildlife and transport onto preserves the seeds of unwanted plants that stick to shoes and clothing. It is the Nature Conservancy's

position that:

11. ECOLOGICAL CONSIDERATIONS SHOULD BE WEIGHED MORE HEAVILY THAN HUMAN CONSIDERATIONS WHEN THERE IS A THREAT THAT SIGNIFICANT NATURAL ELEMENTS ON A PRESERVE WILL BE ALTERED OR SIGNIFICANTLY DAMAGED.

The Minnesota Scientific & Natural Area (SNA) Program

Since the SNA Program may also be involved in the stewardship of Ripley Esker a description of the SNA Program management policies, rules & regulations, and pertinent legislation is included here. If and when Ripley Esker is designated a SNA it will be managed in accordance with these statutes, policies, rules and regulations.

The SNA Program is located in the Minnesota Department of Natural Resource's (DNR) Division of Parks. The Scientific & Natural Areas Act (M.S.A. 84.033) of 1969 created the program. It authorized the Commissioner of the DNR to acquire, designate and maintain SNAs, and to adopt pertinent rules and regulations governing the use of the areas.

The DNR issued rules and regulations governing the SNAs in 1973 (Minnesota Reg. NR 300-303). The rules & regulations, still in effect, cover permitted and restricted uses of SNAs, provide for environmental protection, prohibit certain uses and acts, and establish legal penalties for violations. The rules & regulations also state that the Commissioner of the DNR can restrict: 1) travel within the unit; 2) the hours of visitation; and 3) the number of visitors within the area at any given time.

In 1975 the Scientific and Natural Areas Act was ammended by the Outdoor Recreation Act (ORA: M.S.A. 86A.05). This statute further defined and more adequately funded the program. It included SNAs within the Minnesota Outdoor Recreation System, defined the purpose of SNAs, delineated resource and site qualifications, provided for administration of the units, and

classified SNAs into one of three "use designations": Research, Education and Public Use. The law states that only scientific, educational or public uses which do not impair or threaten the preservation objectives are to be allowed. Physical development is limited to facilities absolutely necessary for protection, research and education projects, and when appropriate for interpretive services. Finally, the ORA requires plans be drawn up for each SNA. No development funds can be spent by the DNR until these plans have been approved.

In order to be designated as a SNA a site must: 1) contain elements of "exceptional scientific & educational value," and 2) "be large enough to preserve their inherent natural values and permit effective research or educational functions." The SNA designation process begins when an individual or group nominates an area. The SNA staff notifies the DNR Commissioner's Advisory Committee (CAC) on SNAs and the Minnesota Natural Heritage Program of all new nominations. The SNA staff then is responsible for conducting a field survey of the site to determine the site's qualities, vulnerability, extent of man-made disturbances and management practices which may be needed. The results of this field survey are forwarded to the Heritage Program which then evaluates the significance of the site's elements. Using the field survey data and the Heritage Program evaluation CAC assesses the site and sends a recommendation to the SNA Program. Based on the CAC recommendation, the priorities for protection as established by the Heritage Program, and on other considerations, such as the opportunity to acquire the area, the SNA Program sends the proposal to the Division of Parks for approval. Finally, the proposal is passed on to the DNR Commissioner. If the DNR Commissioner approves the site the land is acquired either by fee simple purchase, lease

(as is the case with Ripley Esker), donation or easements. Once the DNR Commissioner determines sufficent land rights have been acquired to administer the area as a SNA it is formally designated. The formal designation includes the classification of the site as either a Research, Educational or Public Use unit.

If and when Ripley Esker is designated a SNA the Outdoor Recreation Act requires that a master plan for the area be completed and approved. The SNA Program is responsible for completing this plan. After the SNA draft plan is completed the CAC and DNR review and approve it. An announcement is then made to the public and other state agencies regarding the existence of the plan. Interested persons and agencies are invited to review and comment on the plan within thirty days of the announcement. Comments received by the DNR are reviewed and appropriate changes are made in the plan. Finally, the revised plan is submitted to the State Planning Agency for review. After the DNR reviews this agency's recommendations, and makes the necessary changes, the plan is offically approved.

In July 1979 the DNR issued a policy statement on SNAs. These policies will affect the management of Ripley Esker if and when it is designated. The policies are divided into Designation, Resource Management and Human Use Management. To ensure the preservation of the SNA's elements of natural diversity it is the DNR's policy to:

1. IDENTIFY AND CATALOG THE NATURAL FEATURES OF THE AREA.
2. ENSURE THAT RESOURCE MANAGEMENT IS DIRECTED TOWARD PRESERVATION AND MAINTENANCE OF ALL SIGNIFICANT ELEMENTS OF THE AREA.
3. MANAGE THE AREA IN SO FAR AS POSSIBLE, TO PERPETUATE OR ESTABLISH NATURAL PROCESSES AND LIMIT THE EFFECTS OF HUMAN ACTIVITIES.
4. PROMOTE WISE STEWARDSHIP WITH USERS, LOCAL RESIDENTS AND SPECIAL

INTEREST GROUPS.

To fulfill these general policies the DNR will:

5. MONITOR AND EVALUATE SNA MANAGEMENT PERIODICALLY TO DETERMINE IF MANAGEMENT OBJECTIVES ARE BEING ACHIEVED.

6. USE MANAGEMENT METHOD(S) CONSIDERED MOST NATURAL AND APPROPRIATE TO THE TOTAL ENVIRONMENT OF THE AREA AND:
   A. NOT USE COST ALONE TO DICTATE SELECTION OF THE APPROPRIATE MANAGEMENT METHODS;
   B. DESIGN MANAGEMENT PLANS TO ADDRESS THE ECOLOGICAL INTEGRITY OF THE AREA TO PREVENT MISMANAGEMENT;
   C. REMOVE EXISTING DEVELOPMENTS OR UNNATURAL OBJECTS UNLESS THEY ARE UNOBTRUSIVE AND NOT DETRIMENTAL TO THE PURPOSES FOR WHICH THE AREA WAS DESIGNATED OR OF HISTORIC VALUE.

7. PROHIBIT THE FOLLOWING:
   A. CUTTING OF GRASS, BRUSH, OR OTHER VEGETATION, THINNING TREES, REMOVAL OF DEAD WOOD AND WINDFALLS, OPENING OF SCENIC VISTAS, OR PLANTING EXCEPT AS PROVIDED FOR IN THE MANAGEMENT PLAN;
   B. INTRUSIONS OF DEVELOPMENT ON, THROUGH OR OVER SNAs UNLESS ESSENTIAL TO THE MANAGEMENT OF THE UNIT;
   C. MINERAL EXTRACTION, PEAT HARVESTING AND WATER INUNDATION OR APPROPRIATION;
   D. COLLECTION OF PLANT, ANIMAL, HISTORIC OR GEOLOGICAL SPECIMENS (EXCEPT BY PERMIT) OR ANY CONSUMPTIVE USE OF NATURAL RESOURCES;
   E. INTRODUCTION OF PLANT, ANIMAL OR OTHER OBJECTS, INCLUDING LIVE SEEDS OR DISEASE ORGANISMS, UNLESS EXPRESSLY PROVIDED FOR IN THE MANAGEMENT PLAN.

8. PROVIDE THE FOLLOWING:
   A. SPECIAL MANAGEMENT TO TRANSIENT SPECIES ONLY WHEN THERE IS A WELL DEFINED NEED;
   B. SPECIAL MANAGEMENT FOR BALD EAGLE NESTS AND COLONIAL WATER BIRD NESTING SITES WHERE APPROPRIATE;
   C. REVIEW OF DNR PERMITS AND ACTIONS TO MINIMIZE ADVERSE EFFECTS ON A DESIGNATED SNA.

9. INVOLVE USERS, LOCAL RESIDENTS, AND SPECIAL INTEREST GROUPS IN THE MANAGEMENT OF THE SNA AND ENFORCEMENT OF RULES.

10. ESTABLISH A WORKING RELATIONSHIP WITH ADJACENT LANDOWNERS SO AS TO MINIMIZE OR ELIMINATE THOSE LAND USE PRACTICES HAVING AN ADVERSE IMPACT ON THE SNA.

To ensure the preservation of SNA resources and provide for use of the area it is the DNR's policy to:

11. LIMIT HUMAN USE ON SNAs TO THE AMOUNT THE RESOURCE CAN TOLERATE WITHOUT DAMAGE TO SPECIAL FEATURES.

12. PROVIDE FOR THE INTERPRETATION OF THE SPECIAL FEATURES AND THEIR MANAGEMENT.

13. SEEK INPUT FROM USERS, LOCAL RESIDENTS AND SPECIAL INTEREST GROUPS IN DECISIONS REGARDING MOST SUITABLE USE(S).

14. REQUIRE USERS ENGAGED IN SCIENTIFIC STUDY TO MAKE INFORMATION OBTAINED ON THE SNA AVAILABLE TO DNR AND ENCOURAGE USERS TO MAKE THEIR STUDIES AVAILABLE TO THE SCIENTIFIC COMMUNITY THROUGH REPORTS OR PUBLISHED ARTICLES.

To fulfill these general policies the DNR will:

15. ENCOURAGE:
    A. ACTIVITIES WHICH CAN OCCUR EQUALLY WELL ON LESS VULNERABLE OUTDOOR AREAS TO BE CONDUCTED ELSEWHERE;
    B. SCIENTIFIC STUDIES, PHOTOGRAPHY, AND KEEPING OF PHENOLOGICAL RECORDS AND FAUNAL AND FLORAL LISTS FOR LONG TERM RESEARCH AND EDUCATIONAL BENEFITS;
    C. APPROPRIATE USERS AND PUBLIC SUPPORT RATHER THAN UNRESTRICTED PUBLIC USE.

16. PROHIBIT THE FOLLOWING ACTIVITIES UNLESS NECESSARY FOR MANAGEMENT PURPOSES OR SPECIFICALLY AUTHORIZED BY THE MANAGEMENT PLAN: COLLECTING PLANTS & ANIMALS, HUNTING, FISHING, CAMPING, PICNICKING, HORSEBACK RIDING, MOTORIZED VEHICLE USE WITH THE EXCEPTION OF PARKING FACILITIES AND SIMILAR ACTIVITIES.

17. ASSURE STRUCTURES, TRAILS AND SIGNS ARE AS SPECIFIED IN THE MANAGEMENT PLAN AND IN KEEPING WITH THE NATURAL SURROUNDINGS AND PRESENT ONLY SO FAR AS REQUIRED FOR RESOURCE PROTECTION AND PROVISION OF BASIC USER NEEDS.

18. ADAPT INTERPRETIVE TECHNIQUES AND MATERIALS TO THE USER.

19. LIMIT OR EXCLUDE USE FROM AN AREA FOR AN APPROPRIATE PERIOD OF TIME WHEN IMPORTANT NATURAL FEATURES ARE THREATENED AS A RESULT OF SUCH USE.

20. CLEARLY POST THE PROCESS FOR OBTAINING A VISITOR USE PERMIT WHEN REQUIRED, AT THE ENTRANCE TO THE SNA.

21. NOTIFY ADJACENT LANDOWNERS AND INTERESTED PARTIES PRIOR TO IMPLEMENTING MAJOR MANAGEMENT ACTIONS.

22. ERECT BOUNDARY SIGNS AS SPECIFIED IN THE MANAGEMENT PLAN TO DISCOURAGE ENCROACHMENT AND TRESPASS ONTO THE SNA AND ONTO ADJACENT PROPERTY BY SNA USERS.

23. REQUIRE A "PACK OUT WHAT YOU BRING IN" LITTER PHILOSOPHY AND ENFORCE LITTER REGULATIONS.

24. FENCE ONLY WHEN NECESSARY TO CORRECT PERSISTENT ENCROACHMENT OR TRESPASS PROBLEMS TO THE SNA OR ADJACENT PROPERTY.

25. REGULATE USE BY EMPLOYING, SINGLY OR IN COMBINATION, METHODS THAT INCLUDE BUT ARE NOT LIMITED TO THE FOLLOWING:
    A. NO ACCESS RESTRICTIONS;
    B. ACCESS BY PERMIT ONLY;
    C. ACCESS ON DESIGNATED TRAILS ONLY;
    D. TEMPORAL OR SPATIAL ZONING.

26. REQUIRE:
    A. REVIEW OF ALL RESEARCH PROPOSALS FOR THE SNA WITH EMPHASIS ON THE PROPOSED RESEARCH METHODOLOGY;
    B. IF NECESSARY, BONDING OF RESEARCHERS TO GUARANTEE CLEAN-UP FOLLOWING COMPLETION OF THE PROJECT(S).

Other Management Considerations

The Ripley Esker lease is another factor affecting management while the lease is in effect. Under the provisions of the Nature Conservancy-DNR lease:

1. Management planning is a joint and cooperative responsibility of the DNR and the Nature Conservancy.

2. The DNR will notify TNC thirty days prior to any proposed change in the rules & regulations. The Conservancy will then notify the DNR within thirty days if the change is acceptable or not.

3. The DNR will not cause or permit to be caused any act constituting harm or destruction of the unit.

4. The DNR shall not apply or permit application of any chemicals, including herbicide and insecticide, unless it has been approved for in the management plan or unless written permission has been first obtained from the Conservancy.

5. If consistent with the management plan a permanent recognition sign shall be erected by the DNR on the unit.

6. Upon request the DNR shall provide TNC with an annual report on use management of the unit.

7. The Conservancy shall have access to the unit at any time.

8. TNC may, with the consent of the DNR, lease all or any portion

of the unit for purposes consistent with the management plan.

9. Both TNC and DNR can terminate the lease when there is a breach of the contract or if there is an irreconcilable difference regarding management of the area.

Finally, several Minnesota statutes may affect the management of Partch Woods. They include:

1. Collecting and taking of wild animals:

   Under state law (M.S. 98.48) special permits are required from the DNR,Division of Fish & Wildlife,for the collection or taking of protected wild animals.

2. Endangered species:

   The Endangered Species Act (M.S.A.97.488) states that no endangered wild animal may be taken except under special circumstances. The DNR,Division of Fish & Wildlife, may undertake programs or promulgate rules and regulations which also affect the management of endangered or threatened species.

3. Conservation of certain flowers:

   Under state law (M.S. 17.23) no member of the Orchid or Trillium families, or any species of Lotus (Nelumbo lutea), Gentian (Gentiana), Arbutus (Epigaea repens) or Lily (Lilium) can be taken or gathered in any manner from public land without the permission of the Commissioner of Agriculture - and then only for scientific and herbarium purposes.

4. Control of noxious weeds:

   It is the duty of all landowners, according to state law (M.S. 18.181) to eradicate or otherwise destroy all noxious weeds. Section 18.315 also states that towns and cities may take steps to control noxious weeds on state lands within the territorial limits of the towns or cities provided that the managing agency fails to take action within fourteen days of receiving notice to cut or control the weeds. The following plants are considered noxious weeds statewide: Field Bindweed; Hemp; Poison Ivy; Leafy Spurge; Perennial Sowthistle; Bull Thistle; Canada Thistle; Musk Thistle; and Plumeless Thistle. In addition, in Stearns County Cockleburr, Wild Mustard, Sunflower and Velvet Leaf are all classified as noxious weeds.

II. MANAGEMENT ACTIONS FOR RIPLEY ESKER

Introduction

This section describes the specific actions to be implemented on Ripley Esker. The actions are grouped into three broad categories: resource management actions, use management actions and monitoring actions.[1] The resource management actions, in general, are primarily directed at preserving, perpetuating and restoring the tract's natural resources. Use management actions are directed primarily at the problems caused by, and needs of, the visitors. Monitoring actions are directed at insuring that both resource and use management actions are being effectively implemented, identifying unforeseen changes occurring on the site, and recording the results of management implementation. Under each management action there is a brief statement expanding on the action and the need for the action. In parentheses there is a numerical reference to the various TNC guidelines and SNA policies each action is designed to carry out. Since the actions usually implement more than one guideline or policy there are usually several numbers in the parentheses.

Within each of the resource, use and monitoring action categories the actions are subgrouped when possible according to function. The actions are not listed in order of priority.

Ownership modifications are of special concern to adjacent landowners, managing agencies, users and interested parties. Ownership modifications, including fee title purchase and conservation easements, which are taken to protect a resource, facilitate management, or enhance use are therefore listed

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1. It should be noted that these categories are artificial: user management actions affect resource management actions and vice versa. However, for the purposes of discussion it is convenient to follow this convention.

separately after the management actions have been outlined. In addition, modifications whose purpose is to protect "new" resource(s) outside the tract are noted here.

RESOURCE MANAGEMENT ACTIONS

Action 1. Maintain the tract's boundary fences (TNC guidelines 3,4 and 9; SNA policies 2,3,7(E),17, and 24).

All of the tract's boundary fences need repair, except for the west side which was repaired in 1977. It is particularly important that a four-strand barbed-wire fence on the east boundary be maintained in good condition to prevent grazing by cattle. Other boundary fences can consist of a single wire to mark the tract's boundary. Fences should be inspected monthly to determine that no objects are leaning on the fences, brush is not covering the fences, posts are firm and wires are adequately strung.

Action 2. Remove the internal fences along the north and south base of the esker (TNC guidelines 7 and 9; SNA policies 3, 6(C), 7(B) and 24).

These fences are unnecessary and are obtrusive signs of past human use. They also present a potential safety hazard to visitors on the site. If the fences are in good shape a nearby farmer might be contacted and asked to remove the fences in exchange for the salvagable materials. However, any such arrangement must be in writing and be approved by TNC's legal counsel before it is finalized. A record should also be kept of the location of the fence line for future reference.

Action 3. Develop and implement a wild fire suppression plan(TNC guidelines 4 and 8; SNA policies 3 and 4).

Local fire authorities, the fire chief of the nearest fire department and the

DNR area forester, should be contacted annually about control methods to use should a wild fire start on or spread into the area. Fire control should be to prevent the spread of the fire outside of the tract's boundaries and be designed to minimize the damage produced by fire supression activities--the practices used to suppress the fire may be more damaging than the fire to the natural resources. During extreme fire danger periods visitors and neighbors should be alerted to prevent man-caused fires. In the event a fire does occur natural fire breaks or backfires should be used to keep the fire from spreading outside of the tract. Heavy equipment and fire plows should not be used on the tract.

Action 4. Periodically burn Ripley Esker's prairie and oak savanna (TNC guidelines 3 and 4; SNA policies 2,3 and 6).

Areas like Ripley Esker's prairie are thought to have been a regular occurrence before white settlement.[1] After white settlement, however, fire was suppressed. Prescription burning is necessary to: reinstate a natural ecological process and regulate plant succession; maintain the area's open character; thin woodland and suppress brush; restore the esker's prairie, oak savanna and disturbed areas; remove built-up fuel and reduce the wild fire hazard; suppress alien (non-native) species; perpetuate fire-dependent native plants; and improve the habitat for animals.

Ripley Esker is divided into two fire units (See Figure 1 on page 30).[2] The exact dimensions of the two units must await an on-site inspection to determine

1. See for instance J.T. Curtis, The Vegetation of Wisconsin (Madison:University of Wisconsin Press, 1959).
2. The following prescription burn plan was developed by Mark Heitlinger, Minnesota TNC Coordinator of Preserve Management, and was based on: 1)his knowledge and experience in burning similar areas; 2) an assessment of the tract's vegetation and species composition; and 3) the conditions required to safely burn the area.

where fire breaks should be located. Initially Unit I should be burned three consecutive years in early May, beginning in 1980. Then Unit II should be burned following the same treatment. After these initial burns have been completed both units should be burned every fourth year as soon after snow melt as possible. The burns should begin on the south-facing base of the esker and be allowed to burn naturally through the prairie into the oak woods. However, both units should not be burned in the same year. Until the status of the tract's south fields is resolved prescribed burns should be limited to just the esker (See Ownership Modifications). If the fields are kept then this area should also be burned; another burn plan will have to be developed for the fields.

TNC procedures for prescription burning should be followed for all planned burns: 1) a prescribed burning proposal must be prepared and approved by authorized TNC personnel; 2) all conditions described in the proposal, including the crew, fire boss, equipment, weather, fire breaks, DNR permits, courtesy notifications, and publicity, must be in effect for the burn to occur. Following the burn a prescribed burn report must be submitted to the Nature Conservancy office (See Appendix III, Procedures for prescription burning, in the Manual for stewardship of Nature Conservancy lands in Minnesota, for more information).

Action 5. Hand pull all Mullein growing on the esker (TNC guidelines 3,4 and 8; SNA policy 3).

