Preserving biological diversity | A description and analysis of the Nature Conservancy's program in Montana

Robert C. Ehrhart

The University of Montana

Let us know how access to this document benefits you.

Follow this and additional works at: https://scholarworks.umt.edu/etd

Recommended Citation
https://scholarworks.umt.edu/etd/3299

This Thesis is brought to you for free and open access by the Graduate School at ScholarWorks at University of Montana. It has been accepted for inclusion in Graduate Student Theses, Dissertations, & Professional Papers by an authorized administrator of ScholarWorks at University of Montana. For more information, please contact scholarworks@mso.umt.edu.
PRESERVING BIOLOGICAL DIVERSITY: A DESCRIPTION AND ANALYSIS OF THE NATURE CONSERVANCY'S PROGRAM IN MONTANA

By

Robert C. Ehrhart

A.B. Gettysburg College, 1967
Ph.D. The University of Texas, 1975

Presented in partial fulfillment of the requirements for the degree of Master of Science

The University of Montana

1991

Approved by

Chairman, Board of Examiners

Dean, Graduate School

Date
The Nature Conservancy (TNC) is a private, non-profit organization whose objective is the preservation of biological diversity. In addition to fund-raising, the Conservancy pursues its objectives through three functions: Identification, Protection, and Stewardship. These functions are carried out by state Field Offices.

The Montana Field Office of The Nature Conservancy (MTFO) has been operating since 1979. It currently has stewardship responsibilities for 8 preserves, 22 conservation easements, and 22 registry sites. Because of the particular character of land ownership in Montana, in conducting its functions of identification, protection and stewardship TNC interacts routinely with government and tribal land managers as well as private landowners.

In the selection, design and management of its preserves, MTFO considers availability, ecological significance of plant and animal species and communities, land uses, and threats to preserves or their components (including off-site development, exotic species and potential hydrologic changes). Preserve designs and management plans also identify management needs for the preserve and individual components and requirements for additional information. Both ecological and non-ecological factors influence preserve management. These include: hydrology, natural resource development, degradation of surrounding lands, grazing, exotic species, fire management, community relations, and financial considerations. The Montana Field Office emphasizes monitoring programs designed to: (1) increase the basic knowledge of critical elements, (2) establish baseline and follow-on data to identify conditions and trends, and (3) evaluate the effectiveness of management prescriptions.

The MTFO stewardship program is characterized by: (1) active, hands-on management; (2) management decisions based on scientific knowledge and (3) an extensive monitoring effort to increase this knowledge; (4) recognition of the potential impact of influences both internal and external to the preserves and (5) efforts to address such influences along with monitoring programs to assess the effects of management prescriptions; and (5) a sense of priority in the allocation of limited resources.
"Biodiversity" has become the ecological buzzword of the 1990's, and the need to maintain biodiversity is being extolled in and out of traditional conservation organizations. Both the term "biodiversity" and the best methods for preserving it are subject to interpretation, however. "Diversity" in a biological context may refer to several qualities, including richness (the number of total items in an area), proportion (the number of different items in an area), or equitability (evenness in the relative abundance of items in an area). (Westman 1985) Measures of biodiversity may be applied to any number of categories, but are most often used to calculate the variety or range of different ecosystems, habitats, species, or genetic components. Methods offered for the preservation of biodiversity, then, depend on what definition one uses. They may range from gene pool manipulation, to sequestering in botanical gardens and zoos, to habitat modification, to laws prohibiting the destruction of specific species, to the establishment of nature reserves intended to maintain a "natural environment" for ecosystems and the biological elements within them.

While popular concern for biological diversity is a relatively new phenomenon, The Nature Conservancy (TNC) has focused on the preservation of biological, or natural, diversity for forty years and has developed an elaborate program by which to pursue this objective. TNC is a private, non-profit organization whose declared mission is
"the preservation of biological diversity." (Sawhill 1990) It defines the maintenance of biodiversity as preserving "plants, animals and natural communities that represent the diversity of life on Earth by protecting the lands and waters they need to survive." (Anonymous 1990) Diversity is thus the total number of species and communities which exist on the planet. Preservation of these ecological elements is to be accomplished through protection of the natural habitats and ecosystems in which they exist.

The Conservancy employs a number of strategies, methods and tools in pursuit of this mission. Broadly, activity falls into four major categories: (1) Identification and classification of which species and communities are most in need of active protection and determination of where the best occurrences of these elements are located (Identification); (2) Selection of the most appropriate means by which to protect element occurrences (Protection); (4) Development and implementation of management programs for those elements for which the Conservancy assumes direct responsibilities (Stewardship); and (4) Accumulation of the financial means necessary to carry out the first three tasks (Development).

The objectives of this thesis are to describe and analyze how The Nature Conservancy pursues its broad objective of preserving natural diversity by focusing on operations in a single state: Montana. When I began this project, I had intended to address only those properties for which TNC assumed a legal responsibility. It quickly became apparent that to understand and evaluate the Conservancy's efforts it was
necessary to consider not only stewardship but the processes of identification and protection as well. Consequently, I have had to address several interrelated questions. How does The Nature Conservancy select parts of the natural world to protect? How does it determine the best means by which to do so? What are the factors which affect the management of TNC preserves, and how does the organization address them? And, finally, how does the organization measure the success of its efforts?

Because TNC state components are subordinate to the national headquarters, it was also necessary to consider the characteristics of The Nature Conservancy as a whole and the doctrine it has evolved to guide state programs. Accordingly, the first chapter offers an overview of The Nature Conservancy with emphasis on the guidance the parent organization provides regarding the functions of identification, protection and stewardship, while the following chapter provides a brief history of Conservancy activities within Montana and a description of how the state office has carried out these three functions. The core of the study focuses on the planning, execution and evaluation of the stewardship functions in Montana with an emphasis on preserve management. Chapter 3 describes the six major preserves in Montana and addresses the key requirements for management of each as well as the steps the Conservancy has taken to meet these requirements. Chapter 4 analyzes in greater detail the factors which influence preserve management and evaluates the Conservancy's responses to them, while the next chapter offers an
evaluative summary of how successful the Conservancy has been in pursuing its task of managing for natural diversity in the state of Montana. The concluding chapter reviews the important literature on nature preserve selection, design and, especially, management.

