

SPECIAL REPORT

A Progress Report of the Cedar Creek Natural History Area

DAVID F. PARMELEE

David F. Parmelee, Professor and Program Director, Field Biology Program, University of Minnesota, has directed the Cedar Creek Natural History Area and the Lake Itasca Forestry and Biological Station since 1970. He received a B.A. from Lawrence University, M.S. at the University of Michigan and a Ph.D. from the University of Oklahoma.

The Cedar Creek Natural History Area is a 2,185 hectare research site in Anoka and Isanti Counties near East Bethel, Minnesota. It is especially valuable not only because of its proximity to the Twin Cities but also because it contains elements of prairie and boreal vegetation in addition to predominately eastern deciduous types. Cedar Creek has a variety of soil types, and important underground aquifer, and oak savannas maintained through controlled burning. The area serves both as a "living museum" and an important site for ongoing scientific research.

Dr. William H. Marshall, director of the Cedar Creek Natural History Area from 1961 to 1970, wrote two progress reports (Marshall, 1964, 1968) for the Minnesota Academy of Science. Although many aspects of the Cedar Creek program have changed little since Marshall's time, a number of developments in recent years almost certainly will have lasting influences. The purpose of this report is to inform Academy members and other interested persons of these activities.

Cedar Creek Advisory Committee

According to Marshall (1968), the Cedar Creek Advisory Committee, chaired at the time by Dr. Donald B. Lawrence, consisted of representatives from various departments of the University of Minnesota and three Academy members — Drs. William Downing, David Grether, and Dale Chelberg. This arrangement was adopted and used with slight modification by the current administration since 1970. The only reorganization of consequence had its beginning in February 1977 when Chairman L. Daniel Fenzel commissioned an *ad hoc* committee comprising Drs. Harrison B. Tordoff and David Grigal to develop guidelines for selection and rotation of the Advisory Committee chairperson and members.

The guidelines, as set forth in the November 1977 minutes are as follows:

The Cedar Creek Advisory Committee will be comprised of 12 members. Eight members represent the university departments whose research interests are tied closely to Cedar Creek (Botany; Ecology and Behavioral Biology; Entomology; Fisheries and Wildlife; Forestry; Bell Museum of Natural History; Soils; Field Biology Program and Zoology), three represent the Minnesota Academy of Science, and one represents the staff working at Cedar Creek.

New members of the committee shall serve 4 year terms. Each year three members of the committee will be replaced with

others from the departments they represented. It was recommended that only one representative from the Minnesota Academy of Science be replaced in any year.

The three replacement members each year will be suggested by a nominating committee made up of existing Cedar Creek Advisory Committee members, excepting that representatives from the Minnesota Academy of Sciences be appointed by the Academy. The suggested nominees will be presented to the Dean of the Graduate School for his approval and appointment.

The chairman of the committee will serve a two-year term and will be nominated and elected by the advisory committee membership.

The reorganization proved fruitful in many respects but it also had shortcomings. Departments often were tardy in appointing replacements, and meeting attendance was sluggish at best. In order to improve Academy attendance, former Academy President Wayne C. Wolsey met with the Academy's Board of Directors at its March 1982 meeting and was instrumental in passing a number of important resolutions:

Each year one new member shall be appointed to a three year term on the Cedar Creek Advisory Committee. Primary consideration should be given to candidates who exhibit a professional interest in Cedar Creek. The committee members should attend all meetings or arrange for a substitute from an alternate list. A copy of all minutes shall be sent to the Academy office and to the President and President-Elect of the Academy.

The committee representatives shall report at least annually to the Board of Directors.

Currently the Cedar Creek Advisory Committee has three primary members and three alternate members from the Academy. A frequently voiced concern relating to membership is that state educational institutions, in addition to the University of Minnesota, be adequately represented on the Cedar Creek Advisory Committee. The Academy should be cognizant of these concerns because only it can appoint such members under existing guidelines.

As of March 1983, the Cedar Creek Advisory Committee consisted of the following:

ACADEMY REPRESENTATIVES

Primary Members

Dr. L. Daniel Fenzel -- University of Minnesota
*Mr. William V. Lucina -- Blaine Senior High School
Dr. Richard Meierotto -- College of St. Thomas

Alternate Members

Dr. Mark Davis -- Macalester College

Dr. Wayland Ezell--St. Cloud State University
Dr. Donald B. Lawrence--University of Minnesota
CEDAR CREEK STAFF REPRESENTATIVE
Mr. Valarian B. Kuechle
UNIVERSITY OF MINNESOTA DEPARTMENTAL
REPRESENTATIVES

Dr. David Grigal--Soil Science
Dr. Frank Irving--Forest Resources
Dr. Herbert M. Kulman--Entomology
Dr. Frank McKinney--Bell Museum
Dr. Thomas Morley--Botany
Dr. Patrice A. Morrow--Ecology and Behavioral Biology
EX OFFICIO MEMBERS
Dr. David F. Parmelee--University of Minnesota
Dr. G. David Tilman--University of Minnesota
*Committee chairman

Visitation

Visitor regulations have remained essentially unchanged at Cedar Creek since Marshall's time because the policies in place appear to work fairly well. The current list of regulations, approved by the Cedar Creek Advisory Committee on November 11, 1982, is available at the Cedar Creek Laboratory.