Mullein is a non-native weed and should be controlled before it spreads. The plant was growing on the esker's prairie in 1979. Fire apparently isn't an effective means of controlling this plant. Therefore, all Mullein on the esker should be hand pulled, before seed development. Whenever managers are on the

tract they should be alert for the presence of this plant, and eliminate it when identified. If old stalks or plants in seed are pulled they should be carefully transported off the preserve so seeds aren't scattered over the area.

Action 6. No effort should be made to control or remove diseased plants from the tract (TNC guidelines 3,4, and 11; SNA policies 3,6 and 7(A)).

There is possibly some Oak Wilt on the site. However, some of the techniques used to remove or control trees with Oak Wilt are more disruptive to the vegetative community than allowing the trees to die and rot. Therefore no action should be taken to control the Oak Wilt. No sanitation is necessary.

Action 7. Inventory Ripley Esker's amphibians and reptiles (SNA policy 1).

Actions 7-11 are necessary in order to identify significant and sensitive resources, obtain baseline data, and identify opportunities, problems and trends for management. The data are also valuable for research purposes. The 1977 inventory did not examine Ripley Esker's amphibians and reptiles. This information will result in a more complete resource baseline for the tract. The inventory should follow the methodology and procedures outlined in the 1979 SNA inventories.

Action 8. Survey Ripley Esker's water quality and hydrology (TNC guideline 4; SNA policies 1,3 and 7(B)).

Presently there is no information on the site's surface and subsurface water quality and hydrology. The depth of the groundwater can be measured using the methods described by Turnock & Lawrence (1953).[1] Water quality data can be

1. William Turnock and Donald B. Lawrence, Measurement of the level of groundwater at the Cedar Creek Forest (Mimeo, 1953). For more information contact the Sherburne National Wildlife Refuge where this method was also used.

obtained using the Hach Chemical Company's DR-EL/1 and DR-EL/1a Environmental Laboratory Water Test Kits, or similar equipment. It would also be desirable to test the water periodically for pesticides. Data obtained from this research will provide a more complete resource baseline and will alert managers to possible pollution problems.

In addition, a study must be conducted to assess the drainage ditch's effect on the tract. The drainage ditch has apparently affected the pond's water levels and eroded the esker. However, there is some question as to: 1) whether the drainge ditch follow the area's original drainage pattern; 2) whether the ditch is having a detrimental impact on the two features; and 3) if the ditch is indeed adversely affecting the pond and/or esker what steps can be taken to eliminate the impacts and restore the area's natural drainage pattern. Options the study should examine include: 1) damming and/or diverting the drainage ditch; 2) filling in the ditch; 3) installing a culvert in the esker to reduce erosion; 4) taking a combination of actions; and 5) taking no action. Legal, biological and hydrologic considerations all need to be addressed in the study.

Action 9. Collect additional information on Ripley Esker's flora (SNA policy 1). This supplementary inventory will focus on those plants which the 1977 inventory did not thoroughly survey: the non-vascular plants, such as the mosses and lichens, and the early spring vascular plants. Species which are identified in this new inventory, and not identified in 1977, should be added to the tract's annotated plant list. The site's spring phenology should also be recorded.

Action 10. Collect additional information on the tract's bird population (SNA policy 1).

The 1977 inventory did not adequately distinguish between which bird species pass through the area and which species actually reside on the tract. It may also have missed some birds due to a limited field season. This supplementary inventory will provide a more complete resource baseline for the tract. The inventory shall follow the methodology and procedures outlined in the 1979 SNA inventories.

Action 11. Collect additional information on Ripley Esker's butterfly population (SNA policy 1).

Several of Ripley Esker's vegetative communities were not intensively sampled, particularly the more mesic grassland and wet meadow communities. These communities probably harbor a few species not recorded during the 1977 inventory. This supplementary inventory will result in a more complete resource baseline for Ripley Esker.

USE MANAGEMENT ACTIONS

Action 12. Remove the refuse pile and old stove on the tract (TNC guidelines 4 and 7; SNA policies 3 and 6(C)).

A large refuse pile is located on the southeastern edge of the tract, while an old stove is located in the northwest part of the site (See Figure I on page). The refuse is unsightly and should be removed since it is detrimental to the purposes for which the area was acquired. Furthermore, the refuse constitutes a potential threat to the public safety. A truck or tractor will have to be used to remove the refuse pile. The U.S. Soil Conservation Service may be able to assist here. (Colonel Hoenke at Fort Ripley should be contacted. Colonel Hoenke has been helpful to TNC in similar endeavors in the past and may be willing to help again.) However, this action is conditional upon the adjacent land owner granting permission for access across his land to the pile.

Action 13. Conduct litter cleanup operations (TNC guidelines 4 and 7; SNA policies 3,6(C) and 23).

Litter is unsightly and is detrimental to the purposes Ripley Esker serves. Presently there is not a litter problem on Ripley Esker. However, users and managers will be encouraged to look for and dispose of litter properly.

Action 14. Post all boundaries of the tract and maintain the posts and signs (TNC guidelines 4,7,8 and 9; SNA policies 3,7,16 and 22).

The signs are necessary to prevent inadvertent encroachment by adjacent land owners, minimize unauthorized activities (e.g.,hunting), and to identify the area's boundaries to managers. TNC posts and signs must meet the State of Minnesota legal requirements for posting. Two inch letters must be on the signs. Posts should be set no more than one-tenth mile apart; if visability

is obstructed they should be set closer together. At corners, posts should be set so that the signs are nearly touching and at the same angle as the boundary lines. After the additions to Ripley Esker have been made posts will have to be moved to the new boundaries (See Ownership Modifications). If and when Ripley Esker is designated a SNA offical SNA signs should be placed on all the boundaries; TNC signs will be phased out. The signs and posts should be checked annually and repaired and replaced when necessary.

Action 15. Erect and maintain a main recognition sign on the northwest boundary near the entrance of the parking area (TNC guidelines 7,9, and 10; SNA policies 3,7,15 and 16).

An interim TNC recognition sign should be erected on the site. It should be visable from the road, note the land is owned by the Nature Conservancy, and direct visitors to the registration box. The sign should follow standard TNC design. If and when Ripley Esker is designated a SNA this sign should be replaced with a SNA sign. As noted in the Nature Conservancy-DNR lease, the SNA sign should state the land was acquired by the Nature Conservancy and managed as a SNA by the DNR. The sign should be annually touched up with Olympic wood stain, and the sign's letters repainted. Other maintenance actions should be taken as required.

Action 16. Maintain the registration box and its supplies (TNC guidelines 4, 6,7,9 and 10; SNA policies 3,4,7,9,12,13,15,16,23 and 26).

A TNC registration box was erected on the esker's crest in 1979. The registration box should be checked weekly during the spring, summer and fall to see that adequate copies of maps, borchures, registration sheets and other relevent information notes (including notes on upcoming special events, the nearest DNR or volunter information source, the SNA rules & regulations (if appropriate)

and/or TNC rules & regulations) are present. It is particularly important that registration sheets be collected and kept for analysis.

Action 17. Develop and distribute a map showing the tract's boundaries, trails and general features of interest (TNC guidelines 6,7,9, and 10; SNA policies 9,12,15(C) and 25(C)).

This map should be distributed to users, adjacent owners and interested parties until a Ripley Esker brochure is developed.

Action 18. Develop and distribute a brochure on Ripley Esker (TNC guidelines 4,6,7,9, and 10; SNA policies 3,4,7,9,12,15,16,23,25(C), and 26).

The brochure should include an accurate map of the area, a description of Ripley Esker's history, natural features and significance, and a discussion of the impacts caused by people. It shall describe the Nature Conservancy-SNA program (if appropriate), note conducted tours, promote a "pack out what you bring in" litter philosophy, identify people to contact for more information about the site, and encourage visitors to register, provide comments and become involved in managing the area. Finally, it should note TNC and/or SNA rules & regulations governing use, including the requirement that all researchers obtain a permit prior to conducting research on the area.

Action 19. Develop and implement a parking plan for Ripley Esker (TNC guidelines 9 and 10; SNA policies 12,15(C) and 25).

Visitor access is an important management consideration. Presently there is no place to park except on the gravel road. A parking area is needed to provide safe access for users. The parking area should be developed on the relatively flat field on the tract's northwest boundary, adjacent to the road (See Figure 1 on page). It should be kept small (i.e., space for six to ten cars) to keep

design costs down, minimize negative impacts on the tract, and discourage inappropriate public use. Gates or fencing may be needed to keep visitors from driving beyond the parking area and to control access to the site. The DNR Bureau of Engineering should be consulted about the parking area design and surfacing.

Action 20. Maintain the trail loop (TNC guidelines 4,9, and 10; SNA policies 3,12,15(C),17 and 25(C)).

In 1979 a trail loop was completed on Ripley Esker (See Figure 1 on page). This trail provides controlled access, while encouraging visitors to hike through the area; it should be maintained. The trail should not exceed four feet in width. Fallen logs and brush on the trail will have to be removed. Some hand clearing of vegetation, particularly the Hazel roots on the northwestern edge of the site, may be necessary from time to time. Steps may have to be installed on the esker slope if erosion is detected to be occurring. If it becomes necessary a sign should be erected at the trailhead asking visitors to stay on the trail. It may also become necessary to install a walk-around horse-proof structure to prevent horseback riding and off-road vehicle use of the trail.

Action 21. Inform local middle and secondary schools about the site (TNC guidelines 6 and 10; SNA policies 4,9,12 and 15).

All secondary schools in the vicinity of Ripley Esker should at least know of the existence of the site and its educational potentail for teaching such topics as native flora & fauna, ecology and geology. An effort should be made to annually meet with all teachers who express an interest and encourage them to use the site if appropriate (i.e., if such use cannot occur equally well on

less vulnerable areas). The sensitivity of the resources and teacher responsibility in caring for the land must be stressed in these meetings. Before a school group comes to the site teacher workshops should be held so that the teachers are trained and well-informed about the area. When the class comes to the site managers or scientists should, if possible, also be present to assist the teachers.

Action 22. Consult with and inform regional higher educational institutions on the site's resources and management (TNC guidelines 4,6, and 10; SNA policies 1,2,3,4,5,12,13,14,15 and 26).

St. Cloud State and St. John's Universities, the College of St. Benedict, Brainerd Community College and other scientific research groups or individuals who express a research interest should be annually contacted. The purpose of these meetings is to inform the researchers about the area (including TNC's rules & regulations; all researchers should know that a permit is required for all research conducted on the tract), and to promote education and research possibilities. Data gathered from scientific studies are also important for monitoring the site. Thus all researchers conducting studies are to be consulted about their data and conclusions. Researchers should inform managers immediately of important natural changes and human impacts they discover. Researchers should furthermore be consulted and encouraged to offer input into managing the tract. Finally, research information should be accumulated, stored in a site file, and shared with interested researchers.

Action 23. Conduct field walks on the tract (TNC guidelines 5,6, and 10; SNA policies 4,12,13 and 15(C)).

This action will help acquaint and involve people with the area and its management. The number of conducted tours depends on time and money limitations,

and the impact of the tours on the area. An effort should be made to lead trips in May, June, September and October which are ideal times for walks. News releases should be sent to the local media to publicize the walks and a reporter(s) should be periodically asked to participate in the walks. In addition to educating visitors about Ripley Esker's resources, guides should make a special effort to answer questions, inform visitors about the Nature Conservancy-SNA program (if appropriate), obtain feedback on management, and make visitors feel like land stewards--involved in managing the site and responsible for its well-being.

MONITORING ACTIONS

Action 24. Recruit a local volunter manager preferably living within four miles of the tract (TNC guidelines 4,5,6,7,8, and 10; SNA policies 1,2, 3,4,5,7,9,10,13,15,16 and 21).

The volunter manager must have the time, interest and commitment to become intimately involved with the protection and management of the site. His/her job is primarily to: 1) maintain the registration box supplies and collect registration sheets; 2) periodically monitor the tract for signs of misuse or management problems and communicate them to managers (a "watchdog" function); 3) facilitate communications between managers, local residents and other parties; 4) aid managers when requested; and 5) orientate new managers to the site and the local community. One possible volunter manager is Joseph Gilson who lives south of the preserve.

Action 25. Periodic meetings will be held by managers for local residents TNC guidelines 5,6,7,8, and 10; SNA policies 3,4,5,9,10,13 and 21).

Meetings will be publicized through news releases sent to the local media (A reporter might also be asked to attend). They will be held at least once per year at a time and place convenient for local residents, perhaps in conjunction with a field trip or other activity; special circumstances, such as the implementation of a major management action, may warrant more than one meeting. These meetings can be used to enlist support for project work (e.g., monitoring), as a forum to discuss management actions, decisions, and problems, or to encourage land owners to adopt various practices. It is particularly important that adjacent land owners and frequent users be present at these meetings since their activities can have a large impact on the tract and vice versa. All comments regarding management should be recorded.

Action 26. Develop and implement a monitoring program for Ripley Esker's vegetation (TNC guidelines 1,2,3, and 4; SNA policies 1,2,3,5, and 11).

A monitoring program should be developed to record changes occurring on the tract, such as changes in plant succession or species diversity. Permanent releves and photo points should be set up in each of the site's vegetative communities following the guidelines and procedures described in the 1979 SNA inventories. Color IR aerial photographs should also be taken of the site once every five years.

Action 27. Periodically inspect the site (TNC guidelines 1,2,3,4,7, and 8; SNA policies 1,2,3,5,6(C),7,11,16 and 23).

The tract shall be thoroughly inspected at least once per month for human impacts (e.g., vandalism, trail widening, new unauthorized trails, trampling of plants, littering, erosion), signs of violations in rules & regulations (e.g., hunting, snowmobiling, horseback riding), natural changes in the tract (e.g., tree blow-downs, insect infestations), and the need for and effect of management actions (e.g., trail maintenance). This is also an opportunity to gather feedback from users in the area concerning the site and management actions. On randomly selected days of high use the number of visitors in the area could be counted for a comparison with the number that registered. Visitors observed violating rules & regulations should be tactfully asked to correct their behavior, e.g., remove rubbish dumped on the site. Serious problems requiring immediate attention should be referred to the DNR Conservation Officer or County Sherrif. A report should be submitted to TNC if further action is advisable.

Action 28. Contact the local DNR Conservation Officer (C.O.) and request his assistance in managing the site (TNC guidelines 2,3, and 4; SNA policies 3,4,7,16 and 23).

This action should be taken at least once per year. Since the C.O. is the primary natural resource enforcement officer it is important to bring the site to his attention and familiarize him with its resources and problems. This action is also necessary to obtain advice on management and on enforcement activities.

Action 29. Submit an annual written report to TNC and the SNA Program (if appropriate) (TNC guidelines 1,2,3, and 4; SNA policies 1,2,3,5, 11,13,14,15 and 26).

The annual report shall note completed management actions, progress made in implementing other actions, number of users and violations (compared against preceeding years), solicited and unsolicited comments regarding management, ressearch proposals and studies underway, changes in the resources, problems identified by managers, local residents and researchers, and recommendations for changes in the plan. Actions which are taken but which are not included in this plan should be described in detail in the report.

OWNERSHIP MODIFICATIONS

The 1977 inventory team recommended that more of the esker be acquired and preserved. The highest priority for acquisition should go to the land immediately east of the present site (See Figure 1). This end is believed to contain gravel and may eventually be exploited. It might be possible to trade the formerly cultivated land south of the low wet area in the southern third of the tract for the esker. This formerly cultivated area is not essential to the integrity of the preserve. However, if the area is traded a conservation easement should be attached to the deed limiting the land to agricultural use. If the present owner is not agreeable to the swap or to the fee simple purchase of his land then perhaps a conservation easement could be acquired. Otherwise this acquisition should be pursued at a later time.

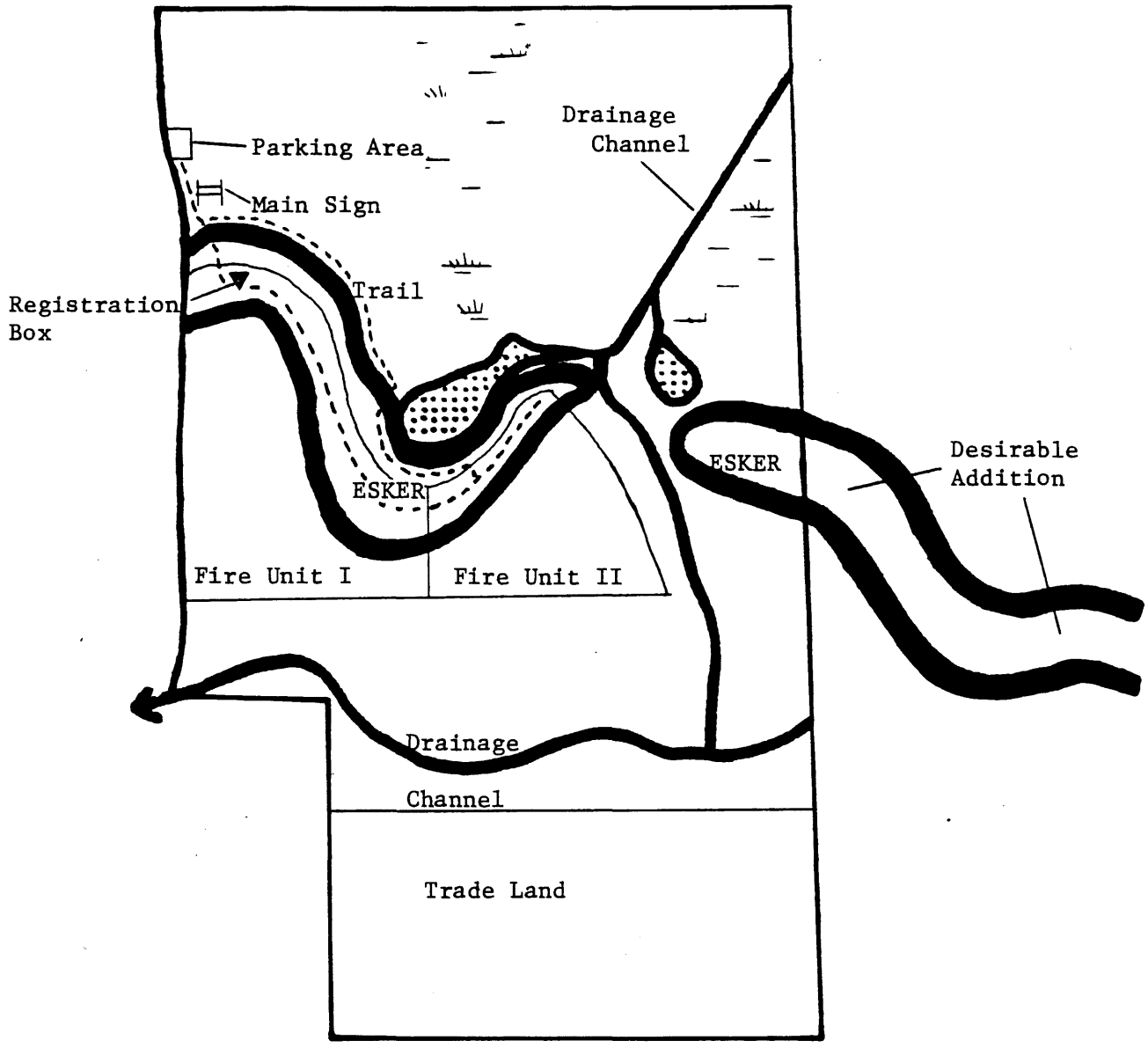

Figure 1. Ripley Esker Management. Scale 8 inches : 1 mile.

III. REVIEW OF THE PLAN

The actions outlined in this plan must be considered provisional, not definitive, and should be reviewed periodically to see that they are still relevant in light of current conditions. Changes in the site's resources, users and other management considerations are bound to occur. If warranted, the plan's management actions can and should be modified so that they more effectively and/or efficently implement TNC guidelines and SNA policies (if appropriate). All proposed actions should be primarily directed at protecting and preserving elements which are a significant part of Minnesota's natural diversity. In any event the plan should be thoroughly reviewed and updated at a minimum of every ten years.

Management Summary for Ripley Esker. 1979

TNC's strategy for Ripley Esker is to develop a cooperative management alliance, consisting of TNC, local citizens, and the DNR's Scientific & Natural Area (SNA) Program. To enable the DNR to manage Ripley Esker as a joint partner with TNC, Ripley Esker was proposed as a state SNA and a ten year (conditional) renewable lease was signed by TNC and DNR. If Ripley Esker is designated a SNA then the DNR will have the primary responsibility for implementing actions on the tract. Management planning, however, will be the joint responsibility of TNC and the DNR. This strategy, we believe, provides maximum assurance that proper stewardship will be provided in perpetuity for Ripley Esker.