This project would not have been possible without the assistance and support of numerous individuals. Dr. Earl Willard initially suggested I "take a look at The Nature Conservancy" and then gave me the freedom to pursue the project in my own way. The Mansfield Library Interlibrary Loan Office queried far and wide to find key works on nature preserve design and management. The staff at the Montana Heritage Program provided both valuable information and moral support. Bob Kiesling, the former Montana TNC State Director, willingly gave of his time and his insights on more than ten years of Conservancy activity in Montana. Peter Lesica offered a knowledgeable but detached perspective. Brian Kahn and the folks in the Montana Field Office, particularly Dr. Joan Bird, have been exceedingly gracious in allowing me to impose on their hospitality—and their office space. My especial thanks go to Bernie Hall, formerly the Director of Stewardship and recently promoted to Director of Lands Conservation, MTFO. This project would simply not have been possible without his wholehearted support—freely given even when we weren't quite sure where I was going.
TABLE OF CONTENTS

ABSTRACT ii
PREFACE iii
TABLE OF CONTENTS vii
Chapter
  1. The National Conservancy: Characteristics and Functions 1
     Characteristics 1
     Functions 7
     Identification 8
     Protection 10
     Stewardship 21
     TNC's Expanded Focus 28
  2. The Montana Field Office: Conservancy Operations in Montana 30
     Early Operations 31
     Identification 35
     Protection 38
     Stewardship 45
  3. TNC Preserves in Montana 52
     Crown Butte 56
     Dancing Prairie 58
     Meeteetse Spires 64
     Pine Butte 68
     Safe Harbor Marsh 72
     Swan River Oxbow 76
Chapter 1

THE NATURE CONSERVANCY:
CHARACTERISTICS AND FUNCTIONS

Characteristics

The Nature Conservancy (TNC) seeks to preserve "the full array of biological diversity by finding, protecting, and maintaining the best examples of communities, ecosystems and endangered species in our natural world" (TNC, 1986). The Conservancy evolved from The Ecological Society of America, an organization formed in 1917 "to promote the scientific study of organisms in relation to the environment and to facilitate an exchange of ideas among ecologists" (Behlen 1981). In 1946 a group of individuals interested in actively lobbying for the preservation of natural areas broke away to form the Ecologists Union. Although the Ecologists Union was renamed The Nature Conservancy in 1950 (when it was also granted tax-exempt status), the new organization retained its focus on the study and preservation of natural areas and biological communities. Acquisition of land as a means to ensure this objective become a stated purpose of the Conservancy in 1953.

From an organization which had fewer than 300 members and no property when it was incorporated, the Conservancy has grown tremendously. Much of this growth has occurred within the past ten years. By 1988, membership exceeded 398,000, and TNC had
assisted in putting into some protection status more than 3 million acres of land, of which it then owned more than 500,000 acres in 968 preserves (Colorado Field Office Flyer, n.d.). Two years later membership exceeded 550,000 (up from 250,000 five years earlier). The number of protected acres has expanded to more than 5.3 million, while TNC now owns and manages some 1,200 preserves in all fifty states as well as Canada, the Caribbean, and Latin America. In addition, the Conservancy maintains a revolving Land Preservation Fund of some $79 million from which it can draw for future projects (Anonymous 1991).

As an organization, the Conservancy is an interesting mix of centralized guidance and oversight and decentralized focus and operations. National headquarters are located in Arlington, Virginia. Because one of the principal tenets of the Conservancy has been to decentralize as much of the operation as feasible, there are now six Regional Offices, which focus primarily on protection and stewardship activities for the states within their area of responsibility. TNC national headquarters also has major divisions to handle activities in Latin America and the Caribbean. The Montana Field Office (MTFO)—referred to as Big Sky Field Office, or BSFO, until 1990—is part of the Western Region.

The cutting edge of Conservancy operations traditionally has rested at the state level, where the unit of organization is referred to as a Field Office. Within the framework and guidance laid down by national and regional headquarters, each field office (and state Natural
Heritage Program, addressed below) is responsible for planning, organizing, and executing the Conservancy's four overarching tasks: identification, protection, stewardship, and development. Major development projects, proposed protection activities, and stewardship plans must be approved at either the regional or national level, however. The senior officer within a state field office is the State Director, who is responsible for all aspects of TNC activities in his state. With regard to protection and stewardship, the key positions within a Field Office are the Protection Planner and the Director of Stewardship (sometimes called the Land Steward).

What most clearly distinguishes The Nature Conservancy from other conservation or environmental groups is its focus on the preservation of biodiversity through the protection of private land and cooperation with public natural resource agencies. Rather than legislative lobbying, TNC's primary emphasis has been on direct interaction with private landowners as well as state and federal agencies involved in resource management and on the acquisition and management of their own properties. A second distinguishing characteristic has been its focus on specific species or plant communities. Most conservation groups have tended to seek out for preservation "natural areas" and thereby protect whatever fauna and flora might be in these areas; the Conservancy has adopted the inverse approach. Rather than finding pristine areas and determining what plant and animal species or plant communities are present, TNC seeks first to determine what species or communities most need to be
protected and then to determine where the best examples of these are located.

The foundation for this approach is the concept of "elements of biological diversity." By TNC definition, an "element" is "a natural feature of particular interest, either because it is unique or endangered within the state or nationally . . . or because it represents an important type . . ." (Chipley 1977). Elements are categorized into three groups: Special Plants, Special Animals, and Special Plant Communities. An important aspect of this classification system is the idea that there is value not only in saving individual rare species but also in retaining pristine or near-pristine examples of representative plant communities, landscapes and ecosystems. In this sense the approach addresses both "the last of the least" and "the best of the rest." The incorporation of communities and ecosystems into the Conservancy's protection efforts has been of special significance for TNC activities in Montana.