Use of the Cedar Creek area ordinarily falls into one of four general types.

1. *Exploratory* - Educational and scientific groups, conservationists, researchers, teachers, etc. become acquainted with facilities, landscape, flora, and fauna for possible future demonstration or study.
2. *Teaching* - Organized trips and demonstrations. Groups are limited to 20 individuals unless granted special permission. The Field Biology Program's graduate teaching assistant (TA) assists groups whenever possible. During periods when a TA is not available, qualified group leaders may conduct their own tours. Prospective group leaders are urged to attend an orientation workshop offered at Cedar Creek every year on the third Saturday in April.
3. *Research* - Independent researcher, faculty member, undergraduate or graduate student from within or outside of the University of Minnesota studies a specific problem, which he/she proposes well in advance to the Program Director, and carries out according to a plan approved by at least three members of the Advisory Committee. Research proposal forms are available at the Cedar Creek Laboratory or Field Biology Program office.
4. *Nature Trail* - A designated Nature Trail is provided for public use, and those using it are required to stay within its boundaries. Map available at the Cedar Creek Laboratory on request. No permit required.

One of the chief responsibilities of the graduate student teaching assistant (TA) at Cedar Creek is to assist visiting individuals or groups. The TA often presents slide demonstrations and conducts tours in the field. Since it is not always possible to obtain a qualified TA, we are initiating an annual orientation workshop at the Laboratory. It is our hope that prospective group leaders will attend the workshop in order to qualify as guides in conducting their own tours.

Over the years our staff and students have willingly assisted many visiting groups. Since most visitors are intensely interested in the radio-telemetry program, our electronics personnel deserve special praise for their patience and assistance.

The only area on Cedar Creek available to the public without entry permit is the Nature Trail located near Fish Lake.

Inasmuch as Professor Marshall was instrumental in its planning and development, we think it highly appropriate to call it the "Marshall Nature Trail." Plans are underway to obtain official recognition for the naming of this trail and other trails and historic sites at Cedar Creek.

Land Acquisition

Most of Cedar Creek's 5300 acres (2185 hectares) were acquired through gift or purchase during the early days of its history when land was relatively obtainable and inexpensive. According to Marshall (1968) the last major purchases were made in 1967 for lands adjacent to Fish Lake, including a public nature trail. No further land acquisitions have been made since 1967, even though several 40- to 80-acre plots would be desirable to fill out conspicuous indentations in Cedar Creek's Western edge.

Public sentiment and recent housing developments do not encourage extensive expansion of Cedar Creek beyond its borders. Considering the many acres that already buffer the area's most crucial habitats, we have noted little enthusiasm for additional acquisitions at current prices. Marshall and others had the keen foresight to obtain as much land as they did during a critical period of the area's development.

Experimental Ecological Reserves

One of the more important annual meetings for field station directors is the Organization of Biological Field Stations (OBFS) which began in 1968 at the Cedar Creek Natural History Area. The meeting is held each September at a different station, thus affording directors the opportunity to visit a variety of sites. A highlight of the meeting is a talk and discussion by representatives of the National Science Foundation (NSF) on federal funding of research at field stations.

At the September, 1971 OBFS meeting, NSF representatives stated emphatically that research funds earmarked for stations likely would be limited to those sites that could clearly demonstrate ongoing research coupled with strong institutional support; those showing only promise and unfulfilled potential would receive little funding. NSF then turned to The Institute of Ecology (TIE) for assistance in determining which of the many field sites qualified. From this beginning emerged the concept of a national network of Experimental Ecological Reserves (EER).

A study of the feasibility of a system of Experimental Ecological Reserves was supported by a grant from NSF's Biological Research Resources Program. Project meetings followed, and in time those sites wishing to enter the designation competition were asked to submit lengthy and detailed reports on all aspects of station activity, including past and current budgetary accountings. The Field Biology Program put forth its best effort in behalf of the University's Cedar Creek and Lake Itasca Forestry and Biological stations.