TNC policy requires that a management plan be developed for Ripley Esker. The following 29 actions have been proposed for Ripley Esker. These actions, based on data gathered by the 1977 inventory team, experts' opinions, TNC guidelines and SNA policies, are judged necessary if the the tract's resources are to be maintained, protected, and also enjoyed by visitors. The actions are listed in outline form and are <u>not</u> listed in order of priority.

<u>Resource Management Actions</u>:

1. Maintain the tract's boundary fences.
2. Remove the internal fences along the north and south base of the esker.
3. Implement a wildfire suppression plan.
4. Periodically burn Ripley Esker's prairie and oak savanna.
5. Hand pull all the Mullein growing on the esker. (This weed was growing on the tract's prairie in 1979.)
6. No effort should be made to control or remove diseased plants from the tract. (There is possibly some Oak Wilt on the site.)
7. Inventory the tract's amphibians & reptiles (not done in 1977).
8. Survey Ripley Esker's water quality and hydrology. A study must be done to assess the drainage ditch's effect on the tract.

9. Collect additional information on the tract's flora, particularly the non-vascular plants and the early spring vascular plants.

10. Collect additional information on the site's bird population.

11. Collect additional information on the site's butterfly population.

Use Management Actions:

12. Remove the refuse pile and old stove on the tract.

13. Post new signs on all the tract's boundaries and maintain the signs. These new signs will be more attractive and less negative than the old TNC signs.

14. Erect and maintain a main recognition sign on the northwest boundary near the entrance to the parking area.

15. Maintain the registration box and its supplies. The box should contain adequate copies of maps, brochures, information notes, and comment cards.

16. Develop a map, showing the tract's boundaries, trails, and general features of interest, and distribute it to users, potential users, and adjacent owners.

17. Develop and distribute a brochure on Ripley Esker.

18. Develop and implement a parking plan. The parking area should be developed on the flat field on the tract's NW boundary, adjacent to the road. It should have space for 6-10 cars. Gates or fencing may also be needed.

19. Maintain the trail loop along the esker. (The trail was completed in 1979.) It may become necessary to erect a walk-around horse-proof structure, stairs & a sign to control access and keep people on the trail.

20. Encourage local secondary schools, regional institutions and researchers to use the site if appropriate.

21. Conduct field walks on the tract.

Monitoring Actions:

22. Recruit a local volunteer manager preferably living within 4 miles of the tract.

23. Maintain a close relationship with local & regional governmental officals, natural resource professionals, and other appropriate individuals.

24. Maintain close contact with all scientists who are using the site.

25. Maintain close contact with the DNR Conservation Officer.

26. Hold periodic meetings for local residents.

27. Develop and implement a vegetative monitoring program which includes setting up permanent releves and photopoints,and taking color IR aerial photographs.

28. Periodically inspect the site.

29. Submit an annual written report to TNC and the SNA Program (if appropriate).

Ownership Modifications:

The highest priority for acquisition should go to the land immediately east of the present site. It might be possible to trade the formerly cultivated land south of the low wet area in the southern third of the tract for the esker. (If this area is traded then a conservation easement should be attached to the deed limiting the land to agricultural use.)

June, 1980

RIPLEY ESKER INVENTORY ERRATA

Page 30, Footnote 2: Delete *Quercus palustris*.

Page 38, Par. 1, line 2: Change "six" to *five*.

lines 3-4 should read: "...from *Morrison County based on specimens* in the University...."

Page 53, Par. 2, line 1: Change "and" to *or*.

PLEASE NOTE: Additional editorial, grammatical, typographical, and miscellaneous changes have been made in the inventory. A list of these changes is on file at TNC's Minnesota Chapter office.

June, 1980

RIPLEY ESKER MANAGEMENT PLAN ERRATA

Page 2, Par. 3, lines 3-5 should read: "...Ripley Esker. A ten year renewable lease was therefore signed by TNC on 25 July 1979, and by the DNR on 9 August 1979."

Page 8, Par. 2, line 16 should read: "...Program sets a priority for designating the area as an SNA. Recommended proposals are next sent to the Division...."

Page 13, Par. 4, lines 11-12: delete the sentence beginning "In addition...."

Page 15, Par. 2, lines 6-7 should read: Before the fences are removed their location should be marked with conduit and mapped for future reference.

Par. 4: Replace Action 3 with the following:

Action 3. Implement a wildfire suppression plan (TNC guideline 8; SNA policy 4).

Wildfires may threaten human health and property adjacent to the tract. However, the practices used to suppress wildfires may be more damaging to the site than the fire itself. Fire control should be to safely prevent the spread of the fire outside of the tract's boundaries, and be designed to minimize the damage produced by fire suppression activities. Several steps will be taken to achieve this goal.

Local fire authorities, the fire chief of the local fire department and the DNR area forester, should be annually contacted about control methods to use should a wildfire start on or spread into the tract. These authorities should be made aware of the nature of the tract and TNC's concern about what suppression methods are used on the site. They should be asked to consider using natural fire breaks and backfires, rather than heavy equipment and fire plows, to contain the fire. The fire authorities should have the names and telephone numbers of the local volunteer manager and TNC preserve management coordinator to contact for assistance in the event of a fire. A map should be provided showing the tract's boundaries, access points, and fire breaks.

Adjacent landowners should also be provided with the names and phone numbers of the local fire department, volunteer manager, and TNC preserve management coordinator to contact in case of a fire. If a wildfire does occur on the tract the neighbors can serve as an "early warning network", alerting the proper individuals. During extreme fire danger periods neighbors, and visitors, should be alerted to prevent man-caused fires

and to be on the lookout for fires.

Page 16, Action 4 should read: "...prairie, oak savanna, and north flatlands...."

Page 17, Par. 1, line 7: insert a new paragraph after "...in the same year."
The land north of the esker should not be burned until the fire history of the area is analyzed. This area probably experienced occasional burns. An analysis of the vegetation, including the documentation of any fire scars, should be done to provide evidence for this assertion. Dr. Max Partch should also be consulted about burning the area. If the area is burned fire breaks may be needed and are shown in Figure 1.
Following the burn....

Page 20, Par. 2: delete Action 11. (NOTE: all subsequent actions should be renumbered.)

Page 21, Par. 2: delete Action 13. (NOTE: all subsequent actions should be renumbered.)

Par. 3: replace Action 14 with the following:

Action 12. Post new signs on all the tract's boundaries and maintain the signs (TNC guidelines 3,4,7,8,9 & 10; SNA policies 3,7,15,16 & 22).
All of the tract's boundaries should be posted to prevent inadvertent encroachment by adjacent landowners, to minimize unauthorized activities (e.g., hunting), and to identify the area's boundaries to users and managers. If the tract is not designated an SNA in the near future, new signs will be posted on an experimental basis on all the tract's boundaries. (The posts will have to be moved if additions are made to the preserve. See Ownership Modifications.) These new signs will be more attractive and less negative than the old TNC signs they replace. (TNC's present signs emphasize what activities are prohibited on the tract.) The new signs will help promote TNC's cause to the local community and help form a positive image of the tract and its managers. The signs should be set no more than one-tenth mile apart; if visibility is obstructed they should be set closer together. At corners posts should be set so that signs are nearly touching and at the same angle as the boundary line. All signs and posts should be checked annually and repaired and replaced when necessary. As noted above, the new signs are an experiment: if problems develop on the tract then the signs

may have to be changed.

The above action does not apply if the tract is designated an SNA. If this occurs, the SNA Program will determine what action should be taken on posting.

Page 22, Par. 2, lines 5-7 should read: "visable from the road. The sign should follow standard TNC design, noting the owner and purpose of the tract. If and when...."

Par. 3, line 4: change "weekly" to biweekly.

Page 23, Par. 1: insert the following new paragraph after "...are present.":

Two sets of 5x7 standardized comment cards will also be kept in the box. One set of cards will be available for users to write comments on management and use of the tract (e.g., problems observed on the site, proposals for management, evaluation of the managers). The other set of cards will be available for visitors to write observations on the site's natural features. These cards will ask: the observer's name and address; what species were observed; the number of individuals seen; where the species were observed (space can be left for a sketch); and other remarks (e.g., presence of nesting activity, territorial behavior, identifying marks of unknown species). The back of the cards will have instructions and note the purpose of the cards. A list of those species which are of particular interest to managers and scientists could also be included here. The registration sheets and the comment/observation cards can provide valuable monitoring data to managers. It is therefore important to collect the cards and the registration sheets, and keep them for analysis.

Finally, the registration box should be annually touched up with Olympic wood stain. Other maintenance actions should be taken as required.

Page 24, Par. 3: replace Action 21 with the following:

Action 19. Encourage local middle and secondary schools, regional education institutions and researchers to use the site if appropriate (TNC guidelines 6 and 10; SNA policies 4,12, and 15).

All local secondary schools, the Minnesota Environmental Education Board's regional coordinator, St. Cloud State and St. John's Universities, the College of St. Benedict, Brainerd Community College, and other scientific research groups should at least know of the

site's existence, its potential for teaching such topics as native flora and fauna, ecology, and geology, and whom to contact for more information (e.g., the local volunteer manager, TNC preserve management coordinator, DNR regional naturalist). An effort should be made to meet annually with all teachers and researchers who express an interest in the site. Educational and research opportunities can be promoted at these meetings. However, the sensitivity of the resources and user responsibility in caring for the land must be stressed at these meetings. Use should only be encouraged if appropriate, i.e., if such use cannot occur equally well on less vulnerable areas. All teachers and researchers should be aware of the site rules and regulations, such as the need to obtain a permit prior to collecting or conducting research in the area, before they enter the site. Before a class comes to the tract teacher workshops should be held so that the teachers are trained and well-informed about the area. When the class comes to the site managers or scientists should, if possible, also be present to assist the teachers.

Page 25, Par. 2: delete Action 22 (NOTE: all subsequent actions should be renumbered--e.g., Action 23 should be 20.)

Pages 27-29: the actions on these pages are out of order and incorrectly numbered. Also, some new actions have been added here. The correct order is as follows:

Action 21. Recruit a local volunteer manager,...(See p. 27)

Action 22. Develop and maintain a close relaionship with local and regional government officials, natural resource professionals and other appropriate individuals (TNC guidelines 5,6, and 8; SNA policies 4,5,9,13, and 21).

Local and regional governmental officials (e.g., the mayor, county assessor, county board members) and resource management professionals (e.g., the county extension agent, DNR area wildlife manager, Soil Conservation Service district conservationist, U.S. Fish & Wildlife Service managers) should be contacted annually and informed about the site. These individuals are all concerned with natural resources in their respective capacities. They should be aware of the site, its importance, and major management actions which are planned for or being implemented on the tract. This action can help eliminate public suspicions and misconceptions, build trust and rapport, and increase community support. It is also another way of monitoring what

the public feels about the site and the managers.

Keeping in close contact with local and regional professional resource managers is also important. These individuals, if they are aware of the site and interested in its preservation, can provide valuable expertise and manpower, and lend equipment if needed for management. As local residents they can help generate community support for the tract. Co-operative management efforts can also sometimes be used to solve problems which affect (or could affect) several sites in the area, including the preserve.

Action 23. Maintain close contact with all scientists who are using the site for educational and research purposes (TNC guidelines 4,5, and 6; SNA policies 1,2,3,4,5,9,12,13, and 15).

Scientists, as trained observers, can provide valuable information and insights for managing the site. Data gathered from scientific studies are also important for monitoring the site. Thus all scientists using the site will be contacted annually. Researchers conducting studies will be consulted about their data and conclusions. Researchers should inform TNC and the DNR (if appropriate) immediately of important natural changes and human impacts they discover. Researchers should furthermore be consulted and encouraged to offer input into managing the tract. Finally, research information should be accumulated, stored in a site file, and shared with interested researchers.

Action 24. Contact the local DNR conservation officer....(See p. 29)

Action 25. Hold periodic meetings for local residents....(See p. 27)

Action 26. Develop and implement a monitoring program...(See p.28)

Action 27. Periodically inspect the site...(See p. 28)

lines 5-6 should read: "...infestations). If urgent action is required on the site TNC should be contacted immediately. Otherwise, records should be kept of observations for the annual status report.

The inspections are also an opportunity...."

Action 28. Submit an annual written report.... (See p. 29)

lines 8-9: delete the sentence beginning "On randomly...."

Page 30: add a footnote to the period on line 3:

1. The esker on the west side of the road, owned by the Doucettes, should also be investigated for possible acquisition. (Dave Grether stated this part of the esker is in much better condition than the land east of the present site.)

PLEASE NOTE: Additional editorial, grammatical, typographical and miscellaneous changes have been made in the plan. A list of these changes is on file at TNC's Minnesota Chapter office.

The 1977 Inventory
for
Ripley Esker
Morrison County, Minnesota

SW¼ of Section 18 and N. Half of NW¼,
Except the West 20 Acres thereof, of Section 19
Township 42 North, Range 31 West
Belle Prairie Quadrangle

Prepared by
The Minnesota Chapter of The Nature Conservancy
and
The Scientific and Natural Areas Section
Division of Parks and Recreation
Minnesota Department of Natural Resources

October 1979 Draft

TABLE OF CONTENTS

INTRODUCTION

Scope and Organization

The primary purpose of this document is to provide data necessary for the Minnesota Natural Heritage Program to evaluate the significance of Ripley Esker. This evaluation will be used to determine if the tract qualifies as a Scientific and Natural Area (SNA). In addition, the inventory provides information on the site's viability, notes man-made disturbances, identifies fragile, sensitive resources, and provides a temporal baseline from which changes in the area can be identified. This information is useful to the Natural Heritage Program evaluators, to scientists who may study the area, and to SNA managers should the site be designated a SNA.

The Ripley Esker inventory is divided into nine sections covering climate, the unit's physical resources (geology, soils, water resources), plant communities and the various biological subdivisions (flora, butterflies, birds, and mammals).[1] In addition to identifying and cataloging the tract's natural features each section describes the reasons for conducting the inventory, describes the inventory methods used, highlights elements which researchers have labeled "significant", and points out additional inventory data which could be collected on the site.

The final two sections of the inventory are concerned with human activities on and adjacent to the site. The land use history section describes how the tract has been changed through human activities, where known, and identifies adjacent land uses. The natural area visitor section

1 No information was collected by the 1977 inventory team on the site's amphibians and reptiles. Thus no information is presented in this document on these animals.

points out regional populations centers, educational and research centers and groups which may be sources of users.

The Ripley Esker inventory represents the culmination of many individuals' efforts. The inventory was completed in the summer of 1977 by six Nature Conservancy student interns: Kathryn Bolin, Robert Dana, John Dorio, Erik Englbretson, Steve Hansen and Hagdis Tschunko. These individuals did all the research and preliminary writing. Each member of the team was responsible for completing a part of the inventory in which they had expertise. Approximately 184 hours were spent in preparation of specimens, researching the literature, processing and analyzing data and writing. Mr. Mark Heitlinger, TNC Coordinator of Preserve Management, Minnesota Chapter, helped supervise and edit the inventories. Michael Rees, Scientific and Natural Area Research Writer prepared the final inventory. Other individuals who assisted in the preparation of the inventory are mentioned in the appropriate sections. Their help is gratefully acknowledged.

Unit Overview

Ripley Esker is a geologically significant example of the glacial age in Minnesota. The tract is located in Morrison County, forty-four miles from St. Cloud and 10.2 miles north of Little Falls in central Minnesota. The esker is a steep-sided gravel ridge which runs for approximately three-quarters of a mile on the unit and is approximately 225-250 feet wide. The surrounding landscape is a flat to rolling plain of glacial till. Maximum relief on the tract is sixty feet. A small ice-block pond is also present on the north face of the esker.

Seven distinct vegetative communities can be discerned on the tract's 220 acres. Communities present on the unit include Oak Woods, Aspen Woods, Old Field, Brome Grass, Dry Prairie, Sedge-willow and an Emergent Aquatic

community. Two hundred vascular plant species were identified in these communities by the 1977 inventory. Only 25 of these species are not native to Minnesota. Thirty-three butterfly , fifty-five bird and nine mammal species were also observed in the area.

Ripley Esker's biotic communities have been extensively affected by past human activities. The unit's woods have been selectively cut and grazed. Most of the land adjacent to and surrounding the esker has been cleared for cultivation.

A drainage ditch was also built on the land. This drainage ditch passes through the esker, causing erosion, and may be affecting water levels of the near-by pond.

The most significant element on the unit, and the primary reason for its nomination as a Scientific and Natural Area, is the esker. Ripley Esker is unique to this region because of its excellent preservation. It has been labeled a "textbook example", one of the "outstanding" examples of this glacial formation in Minnesota, and an "ideal" site for teaching field geology. The esker has also been illustrated in several geology textbooks, and was cited by the geologist and ecologist Dr. W.S. Cooper in his writings. In addition to its geologic value the area is of interest to biologists. Few areas in the state have a north and south slope in such close proximity with such extreme differences in vegetation. Thus the area offers excellent opportunities for ecological study. If the site's vegetation can be restored to its original pre-settlement native prairie and oak savanna, two important elements of the state's natural heritage will be protected. Finally, the site contains four plant species which are at their state or continental range limits, and one special species, Gentiana puberula, which infrequently occurs in Minnesota.

CLIMATE

Climate has a major influence on the biotic and physical resources of Ripley Esker. Species diversity, density and distribution, soil type, erosion, hydrology and land use are all affected by temperature, precipitation and wind.

Methods

Climatological data were gathered by researching National Oceanic and Atmospheric Administration and Minnesota Agricultural Experimental Station reports. Since Ripley Esker doesn't have a weather station, data were gathered from the St. Cloud NOAA weather station.

Regional Climate[1]

Ripley Esker's climate is subject to marked changes in temperature which characterize all of Minnesota. The area experiences frequent periods of cold Arctic air during the winter months. A typical winter has five to ten days with temperatures ranging from -20 to -30 degrees Fahrenheit. Although winters are cold, strong winds and high humidities are generally absent on the coldest days.

The region's growing season is fairly short, extending from mid-May to the end of September, averaging 140 days per year. Since the Gulf of Mexico air masses seldom reach this far northward, prolonged periods of hot and humid weather are infrequent in this area. Only once in every five to ten years does the temperature exceed 100 degrees Fahrenheit, and then usually for only one day.

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1 The following information is taken from NOAA 1976 Local Climatological Data: Annual summary . . . . . .

Approximately 60% of the region's average 26.8 inches of precipitation (water equivalent) falls during the months of May through September; June is the wettest month of the year. The principal source of rain during this season is thunderstorms. Average annual snowfall is 43.1 inches, with the heaviest snow falls occurring in March.

Damaging storms such as severe blizzards, tornados and ice storms, occur infrequently in the region. The occurrence of ice storms, causing extensive damage to trees, averages less than once per year. However, heavy rains, winds and hail associated with thunderstorm line squalls occurs each year in the region.

Table 1 is a summary of selected temperatures and precipitation data for the St. Cloud area.

Sources of Information

Baker, D.G. and J.H. Strub, Jr. 1963a. Climate of Minnesota: Part I. Probability of occurrence in spring and fall of selected low temperatures. Minnesota Agricultural Experimental Station Tech. Bulletin 243, 40p

_____1963b. Climate of Minnesota: Part II. The agricultural and minimum-temperature-free seasons. Minnesota agricultural Experimental Station Tech. Bulletin 245. 32p

_____1965. Climate of Minnesota: Part III. Temperature and its applications. Minnesota Agricultural Experimental Station Tech. Bulletin 248. 64p

National Oceanic and Atmospheric Administration, (NOAA) Environmental Data Service. 1976. Local climatological data: annual summary with comparative data, St. Cloud, Minnesota. National Climatic Center, Asheville, N.C.

Table 1. Selected Weather Data for St. Cloud.[a]

TEMPERATURE	°F	°C
Mean annual temperature:	41.7	5.4
Mean annual daily maximum temperature:	52.4	11.3
Mean annual daily minimum temperature:	31.0	-0.6
Highest temperature recorded (July, 1940, Aug., 1947):	103.0	39.4
Lowest temperature recorded (Jan., 1951):	-40.0	-40.0
Average temperature warmest month (July):	70.2	21.2
Average daily maximum--July:	81.8	27.7
Average daily minimum--July:	58.6	14.8
Average temperature coldest month (January):	8.9	-12.8
Average daily maximum--January:	19.2	-7.1
Average daily minimum--January:	-1.4	-18.6
Average date last occurrence 32°F (0°C) or less (spring):	c. 5 May[b]	
Average date first occurrence 32°F (0°C) or less (fall):	c. 1 Oct.[c]	
Average number days in growing season (period free of 32°F (0°C) or less):	c. 140[d]	
Average growing degree days, T_b = 40°F (4.4°C):	4102[e]	
Average growing degree days, T_b = 50°F (10.0°C):	2377[e]	

PRECIPITATION	in.	cm.
Average annual precipitation (water equivalent):	26.84	68.17
Average annual snowfall:	43.10	109.47
Average precipitation wettest month (June):	4.64	11.78
Average precipitation (water equivalent) driest month (Jan.)	0.76	1.93
Average snowfall heaviest month (March):	9.9	25.15

[a]All data except that noted otherwise is from National Oceanic and Atmospheric Administration, Environmental Data Service. 1976. Local Climatological Data: Annual Summary with Comparative Data, St. Cloud, Minnesota. National Climatic Center, Asheville, N. C.