The Conservancy has developed an elaborate system for organizing these elements and their related information and for prioritizing the activities required to ensure appropriate protection measures. This system, known as the Element Ranking System, ranks elements according to the degree of rarity or endangerment both on a global and state level. Because of the dynamic nature of the process and the continual updating of databases, these rankings are subject to change, but provide a qualitative framework within which decisions can be made at any given point in time. The basic rankings are G
(Global) 1 through 5 and S (State) 1 through 5. An element ranked "G1" is flagged as being "Critically impaired globally because of extreme rarity (5 or fewer occurrences or very few remaining individuals or acres) or because of some factor in its biology making it critically vulnerable to extinction" (TNC 1984). A ranking of "S1" would apply the same criteria to that element within the context of a given state. (Complete element ratings and their definitions are contained in Appendix 1.) This TNC-derived ranking system is not synonymous with other species designations such as federal rare and endangered species, although there is often considerable similarity, especially at the G1/G2 levels.

Ranking elements both globally and within a state serves several purposes. While the Conservancy's avowed objective is to save as many species and plant communities as they can, financial and other considerations make immediate achievement of this objective impossible. The element ranking system provides a means of prioritizing protection efforts. The state ranking provides a measure of value or effort-to-be-expended which is in keeping with the decentralized, state-oriented approach of the Conservancy. It is also a recognition that an organization largely dependent on private sources of funding and public support must bear in mind people are often most interested in what is in their "backyard." The global rank remains the primary standard, however, and serves to reduce the possibility limited funds will be expended to save the fortieth example of one
species while the third or fourth of a more endangered species goes begging for want of funds.

Closely related to the Element Ranking system is a sophisticated database management system (DBMS), the current version of which is the Biological and Conservation Data System (BCD) (Juday 1990). This dynamic system contains biological and ecological information about each element as well as records of locations and current protection levels. It provides the basis upon which to rank elements and information upon which to base protection and stewardship decisions. Maintained at national headquarters in Virginia, BCD can be queried and by field offices and Heritage programs.

Tied to both the classification and database management systems is yet a fourth unique aspect of the Conservancy's approach to maintaining biodiversity: the Natural Heritage Program. The Heritage Program, the objective of which is identification of the States' natural (biological) diversity, is a prime example of the mixture of private-public and centralized-decentralized approaches which characterize the Conservancy. Throughout much of the 1970's and 1980's TNC was instrumental in the establishment of Natural Heritage programs in many states, offering field expertise, the methodologies developed through its classification and database management systems, and sometimes even a complete "Heritage Task Force." In return, the data acquired within each state was incorporated into the national database. At the conclusion of the initial effort, which usually lasted about two years, the Conservancy's objective was to have the program lodged
within an agency of the state government with funding provided by a combination of state, federal, and TNC support (Chipley 1977). Every state currently maintains a Natural Heritage program of some type with links to The Nature Conservancy.

**Functions**

The Nature Conservancy pursues its objectives of protecting the elements of natural diversity through the accomplishment of four functions: Identification, Protection, Stewardship, and Development. Identification refers to the identification, classification and location of target elements. Protection includes determination of the needs of elements, analysis of the most appropriate mechanisms by which to achieve the appropriate level of protection and actions taken to place elements into a protected status. Stewardship involves the development and implementation of appropriate management actions on TNC-owned preserves and the influencing of appropriate management of critical elements on properties they do not own. Development is concerned with the acquisition of funds necessary for operations, acquisition of property or property rights and stewardship costs.

Reflecting its expanded size and more structured approach, the Conservancy within the last six years has published manuals which address each of these functions in some detail. Some of these documents had less elaborate predecessors. Others, such as the Preserve Selection and Design Manual (1987), did not. Collectively,
they are intended to provide guidance based on experience acquired through trial-and-error and on the ever-expanding base of scientific knowledge which drives The Conservancy's approach.

**Identification**

To protect and maintain biological diversity, one must first determine which species and communities are most endangered and then locate viable populations of these elements (called "Element Occurrences" or "EOs"). Accordingly, the initial step in the establishment and development of a state TNC program normally involves determination of what elements are present within the state and identification of the best occurrences of these elements. The instrument for carrying out this function is the Heritage Program. Once established within a state, the Heritage Program continues to locate elements and also maintains and updates the database management system which provides the scientific basis for protection and management decisions. In addition, it begins to bridge the gap between Identification and Protection by providing an initial prioritization of elements and thus of Field Office protection efforts. The vehicles for accomplishing this latter task are the annual "Diversity Scorecards." The scorecards are actually multi-page computer listings for each category of element (Special Plants, Special Animals, Special Plant Communities) which list by Global and State rankings the known locations of each priority element and the status or condition of these Element Occurrences as well as some limited ownership information (TNC 1982).
The Heritage staff presents the Scorecard information to key members of the Field Office, including the State Director, Protection Planner, and Land Steward. It is during preparation and discussion of the scorecards that the focus expands from individual elements to a broader perspective of element occurrences and subsequently to site locations on which several elements might be present. Within the past two years, the development of a new information file, the Site Basic Record, has resulted in an explicit emphasis on this site-oriented approach (Bird pers. comm.; Beer pers. comm.).