The peer reviews by TIE were thorough. Some of the toughest questions dealt with experimental manipulation of land within a natural area or park, such as Itasca State Park. The Itasca problem was quickly resolved when it was demonstrated that the state park already had developed a model plan that included five major classifications of land usage ranging from highly manipulative to untouchable sanctuary types. Although Cedar Creek had many sanctuary-type uplands and marshes as well as tracts being converted to a natural state, considerable areas were also being manipulated through controlled burning and farming. That research was an important component of Cedar Creek from the time of its inception was clearly demonstrable through its research record dating back to Ray Lindeman's classic studies at Cedar Bog Lake.

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The site evaluation scheme used by TIE stressed (1) site quality, including representativeness, size, and control heterogeneity, and (2) research activities, including historical data, quality and intensity, publication record and staff capabilities. Also weighed heavily were logistics and support, including site integrity, laboratories and equipment, resident research staff, technical staff, accessibility and utilities, services, housing and amenities, and scientific interchange. Consideration was also given ancillary benefits, including training programs.

The complete TIE report on Experimental Ecological Reserves may be obtained from the Superintendent of Documents, U.S. Government Printing Office. With respect to the evaluations, a score of 70 percent or greater indicated that the site being considered met the criteria for designation as an EER. A score of less than 70 percent indicated that the site had good, some, or very limited potential. On the recommendation of TIE, 67 sites spanning the breadth of the nation were designated EERs in the initial network. Itasca scored very high because of its unique setting and habitats as well as its long history and institutional support. Cedar Creek scored somewhat lower, although still over 70 percent. Three additional Minnesota sites, Cutfoot, Marcell and Pike Bay Experimental Forests, scored under 70 percent but nevertheless were recognized for their high potential.

A number of potential benefits were anticipated from the EER network. The TIE report noted that a "a comprehensive EER network will provide an ecologically-sound framework within which to test scientific hypotheses and will offer the capability to examine environmental impacts in many ecosystems." The report also stated that "experimental studies and monitoring at EER sites will provide the baseline data for a framework within which each ecosystem's responses can be evaluated" and that "(an) enhanced data base and interaction of scientists using the site will be conducive to development of collaborative and integrated research efforts." According to the TIE report, "The EER network will guide the investment of limited financial resources in physical facilities and technical support skills and will encourage their effective use."

This last statement has special significance with respect to federal funding. The EER designation merely *guides* NSF in distributing its limited resources. It does not mean, as some thought it might that an EER is automatically targeted for federal support. The EER designation does give the site *very good credentials*.

Appointment Of Associate Director

The Field Biology Program was established in 1966 and incorporated not only the Cedar Creek Natural History Area but also the Biology Session at the University of Minnesota Forestry and Biological Station at Lake Itasca, Minnesota. Although there are many advantages in having the two field stations under one office, there are certain disadvantages, notably that the program director of the Field Biology Program cannot reside in two places at once. Since it is imperative that the program director be at the Itasca station during the busy summer training period, the Cedar Creek station is left without adequate supervision during its most important season.

In the fall of 1980, Dr. G. David Tilman of the Department of Ecology and Behavioral Biology was appointed Associate Director of the Cedar Creek Natural History Area. His duties include selecting and chairing an outside advisory panel and extending the computer-based system for managing data from the

Cedar Creek research. To qualify as a regional or national facility, a field site such as Cedar Creek should be advised and evaluated on a regular basis by an unbiased panel of scientists outside Minnesota—an important consideration not to be taken lightly in view of National Science Foundation guidelines. The outside advisory panel for Cedar Creek currently includes Dr. Gene Likens of Cornell University, and Dr. James McMahon of Utah State University. A third member is to be selected.

Judging by what transpires at the annual meeting of field station directors these days, probably no greater concern exists than that dealing with the management of field data. Record managing at most field stations is archaic; Cedar Creek is no exception. With incredible advancements in computers and recording devices in the past decade, there is hope that our new programs will speed the modernization of the system. Already one of our new programs described below under Long-Term Ecological Research is accumulating vast amounts of field data and storing them in University computer banks for safe keeping and convenient retrieval. An LTER is committed to good management of its data. Other investigators will be encouraged to manage their Cedar Creek data equally well.

Long Term Ecological Research

A sibling association of the EERs is the Long-Term Ecological Research (LTER) by the Division of Environmental Biology of NSF. The pilot program, which was first open to national competition in 1979, required that the following research efforts be addressed: (1) pattern and control of primary production; (2) spatial and temporal distribution of populations selected to represent trophic structure; (3) pattern and control of organic matter accumulation in surface layers and sediments; (4) patterns of inorganic inputs and movements of nutrients through soils, groundwater, and surface waters; (5) patterns and frequency of disturbance to the research site. Since LTER sites are considered regional and national facilities, they are committed to collaborative research with scientists from outside as well as within the home institution.