[b]Based on Figure 3. Baker, D. G., and J. H. Strub, Jr. 1963a. Climate of Minnesota: Part I. Probability of Occurrence in Spring and Fall of Selected Low Temperatures. Minnesota Agr. Exp. Sta. Tech. Bull. 243.

[c]Based on Figure 4. Baker and Strub, 1963a.

[d]Based on Figure 16. Baker, D. G., and J. H. Strub, Jr. 1963b. Climate of Minnesota: Part II. The Agricultural and Minimum-Temperature-Free Seasons. Minnesota Agr. Exp. Sta. Tech. Bull. 245.

[e]From Appendix Table 2. Baker, D. G., and J. H. Strub, Jr. 1965. Climate of Minnesota: Part III. Temperature and Its Applications. Minnesota Agr. Exp. Sta. Tech. Bull. 248.

Growing degree days = $\Sigma(\overline{T} - T_b)$ where $\overline{T}$ = mean daily temperature and T_b = selected baseline temperature (40° F or 50° F).

GEOLOGY

The earth's rocks, minerals, and topography form the physical landscape we see today. The type of bedrock and glacial drift affects the soil and groundwater, which in turn influence the vegetation. The land's relief, slope, and aspect affect hydrology, microclimate, soil formation, and the biotic community. Some geological formations are visually striking, illustrating geological processes; other features are more subtle, such as fossils showing how life has developed on the earth. Protecting examples of geological features is one important part of preserving natural diversity in Minnesota.

Methods

Geologic information was primarily obtained through a literature search. Field surveys using topographic maps and aerial photographs aided in interpretation.

Historical Geology

Like all of central Minnesota, Ripley Esker's physical landscape owes much of its present configuration to the late Wisconsin glaciers of the Pleistocene Epoch. Approximately 20,500 years ago the Rainy and Superior glacial lobes descended from Canada and covered much of east central Minnesota. One sublobe of these glaciers, the Pierz sublobe, is responsible for many of the characteristics of the Brainerd-Pierz Drumlin Area, the geomorphic region in which the site is located. (The unit is in the northwest portion of the region. (See Figure 1.). The Pierz sublobe was also responsible for the primary element of significance on the unit, the esker. Eskers were formed by streams of meltwater carving out tunnels at the base of a stagnant glacier. The stream carried gravel, much as streams and rivers do today, and it deposited much of this gravel on its bed when the stream's velocity decreased.

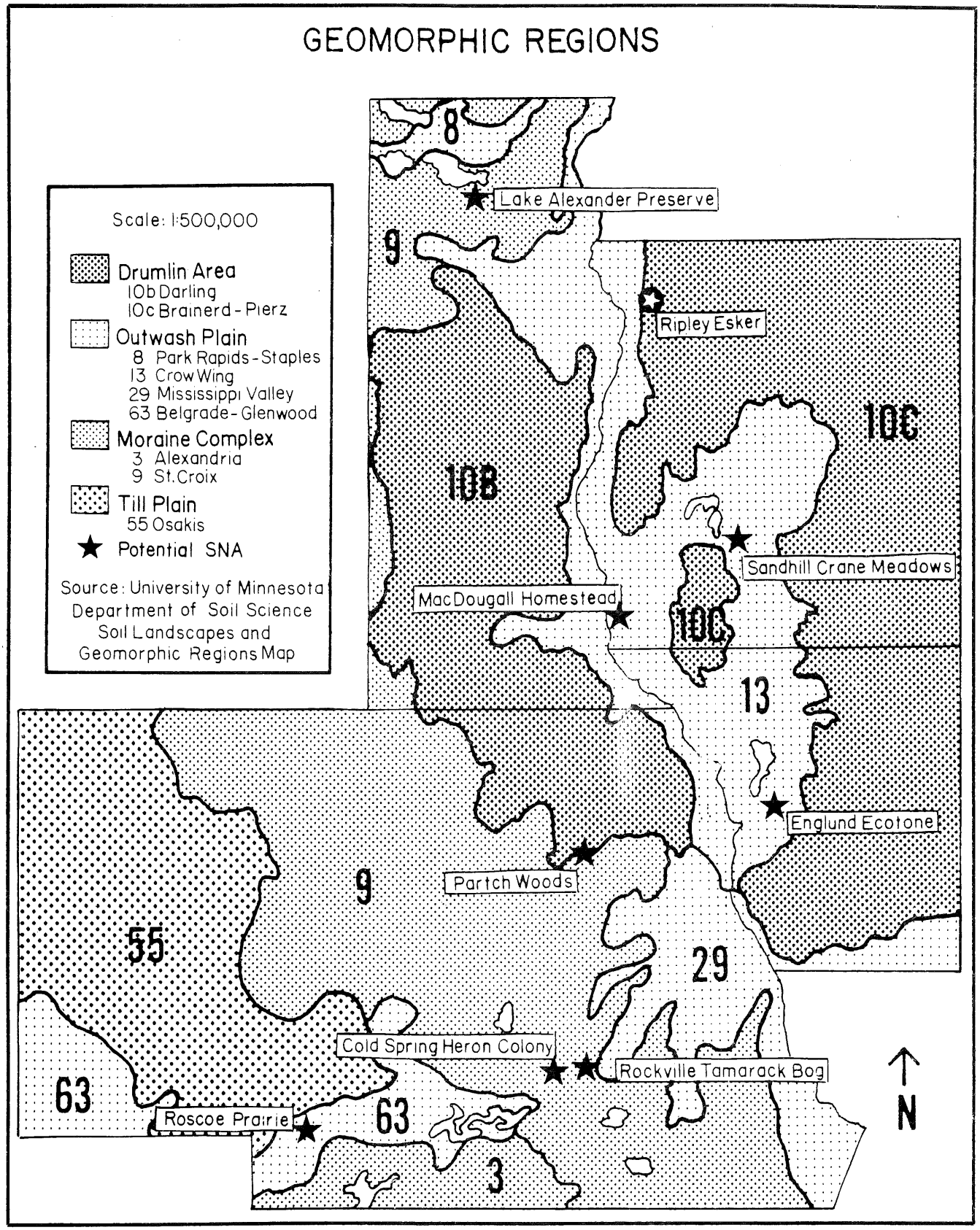

Figure 1. Ripley Esker and nearby potential Scientific & Natural Areas in relation to geomorphic regions in central Minnesota (Benton, Morrison and Stearns Counties).

Thus gravel piled up inside the glacial tunnel. When the glacier melted back the pile of gravel remained although the stream no longer existed. Without the lateral support of the surrounding ice the mound of gravel collpased slightly, forming a steep-sided ridge with a rounded top. This ridge rises out of the plain that was made by glacial action. Ripley Esker is part of the Fort Ripley Esker which has an overall length of 6-3/4 miles. Approximately three fourths of a mile of the esker is presently owned by The Nature Conservancy.

Ripley Esker's Topography and Bedrock

Figure 2 shows the topography of the site. Ripley Esker stands out on the map as a sinuous, steep-sided, narrow ridge about 225-250 feet in width running east-west across the unit. Elevation of the esker ranges from a low of approximately 1170 feet at the drainage ditch, to a high of approximately 1230 feet at one point on the top of the ridge. Thus the maximum relief of the unit is sixty feet.

North and south of the esker the landscape is much smoother till plain. Elevation of this flat to rolling landscape ranges from 1160 to 1180 feet.

Ripley Esker lies on the border between two bedrock formations (See Figure 3). Cuyana Series lies to the north and west of the tract. This series is about 1.62 billion years old and consists of iron-bearing chert and slates, intrusive igneous rocks and younger horizontal sediments. The Thomson formation lies to the east and south of the tract. This formation is the same age as the Cuyana series but consists of granite and slates. No bedrock outcrops are present on the site because glacial drift covers the bedrock.

Significance of Ripley Esker

The primary reason for the nomination of this site as a SNA is the esker. Eskers have been becoming more and more scarce in the state due to gravel operations - eskers are composed almost entirely of gravel and

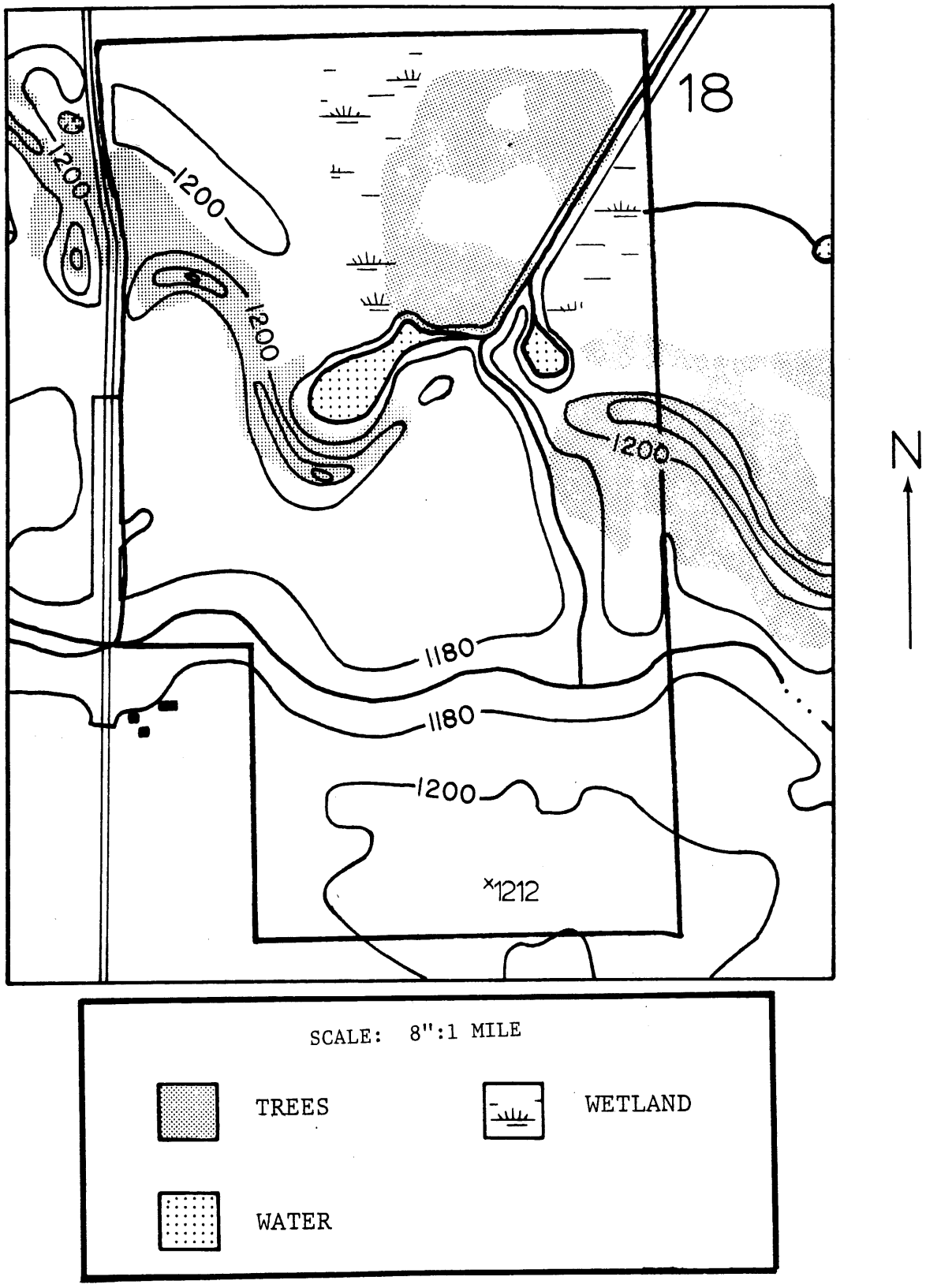

Figure 2. Ripley Esker's topography. Elevations are in feet above mean sea level. Adapted from the U.S. Geological Survey, Belle Prairie Quadrangle, 1:24,000, 1956.

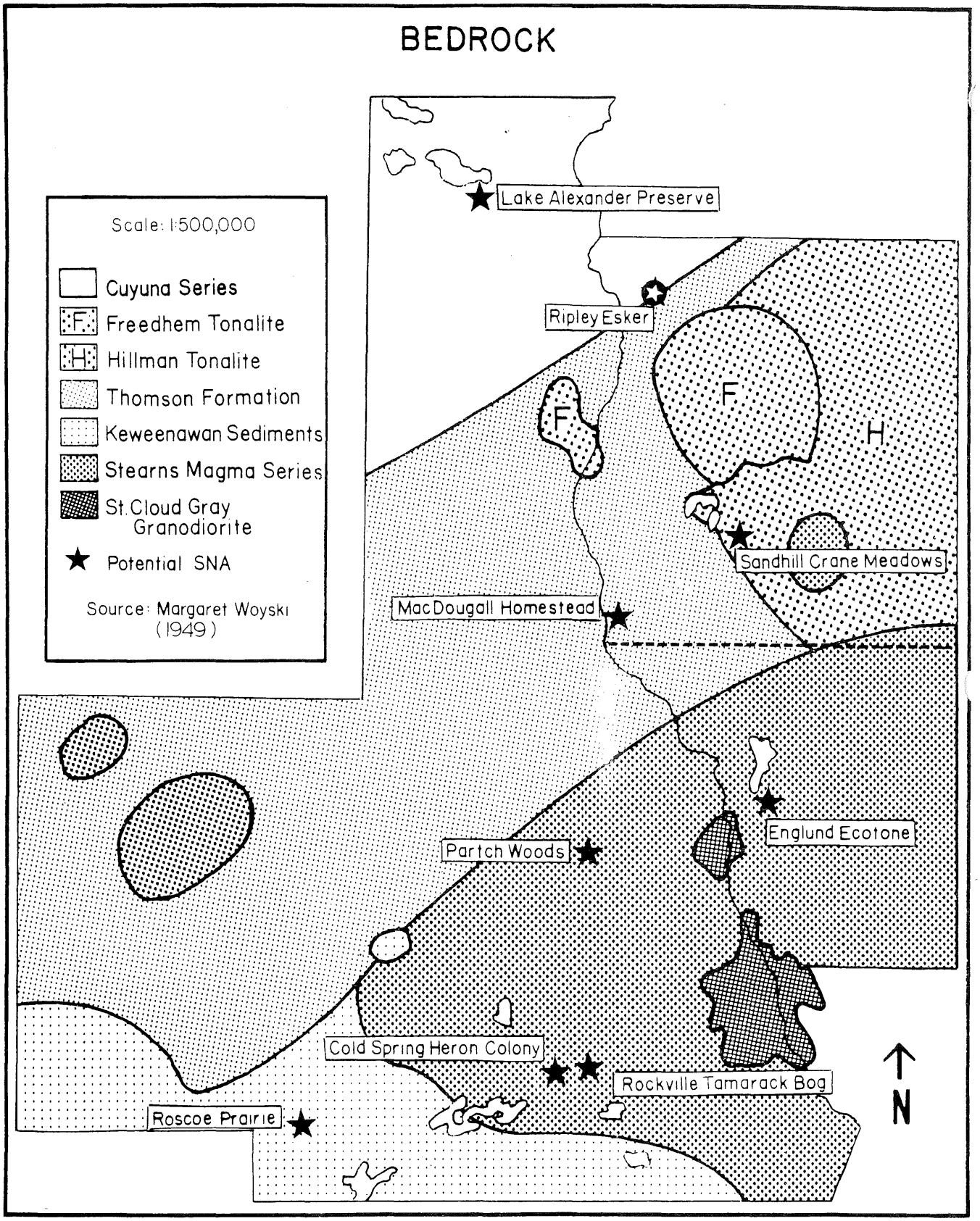

Figure 3. Bedrock formations in the area of Ripley Esker and nearby potential Scientific & Natural Areas in central Minnesota (Benton, Morrison, and Stearns Counties).

gravel is valuable for construction purposes. Ripley Esker is unique to this region because of its excellent preservation. It has been labeled as an "outstanding example" by Professor David T. Grether, St. Cloud State University, and as "ideal" for teaching field geology by Professor Edward Cushing, University of Minnesota. Ripley Esker has also been used as an illustration in several geology text books, and the geologist and ecologist Dr. W. S. Cooper cited this esker in his writings on the Upper Mississippi River Valley. Thus the value of this esker has been recognized for many years.

Sources of Information

Cooper, William S. 1935. The history of the upper Mississippi River in late Wisconsin and post glacial time. Minnesota Geological Survey. Bulletin #26. University of Minnesota Press, Minneapolis.

Goldich, Samuel S. 1961. The pre-cambrian geology and geochronology of Minnesota. Minnesota Geological Survey. Bulletin #40. University of Minnesota Press. Minneapolis.

Schneider, Allan F. 1961. Pleistocene geology of the Randall region, central Minnesota. Minnesota Geological Survey. Bulletin #40. University of Minnesota Press. Minneapolis.

Schwartz, George M. and George A. Theil. 1954. Minnesota Rocks and Waters. University of Minnesota Press. Minneapolis.

U.S. Department of the Interior. Geological Survey (USGS). 1956. Belle Prairie Quadrangle. MN: 7.5 Minute series (Topographic). 1:24,000 Denver, Colorado.

University of Minnesota. Department of Soil Science in cooperation with Minnesota Geological Survey and the USDA Soil Conservation Service. 1975. Minnesota Soil Atlas:Soil Landscapes and Geomorphic Regions - Brainerd Sheet 1:250,000.

Woyski, Margaret S. 1949. Intrusives of central Minnesota. Geological Society of America. Bulletin #60: 999-1016.

SOILS

Soils are one of the earth's most important resources. The decomposition of organic material, recycling of nutrients, ground water recharge, erosion, and drainage are all affected by the soils. Plants depend on the soils for their anchoring medium, water, and nutrients. Soils are also an indicator of past and present climate, parent material, topography and vegetation. Soil inventories are necessary to help determine the above information, to identify rare soil types, and to establish a baseline so changes occurring in the soil over time can be monitored.

Methods

Soil information for this inventory was obtained from the literature and from a detailed soil survey.[1] A soil inventory of Ripley Esker was conducted by the U. S. Soil Conservation Service in October 1977. Soil series descriptions and single sheet interpretations for each of the soils occurring on the unit were obtained from the University of Minnesota Soil Science Department.

Soils of Ripley Esker

Ripley Esker lies in an area of generally light colored, coarse to medium textured soils formed under forest vegetation. Table 2 and Figure 4 show the site's soils and soil characteristics. Eleven major soil series are evident. Soils of the old fields south of the esker and a small portion of the wooded area in the northeast corner of the site have been classified as light colored fragiochrepts of the

1 The following professionals were consulted and gave valuable help during the inventory:
H.R. Finey, Minnesota State Soil Coordinator; Steve Wilson, U.S. Soil Conservation Service District Conservationist; John LaCore, U.S. S.C.S. Little Falls; and Don DeMartelelaese, U.S. S.C.S. Soil Scientist, Fergus Falls.

Key to Table 2.

TEXTURE: Relative proportions of various soil separates (silt, sand, clay) in a soil.

Topsoil: "surface soil" in uncultivated soils, a depth of 3 or 4 to 8 or 10 inches; in agriculture, refers to the layer of soil moved in cultivation.
Subsoil: soil below the topsoil, from 8 or 10 to 60 inches.

DRAINAGE CLASS: Soil drainage refers to natural frequency and duration of saturation which exists during soil development. Soil drainage classes are those used in making detailed soil maps (Arneman and Rust, 1975; USDA-SCS and Minnesota Agr. Expt. Sta., 1977)

VPD - Very Poorly Drained -- water table remains at or near surface (above 18 inches) greater part of the time. Soils wet nearly all the time, with or without mottling.

PD - Poorly Drained -- water table seasonally near surface for prolonged intervals. Water table from 18 to 36 inches. Soils wet for long periods, generally with mottles.

WD - Well Drained -- water is removed from soil readily but not rapidly. Soils are nearly free of mottling.

SWED - Somewhat Excessively Drained -- water is removed rapidly and soils are without mottles.

ED - Excessively Drained -- water is removed very rapidly. Soils are without mottles.