Of particular importance for influencing possible Field Office activity and the priority which might be assigned to this activity is the EO Rank provided by the Heritage staff for each Element Occurrence. Always aware that limited resources preclude efforts to protect every occurrence of every element, the Conservancy rates element occurrences on the basis of four criteria: quality, condition, viability, and defensibility. **Quality** refers to the current quality of the element(s) on that site and includes such factors as the representativeness of the occurrence, the distribution and number of the population (for plants and animals), and the vitality and vigor of individuals. Plant community considerations include age and maturity, productivity, diversity and number of non-characteristic species present. **Condition** compares a given site to an optimum habitat delineated by The Conservancy. It considers what man-made or natural disturbances have resulted in degradation of the habitat, the status of the disturbance, the amount of time since the disturbance
was removed (if at all), and the site's recovery potential. **Viability** addresses the long-term prospects for the continued existence of the EO at the indicated level of quality and weighs such factors as the nature of the element(s) and its reproductive biology, those factors which might limit the element at that site, the size of the site, and the condition of surrounding land. **Defensibility** considers the extent to which the occurrence can be protected from extrinsic human factors that might otherwise degrade or destroy it. It includes both direct impacts (e.g., vandalism, introduction of exotics) and indirect impacts (e.g., air and water pollution). Special considerations include landscape configuration, watershed lines and adjacent land uses (TNC 1987).

Subsequent to the scorecard meeting, the Field Office Protection Planner uses the Site Basic Record to determine those sites which have occurrences of the most crucial elements, the condition of the EO, and the current protection status of the EOs broken down by ownership tract. Although the process outlined above appears rather rigid, TNC doctrine stresses the need for flexibility and the capability to respond to opportunities as they might arise: "The point if NOT . . . to derive an immutable site list in precise order of significance, but rather to have a good working list of top-priority sites, all worth doing" (TNC 1987).

**Protection**

It is more difficult to define Protection as a function than Identification or Stewardship since in the broadest sense the
"protection of natural diversity" is what the Nature Conservancy is all about. As a process, the Conservancy defines "Protection" as "moving a pre-identified rare, threatened, or endangered plant, animal or natural system from a relatively unprotected or a vulnerable survival status to a status offering a realistic chance of survival" (TNC, 1988). The type of protection may fall within a broad range of instruments and need not involve direct management by TNC.

To achieve this objective, the Conservancy's Protection Manual delineates three "subfunctions": Selection and Preserve Design, Protection Planning, and Protection Implementation. The first of these -- Selection and Preserve Design -- involves primarily an ecological evaluation which seeks to answer the question, "Do we want to protect a given EO?" and, if so, "How would we structure a preserve to best ensure adequate protection?" Protection Planning incorporates non-ecological considerations into the equation, focusing on the availability and suitability of specific properties for a particular protection action, the estimated costs of acquisition and stewardship, and alternative protection measures short of acquisition. At this stage, the key question is, "How can we provide appropriate protection at the least cost?" Protection Implementation involves the actual negotiations and legal, administrative and financial activities involved in moving a parcel or parcels of land into a protected status.

Responsibility for selecting which element occurrences are most suitable for protection and for prioritizing protection efforts rests primarily with the Field Office. TNC national headquarters provides
general guidance, involving both ecological and non-ecological considerations, in the Protection and the Preserve Selection and Design Manuals. The prioritization of potential sites should be "roughly in the order of their biological significance." Sites highest on the list should be those with a high number of occurrences of elements ranked G1 or G2 ("the last of the least") or outstanding occurrences of community types ("the best of the rest").

A second criterion involves the suitability of a site and its current level of protection. Evaluators should normally consider first unprotected or under-protected occurrences judged "best" by the EO ranking criteria of quality, condition, viability, and defensibility. Stewardship considerations constitute a third criterion. If a site appears unmanageable or if management would constitute an unreasonable financial strain, it should be excluded from further consideration. Finally, field offices are admonished to weigh financial considerations in terms of costs versus benefits. Reiterating the theme of practicality which underlies the Conservancy's approach, the Preserve Design Manual reminds the reader, "Our goal is the 'least cost' protection of the elements of natural diversity."

Having determined a site is worth protecting and efforts in this direction might be expected to succeed in a reasonable period of time, the next step is to design an optimum preserve. Preserve design involves four primary considerations: (1) Identification and mapping of the ecological boundaries necessary to protect the target element occurrence(s) over the long haul; (2) Evaluation of internal and
external threats which might effect these EOs, (3) Assessment of stewardship problems and needs, and (4) Investigation of current tract ownership. Conservancy doctrine emphasizes the importance of determining the "primary" (minimum) and "optimal" (desired) ecological boundaries necessary to protect the EOs without regard to tract ownership. Closely related is the requirement to review the biological information available on target species and communities: "Only if you understand its requirements can you set adequate boundaries to protect it and understand the stewardship problems involved" (TNC 1987)

The Selection and Design Manual addresses both theoretical and practical issues in the design and management of nature preserves. Rather than dwelling on the former, however, TNC guidance admonishes Field Offices and preserve designers to concentrate on "Questions Related to the Element, the Occurrence, the Site, and Site Stewardship . . . [which] are far more important to us in a practical sense." It is in addressing these questions that preserve selection and design shades into stewardship. For the answers to these questions not only indicate whether a potential site is practical and possible, but also flag potential management problems which could affect the success of a project. Element-related questions include: What is the pollinator of a target plant? How are seeds dispersed? What is the normal home range and/or territory of a target animal species? EO-related questions address such issues as population size, evidence of decreasing populations and possible factors for a decline, the presence
of biological threats and possible methods of control (and related costs), and whether all the habitat needs of an element are available on the site.

Site-related questions attempt to place the proposed preserve within its environmental context and ecological surroundings. For example, what is the hydrology of the site, and can surface and groundwater flow quality and quantity be assured? What are the outside threats to the hydrologic regime, and how serious might they be? What has been the role of herbivores in maintaining the vegetative structure? Will the preserve need to be fenced to prevent grazing/foraging, or should such activity be encouraged? Under Site Stewardship the designer addresses such issues as manipulations which might be required to maintain a desired community or to support a specific element occurrence and the associated ecological and financial costs. He or she also considers the presence of possible liabilities such as open cisterns and crumbling buildings, the use of chemical agents on surrounding land, attitudes of local landowners, and the impact of these attitudes on preserve management. The last major area in preserve design is determination of tract ownership. Almost always, both primary and optimal ecological boundaries will encompass properties owned by several, if not numerous, owners.