A cadre of scientists at the University of Minnesota entered the competition and chose Cedar Creek rather than Itasca as their home base. Cedar Creek had a variety of interesting soil types and its proximity to the Twin Cities campus provided many advantages. Moreover, former studies had provided valuable baseline data. Although ecosystem ecology was the mainspring of the LTER program and the University clearly lacked in ecosystem specialists, enough talent in ecology and related areas was available to win recognition with a revised second proposal. In December 1981, Cedar Creek was designated an LTER—one of only 11 in the nation—and shortly thereafter awarded a five year, \$1.3 million subvention.

Drs. G. David Tilman and John R. Tester of the Department of Ecology and Behavioral Biology are the Principal Investigators of the Cedar Creek LTER project. Other LTER investigators are listed below under Current Major Research Projects. According to Tilman, the research is an attempt to understand succession through a synthesis of population, community, and ecosystem perspectives combined with long-term experimental manipulations of natural communities. The research includes detailed observations of large plots and experimental manipulations of smaller plots. The manipulations include: (1) fertilization with different levels of nitrogen with all other elements supplied in excess; (2) fertilization with each of 6 nutrient elements applied singly; (3) disturbance-nitrogen in-

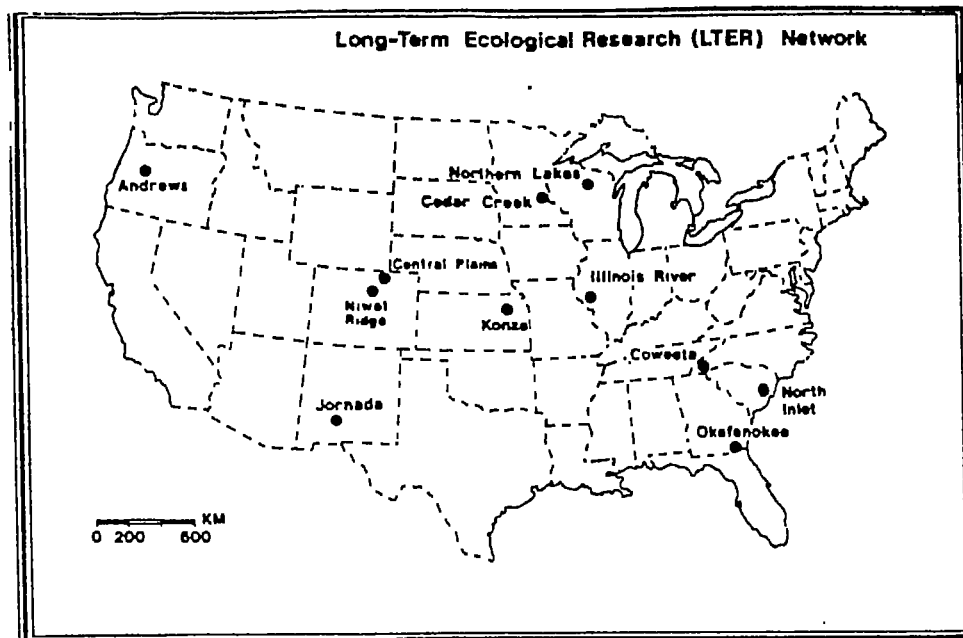


Figure 1. Location of the 11 Long-Term Ecological Research (LTER) sites established by the NSF Division of Environmental Biology. Cedar Creek became part of the LTER system in 1981.

teractions; (4) gopher removal; (5) deer removal; (6) insect removal; (7) fire. Of primary interest are the mechanisms whereby soil processes, interspecific plant competition, and herbivores influence the diversity and species competition of natural plant communities.

LTER at Cedar Creek began in the spring of 1982 and was in full swing by summer of the same year. Field season site usage increased from about 10 full-time individuals to over 50 individuals. Among the participants were many undergraduate and graduate students chosen on a competitive basis from the University of Minnesota and other educational institutions. As it turned out, most of the undergraduate student employees for the 1982 season came from schools other than the University.

The LTER also gave Cedar Creek its first and long sought after Resident Ecologist. The position was advertised nationally and, following a critical review of several hundred applicants, Dr. Mark Stillwell from Ft. Collins, Colorado, was chosen for the position on a post-doctoral appointment. Dr. Stillwell's background and expertise in nitrogen cycles and ecosystem ecology adds a new dimension to Cedar Creek's research potential.