COMPONENT IN STATE: Extent of acreage in state.

M - Major: 100,000 acres or more
I - Intermediate: 10,000 to 100,000 acres
m - Minor: 10,000 acres or less

Table 2. Soil Characteristics of Ripley Esker

	SOIL SERIES (Mapping unit)	DRAINAGE CLASS	DEPTH TO WATER TABLE	PARENT MATERIAL	LANDSCAPE POSITION	TEXTURE		VEGETATION		COMPONENT IN STATE	LOCATION IN STATE
						TOPSOIL	SUBSOIL	ORIGINAL	PRESENT		
FOREST SOILS	Flak (144)	WD	6'	Rainy lobe till (glacial)	side slopes of ground moraines & drumlins 2-25% slopes	fine sandy loam	sandy loam	mixed deciduous woods	oak woods, brome	M	Central & East Central
	Pomroy (119)	WD - MWD	6'	fine sand over Superior lobe red drift	upper side slopes of ground moraines, drumlins 1-10% 2-6% common	fine sand	sandy loam	deciduous woods - oak	old field, aspen	I	East Central & Central
	Unnamed (751)	MWD	2-4'	outwash sand and gravel	plane or concave slopes on outwash plains, valley trains 0-2% slopes	fine sandy loam	gravelly coarse sand	deciduous coniferous forest	oak woods sedge-willow	m	East Central
	Brainerd (163)	MWD	1.5 - 2.5'	Rainy lobe till (glacial)	side slopes of ground moraines & drumlins 2-7% slopes	sandy loam	sandy loam	mixed deciduous woods	brome sedge-willow	M	Central & East Central

Table 2 cont. Soil Characteristics of Ripley Esker

	SOIL SERIES (Mapping unit)	DRAINAGE CLASS	DEPTH TO WATER TABLE	PARENT MATERIAL	LANDSCAPE POSITION	TEXTURE		VEGETATION		COMPONENT IN STATE	LOCATION IN STATE
						TOPSOIL	SUBSOIL	ORIGINAL	PRESENT		
FOREST SOILS	Nokay (142)	PD	2-4'	Rainy lobe till (glacial)	bases of slopes, heads of drainage ways 1-2% slopes	fine sandy loam	sandy loam	mixed deciduous woods	brome, sedge-willow, aspen	I	Central
FOREST SOILS	Parent (165)	PD	0-3'	Superior &/or Rainy lobe till (glacial)	broad areas in gently undulating ground moraines; 1% or less slopes	loam, silty loam	fine sandy loam	oak savanna	oak woods, sedge-willow	I	Central & North-east
FOREST SOILS	Barrows (139)	VPD	0-1'	Rainy lobe till (glacial)	low areas between drumlins & upland depressions nearly level	sandy loam	sandy loam	mixed marsh, shrub forest	brome, aspen, oak	m	Central
PRAIRIE TRANSITION SOILS	Emmert (12)	ED	6'	sorted coarse textured drift of Rainy lobe outwash	steep convex positions of kames, eskers and moraines 3-50% slopes 9-18% common	gravelly coarse sand	gravelly loamy sand	conifer, aspen, oak	esker - oak woods	I	Central North-east

Table 2 cont. Soil Characterisitics of Ripley Esker

	SOIL SERIES (Mapping unit)	DRAINAGE CLASS	DEPTH TO WATER TABLE	PARENT MATERIAL	LANDSCAPE POSITION	TEXTURE		VEGETATION		COMPONENT IN STATE	LOCATION IN STATE
						TOPSOIL	SUBSOIL	ORIGINAL	PRESENT		
PRAIRIE TRANSITION SOILS	Chetek (155)	SWED	6'	well sorted outwash sand & gravel of Superior &/or Rainy lobe	level stream terraces, rolling outwash plains, pitted moraines 1-30% slopes 5% most common	sandy loam	sandy loam	conifer, aspen, oak	brome, oak, sedge-willow	I	Central North-east
	Watab (218)	SWPD	2-4'	sandy sedi-ments over Rainy lobe till	plane to slight depressions adjacent to drainage ways 0-2% slopes	loamy fine sand	fine sandy loam	hardwoods	aspen woods	m	Central & North Central
	Isanti (IM) (161)	VPD	0-2'	eolian deposits over Des Moines lobe outwash	outwash plain depression adjacent to Mississippi River 0-2% slopes	fine sand	mucky loamy fine sand	grasses, sedges, shrubs	sedge-willow	I	East Central

KEY

	SOIL SERIES	DRAINAGE CLASS
12	Emmert	Excessively Drained
155	Chetek	Somewhat Excessively Drained
144	Flak	Well Drained
163	Brainerd	Moderately Well Drained
119	Pomroy	Moderately Well Drained
751	Unnamed	Moderately Well Drained
218	Watab	Somewhat Poorly Drained
142	Nokay	Poorly Drained
165	Parent	Poorly Drained
139	Barrows	Very Poorly Drained
161	Isanti	Very Poorly Drained
	Unknown	
W	Water	

SLOPE

B	2-6% Slope
C	6-12% Slope
E	6-25% Slope

Road

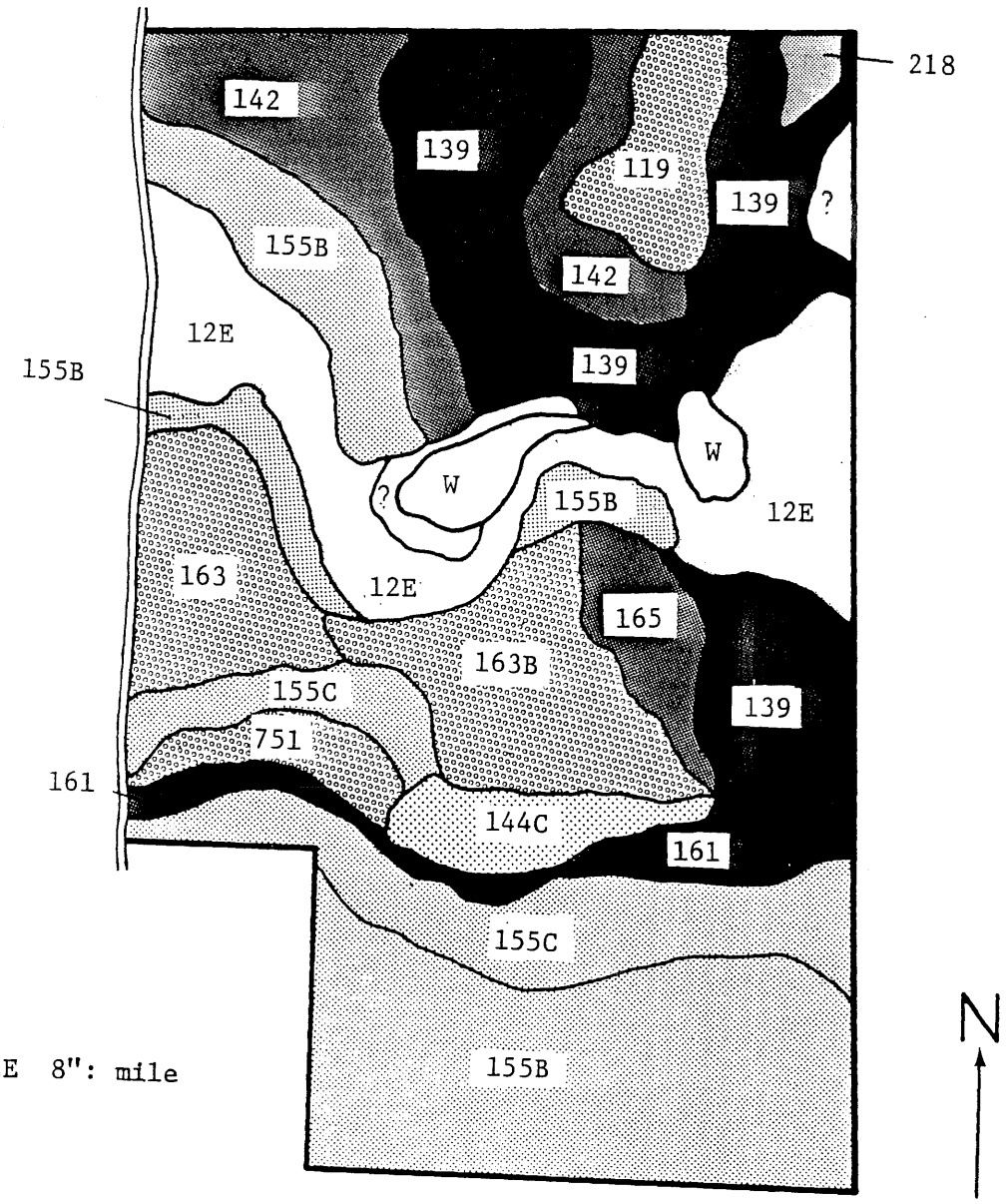

Figure 4. Ripley Esker's soils and drainage classes.

Brainerd, Flak, Pomroy and Watab series - loamy, medium to strongly acidic soils underlined by a fragipan (a hard layer of soil where percolation of water is extremely slow, if at all, and root penetration is difficult). The fragipan commonly occurs at a depth of between twenty to forty-two inches. Root depth is further restricted by a seasonal water table above the fragipan at some time during the year. Consequently the rooting depth in these soils is shallow. The Brainerd and Flak soils were formed from glacial till of the Rainy lobes while the Watab and Pomroy soils formed from fine sandy sediments lying over Rainy Lobe till and Superior Lobe red drift respectively.

Another soil series in the old fields south of the esker is the Unnamed 751 Series: a sandy loam, light colored haplaquept. This soil is wetter than the fragiochrepts and lacks a fragipan. It is similar to the Watab and Pomroy soils in that it formed in loamy material lying over Rainy or Superior Lobe outwash.

Soils under the wooded areas north and south of the esker and a narrow band in the hollow that extends across the southern third of the unit from east to west are haplquolls. These soils, (which include the Parent Series) are dark colored, noncalcarious, strongly acidic to neutral soils formed from loamy Rainy or Superior lobe till. The soils are poorly drained.

Soils of the old field and part of the wooded area north of the esker, the field in the southeast corner, and two strips bordering the esker on the south are classified as the Nokay Fragiaqualifs and the Chetek Glossoboalfs. These soils are noncalcarious sandy loam and fine sandy loam, strongly to moderately acidic soils. They formed from Rainy lobe glacial till and from loamy outwash lying over till. The Nokay series is similar to the Brainerd, Flak, Pomroy and Watab fragiochrepts in that it

also has a fragipan which restricts drainage and may retain ground water. Chetek soils are more freely drained.

Three other soils series are found in the Ripley Esker site. The Isanti series, found in a narrow strip in the southern fields, consist of poorly and very poorly drained noncalcareous, sandy soils. The Emmert series are the primary soils found on the esker proper. They are dark, deep, excessively drained, gravelly coarse to loamy sandy soils, derived from Rainy Lobe outwash. The Barrows series is found under the wooded areas in the north and south of the esker.[1] The soils are deep, dark, very poorly drained sandy loam, formed from glacial till.

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1 The Barrows Series is presently a tentative, unestablished soil classification. When Morrison County has been offically mapped, this series may become an established series, or it may be grouped under other soil series.

WATER RESOURCES

Water is another of the key resources which affects the landscape. Besides adding diversity to the physical landscape water nourishes plants and animals, provides habitat for aquatic organisms, and affects soils and erosion. Possible changes in water chemistry, water table depth and drainage can drastically modify the biotic community. Water resources are studied to identify significant and fragile wet areas, and to help classify the area.

Methods

The major source of information on water resources was the literature. Field surveys using maps and aerial photographs were also conducted on the unit.

Ripley Esker's Water Resources

Ripley Esker is located three miles to the west of the Mississippi River. Water drains into the river via groundwater, and a drainage ditch which enters the unit from the northeast, flows south through the esker and then west. A small iceblock pond about two acres in size is also present on the north side of the esker. The pond apparently has been affected by the drainage ditch in past years. Local residents can only recall once, in 1976, the pond being totally dry.

Additional Inventory/Research Needs

It is not known what effect the drainage ditch is having on the lake. The tract's water levels, flow rates, and drainage patterns need to be investigated to determine this. The 1977 inventory also did not conduct water quality tests on the site. This data would provide a more complete hydrologic baseline for Ripley Esker.

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VEGETATIVE COMMUNITIES

Vegetative communities are often one of the primary reasons for designating an area as a Scientific and Natural Area. The most significant plant communities are those that provide exceptional examples of the state's plant communities or natural processes, are relict communities persisting from an earlier period, and/or harbor significant species. Indeed, all significant biotic elements are dependent on the vegetative communities' characteristics: plant communities affect soils, hydrology, microclimate, and individual plant species. They also provide food, cover, and shelter habitat for the area's animal populations. The primary means of holistically viewing and classifying an area's biotic elements is through the plant communities.

Methods

Ripley Esker's vegetative communities were catagorized according to their cover types. Color infrared 1976 aerial photographs were used to delineate the boundaries of each community. The relative area of each plant community was determined from the vegetative map with the aid of a Soil Conservation Service grid-dot acreage estimator. Each plant community was checked in the field by walking through the community and recording the dominant species present. Historical vegetative changes were determined through a literature search.

Overview of Regional Plant Communities

Ripley Esker is located in the northern tip of the Mississippi River Sand Plains landscape region of Minnesota (see Figure 5). This is an area within the prairie-forest transition zone. Figure 6 shows the vegetation of the Ripley Esker area prior to European settlement. The Ripley Esker area consisted of oak openings and prairie (Marschner, 1930). Oak savanna persisted largely because of natural fires. With European settlement fires in the area were reduced and the oak savanna was replaced by oak woods on land not utilized for farming.

Ripley Esker's Vegetative Communities

The vegetative communities in and around Ripley Esker are displayed in Figure 7 . Seven distinct vegetative communities are present on the unit: Oak Woods, Aspen Woods, Old Field, Brome Grass Field, Dry Prairie, Sedge-willow, and Emergent Aquatic communities.

The Oak Woods forest constitutes 15% of the unit. The dominant species of the forest canopy are Pin Oak (Quercus ellipsoidalis) and Bur Oak (Quercus macrocarpa). The understory dominants include: Wild Lily of the Valley (Maianthemum canadense var. interius), Wild Sarsaparilla (Aralia nudicaulis), Burdock (Arctium sp .), Wild Geranium (Geranium maculatum), Hemp Nettle (Galeopsis tetrahit), and Enchanter's Nightshade (Circaea quadrisulcata).

Twenty-two percent of the tract is Aspen Woods. The dominant species of the canopy is Quaking Aspen (Populus tremuloides), while the understory dominants are Big Bluestem (Andropogon gerardi) and Arrow-leaved Aster (Aster sagittifolius).

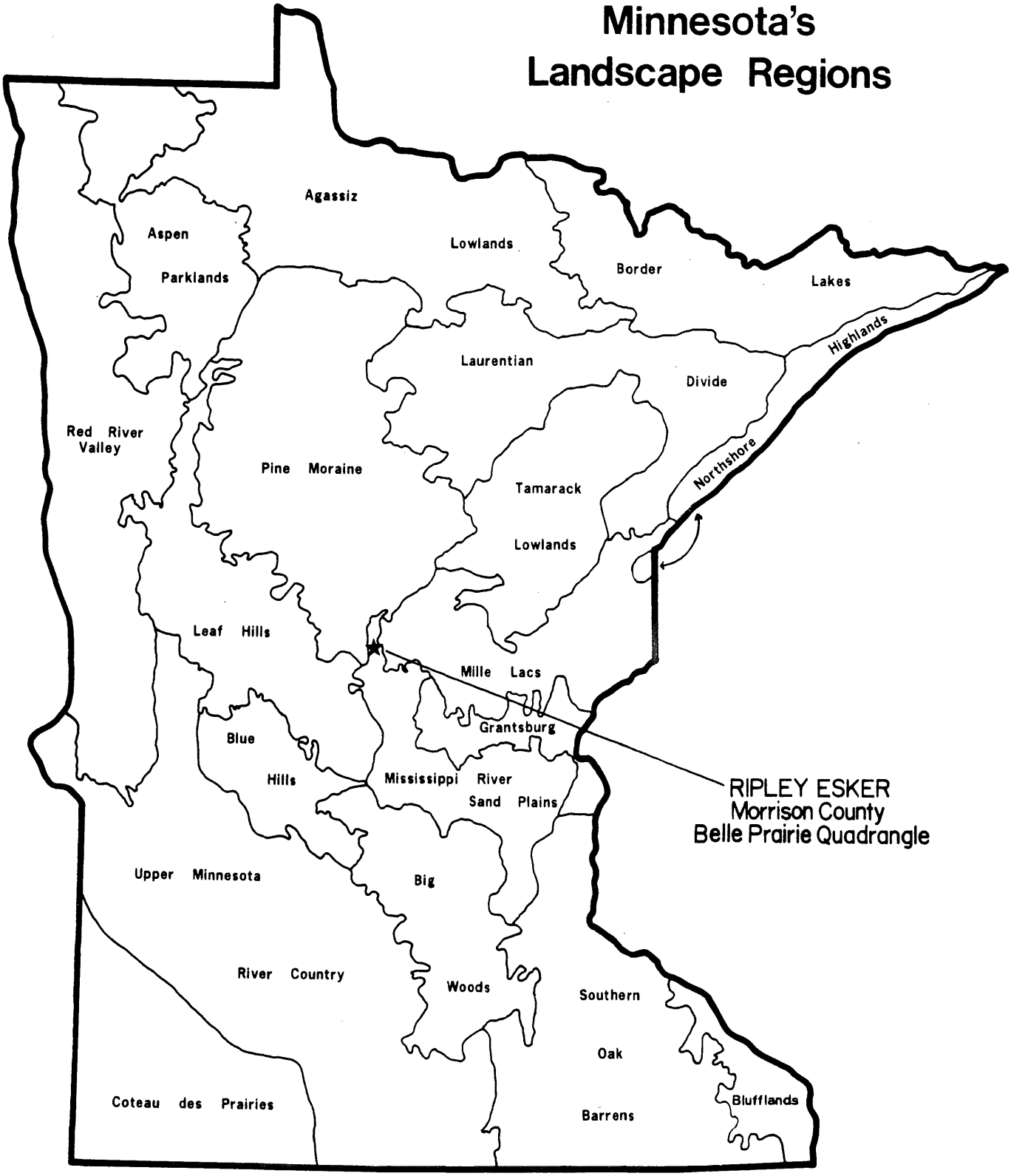


Figure 5. Ripley Esker in relation to Minnesota's landscape regions. Adapted from T. Kratz and G.L. Jensen, An ecological geographic division of Minnesota (Unpublished, 1977).