Having determined the optimum preserve configuration and ascertained legal ownership of the tracts involved, the Field Office evaluates which of several protection tools would provide the best level of protection at the most efficient cost with the greatest chance of
When reviewing these instruments, one must keep in mind several considerations. First, the different categories of protection (below) and the specific tools within each do provide proportionately greater protection for designated elements over the long term, but they do so at increasingly greater costs in effort, finances and manpower. Second, protection is a dynamic process, and the most appropriate level of protection may only be achieved by a series of steps. Third, the Conservancy’s primary goal is not necessarily to acquire land or to manage element occurrences themselves. The decision to do so depends on the priority of the elements involved, the availability of other capable land managers, and the costs of acquisition and stewardship. Finally, the landowner's attitude toward protection and the extent to which he or she is willing to relinquish ownership and management rights are fundamental.

Protection instruments may be grouped into four categories: voluntary non-binding agreements, legally binding agreements with less-than-fee interests, fee title, and public designation/dedication. (TNC 1988)

Voluntary Non-Binding Agreements: Simply notifying the landowner that he or she has one or more special species or communities on a property avoids the accidental destruction of an EO and is often sufficient to encourage the landowner to be more protective. Registration involves a voluntary agreement by the landowner or land manager to protect an EO in return for some sort of physical recognition (e.g., plaque, certificate) and inclusion in a formal list of Registered Sites maintained by TNC. In return the Conservancy
asks the landowner to notify them of potential changes in management practices or a decision to sell the property. Registration allows the Conservancy to develop a relationship with the landowner and thus "get its foot in the door" (Hall pers. comm.). It is not, however, legally binding. Moreover, because people sometimes forget they have made this agreement, registry sites should be monitored and the landowners reminded of their arrangement. Landowners can bequeath land or an interest in land to the Conservancy in their will. Bequests are non-binding because the donor can change them by changing the will. Moreover, they do not provide protection for existing EOs during the landowner's lifetime, although they obviously represent a psychological commitment to care for the land.

Legally-Binding Agreements with Less-Than-Fee Interests: This second level of protection enhances the degree of protection afforded elements by granting various types of legally enforceable rights to the Conservancy. By definition, however, less-than-fee interest means there is more than one owner of the property and other owners may have a greater legal interest than the Conservancy. A Right of First Refusal is a legally enforceable right to match the best offer on a property in the event it goes on the market. A landowner might give such a right to TNC, or the Conservancy might purchase such an option. The advantage of a right of first refusal is that it allows TNC to determine at a future time, when it may have a better sense of alternative opportunities, whether it wishes to commit the required resources. It does not protect the property prior to the time the right
goes into effect. It could be coupled, however, with another tool which would provide interim protection. A *Remainder Interest* occurs when the landowner irrevocably agrees to transfer land to the Conservancy at some future time, often in return for an immediate tax break based on the reduced commercial value of the property. Because remainder interests, like rights of first refusal, do not themselves restrict management practices, they are often linked with another tool such as an easement, lease, or management agreement which provides protection until TNC receives title.

The Conservancy may use *Retained Rights* and *Reverter Interests* on properties it gives or sells to another organization as a means to ensure the objectives for which the land was purchased continue to be pursued and to retain the legal ability to take back the property in the event this does not happen. Although restrictions can be incorporated into deeds, *Deed Restrictions* are not often used by conservation groups since courts are generally leery of enforcing what often appear to be burdensome restrictions. Another tool which conservation groups rarely use is that of *Undivided Interests*. In this situation several co-owners share in the management of a property according to the designated percentage of their interest. Such an arrangement can be troublesome if the several co-owners have different objectives (e.g., rare plant protection vs. heavy livestock grazing). In the event of irrevocable differences, the courts might be forced to divide the property, and there is no way to ensure the target EOs would end up under Conservancy control.
Leases, licenses and management agreements provide the right to manage for a limited, specifically designated length of time an element occurrence on someone else's property. The advantages of these instruments are the flexibility which can be written into them and the fact that they may be more acceptable to a landowner than a perpetual conservation easement (see below). Their disadvantages lie primarily in their temporary nature and the limits which might be imposed on the specific rights granted. The Conservancy tends to acquire leases when the owner cannot sell a property (as with railroad rights of way or state lands) or as supplemental protection tools tied to longer term instruments (such as bequests and remainder interests).

One of the Nature Conservancy's more widely used protection instruments is the Conservation Easement. In fact, TNC was a pioneer in the use of this tool. Generally, conservation easements are negative or prohibitory in nature in that they restrict what can be done on a property. They have the advantage of being extremely flexible since they can be tailored to particular situations and thus can allow the Conservancy to own (and pay for) only the rights a landowner could use to destroy or degrade the protected elements. Acquisition costs are either low or absent, and management costs and responsibilities may be lower than on acquired property. In return for giving up designated rights, the landowner may receive a significant tax break. He or she also has the assurance the land will remain as designated in perpetuity (Hoose 1981).
For an easement to be successful requires the full cooperation of the landowner. While serious problems in dealing with the individual(s) who initially signed the agreement arise only infrequently, future owners of the property may be less inclined toward conservation objectives and less diligent in adhering to the provisions of the easement. Moreover, even though TNC exercises less control over easement properties, the requirement to monitor an agreement may, depending on the property, the landowner, and the specific terms of the easement, necessitate more effort than would be involved in outright ownership. There is almost always an extensive "front end" commitment of time and resources since effective long-term monitoring requires a detailed knowledge of what is being protected, the condition of the property at the time of signing, and an exact delineation of what is required and prohibited on the part of the landowner. In terms of public relations, conservation easements may be confusing to both landowners and neighbors, they are hard to appraise, and they may be opposed by local officials who are concerned with their impact on local tax rolls (Roush 1982).