The position of Resident Ecologist should not be confused with that of Resident Manager. The latter is supervised and budgeted by the Physical Plant Operations of the University of Minnesota. Mr. Alvar Peterson was Cedar Creek's former Resident Manager. After many distinguished years of service, he retired on 4 February 1982. The position was filled on 1 April 1982 by Mr. David Bosanko, former Resident Biologist of the University's Lake Itasca Forestry and Biological Station.

Current Major Research Projects

Research projects at Cedar Creek during the 1970's are listed by author, title, and abstract in the Cedar Creek Annual Reports that are prepared and filed by the Field Biology Program. The reports and updated lists of publications are too cumbersome to include here; however, a brief listing of on-site projects active or pending for 1982-83 follows.

WATERFOWL BEHAVIOR AND MATING SYSTEMS (NSF renewal pending)

Frank McKinney, Professor, Ecology and Behavioral Biology;
Jeffrey Burns, Post-Doctoral Researcher

INSECT HERBIVORY AND ASSOCIATIONAL RESISTANCE IN NATIVE PLANTS (NSF)

Patrice A. Morrow, Associate Professor, Ecology and Behavioral
Biology; David Tonkyn, Post-Doctoral Researcher

MICRO AND MACRO VIEWS OF SUCCESSION, PRODUCTIVITY, AND DYNAMICS IN TEMPERATE ECOSYSTEMS (NSF, Long-Term Ecological Research)

Donald Alstad, Assistant Professor, Ecology and Behavioral
Biology; David F. Grigal, Professor, Soil Science; Patrice
Morrow, Associate Professor, Ecology and Behavioral Biology;
Donald B. Siniff, Professor, Ecology and Behavioral Biology
(Principal Investigator); G. David Tillman, Associate Professor,
Botany, Michigan State University.

THE ROLE OF ROOT DYNAMICS IN OLD FIELD SUC- CESSION (funded through U.M. Agricultural Experiment Station)

David F. Grigal, Professor, Soil Science; Robert McKane,
Graduate Student, Soil Science

CONTROLS OF PRIMARY PRODUCTIVITY IN FORESTS AND FIELDS: THE ROLE OF SOIL CHARACTERISTICS AND LIGHT ATTENUATION EFFICIENCY (funded through U.M. Agricultural Experiment Station)

David F. Grigal, Professor, Soil Science; Mike Norland,
Graduate Student, Soil Science

FORAGING DYNAMICS, HABITAT USE AND SOCIAL SYSTEMS IN GEOMYS BURSARIUS (GOPHERS) (NSF proposal pending)

James O. Reichman, Assistant Professor, Division of Biology, Kansas State University; John R. Tester, Professor, Ecology and Behavioral Biology; Kathleen Zinnel, Graduate Student, Ecology and Behavioral Biology

THE ROLE OF ABOVE AND BELOW GROUND INSECT AND MAMMALIAN HERBIVORES IN DETERMINING PLANT COMMUNITY STRUCTURE (partial NSF support via LTER)

Nancy J. Huntly, Post-Doctoral Researcher, Field Biology Program

RESOURCE ALLOCATION AND THE LIFE HISTORIES OF PERENNIAL PLANTS (partial NSF support via LTER project)

Richard S. Inouye, Post-Doctoral Researcher, Field Biology Program

DEER HERBIVORY AND THE INVASION OF OLD FIELDS BY WOODY PLANTS (partial NSF support via LTER project)

Richard Inouye, Post-Doctoral Researcher, Field Biology Program; Taber Allison, Graduate Student, Ecology and Behavioral Biology

NITROGEN CYCLES AND SUCCESSION: THE ROLE OF LITTER DECOMPOSITION AND MINERALIZATION PROCESSES (partial NSF support via LTER)

Mark Stillwell, Resident Ecologist (Post-Doctoral Researcher), Cedar Creek

Independent Graduate Student Research

EVOLUTION OF MONECY, DIOECY, AND OUT-CROSSING IN GRASSES (Field Biology Program support)

Mark McKone, Graduate Student, Ecology and Behavioral Biology

COEVOLUTION IN A GUILD OF ANT-TENDED HERBIVORES

(Field Biology Program support)

Jeffrey Brokaw, Graduate Student, Ecology and Behavioral Biology

EFFECTS OF DEER BROWSING ON TAXIS CANADENSIS

(Field Biology Program support)

Taber Allison, Graduate Student, Ecology and Behavioral Biology

THE BEHAVIORAL ECOLOGY OF THE BLUE JAY, CYANOCITTA CRISTATA (Dayton-Wilke Fund)

William J. Hilton, Jr., Graduate Student, Clemson University

PLANT DYNAMICS IN EARLY SUCCESSION

Barbara Delaney, Graduate Student, Botany Department

INSECT DYNAMICS IN EARLY SUCCESSION

John Haarstad, Graduate Student, Entomology, Fisheries and Wildlife.