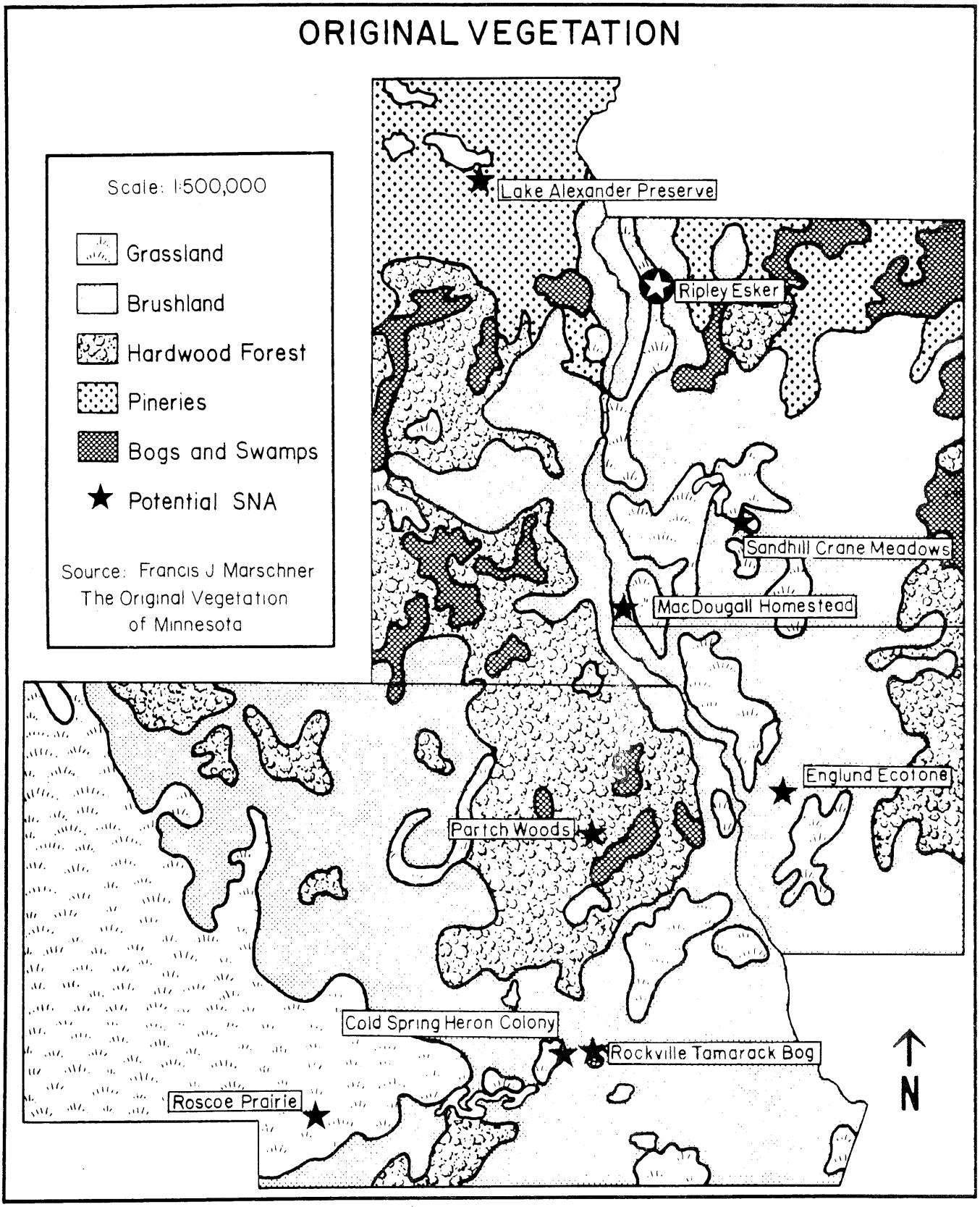
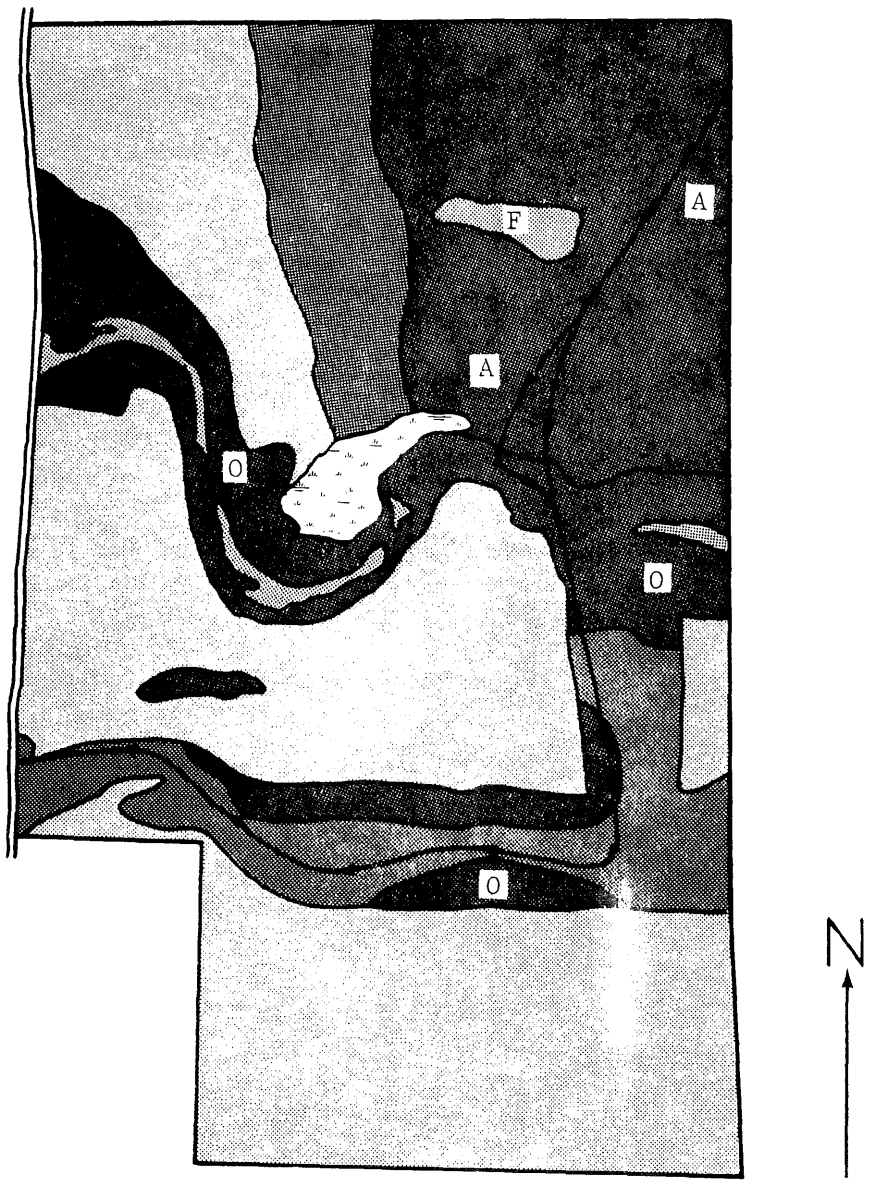


Figure 6. The original vegetation of Ripley Esker and nearby potential Scientific & Natural Areas in central Minnesota (Benton, Morrison and Stearns Counties).



SCALE: 8":1 MILE

BROME GRASS FIELD	EMERGENT AQUATIC
O OAK WOODS	SEDGE WILLOW
DRY PRAIRIE	A ASPEN WOODS
F OLD FIELD RECOVERING TO PRAIRIE	DRAINAGE DITCHES
	GRAVEL ROAD

Figure 7. Vegetative communities identified on Ripley Esker in 1977.

One percent of the unit is Old Field recovering to prairie. The dominant grasses are Big Bluestem (Andropogon gerardi), and Little Bluestem (Andropogon scoparius). Stiff Goldenrod (Solidago rigida) and Showy Goldenrod (Solidago speciosa) are the dominant forbs.

The largest single vegetative community on the Ripley Esker site, constituting 43% of the unit, is Brome Grass Field. The dominant species are Smooth Brome Grass (Bromus inermis) and Quack Grass (Agropyron repens).

Dry Prairie makes up 3% of the area. Dominant grasses are: Big Bluestem (Andropogon gerardi), Little Bluestem (Andropogon scoparius), and Prairie Dropseed (Sporobolus heterolepis). The community's dominant forbs are Common Ragweed (Ambrosia artemisiifolia), Pepper Grass (Lepidium densiflorum), and Lamb's Quarters (Chenopodium album). Four indicator species of Dry Prairie, designated as modal by Curtis (1959), are present on Ripley Esker, including: Western Silvery Aster (Aster sericeus), Lead Plant (Amorpha canescens), Pasque Flower (Anemone patens) and Side-oats Grama (Bouteloua curtipendula).

Thirteen percent of the tract is Sedge-willow Wetlands. The community's dominant species are the Sedges (Carex sp .) and the Willows (Salix sp .).

An Emergent Aquatic plant community covers 3% of the area. Cattail (Typha latifolia) and Arrowhead (Sagittaria latifolia) are the dominant species. Two indicator species of this community, designated as modal by Curtis, are present: Spike Rush (Eleocharis palustris) and Great Bulrush (Scirpus validus).

Significance of Ripley Esker's Plant Communities

Ripley Esker demonstrates the effect aspect has on plant communities. There are extreme differences in vegetation between the north and south-facing slopes of the esker. The south slope is mostly open with dry prairie and remnant oak savanna, while the north slope supports deciduous woods of a type found in northern Minnesota. Areas with such different

vegetation on north and south facing slopes in close proximity are not common. The area offers substantial opportunities for ecological study. Finally, if the site's prairie and oak savanna can be restored to their original pre-settlement condition two important elements of the state's natural heritage will be protected.

Sources of Information

Curtis, J.T. 1959. The Vegetation of Wisconsin. University of Wisconsin Press, Madison. 651p.

Kratz, T. and G.L. Jensen.1977.An ecological geographic division of Minnesota. Unpublished.

Marschner, F.J. 1930. The Original Vegetation of Minnesota (Map). USDA. North Central Forest Exp. Sta. St. Paul.

FLORA

Plants species are one of the primary components of the state's natural diversity. Plants indicate the diversity of an area, the type of biotic community present, and changes occuring in the area including the degree of human disturbance. Rare plant species may be one reason for designating an area as a Scientific and Natural Area.

Methods

Ripley Esker was visited on a weekly basis, when weather conditions permitted, from 26 May to 12 September 1977. Flowering or fruiting plants and some non-vascular plants were collected and pressed. All collected plant specimen locations, associated species, and the date of collection were recorded. Locations were noted on an aerial photograph of the area.[1] Specimens are housed in the University of Minnesota Herbarium, Botany Department, St. Paul.

A phenological record of Ripley Esker's flowering plants was also kept. The phenological record began on the first visit and ended on the last visit to the area.

1 See TNC, Minnesota Chapter files.

Plants were identified through several sources (cited at the end of this section). John W. Moore, retired Associate Scientist, University of Minnesota, verified 156 specimens. Lichens were identified by C. W. Wetmore, lichenologist at the University of Minnesota. Thirty-four specimens were accidently lost and could not be verified. Several specimens were identified but not collected.

Ripley Esker's Vascular Flora

Table 3 is an annotated list of the plants identified on the tract.[1] A total of 200 vascular plant species, representing fifty-five plant families, were recorded on the unit in 1977.[2] Forbs were the most numerous group with 142 species (representing 70% of the total number of species present), followed by twenty-four species of shrubs (12% of the total), twenty species of grasses (10% of the total), eight tree species (4%), five sedge species (2%) and one fern species (.5%). The plant families with the most species on the unit were: The Compositae with forty-one species (20% of the total species), the Gramineae with 20 species (10%), the Rosaceae with fifteen species (7%), the Fabaceae with eleven

1 Nomenclature is according to Gleason and Cronquist. (1963). Additional plant lists organized alphabetically by common name, scientific name and family are on file, The Nature Conservancy, Minnesota Chapter.

2 In addition to the above plants Dr. Max Partch, St. Cloud State University identified the following plants on the tract prior to 1977: Acer negundo Acorus calamus, Actaea sp., Amelanchier, Anenomone quinquefolia, Antennaria sp. Arabis drummondi, Botrychium virginianum, Callitriche sp., Carex rosea, Equisetum sp., Houstonia longifolia, Koeleria cristata, Lactuca sp., Lemna sp., Nuphar variegatum, Nymphaea tuberosa, Onsomodium molle, Ostrya virginiana, Parietaria sp., Poa pratensis, Potamogeton natans, Potamogeton sp., Prenanthes alba, Pyrola sp., Quercus palustris, Rubus idaeus, Rudbeckia serotina, Scripus fluviatilus, Scropularia lanceolata, Thalictrum dioicum, Trifolium repens, Utrica sp., Uvularia sessilifolia, Verbeng stricta, Viburnum lentago, Viola cucullata. (See The Nature Conservancy files, Minnesota Chapter for more information.) In the summer of 1979 Large Yellow Lady-slipper (Cypripedium calceolus var. pubescens), a protected orchid, was identified in the woods north of the esker. The above plants are not included in the table or following analysis.

Table 3. Annotated Flora List of Ripley Esker.

Format: Scientific name. Common name. Collection number of voucher specimen. Collection number in parentheses indicates specimen was lost before verification. (Notes on nomenclature and taxonomy.) Designated "introduced" if not native to Minnesota. Community in Ripley Esker. Special significance of collection, if any. Asterisk (*) if this consititutes the first collection from Morrison County in the University of Minnesota Herbarium.

I. PTERIDOPHYTA - Spore-bearing Plants

POLYPODIACEAE - Polypody Family
Athyrium Filix-fimina var. Michauxii (L.) Roth. Lady Fern. #674. Oak woods near pond.

II. SPERMATOPHYTA - Seed Plants

A. GYMNOSPERMAE - Gymnosperms

CUPRESSACEAE - Cypress Family
Juniperus virginiana L. - Red Cedar. #675. Brome Grass field north of esker.*

B. ANGIOSPERMAE - Angiosperms

1. MONOCOTYLEDONEAE - Monocots

ALISMATACEAE - Water Plantain Family
Alisma subcordatum Raf. - Water - Plantain. #533. Pond.
Sagittaria latifolia Willd. - Arrowhead. #532. Pond.

COMMELINACEAE - Spiderwort Family
Tradescantia occidentalis (Britt.) Smyth. - Spiderwort. #202. On esker.

CYPERACEAE - Sedge Family
Carex rostrata Stokes. - Beaked Sedge. #525. Sedge - Willow Area.
Eleocharis palustria (L.) R. & S. - Spike Rush. #534. Pond.
Scirpus atrovirens Willd. - Leafy Bulrush. #594. Edge of Pond.*
Scirpus cyperinus (L.) Kunth. - Wool Grass. #670. Edge of ditch.
Scirpus validus Vahl. - Great Bulrush. #536. Pond.

GRAMINEAE - Grass Family
Agropyron repens (L.) Beauv. - Quack Grass. #(313). On Esker & Brome Grass Field. Introduced.*
Agrostis stolonifera var. major (Gaud.) Fariv. - Redtop Grass. #524. Aspen Woods. (Agrostis alba in Fernald 1950). Introduced.
Andropogon gerardi Vitm. - Big Bluestem. #438. On esker, aspen woods, old field.
Andropogon scoparius Michx. - Little Bluestem. #770. On esker & old field.*
Aristida basiramea Engelm. - Three - Awn Grass. #789. On esker. North edge of range in Minnesota.
Bouteloua curtipendula (Michx) Tors. - Side - Oats Grama. #792. On esker.*
Bouteloua gracilis (HBK.) Lag. - Grama Grass. #515. On esker.*
Bromus inermis Leyss. - Smooth Brome Grass. #89. Introduced. On esker and Brome Grass Field.

Eragrostis spectabilis (Pursh) Steud. - Love Grass. #787. On Esker. Northwest edge if its range in North America; it extends east to Maine and south to Florida and Texas.
Glyceria grandis S. Wats. - Reed Meadow Grass. #316. Low area near ditch.
Hordeum jubatum L. - Squirrel Tail Grass. #723. Low area on edge of aspen woods.
Leersia oryzoides (L.) Sev. - Cut Grass. #668. Edge of pond.
Panicum leibergii (Vasey) Scribn. - Leiberg's Panicum. #92. On Esker.
Phalaris arundinacea L. - Reed Canary Grass. (#312). Edge of ditch.
Phleum pratense L. - Timothy. (#314) Introduced. On Esker.
Poa compressa L. Canada Bluegrass. #207. Introduced. On Esker.
Setaria viridis (L.) Beauv. - Foxtail Grass. #369. Introduced. Old Field.
Sorghastrum nutans (L.) Nash. - Indiana Grass. #776. On Esker.
Sporobolus heterolepis Gray. - Prairie Dropseed. #793. On Esker.
Stipa spartea Trin. - Needle Grass. #360. On Esker, old field. *

IRIDACEAE - Iris Family
Iris versicolor L. Blue Flag. #359. Edge of pond.

LILIACENE - Lily Family
Allium stellatum Ker. - Prairie Onion. #514. On Esker.
Maianthemum canadense var. interius Fern. - Wild Lily of the Valley. #215. Oak Woods.
Polygonatum biflorum (Walt.) Ell. - Solomon's Seal. #190. Oak Woods.
Smilacina racemosa (L.) Desf. - False Solomon's Seal. #767. Oak Woods.
Smilacina stellata (L.) Desf. - Starry False Solomon's Seal. #211. Oak Woods.
Smilax herbacea var. herbacea L.- Carrion Flower. #318. Oak Woods.

TYPHACEAE - Cattail Family
Typha latifolia L. - Common Cattail. #378. Edge of pond.

2. DICOTYLEDONEAE - Dicots

ANACARDIACEAE - Cashew Family
Rhus glabra L. - Smooth Sumac. (#310). On Esker.
Rhus radicans L. - Poison Ivy. Oak Woods

APOCYNACEAE - Dogbane Family
Apocynum androsaemifolium L. - Common Dogbane. (#47). On Esker.

ARALIACEAE - Ginseng Family
Aralia nudicaulis L. - Wild Sarsaparilla. #212. Oak Woods.

ASCLEPIADACEAE - Milkweed Family
Asclepias incarnata L. - Swamp Milkweed. #364. Edge of pond.
Asclepias ovalifolia Decne. - Oval-Leaved Milkweed. (#54). On Esker.
Asclepias syriaca L. - Common Milkweed. (#308). On Esker, Brome Grass Field.

BALSAMINACEAE - Touch-Me-Not Family
Impatiens biflora Walt. - Jewel Weed. #374. Edge of Pond.
Impatiens pallida Nutt. - Pale Jewel Weed. #725. Aspen woods near ditch. Extreme northern edge of range in Minnesota. *

BETULACEAE - Birch Family
Betula papyrifera Marsh. - Paper Birch. Oak Woods.
Betula pumila L. - Bog Birch. (#325). Edge of Ditch.
Corylus americana Walt. - Hazel Nut. #194. On Esker.

BORAGINACEAE - Borage Family
Lithospermum canescens (Michx.) Lehm. - Hoary Puccoon. #206. On Esker.

CALLITRICHACEAE - Water Starwort Family
Callitriche spp. - Water Starwort. Ditch.

CAMPANULACEAE - Harebell Family
Campanula aparinoides var. grandiflora Holy. - Marsh Bellflower. #726. (C. uliginosa in Fernald 1950). Near ditch in Aspen Woods.
Campanula rotundifolia L. - Harebell. #204. On Esker.

CAPRIFOLIACEAE - Honeysuckle Family
Diervilla lonicera Mill. - Bush Honeysuckle. #214. Oak Woods.
Symphoricarpos albus (L.) Blake. - Snowberry. #788. On Esker.
Viburnum rafinesquianum Schult. - Arrowwood. (#58). Oak Woods.

CARYOPHYLLACEAE - Pink Family
Arenaria lateriflora L. - Grove Sandwort. (#57). Oak Woods.
Cerastium arvense L. - Field Chickweed. #199. On Esker.
Lychnis alba Mill. - White Campion. #192. Introduced. On Esker.
Silene antirrhina L. - Sleepy Catchfly. #317. On Esker.

CHENOPODIACEAE - Goosefoot Family
Chenopodium album L. - Lamb's Quarters. Introduced. On Esker.
Chenopodium hybridum L. - Maple-Leaved Goosefoot. Oak Woods.

CISTACEAE - Rochrose Family
Helianthemum bichnellii Fern. - Frostweed. #440, #777. On Esker, Aspen Woods.
Lechea stricta Leggett. - Pinweed. #834. Oak Woods near Pond. *

COMPOSITAE - Composite Family
Achillea millefolium L. - Yarrow. #191. On Esker.
Ambrosia artemisiifolia L. - Common Ragweed. #776. On Esker. *
Anaphalis margaritacea (L.) Benth & Hook. Pearly Everlasting. #783. Edge of Brome Grass Field south of Esker. *
Arctium sp. - Burdock. Oak Woods.
Artemisia absinthium L. - Absinthe Wormwood. #595. Introduced. On Esker.
Artemisia campestris L. - Green Sage. #669. (A. canadensis in Fernald 1950). On Esker.
Artemisia ludoviciana Nutt. - White Sage. #832. On Esker.
Aster azureus Lindl. - Azure Aster. #774. Edge of Brome Grass Field north of Esker. On edge of its range in North America; it extends east to New York and south to Texas.
Aster ciliolatus Lindl. - Lindley's Aster. #831. On Esker.
Aster ericoides L. - Heath Aster. #528. Old Field, Edge of Brome Grass Field.
Aster laevis L. - Smooth Aster. #769. Aspen Woods, Esker.
Aster macrophyllus L. - Large-Leaved Aster. #591. Oak Woods. *
Aster sagittifolius Willd. - Arrow-Leaved Aster. #718. Aspen Woods, Esker. *
Aster sericeus Vent. - Western Silvery Aster. #786. Esker.