Fee Title. Fee title, or outright purchase of land, has been the protection tool most frequently used by the Conservancy. It provides the highest level of protection for most tracts. It also generally entails the greatest resource commitment. While ownership reduces several potential problems, it is not in itself a panacea. In the first place, the current landowner must be willing to sell his property at a price acceptable to the Conservancy. The property could still be
condemned for a public purpose. The Conservancy must plan and manage the preserve properly if the target EOs are to be protected. In addition, there may be outstanding timber, mineral, or water rights the exercise of which could threaten the preserve or EOs within it.

Mineral, timber, and water rights are especially important in the western states and do not come automatically with the land. Accordingly, the Conservancy stresses the need for Field Office staff to know state and federal laws regarding these rights and to determine, prior to signing any protection agreement, whether they come with the sale of specific property. Given the importance of water and hydrologic systems in several Montana preserves, it is especially interesting to note the warning that "without a good understanding of how water moves and changes on a particular tract of land, i.e., the hydrology of the area, it is frequently difficult to understand how to protect that tract."

Public Designation/Dedication. Formal designation or dedication of land or rights in land may provide an even higher level of protection than TNC acquisition since it is extremely difficult to condemn dedicated land and "undedicating" it is often politically very difficult. Such designation can be made by federal and state land management agencies. Similar to dedication of land is coverage under the federal Endangered Species Act or a state equivalent. Traditionally, one of the Conservancy's roles has been to assist federal, state and local government agencies to acquire land or interest in land by purchasing and holding parcels until these agencies can budget the necessary
funds. Even when state and federal agencies have designated element occurrences for some form of protection, the Conservancy often maintains an interest in the property by monitoring the agency's activities and providing management assistance, sometimes informally and sometimes through signed cooperative agreements.

In the broadest sense, protection is what The Nature Conservancy is all about, but it is protection within a system and with guidelines: "The objective is to allocate resources to achieve the appropriate level of protection for the greatest number of priority element occurrences" keeping in mind "the goal . . . [is] to guarantee the best return for the dollar." The keys to protection planning are "to understand the importance of every element occurrence and the resources available for land protection, and then to select the most cost-effective tools to accomplish the right levels of protection for the element occurrences" (TNC 1988).

**Stewardship**

The third function in the Nature Conservancy's repertoire for maintaining natural diversity is Stewardship: those management actions necessary to preserve in perpetuity the elements of biological and ecological diversity for which it has assumed responsibility. Broadly, the goals of stewardship are: "(1) to maintain conditions on our properties that will preserve occurrences of species and communities of concern and (2) to develop and sustain the capability to identify and selectively address, through cooperation with other
landowners, the critical management needs of occurrences of significant species and systems not on our properties" (TNC 1984).

In the mid-1980's the Conservancy underwent what its most recent Stewardship Manual (1984) referred to as "a significant shift in the management philosophy and objectives of the Stewardship program." The result was a greater concentration on stewardship and a commitment to allocate resources for the management of the properties it was acquiring. One aspect of this commitment was a shift from relying primarily on volunteers to manage preserves and monitor easements to a greater reliance on professional staff members. A second element was the imposition of more rigorous selection and prioritization criteria to ensure resources went first to protection and management of the highest ranking elements and element occurrences. "We have," the 1984 manual noted, "sharpened our focus to concentrate resources on identifying and meeting the management needs of important occurrences of significant elements of natural diversity under our protection." Six years later A Conservation Strategy for the 1990s: The Nature Conservancy's Strategic Plan (September 1990) listed as its fourth priority the need to "help establish effective stewardship operations on all sites (TNC and others) with important biodiversity."

In the field, stewardship really begins with the earliest assessment of future management needs brought up during the initial preserve selection and design process and continues through the life of a project. It includes those actions necessary to maintain element
occurrences, to keep up preserves, and to fulfill legal, financial, and moral obligations with regard to properties in which the Conservancy has an interest. During selection and design the individuals who conduct field surveys are tasked specifically to collect data which would bear on the management of specific EOs and/or the preserve as a whole. This data should include an assessment of the four criteria addressed earlier (quality, condition, viability, defensibility). It should specifically identify current and past land uses and their impact, existing or potential threats to EOs, manipulations which may be necessary to maintain critical elements, and an estimate of the costs of managing the proposed preserve.

Element- and EO-related data, site management analyses and cost estimates are incorporated into a Site Stewardship Summary (SSS). Summaries are to be prepared for all new and current preserves, easements, transfers, and leases and should be updated as part of the monitoring process. Site Stewardship Summaries are to be "the guiding document" for preserve management since they provide the initial basis for identifying immediate threats and the actions required to meet these threats, provide guidance for initial work plans, and allocate funds for gathering additional information upon which to base subsequent management decisions. Preserve Site Stewardship Summaries should be updated annually.

Fundamental to the planning and management of preserves and their constituent EOs is the collection of data pertinent to specific elements and their incorporation into management plans. This data
includes information on habitat requirements, reproduction, movement, ecological interactions, management needs, and activities important to protect or to control. Ultimately, this information should be contained in an Element Stewardship Abstract (ESA) prepared for each critical element in the Conservancy's database. Serving as the repository for essential information relevant to the existence and management of critical elements, the ESA is "a dynamic document that should be selectively updated as our knowledge of a species or ecosystem increases" (TNC 1984). In terms of providing the basis for management decisions, the ESA is to the element as the Site Stewardship Summary is to the preserve.

Because management requirements and capabilities are intimately tied to local ecological conditions and organizational capacities, both of which may differ dramatically among and within regions of the country, national guidance in the area of stewardship tends to be fairly general. It focuses on planning processes and considerations rather than implementation, preferring to allow preserve managers and state land stewards leeway to address their specific requirements and problems within a general framework. Preserve management plans, however, are to address certain key subjects (TNC 1984).