Graduate Student Research Partially Supported by the Long-Term Ecological Research Project:

THE STRUCTURE OF INSECT COMMUNITIES IN OLD FIELDS

Rebecca Goldberg, Graduate Student, Ecology and Behavioral Biology

EVOLUTION OF HOST-PLANT CHOICE BY SPITTLE-BUGS

William Goodman, Graduate Student, Ecology and Behavioral Biology

DYNAMICS OF RODENT POPULATIONS THROUGH SUCCESSION

(Pre-Doctoral Fellowship)

Susan Braun, Graduate Student, Bell Museum of Natural History

SEED RAIN, SEED BANKS AND THE ECOLOGY OF PLANT ESTABLISHMENT

Sara Webb, Graduate Student, Ecology and Behavioral Biology

HERBIVOROUS INSECT COMMUNITIES ON ARTEMESIA AND AMBROSIA AND EFFECTS OF CRYSEMELID BEETLE ON RHUS GLABRA

Sharon Strauss, Graduate Student, Ecology and Behavioral Biology

Field Assistants For Summer Research In 1982

The LTER employed two Botany MS students and two undergraduate biology majors and Morrow's NSF grant employed two undergraduate students full-time in 1982. In addition, the Field Biology Program employed 8 undergraduate students as full-time field technicians to assist with various aspects of the research projects listed above. Additional field assistants were obtained through the Comprehensive Employment Training Act (CETA) program, which provided 10 ¾-time students. The Youth Conservation Corps assisted with various aspects of the above research programs by providing a crew of 10 for two weeks.

In addition to a year-round staff, at least 10 faculty and visiting scientists, 5 post-doctoral researchers, 14 graduate students, and 24 full-time summer field assistants will be working at Cedar Creek during the summer of 1983. The greatly increased numbers and facility use have challenged the ability of Cedar Creek to provide scientists and students with adequate laboratory, office and housing accommodations. Although such activity was hardly unpredictable, it has been virtually impossible to obtain expanded facilities on promise of increased activity alone. Now that research is flourishing at Cedar Creek, there is a strong, proven case for expanded facilities.

The building program of the 1970's and that planned for the early 1980's are presented below.

Special Activities

The intent here is not to list the many important projects carried on at Cedar Creek during the 1970's, but to mention several that will likely influence many studies in the

future. The following are listed chronologically with respect to completion dates, including some studies that were initiated before 1970.

1. A catalog of the flora of Cedar Creek by Moore (1973). This important long-term study contains 761 taxa of vascular plants based on 30 years of collecting and study by the author, a former scientist of the Department of Botany at the University.
2. A report on Cedar Creek soils by Grigal et al. (1974). In August 1972, a soil survey of Cedar Creek and adjacent areas was begun by the Minnesota Agricultural Experiment Station and the USDA Soil Conservation Service; the resulting report was both comprehensive and significant. Partial funding came from the Field Biology Program.
3. Vegetation mapping by Huempfer and Erickson (1975). As part of a dissertation study by Huempfer on winter foraging by ruffed grouse, financed largely by the Cedar Creek Radio Telemetry Program, a significant portion of Cedar Creek's vegetation was mapped in detail. Roughly one-fifth of Cedar Creek (545 hectares, 1,346 acres) was mapped by the authors, although only 250 hectares were used in the grouse study.
4. Land Management Report by Grigal et. al. (1979). An ad hoc committee of the Cedar Creek Advisory Committee led by Dr. David Grigal developed a land management plan for the area with a number of important recommendations.

These included manipulations for replacement of unwanted smooth brome by native species; continuation of periodic abandonment of old fields to provide a series of tracts of different ages; protection of some old fields from unnecessary disturbance to allow natural succession; and continuation of the burning program for control and regeneration of certain plant species. Over the years Dr. Donald B. Lawrence has been especially active in control and regeneration manipulation.
5. Problem analysis and preliminary plan for expansion of the fire management unit by Irving (1980). For many years Dr. Frank Irving has planned, developed, and supervised the Cedar Creek burning program that not only maintains the oak-savannah habitats but also provides an important data base for future ecological studies.
6. Research policies of the Cedar Creek Natural History Area by Tilman (1983). Dr. G. David Tilman evaluated and revised the research policies of Cedar Creek following an exhaustive review by the Cedar Creek Advisory committee.

In addition to the above, current aerial photo prints (from infrared transparencies) of the Cedar Creek area were purchased in 1981 for use by all investigators at the Cedar Creek Laboratory. During the 1970's, Mr. John Haarstad built a sizable research insect collection which is housed in special cases at the Laboratory. Former plant collections from Cedar Creek are mostly housed in the herbarium at the University where they have been included in a computer-based collections system managed by Dr. Clifford Wetmore. A smaller collection of plants is housed at the Laboratory for on-site use by investigators.