Aster simplex Willd. - Panicled Aster. #715. Aspen Woods. *
Bidens tripartita L. - Trifid Beggar-Ticks. #784. Low area near Ditch.
Cirsium arvense (L.) Scop. - Canada Thistle. #370. Introduced. Edge of Pond and Brome Grass Field.
Cirsium discolor (Muhl.) Spreng. - Field Thistle. #768. Brome Grass Field north of Esker. *
Conyza canadensis (L.) Cronq. - Horseweed. #593. (Erigeron canadensis in Fernald 1950). Esker.
Crepis tectorum L. - Narrow-Leaved Hawksbeard. & (#309). Introduced. Esker. *
Erigeron philadelphicus L. - Common Fleabane. #210. Oak Woods.
Erigeron strigosus Muhl. - Rough Fleabane. #444. Esker.
Eupatorium perfoliatum L. - Boneset. #714. Ditch in Aspen Woods.
Helianthus giganteus L. - Giant Sunflower. #716. Ditch in Aspen Woods. *
Helianthus hirsutus Raf. - Stiff-Haired Sunflower. #665. Oak Woods. *
Helianthus laetiflorus Pers. - Showy Sunflower. #722. Esker.
Hieracium canadense Michz. - Canada Hawkweed. #589. Esker.
Liatris aspera Michz. - Rough Blazing-Star. #772. Edge of Brome Grass Field north of Esker.
Liatris punctata Hook. - Dotted Blazing-Star. #667. Esker. *
Rudbeckia hirta var. pulcherrima Farw. - Black-Eyed Susan. #436. (R. serotina in Fernald 1950). Edge of Brome Grass Field south of Esker.
Solidago canadensis L. - Canada Goldenrod. #672. Brome Grass Field.
Solidago gigantea Ait. - Late Goldenrod. #590. Edge of Pond. *
Solidago graminifolia (L.) Salisb. - Grass-Leaved Goldenrod. #521. Aspen Woods.
Solidago hispida Muhl.- Hairy Goldenrod. #671. Oak Woods. *
Solidago missouriensis var fasciculata Holy. - Missouri Goldenrod. #367. Brome Grass Field. *
Solidago nemoralis Ait. - Gray Goldenrod. #775. Esker, Brome Grass Field north of Esker.
Solidago rigida L. - Stiff Goldenrod. #523. Old Field. *
Solidago speciosa Nutt. - Showy Goldenrod. #717. Old Field. *
Sonchus oleraceus L. - Common Sow Thistle. #512. South Slope of Esker. Introduced. Rare in Minnesota: St. Louis, Stearns, Blue Earth, Olmstead and Houston counties. *
Taraxacum officinale Weber. - Dandelion. #592. Introduced. Esker.
Tragapogon pratensis L. - Goat's Beard. (#43). Introduced. Esker.

CONVOLVULACEAE - Morning Glory Family
Convolvulus sepium L. - Hedge-Bindweed. (#320) Edge of Ditch.

CORNACEAE - Dogwood Family
Cornus racemosaLam. - Gray-Barked Dogwood. #213. Edge of Oak Woods near Pond. *
Cornus rugosa Lam. - Round-Leaved Dogwood. #94. Oak Woods. *
Cornus stolonifera Michx.- Red Osier Dogwood. (#324). Near ditch in Aspen Woods. *

CRUCIFERAE - Mustard Family
Berteroa incana (L.) DC. - Hoary Alyssum. (#15). Introduced. On Esker. *
Lepidium densiflorum Schrader. - Pepper Grass. (#49). On Esker.
Sisymbrium altissimum L. - Tumbling Mustard. #362. Brome Grass Field. Introduced.

CUCURBITACEAE - Gourd Family
Echinocystis lobata (Michx.) T. & G. - Wild Cucumber. #598. On Esker.

FABACEAE - Bean Family
Amorpha canescens Pursh. - Lead Plant. (#322). On Esker.
Amphicarpa bracteata (L.) Fern. - Hog Peanut. #727. Aspen Woods near ditch.
Astragalus canadensis L. - Milk-Vetch. #531. Brome Grass Field north of Esker.
Desmodium canadense (L.) DC. - Showy Tick-Trefoil. #529. Aspen Woods.
Lathyrus ochroleucus Hook. - Cream Peavine. On Esker.
Medicago lupulina L. - Black Medick. (#323). On Esker. Introduced.
Petalostemum candidum (Willd.) Michx. - White Prairie Clover. #366. On Esker.
Petalostemum purpureum (Vent.) Rydb. - Purple Prairie Clover. #439. On Esker.
Trifolium arvense L. - Rabbit-Foot Clover. #377. Introduced. Old Field.
Trifolium pratense L. - Red Clover. #785. On Esker. Introduced.
Vicia americana Muhl - Purple Vetch. #195. On Esker.

FAGACEAE - Beech Family
Quercus ellipsoidalis E. J. Hill. - Northern Pin Oak. #447. Oak Woods.
Quercus macrocarpa Michx. - Bur Oak. #724. Oak Woods.

GENTIANACEAE - Gentian Family
Gentiana puberula Michx. - Downy Gentian. #833. Infrequent in Minnesota. On Esker. *

GERANIACEAE - Geranium Family
Geranium maculatum L. - Wild Geranium. #189. Oak Woods.

LABIATAE - Mint Family
Agastache foeniculum (Pursh) Kumtze. - Giant Hyssop. #437. On Esker.
Galeopsis tetrahit L. - Hemp Nettle. #368. Introduced. Oak Woods.
Hedeoma sp. - Pennyroyal. On Esker.
Mentha arvensis L. - Wild Mint. #526. Sedge - Willow.
Monarda fistulosa L. - Wild Bergamot. #448. Brome Grass Field north of Esker.
Nepeta cataris L. - Catnip. #666. Introduced. Oak Woods.
Scutellaria galericulata L. - Common Skullcap. #791. (S. epilobiifolia in Fernald 1950). Low area near ditch.
Scutellaria lateriflora L. - Mad-Dog Skullcap. #518. Ditch.
Stachys palustris L. - Common Woundwort. #361. Old Field.

LINACEAE - Flax Family
Linum sulcatum Piddell. - Yellow Flax. #372. On Esker.

LOBELIACEAE - Lobelia Family
Lobelia spicata Lam. - Pale-Spike Lobelia. #441. Edge of Brome Grass Field.

NYCTAGINACEAE - Four-O'Clock Family
Oxybaphus hirsutus (Pursh) Sweet. - Four-O'Clock. #513. (Mirabilis hirsuta in Fernald 1950). On Esker.

NYMPHAEACEAE - Water Lily Family
Nymphaea tuberosa Paine. - Water Lily. #535. Pond.

ONAGRACEAE - Evening Primrose Family
Circaea quadrisulcata (Maxim.) Franch. & Sav. - Enchanter's Nightshade. #363. Oak Woods.
Epilobium angustifolium L. - fireweed. (#305). Edge of Brome Grass Field.
Oenothera parviflora L. - Small-Flowered Evening Primrose. #673. Brome Grass Field north of Esker.

OXALIDACEAE - Wood Sorrel Family
Oxalis stricta L. - Yellow Wood Sorrel. #375. Old Field.

PLANTAGINACEAE - Plantain Family
Plantago patagonica Jacqu. - Plantain. (#45). (P. Purshii in Fernald 1950). On Esker.

POLEMONIACEAE - Phlox Family
Phlox pilosa L. - Downy Phlox. (#315). On Esker, Brome Grass Field north of Esker.

POLYGONACEAE - Smartweed Family
Polygonum convolvulus L. - Black Bindweed. #676. On Esker. Introduced.
Polygonum sagittatum L. - Arrow-Leaved Tearthumb. #596. Low Area near Ditch.
Rumex acetosella L. - Red Sorrel. #376. Introduced. Old Field.
Rumex maritinus L. - Golden Dock. #537. Pond.
Rumex mexicanus Meissn. - Mexican Dock. #527. Sedge - Willow.
Rumex orbiculatus Gray. - Great Water Dock. #773. Sedge - Willow.

PRIMULACEAE - Primrose Family
Lysimachia ciliata L. - Fringed Loosestrife. #516. Near ditch in Aspen Woods.

RANUMCULACEAE - Crowfoot Family
Anemone canadensis L. - Canada Anemone. #446. Edge of Ditch. *
Anemone cylindrica Gray. - Long-Headed Thimbleweed. #188. On Esker.
Anemone patens L. - Pasque Flower. (#44). On Esker.
Aquilegia canadensis L. - Columbine. #193. On Esker.
Delphinium virescens Nutt. - Larkspur. #87. On Esker.
Thalictrum dasycarpum Fisch. & Ave-Lall. - Tall Meadowrue. (#304). Near Ditch.

ROSACEAE - Rose Family
Amelanchier alnifolia Nutt. as in Fernald 1950. - Juneberry. (#53). On Esker.
Crataegus rotundifolia Moench. - Hawthorn. #720. (C. shrysocarpa in Fernald 1950). Old Field. *
Fragaria virginiana Duchesne. - Strawberry. #196. On Esker.
Geum aleppicum var. strictum (Ait.) Fern. - Yellow Avens. #306. Edge of Brome Grass Field.
Geum triflorum Pursh. - Prairie Smoke. #205. On Esker.
Physocarpus opulifolius var. intermedius (Rydb.) Robins. - Ninebark. #530. Edge of Ditch in Aspen Woods. Extreme west edge of range in Minnesota.
Potentilla arguta Pursh. - Tall Cinquefoil. (#48). On Esker.
Potentilla norvegica L. - Rough Cinquefoil. #445. Edge of Ditch. *
Potentilla recta L. - Rough-Fruited Cinquefoil. #93. Introduced. On Esker.
Prunus pensylvanica L.f. - Pin Cherry. (#60). On Esker. *
Prunus virginiana L. - Choke Cherry. (#59). On Esker.
Rosa arkansana var. suffulta (Greene) Cockerell. as in Fernald 1950 - Prairie Rose. #449. Brome Grass Field.
Rubus flagellaris L. - Northern Dewberry. #319. Edge of Brome Grass Field. *
Rubus strigosus Michx. - Red Rasberry. #197. (R. idaeus in Fernald 1950). Oak Woods.
Spiraea alba DuRoi. - Meadow Sweet. (#311). Sedge - Willow.

RUBIACEAE - Madder Family
Galium boreale L. - Northern Bedstraw. #203. On Esker. *
Galium trifidum L. - Bedstraw. #529. Edge of Ditch. *

SALICACEAE - Willow Family
Populus tremuloides Michx. - Quaking Aspen. #771. Aspen Woods.
Salix sp. - Willow. Sedge - Willow, Ditch Areas.

SANTALACEAE - Sandal-Wood Family
Comandra umbellata (L.) Nutt. - Bastard Toad Flax. #198. On Esker.

SAXIFRAGACEAE - Saxifrage Family
Heuchera richardsonii var. hispidior R. Br. - Alum Root. (#46). On Esker.
Ribes cynosbati L. - Dogberry. (#200). On Esker.
Ribes missouriense Nutt. - Missouri Gooseberry. #379. Oak Woods.

SCROPHULARIACEAE - Figwort Family
Linaria vulgaris Hill. - Butter-and-Eggs. #88. Introduced. On Esker.
Mimulus ringens L. - Monkey Flower. #519. Ditch.
Penstemon gracilis Nutt. - Slender Beard-Tongue. (#52). On Esker.
Verbascum thapsus L. - Mullein. #719. Introduced. Old Field.
Veronicastrum virginicum (L.) Farw. - Culver's Root. #365. Near Ditch.

SOLANACEAE - Nightshade Family
Physalis virginiana Mill. - Virginia Ground-Cherry. (#50). On Esker.
Solanum nigrum L. - Black Nightshade. #597. Oak Woods.

TILIACEAE - Linden Family
Tilia americana L. - Basswood. (#56). On Esker. *

ULMACEAE - Elm Family
Ulmus americana L. - American Elm. #830. Oak Woods.

UMBELLIFERAE - Parsley Family
Cicuta maculata L. - Water Hemlock. #443. Ditch.
Sanicula marilandica L. - Black Snakeroot. #209. Oak Woods.
Sium suave Walt. - Water Parsnip. #517. Ditch.
Zizia aurea (L.) Koch. - Golden Alexander. #208. Oak Woods.

VERBENACEAE - Vervain Family
Verbena hastata L. - Blue Vervain. #442. Ditch.

VITACEAE - Grape Family
Parthenocissus vitacea (Knerr) Hitchc. - Virginia Creeper. (#307). On Esker.
(P. inserta in Fernald 1950).
Vitis riparia Michx. - River Bank Grape. #721. Aspen Woods near Ditch. *

species (5%), and the Labiatae with nine species (4%). There were twenty-six plant species on the unit which were not native to Minnesota. Forty species had not previously been collected from Stearns County and deposited at the University of Minnesota Herbarium. A preliminary study of the unit's lichens identified five species.[1]

Figure 8 records when Ripley Esker's forbs and shrubs flowered in 1977.[2] One hundred and nineteen species were recorded in flower during the course of the inventory. The peak blooming period was between 3 August and 11 August, 1977.

1 Five lichens were also identified by the 1977 inventory, including: Cladonia cariosa; Cladonia nexoxyna; Parmelia caperata; Physcia stellaris and Xanthoria polycarpa.

2. A table listing the flowering periods of species found on the site is on file, TNC, Minnesota Chapter.

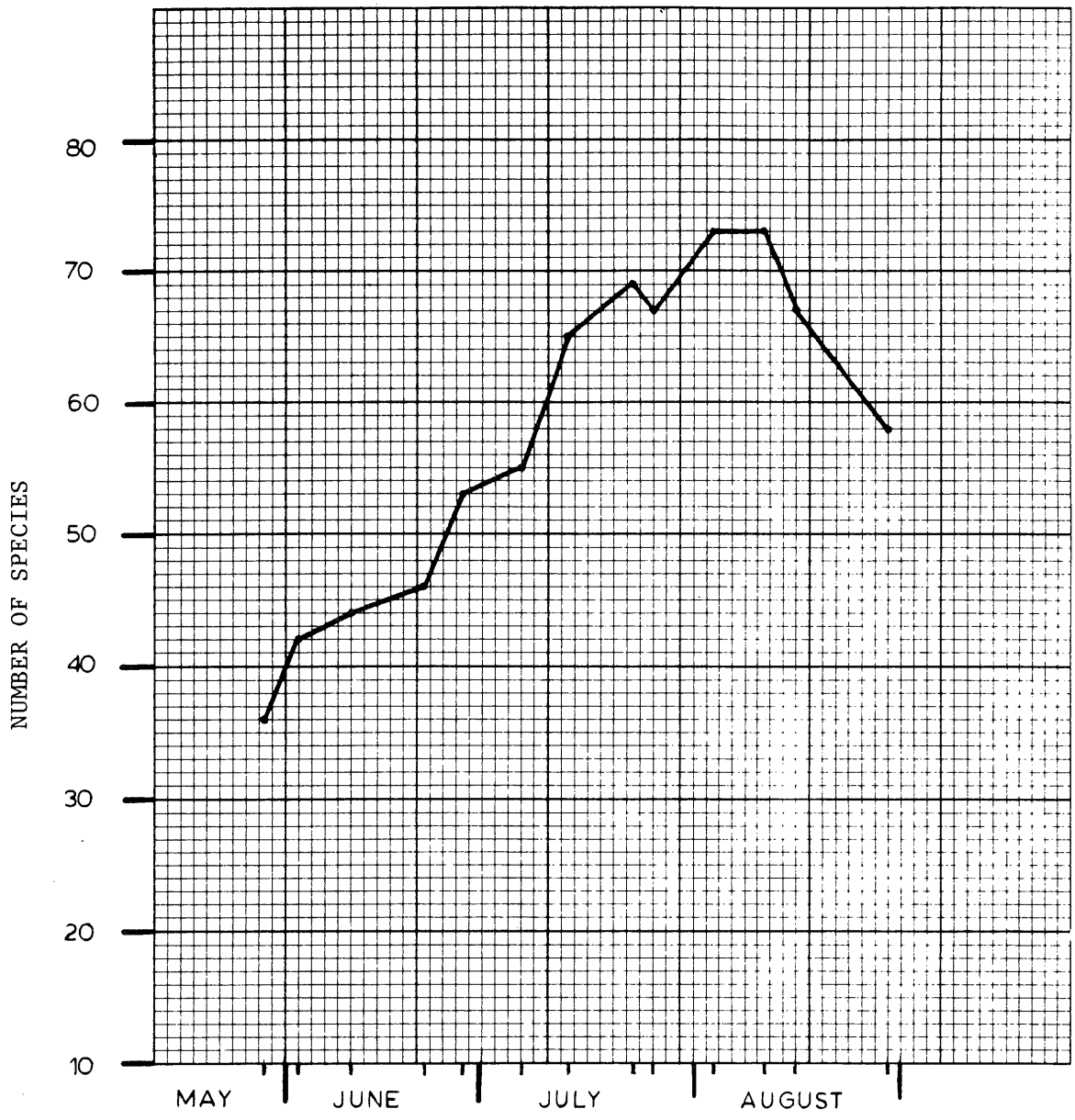


Figure 8. Forb species recorded in bloom on Ripley Esker, 1977.

Five of the 200 species identified on this unit are at the edge of their ranges and one species is not common in Minnesota. Pale Jewel Weed (Impatiens pallida) is the first specimen of this species collected in Morrison County according to the University of Minnesota Herbarium distribution records. It is at the extreme north central edge of its range in the state. Only sixteen other collections have been made in Minnesota of this plant. Three-awn Grass (Aristida basiramea) is at its northern range limit in Minnesota, and Ninebark (Physocarpus opulifolius var. intermedius) is at the extreme western edge of its range in Minnesota. Two species are at the edge of their range in North America and are significant in that respect: Love Grass (Eragrostis spectabilis) is on the northwestern edge of its range in North America. Azure Aster (Aster azireus) is on the western edge of its range. Downy gentian (Gentiana puberula) infrequently occurs on Minnesota's prairies (Heitlinger, 1977).

Additional Research/Inventory Needs

Although a fairly complete record of Ripley Esker's vascular flora is now on hand, the 1977 inventory did not thoroughly survey the site's non-vascular plants. A survey of the non-vascular plants, such as the early mosses and lichens, could be done. Finally, the tract's/spring flora phenology should be recorded.

Sources of Information

Cobb, B. 1960. A Field Guide to the Ferns and Their Related Families of Northeastern and Central North America. Houghton Mifflin Co., Boston. 381 pp.

Curtis, J.T. 1959. The Vegetation of Wisconsin. University of Wisconsin Press, Madison. 657 pp.

Gleason, H.A. and A. Cronquist. 1963. Manual of Vascular Plants of Northeastern United States and Adjacent Canada. Van Nostrand Rheinhold Co., N.Y. 810 pp.

Heitlinger, Mark. 1977. Checklist of selected vascular plants of Minnesota including uncommon species. The Nature Conservancy, Minnesota Chapter. Unpublished.

Kartesz, John T. and Rosemarie Kartesz. 1977. The Biota of North America Part 1: Vascular Plants. Vol. 1: Rare Plants. BONAC, Pittsburgh, Pa. 361 pp.

BUTTERFLIES[1]

Butterflies are found in virtually all of Minnesota's natural areas. They are insect herbivores which feed on and pollinate plants and affect plant distribution and abundance. Butterflies as primary consumers provide sustenance for animals higher up on the food chains. A butterfly inventory is necessary to document an area's natural diversity, to identify rare species needing special protection, and to gain a better understanding of many species which are poorly known. Finally, some butterflies are sensitive ecological indicators, providing useful information on changes occuring in the area.

Methods

In 1977 a detailed inventory of Ripley Esker's butterflies was conducted.[2] Biweekly visits were made to the site from the third week in May to the third week in September. The first intensive butterfly sampling, however, did not begin until the third week in June. Also, no visit was made to the site during the week of 14-20 August. Visits were made when possible during hours and weather conditions favorable for butterfly activity. Sampling was guided principally by the researcher's expectation of significant activity and was concentrated on the esker itself. To a lesser degree the woods at the esker's base were also sampled.

Observations of adult and immature butterflies were recorded together with the location, habitat type and associated plant species. A rough estimate of each species' frequency was also made. Butterflies were usually identified by sight, but a standard butterfly net was employed

1 The term butterflies in this document refers both to the true butterflies (Papilionoidea) and the skippers (Hesperiodea).

2 A more detailed report of this study is on file, TNC, Minnesota Chapter. See also Robert Dana, Department of Entomology, Fisheries and Wildlife, University of Minnesota, St. Paul

to capture the insects when necessary for positive identification. All captured insects were released except when reliable identification required a prepared specimen or when a voucher specimen was desired. All specimens were deposited in the University of Minnesota's Department of Entomology, Fisheries and Wildlife collection, St. Paul.

Scientific and common names used here are taken from Huber (1975), with the addition of some subspecific names based on Howe (1975). Subspecific names are given only when the populations could clearly be assigned to a subspecies other than the nominate. In unclear classes the subspecific name is followed by "ssp" (subspecies).