The plan should address element management issues by identifying and locating the important species and communities protected, with higher ranking EOs addressed first and in greatest detail. Actual and potential threats to EOs should be identified along
with the actions proposed to avoid or to counter such threats. Actions may be specific tasks, monitoring programs, or research proposals for gathering information upon which to more clearly define tasks.

Each preserve management plan should identify the overall objectives of the preserve, the actions necessary to achieve these objectives, and the information required for effective stewardship decisions. It should include a consideration of the costs associated with managing the EOs and the overall preserves, additional design and land protection needs, potential legal liabilities, and boundary maintenance requirements (e.g., fencing). An important requirement is to define the monitoring efforts necessary both to provide element/EO data and to evaluate the effectiveness of the preserve's management.

National headquarters does provide guidance regarding certain management considerations. Habitat manipulation may be necessary to maintain or reestablish certain vegetative types for the benefit of specific critical elements or habitat; it can include clearing, mowing, harvesting, grazing, burning, and hydrologic manipulation. Prescribed burning may be necessary to maintain a "natural fire regime." However, preserve managers will use prescribed fire only "when and where it contributes to the perpetuation of species and communities targeted for preservation." Authority for controlled burns lies with the Regional Land Steward. Fire control should be a part of the management plan if a substantial risk of wildfire exists. Reintroduction of extirpated species is permitted so long as it does
not involve habitat modification or extension and does not adversely affect other priority EOs, overall preserve objectives, or the viability of the preserve. The Regional Land Steward must approve the "control" or removal of feral or exotic species. Use of pesticides is prohibited, and, depending on local law, herbicides will only be used "if no alternative exists." In each case above, the preserve management plan must include objectives, proposed courses of action, and potential impacts.

Each preserve plan should address public access to the preserve and the activities which are permitted or prohibited. In general, TNC policy is to allow the maximum public access compatible with the primary goal of maintaining the long-term quality, condition, viability and defensibility of element occurrences. There appears to be a growing emphasis on such access, especially in the form of environmental education programs, which the Conservancy sees as "tools to protect the resource." TNC also "encourage[s] the use of its preserves for non-destructive scientific research and study" and allows limited collecting of specimens for scientific purposes. The general policy of access and use does contain a number of prohibitions, some of which may be waived with the permission of the Preserve Manager, State Land Steward, or Regional Land Steward. Prohibited activities include: prospecting, camping, building of fires, collecting (except for valid scientific research), introduction of exotic species, alteration of natural growth or natural features for purposes of enhancing beauty, neatness, or amenities, artificial feeding of wildlife, and introduction of
pets (except seeing eye dogs). Activities for which permission may be granted depending on the preserve include: bicycling, horseback riding, rock climbing, spelunking, fishing, hunting, and trapping.

Fundamental to the effectiveness of management of any resource is the capability to assess the results of plans and actions. The Conservancy's Stewardship Manual tasks Field Offices with responsibility for developing and implementing monitoring programs to assess the quality, condition, viability and defensibility of EOs on preserves, easements, and transferred properties ("biological monitoring") and to ensure that legal property rights acquired through purchase, donation or agreement are not violated ("legal monitoring"). It also dictates that each project proposal identify a specific individual who will assume these responsibilities. The manual addresses the requirements and methods for legal monitoring in great detail, but notes the section on biological monitoring is "in progress."

Since 1984 the Conservancy has exhibited a renewed emphasis on biological (now expanded to "ecological") monitoring and is preparing an ecological monitoring manual. As a first step in this process, the Western Regional Ecologist circulated a paper which distinguishes two roles for ecological monitoring: (1) to increase the level of knowledge of elements and thereby provide better management, and (2) to help evaluate the effectiveness of stewardship activities. Stewardship remains responsible for compliance or legal monitoring to ensure rights and responsibilities assumed or granted by the Conservancy are being met (Young 1988). Although this paper
was prepared in 1988, a comprehensive manual is still undergoing the drafting and review process (Humke pers. comm.).

**The Nature Conservancy's Expanded Focus**

While the above components of the Conservancy's approach to maintaining natural diversity remain in place, in the past two years TNC has expanded its scope and is placing special emphasis on "a significant new program of biodiversity conservation: the protection of whole ecosystems." Behind this new orientation is the recognition that conservation "cannot succeed solely with the creation of small, isolated preserves. It must ensure the survival of whole, functioning, natural systems" (TNC 1990). Preservation of "bioreserves," in TNC terminology, is the best way to preserve individual components because it offers the best hope of maintaining biotic and abiotic functions upon which these components as well as the system as a whole depend. These bioreserves (of which TNC intends to identify 75 in the U.S. and Latin America) will encompass a variety of managerial and land use practices, over which a mix of public agencies, private landowners, and conservation groups will act as managing partners.

Precisely what effect this new focus will have on more traditional protection and stewardship methods remains unclear. The 1990 TNC Strategic Plan declared, "We will . . . continue to protect sites outside the system targeted by this new work." The President of The Nature Conservancy, John C. Sawhill, has written, "We will continue to draw
on familiar conservation techniques . . . and we will invent new ones" (Sawhill 1990). At the same time, however, national headquarters has tasked field offices to evaluate each of their holdings to assess which could be managed by an organization other than The Nature Conservancy (Humke pers. comm.). Moreover, to accomplish the protection of 75 designated ecosystem preserves and also "continue to pursue the protection of as many priority sites outside the 75 sites as possible," TNC will rechannel money from sites "with less biological significance that can be protected by others." In line with this tightening of focus is the instruction to Field Offices to outline strategies "for the protection of G1 and G2 elements . . . and . . . rare elements on public lands" (TNC, 1990). According to the national Vice-President for Government Relations (formerly VP for Stewardship), this reassessment will not significantly affect current preserves in Montana (John Humke pers. comm.).
Chapter 2