Graduate Student Research Stipends

In 1981 the Field Biology Program sponsored a graduate student research program designed for Cedar Creek. Seven awards totaling \$2,306 were given that year on a competitive basis with the hope that the seed money would help beginning graduate students initiate on-site research programs that could be funded later through other sources. The awards covered such expense items as field equipment, supplies, transportation, food, but not salaries or assistants. Free dormitory housing was provided the recipients who chose to reside at Cedar Creek.

An expanded program of awards began in 1982. Four graduate student research awards in amounts of up to \$500 each were awarded for a total of \$800. Graduate student summer research stipends of \$1,500 each were awarded three students whose work showed unusual promise. The newly established LTER program at Cedar Creek not only provides opportunities for participation to prospective students, but also will provide all investigators with detailed information on plant population dynamics, phenology and soils, insect and small mammal surveys, etc.

The Field Biology Program plans to continue the student programs whenever it can afford to do so. Numbers of recipients likely will vary from year to year, as almost certainly will the numbers and types of projects proposed or being carried out. The awards will be open to all qualified students on a competitive basis. Information concerning these awards may be obtained from the Field Biology Program Office.

Student awards other than those sponsored by the Field Biology Program are available from time to time. For example, in 1981, Dr. Donald B. Lawrence solicited proposals and awarded a student stipend for brome field conversions.

Friends Of Cedar Creek

When the Cedar Creek Advisory Committee was established, a Promotion and Fund Raising Subcommittee was also set up to raise funds. However, Marshall (1968) reported that this subcommittee had not been activated. The subcommittee was dormant during the 1970's as well, mostly because funds were sought from outside granting agencies.

Most of the funding for Cedar Creek was generated by the Radio-Telemetry Program through federal grants to Drs. John Tester and Donald Siniff, with lesser amounts being generated from federal research grants to Drs. Frank McKinney, Patrice Morrow, Philip Regal, Robert Taylor, and the author. Because of a foreseeable decline in state and federal grants, the Field Biology Program thought it advisable to initiate a "Friends of Cedar Creek" account through the University of Minnesota Foundation. This was set up in December 1980 following a gift of \$632.04 from the late Ms. Edna May Carr.

Small donations have since accrued to this account. No funds have been withdrawn to date, and it is hoped that this modest start may be the beginning of a substantial endowment of the future.

Buildings

The Cedar Creek Advisory Committee reached a decision early in the 1970's concerning the rehabilitation of a number of vacated cabins and homes obtained through land acquisition. The Committee voted to dispose of all buildings that required extensive repair. Nearly all of the dwellings needed new wells and plumbing to meet the health standards set by the University's Department of Environmental Health and Safety. At the time Cedar Creek money was in such short supply that even those buildings believed to have had some marginal value were not salvaged; little by little they were destroyed or removed through contract arrangements supervised by the resident manager, Mr. Alvar Peterson. A few of the old buildings still survive; but two of them, the Corniea Cabin and Skogerboe Home, have been condemned recently by the University. The Norris Cabin near Cedar Bog Lake has been repaired for use as a summer dwelling only, though water has to be hauled in from the main laboratory.

Three year-round family homes at Cedar Creek are in good condition and are nearly always occupied. Faculty, staff, and students have priority for their use, but others may occupy them when they are vacant. Rental income goes to the University's Physical Plant Operations and is used for maintenance purposes.

The main building at Cedar Creek, often referred to as the Laboratory, is a 386.22 m² year-round facility that was financed, in 1954 largely by a \$75,000 grant from the Max C. Fleischmann Foundation of Nevada. For a number of years it was divided into a large assembly room with kitchenette, four offices, a four-bunk women's dormitory, a ten-bunk men's dormitory, bathroom facilities, and a two-bedroom family apartment that was sometimes used for offices and a conference room. This arrangement had its first significant change in 1978 when the Cedar Creek Advisory Committee voted to move the Radio-Telemetry Program from its old quarters in a 155.92 m² shop type building to the Laboratory.

Plans had been drawn previously for a separate Radio-Telemetry Program building that would have operated chiefly on solar energy. The State Legislature decided not to fund the special building but instead awarded \$42,470 to rehabilitate the old telemetry quarters which had severe cooling and dust problems. However, when the University's Physical Planning Office checked the old facility, it soon concluded that it was not worth the conversion. The Planning Office argued that a better expenditure of state funds would be a remodeling of a section of the more substantial Laboratory.