Butterflies of Ripley Esker

Table 4 lists in alphabetical order the butterflies observed on Ripley Esker and the habitat(s) where they were observed.[1] A total of thirty-three species including seven skipper species were recorded on the tract. They include species of woodland and open grassland habitat, reflecting the diversity of vegetative communities present on the site. None of the butterflies is rare in the state, nor are any of the butterflies likely to be dependent on the site for their survival. All the species are well within their known ranges except for one southern species, the Dogface Sulphur, which sporadically moves north into Minnesota and breeds here. Ripley Esker may be the northernmost record for this insect breeding in Minnesota. However, the insect does not overwinter here. Two other butterflies are uncommon in the state. The Gorgone Checkerspot is

1 Estimates of butterfly abundance, adult behavior, food plants and other pertinent observations are on file, TNC, Minnesota Chapter. See also Robert Dana, Department of Entomology, Fisheries and Wildlife, University of Minnesota, St. Paul.

Table 4. Butterflies Observed on Ripley Esker in 1977

Species	Habitat(s) Observed
Atrytone delaware (Delaware Skipper)	meadow just north of pond, on north side of esker
Cercyonis pegala ssp (Wood Nymph)	open areas on esker, around Burr Oaks oozing sap by the esker
Chlosyne gorgone carlota (Gorgone Checkerspot)	open area on esker; meadow just north of pond on north side of esker
Chlosyne nycteis (Silvery Checker-spot)	open area edge of woods on esker; small open area in woods north of esker
Coenonympa tullia inornata (Inornate Ringlet)	open areas on esker; old field north of esker
Colias cesonia (Dogface Sulfur)	open area on esker
Colias eufytheme (Alfalfa Butter-fly)	open area on esker; primarily near road on esker
Danaus plexippus (Monarch)	open areas along esker; open old field north of esker; open area at esker by road
Erymis luclilius (Columbine Dusky Wing)	sunny edges of oak woods along esker
Euchloe olympia ssp (Olympia Marble)	open area on esker
Euphyes vestris metacomet (Dun Skipper)	open area on esker; open meadow base of esker
Euptychia cymela (Little Wood Satyr)	just inside edges of woods and thickets along esker; woods north side of esker
Everes comyntas (Eastern Tailed Blue)	open area on esker
Lethe anthedon (Pearly Eye)	woods in north side of esker
Limenitis archippus (Viceroy)	on ridge of esker in open savanna-like area (probably more frequent in the sedge-willow thickets north of the esker)
Limenitis arthemis ssp (Banded Purple)	edge of woods on esker; on ridge of esker in open savanna-like area
Nymphalis antiopa (Mourning Cloak)	edge of woods on north side of esker ridge; on ridge of esker in open savanna-like area

Table 4 cont. Butterflies Observed on Ripley Esker

Species	Habitat(s) Observed
Nymphalis vau-album j-album (Compton's Tortoiseshell)	edge of woods on north side of esker ridge
Papilio polyxenes asterias (Black Swallowtail)	open area on esker; marshy area on north side of esker
Pholisora catullus (Common Sooty Wing)	open area on esker
Phyciodes tharos (Pearl Crescent)	open areas on esker; meadow just north of pond on north side of esker
Pieris protodice (Checkered White)	open area on esker
Polites themistocles (Tawny-edged Skipper)	open area on esker
Polygonia comma (Comma)	open woods on esker
Satyrium calanus falacer (Banded Hairstreak)	Burr Oaks along edges of open areas on esker
Satyrium edwardsui (Edwards' Hair-streak)	Burr Oaks along edges of open areas on esker and low shrubs out in open areas
Satyrium liparops strigosum (Striped Hairstreak)	edges of woods, thickets on esker
Speyeria aphrodite ssp (Aphrodite Fritillary)	open area at esker by road
Speyeria cybele (Great Spangled Fritillary)	open areas on esker; willow-sedge thicket north of esker (probably more frequent in moist meadows and thickets north of esker
Thorybes pylades (Northern Cloudy Wing)	location not recorded
Vanessa atalanta rubria (Red Admiral)	on ridge of esker; open savanna-like area
Vanessa virginiensis (American Painted Lady	open area on esker
Wallengrenia egermet (Broken Dash)	open area on esker

found on Minnesota's native prairie, oak savanna and sandy "barrens" habitat, but for reasons not understood it is much less frequently encountered in apparantly appropriate habitat (Huber, unpublished data).[1] The Columbine Dusty Wing was observed in small numbers on the site. This butterfly is widely distributed over the eastern part of Minnesota but is infrequently observed (Huber, unpublished data). This infrequency may be in part due to the difficulty of distinguishing it on the wing from a couple of common related species, however.

Ripley Esker provides an unusually favorable habitat for three species of hairstreaks. The Banded Hairstreak and Edwards Hairstreak were abundant along the ridge of the esker. The abundance of the Banded Hairstreak was especially unusual in the investigator's experience. The Striped Hairstreak is much less frequently observed than the other two species; usually only a single or at most a few individuals are encountered (Dana, personal observation: Huber, unpublished data). Ripley Esker's population of this insect was scarce compared to the other hairstreaks but much more common than usual.

Additional Research/Inventory Needs

Several of Ripley Esker's vegetative communities were not intensively sampled, particularly the more mesic grassland and wet meadow communities. These communities probably harbor a few species not recorded during the 1977 inventory. Thus for the sake of completeness these communities could be sampled.

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1 Mr. Ron Huber, Zoology Assistant with the Science Museum of Minnesota, St. Paul, has for a number of years been collecting data on the state's butterflies. This considerable body of information is not published and Mr. Huber's generous assistance in making it available to the researchers is gratefully acknowledged.

Sources of Information

Howe, W.H., (co-ord. ed.) 1975. The Butterflies of North America. Doubleday, Garden City, N.Y. 633pp.

Huber, R.L. 1975. No title (a revision of Huber, R.L., J.S. Nordin, and O.R. Taylor, Jr. 1966. A systematic checklist of Minnesota Rhopalocera (Butterflies and Skippers). Science Museum of Minnesota, St. Paul. Unpublished mimeo. 10pp.

Klots, A.B. 1951. A Field Guide to the Butterflies of North America East of the Great Plains. Houghton-Mifflin Co., Boston. 349 pp.

BIRDS

Birds are another biotic component which adds to the natural diversity of an area. Indeed, there are more bird species than all other vertebrates on Ripley Esker. An inventory is needed to record species diversity, identify endangered, rare or sensitive species, and recognize changes in species composition.

Methods

A bird census was made by walking through the area on various occasions from 23 May 1977 through 3 August, 1977. Birds were identified by sight, sound or a combination thereof. Identification was aided by the use of a bird field guide and binoculars.

Ripley Esker Birds

Fifty-five bird species were identified on or over Ripley Esker during the 1977 inventory. Virtually all of the birds are common residents of the state's deciduous forests, open and brushy areas, and wetlands. American Woodcock and Ruffed Grouse were observed with broods on the site. Table 5 lists the birds in phylogenetic order.[1]

Additional Inventory/Research Needs

Due to a limited field season the 1977 bird inventory may be incomplete. Also the inventory did not distinquish which birds actually nested on the unit. Thus a more detailed bird inventory might be carried out to fill in these gaps.

Sources of Information

Green, Janet C. and Robert B. Janssen. 1975. Minnesota Birds. University of Minnesota Press. Minneapolis.

Robbins, Chandler S., et al. 1966. Birds of North America. Western Publishing Company, Inc. New York.

1 Location and dates birds were observed are on file TNC, Minnesota Chapter.

Table 5. Birds identified in 1977 on Ripley Esker

(Gavia immer) Common Loon
(Ardea herodias) Great Blue Heron
(Butorides virescens) Green Heron*
(Anas platyrhynchos) Mallard
(Buteo jamaicensis) Red-tailed Hawk
(Falco sparverius) American Kestrel
(Bonasa umbellus) Ruffed Grouse
(Porzana carolina) Sora
(Philohela minor) American Woodcock
(Columba livia) Rock Dove*
(Zenaida macroura) Mourning Dove
(Coccyzus erythropthalmus) Black-billed Cuckoo
(Archilochus colubris) Ruby-throated Hummingbird
(Colaptes auratus) Common Flicker
(Dendrocopos villosus) Hairy Woodpecker
(Dendrocopos pubescens) Downy Woodpecker
(Tyrannus tyrannus) Eastern Kingbird
(Myiarchus crinitus) Great Crested Flycatcher
(Sayornis phoebe) Eastern Phoebe
(Empidonax traillii) Willow Flycatcher
(Empidonax minimus) Least Flycatcher
(Contopus virens) Eastern Wood Pewee
(Riparia riparia) Bank Swallow
(Hirundo rustica) Barn Swallow*
(Progne subis) Purple Martin*
(Cyanocitta cristata) Blue Jay
(Corvus branchyrhynchos) Common Crow
(Parus atricapillus) Black-capped Chickadee
(Sitta carolinensis) White-breasted Nuthatch
(Dumetella carolinensis) Gray Catbird
(Turdus migratorius) American Robin
(Catharus fuscescens) Veery
(Sialia sialis) Eastern Bluebird
(Bombycilla cedrorum) Cedar Waxwing
(Sturnus vulgaris) Starling
(Vireo flavifrons) Yellow-throated Vireo
(Vireo olivaceus) Red-eyed Vireo
(Dendroica petechia) Yellow Warbler
(Dendroica pensylvanica) Chestnut-sided Warbler
(Seiurus aurocapillus) Ovenbird
(Geothlypis trichas) Common Yellowthroat
(Setophaga ruticilla) American Redstart
(Dolichonyx oryzivorus) Bobolink
(Sturnella neglecta) Western Meadowlark
(Agelaius phoeniceus) Red-winged Blackbird
(Icterus galbula) Northern Oriole
(Quiscalus quiscula) Common Grackle
(Molothrus ater) Brown-headed Cowbird
(Piranga ludoviciana) Scarlet Tanager

* Observed only in flight over Ripley Esker

Table 5 cont. Birds identified in 1977 on Ripley Esker

(Pheucticus ludovicianus) Rose-breasted Grosbeak
(Passerina cyanea) Indigo Bunting
(Spinus tristis) American Goldfinch
(Pooecetes gramineus) Vesper Sparrow
(Spizella pallida) Clay-colored Sparrow
(Melospiza melodia) Song Sparrow

* Observed only in flight over Ripley Esker

MAMMALS

Mammals must be inventoried to: 1) record the unit's natural diversity, 2) to obtain baseline data so changes in species composition can be discerned and 3) to identify rare or sensitive species.

Methods

Small mammals were censused using eighty live-traps placed on two parallel lines set fifty feet apart. Each line consisted of twenty stations set at intervals of fifty feet. Each station contained a 2x2x6 Sherman live trap and a Longworth live trap. A peanut butter-oatmeal mixture was used to bait the traps. The traplines ran approximately north-south, crossing the esker close to the west end of the pond. The southern end of the traplines was the small clump of trees in the southern field. The end stations of the western line of traps were permanently marked with conduit , while the other stations were temporarily marked with bamboo stakes. The traps were set by noon on 18 July 1977 and were checked at approximately 7:00 P.M. that day, 7:00 A.M. and 7:05 P.M. on 19 July, and 8:30 A.M. 20 July, 1977 at which time they were pulled. Reference specimens were taken and study skins prepared. Specimens were deposited in the James Ford Bell Museum of Natural History, University of Minnesota, Minneapolis.

Large mammals were censused only through direct or indirect observation during the bird census.

Ripley Esker's Mammals

Nine mammal species were identified visually, by trap, track or by other signs in Ripley Esker. Table 6 lists all the species recorded in alphabetical order.[1]

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1 The location, dates and number of mammals recorded on the tract are on file TNC, Minnesota Chapter.

Table 6. Mammals of Ripley Esker

Citellus tridecemlineatus (Thirteen-lined Ground Squirrel)
Clethrionomys gapperi (Redback Mole)
Geomys bursarius (Plains Pocket Gopher)
Mephitus mephitis (Striped Skunk)
Odocoileus virginianus (Whitetail Deer)
Peromyscus leucopus (White-footed Mouse)
Sciurus carolinensis (Grey Squirrel)
Sciurus niger (Fox Squirrel)
Tamias striatus (Eastern Chipmunk)

Sources of Information

Gunderson, Harvey L. and James R. Beer. 1953. The Mammals of Minnesota. The University of Minnesota Press, Minneapolis.

LAND USE HISTORY

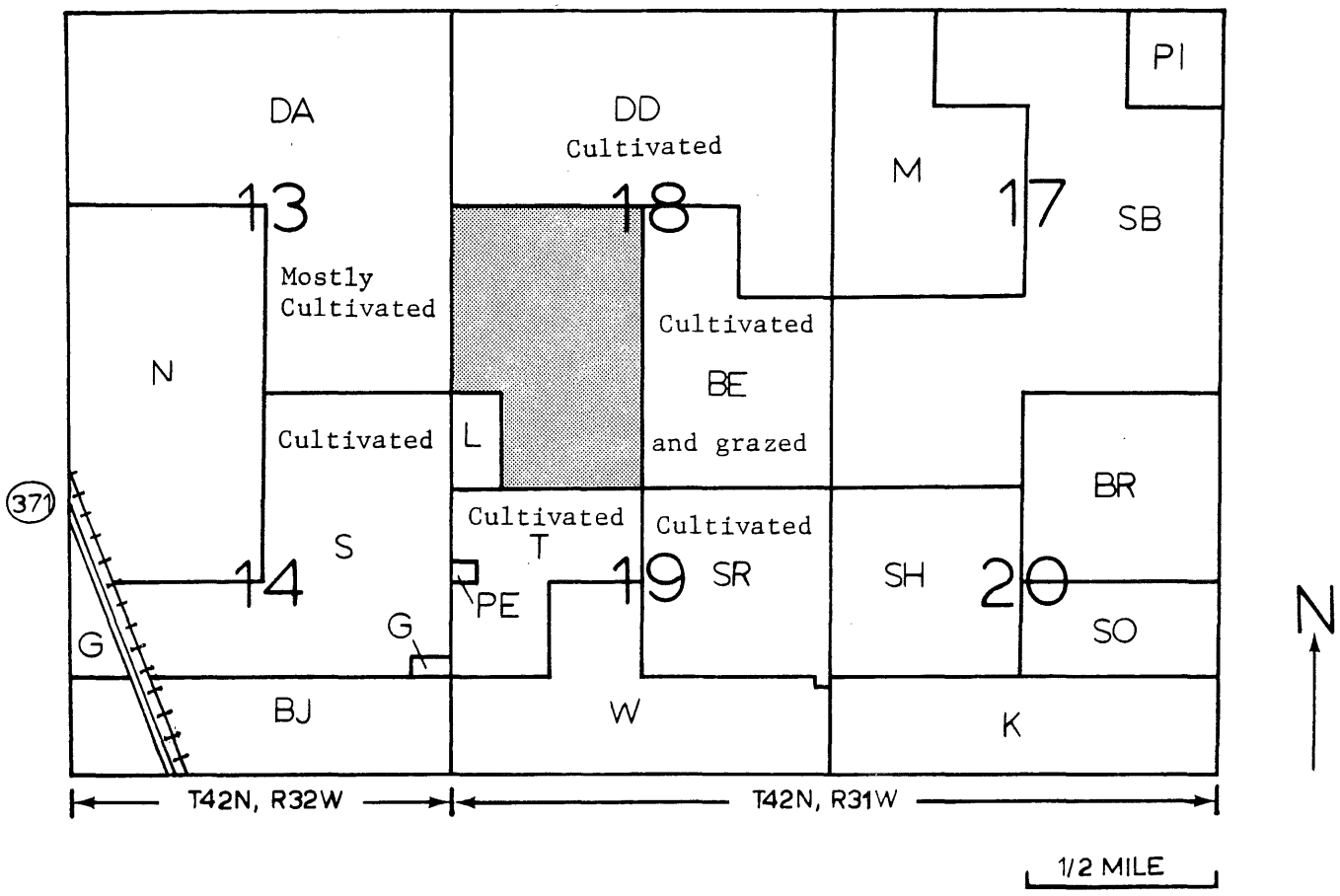
Virtually all "natural" areas have been affected to some degree by the past activities of people. Farming, grazing, logging, hunting, drainage of wetlands and the prevention of fire are some of the ways people have affected the land. Knowledge of historical land use practices helps explain the present condition of the land and its resources, and the origin of human impacts on the area. Surrounding land use practices affect the viability of all natural areas.

Methods

Most of the land use information presented here is based on interviews with neighboring landowners, and the son of a former owner.

Recent Land Use History

The St. Cloud region was first settled by Europeans in the middle of the nineteenth century. Most of the land was cleared for farming and grazing, or used for timber production. Today Ripley Esker is surrounded by cultivated fields and pastures. Figure 9 shows the owners and land uses adjacent to the TNC tract.



BE	Leo S. & Iris Bellefeuille, R. 1, Ft. Ripley,MN 56449	SO	Irving & Margaret St. Onge, R.5,Box 53,Little Falls,MN 56345
BJ	Jane E. Branchaud, R. 4, Little Falls,MN 56345	SB	Byron E. & Beatrice Schilling, R.1,Ft. Ripley,MN 56449
DA	Aurelia Doucette et.al.,R.4, Box 306,Little Falls,MN 56345	SR	Richard Schilling,R.1, Ft. Ripley,MN 56449
DD	Daniel & Dorothy Doucette,R.4, Box 306,Little Falls,MN 56345	S	Kermit Severson,2200 Manor Dr., Burnsville,MN 55337
G	Joseph A. & Laura M. Gilson, R.1, Ft. Ripley, MN 56449	SH	George J. & Laura A. Shimek, R.1,Ft. Ripley,MN 56449
K	David L. Keehr,R.4,Box 311 Little Falls, MN 56345	T	Lawrence I. & Mary Lou Thesing, R.5,Box 134,Little Falls,MN 56345
L	Alan & Bonnie Larson,R.1, Ft. Ripley,MN 56449	W	Robert C. & Eugene A. Weber, R.1,Ft. Ripley,MN 56449
M	Virgil & Rita Morris,R.1, Ft. Ripley,MN 56449		RIPLEY ESKER
N	Mark W. & Gregory S. Nelson, R.1,Ft. Ripley,MN 56449		State Highway
PE	Fred W. & Marie Pelzer,R.1, Ft. Ripley,MN 56449		Railroad
PI	Adolph Pierzinski,R.1, Ft. Ripley,MN 56449		

Figure 9. Adjacent land owners and land use at Ripley Esker. Names and addresses are from the Morrison County Treasurer's Office as of 4 August 1977.

The TNC biotic communities have also been extensively modified by human activities. Ripley Esker's woods were probably selectively cut around the turn of the century, as was done on other land in the vicinity. Also about that time, approximately seventy years ago, a drainage ditch was built on the unit. With the prevention of fire and occasional cutting for firewood an oak woods developed on the north slope of the esker.

All of the land on the tract has been extensively cultivated and grazed. The wooded land was grazed by cattle from the 1920's and 1930's until about 1968. In the 1930's the low areas in the middle of the land north of the esker was hayed. If it was too wet to cut the land would be burned in fall or early spring. The small fields in the northeast and east parts of the unit have not been cropped since 1945 and probably not since the 1930's. During 1957 to 1967 the land was in the soil bank. Figure 10 indicates some of the crops which were planted. Crops were generally rotated at least every two years.

In 1970 the Nature Conservancy began negotiating to purchase part of Ripley Esker to preserve it from possible destruction by gravel operations. On 15 March 1973 TNC bought 240 acres containing part of the esker from Modern Dairy Farms, Inc. A year later TNC sold the southwestern twenty acres resulting in the present 220 acre unit.

Natural Area Visitors

Knowledge of the number of visitors and visitor characteristics is necessary to determine who is using the natural area, and what problems (if any) are being caused by various user groups. Potential users should be identified to help predict future trends and problems.

Visitors were not surveyed in the 1977 inventory, therefore no information is presented here on the area's present users and their characteristics.

SCALE: 8":1 MILE

FIELD --PROBABLY NOT CROPPED SINCE THE 1930'S

DRAINAGE DITCHES; ARROWS INDICATE DIRECTION OF FLOW

Figure 10. 1963 aerial photograph showing recent uses of Ripley Esker.

Many potential users exist for Ripley Esker. Due to its close proximity to St. Cloud a large increase in use could occur when certain segments of the population become aware of the area. Two universities, St. Cloud State in St. Cloud, and St. John's University in Collegeville and two colleges, the College of St. Benedict in St. Joseph and Brainerd Community College in Brainerd are within one hour's drive from the area and could use the esker for educational and research purposes. Seven public middle and secondary schools in Morrison County plus schools in Benton, Crow Wing and Stearns Counties might utilize the area for environmental purposes. Some users might also come up from the Twin Cities area which is two and a quarter hours driving time from the site.