Although legislative money was available as early as May 1978, telemetry was not moved to its present quarters until the summer of 1979, mostly because of many long discussions concerning the change of plan. The part of the Laboratory eventually occupied was the family apartment and the men's dormitory. Shortly thereafter both men's and women's dormitories were established in the original telemetry site following the installation of new exits and fireproof panels, and other modifications required by State policy and codes. The old building still houses a year-round machine shop, animal preparation room, bathroom facilities, and the Cedar Creek weather station.

Two additional buildings were built in the 1970's: in 1976, a 68 m² garage that houses a tractor and accom-

modates woodworking equipment used mostly in summer; and in 1979, a 223 m² storage building. Materials for both facilities were purchased from overhead generated at Cedar Creek, and station labor was employed when feasible. Other major expenditures of the 1970's were the installation of underground electrical lines and transformers to the Cedar Creek Laboratory, a Data General Nova 2 computer, and a deep well that feeds a copious supply of water to Professor McKinney's duck enclosures.

A major building program is anticipated for 1983-1984 in order to accommodate increased research activity. A proposed addition will adjoin the east end of the Laboratory and house much needed wet and dry laboratories, a special soils laboratory, weighing room, plant-insect-vertebrate collections, and several additional offices. A year-round housing unit is also planned. The building project is being funded by a \$100,000 subvention from the biological Research Resources Program of NSF, with additional cost sharing funds of \$35,000 from the University of Minnesota, and \$25,000 from the Minnesota Freshwater Foundation. The target date for completion is February 1984.

Protection Of Cedar Creek

In view of an ever-expanding population flowing northward from the Twin Cities, a high priority must be given to protective policies and measures governing not only Cedar Creek's internal use but its many borders as well. The importance of this crystallized in the early 1970's when it became apparent that one of several proposed international airports abutted Cedar Creek; a rumor at the time was that the undeveloped land (Cedar Creek) would be an ideal dumping ground for unwanted fuel by circling aircraft in an emergency situation. That particular rumor was probably not well founded, but nevertheless it and similar suggestions prompted a search for more state and federal protection than was afforded Cedar Creek at the time.

The first move was to interest the National Park Service in Cedar Creek. For several years the Service visited and evaluated the area's habitats and management policies. Finally in December 1975 Cedar Creek was designated one of the Nation's important Natural Areas. The following spring a ceremony sponsored by the Park Service took place on Cedar Creek's laboratory grounds with University of Minnesota President C. Peter Magrath as key speaker. Today a bronze plaque commemorating the event greets visitors entering the station's laboratory and calls attention to the importance of the area. Some supporters of Cedar Creek were disappointed to learn that the Park Service designation does not generate federal dollars for the site; however, it must be noted that it does prevent the flow of federal dollars to airport and other projects deemed harmful to the Natural Area.

State protection also was sought via the Department of Natural Resources' (DNR'S) proposed Scientific and Natural Area program. Nothing has come of this to date--not only because of long delays in the State's program, but also because there is yet no good plan for placing certain areas under the DNR's protective umbrella while committing others to experimental manipulation. A new scare meanwhile embraces Cedar Creek: A proposed landfill immediately adjacent to Cedar Creek's west side threatens the natural area with

dust and noise pollution, either one of which spells certain disaster for Dr. Frank McKinney's internationally recognized waterfowl behavior studies. The proposal is, fortunately, becoming less popular, mostly through the efforts of Dr. G. David Tilman and the recognition that Cedar Creek sits on an extremely important underground aquifer that feeds water to the Twin Cities. Activity of this sort once again forces us to seek additional state protection.

Equally serious problems relate to the country roads that dissect the natural area and place the public in close contact with such ecologically fragile areas as Beckman Lake. Recent road modifications have cut dangerously close to the lake's boggy margins of black spruce and other plants rare to southern Minnesota. Considering the area's wildlife, and especially its large deer population, speed limits should be lowered and enforced. Judging by the huge amount of litter strewn along Cedar Creek's roads, a certain disrespect for natural areas by some of our citizens cannot be ignored.

After great debate it was decided that some kind of fencing was necessary to protect some of Cedar Creek's outer flanks, even though the cost seemed prohibitive because of the many miles along the area's southeastern border erected during 1979 and 1980 to discourage trespassing and poaching. No fence was thought to be impenetrable, but it was decided that a low fence comparable to that used by the DNR would help. Deer confinement would not be a problem since they could easily clear such a fence. On the other hand, it seemed likely that snowmobilers, grazing horses, and unmanaged dogs on the hunt would be deterred.

Continuous cognizance of these many problems, and great

expenditures of time and energy are necessary to offset habitat destruction of the future.

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