THE MONTANA FIELD OFFICE:
CONSERVANCY OPERATIONS IN MONTANA

As with any program which mixes centralized direction and decentralized operations and which combines guidance with opportunism, the operations of the Nature Conservancy in Montana have not always proceeded in strict accordance with national policy. The digressions which have occurred, however, have been relatively minor within the context of the Conservancy's overall mission and methodologies and have been largely matters of nuance and timing. They have also reflected the constraints imposed by financial considerations, the lack of scientific knowledge and the flexible opportunism which has characterized TNC in this state. The three most obvious of these "differences" are: (1) protection efforts, including acquisition, began before the Heritage-driven identification program was in place; (2) much of the Big Sky Field Office's attention in its early phase focused on cooperative activities with government agencies rather than on the establishment of preserves for protection of critical elements; (3) from its inception the Montana Office has emphasized communities and large blocks of land, and ecosystems.
Early Operations

Prior to 1978, TNC activities in Montana had been minor in scale and conducted out of a "mini-regional" office located in Portland, Oregon. That year Bob Kiesling was given $10,000 and an administrative assistant and told to "go do good things" in Montana and Wyoming. (Big Sky Field Office was responsible for both states until the establishment of the Wyoming Field Office in 1989; the title was changed to Montana Field Office--MTFO--the next year.) There was little guidance available in the form of TNC publications in this period. Although a stewardship manual had been published in 1978, there is no evidence the office in Helena received it or that it provided the basis for Montana Field Office decisions. Some guidance did exist, however. There was, recalled Kiesling, "a very clear marching order from the national office that one set about getting a Heritage program put in place in your state because otherwise the business of selecting preserves was hit or miss" (Kiesling pers. comm.).

Unfortunately, establishing such a program in Montana proved a difficult task. No state agency was terribly interested in the program, especially if it entailed asking the administration or the legislature for additional funding. The Department of State Lands, thought by many to be the most logical agency, felt the Heritage approach was too limited since it only included flora and fauna. One senses also a certain level of hostility on the part of state officials who resented "outsiders" telling them what to do and how to do it. Coupled with this was, apparently, a certain amount of arrogance on the part of
Conservancy representatives operating in the state in the 1970's (Kiesling pers. comm.; Shelley pers. comm.).

Faced with these obstacles, Kiesling sought nevertheless to get a handle on the identification process while continuing to seek state support for a Heritage program. In 1979 he contracted for a "pre-Heritage" survey of Montana's natural heritage. The resulting study provided an overview of the organizations involved in protection efforts within the state and offered an initial list (based on secondary sources) of the critical elements then known to exist in Montana. It also spelled out what was to remain a central theme of the Big Sky Field Office: "An aspect of Montana's unique natural heritage is the diversity of its ecosystems and transitional areas (ecotones) between ecosystems" (McAllister 1980). Although this study did not formally identify potential preserve sites, the process of compiling it brought BSFO into closer contact with individuals and agencies concerned with and knowledgeable about different aspects of the state's natural heritage. (The author of this report became a part-time and eventually the first full-time scientific staff member of the Helena office.)

In the absence of a formal identification program, the Big Sky Field Office began its protection program by continuing an emphasis, initiated by the Portland office, of working closely with state and federal agencies whose interests lay in wildlife management areas or in the nascent Montana Natural Areas program. During these early years, TNC filled several roles. It took conservation easements in support of agency objectives or for general "protection" purposes. It
purchased and held land until an agency could secure funding for transfer. In two instances (Crown Butte and Pine Butte Swamp) it acquired and retained properties which a government agency had been unable to acquire but which offered unique protection opportunities. By the end of 1980, TNC had acquired and subsequently transferred to state and federal agencies some 122,000 acres (McAllister 1980).

A particularly interesting and, as it turned out, farsighted project was participation in the Blackfoot River Management Plan. The impetus for this project began in the 1970's when an increase in recreational use of this scenic river combined with evidence of possible development to prod private landowners and public land managers to look for a means of retaining the natural quality of the river corridor while also allowing recreational use. Eventually, a cooperative agreement was signed among several county, state and federal agencies with the participation of private individuals and The Nature Conservancy. The primary function of the Conservancy was (and remains) the taking and monitoring of conservation easements. To date there are fifteen separate tracts along the river on which TNC holds an easement and for which it retains stewardship responsibilities. In addition, the Conservancy purchased some land which it then transferred, and it acquired by fee-title a single six-acre tract.

Conservancy involvement in the Blackfoot River corridor is interesting for several reasons. In the first place, it was an early
example of supporting the idea that what Montana has to offer in terms of maintaining biodiversity is its relatively pristine landscapes and ecosystems. It illustrates as well the strenuous and largely successful efforts by BSFO to establish itself with agencies and with the public at large as a "can do," cooperative organization. Third, one gets the impression regional and national headquarters were never keen on TNC's involvement in this project since it didn't fit the element-management approach. Within this context, a fourth and ironic aspect of BSFO involvement was that it proved to be an idea ahead of its time. As noted above, TNC has recently broadened its focus to ecosystems and is particularly emphasizing the necessity to protect riparian systems so essential to natural diversity in the west (Kiesling pers. comm.; Hirschenberger 1990).

By the middle of the 1980's, although still very limited in size and funding, the Big Sky Office began to reorient its focus from a concentration on cooperative transfers to meet the goals of others and toward its own agenda of maintaining natural diversity. Thus was born the Centennial Project, intended to tie the Conservancy's efforts into the upcoming Montana statehood centennial. The document which launched this project iterates in its clearest form the thrust of the Conservancy's approach in Montana: "Between 1985 and Montana's 100th birthday in 1989, the Conservancy will establish a reliable, ongoing system to protect Montana's rare and endangered natural elements in perpetuity. Concurrently, we will target several highly critical, unprotected natural areas and create permanent protection
for them as 'Montana Centennial Preserves,' sheltering the finest remaining examples of our state's most jeopardized plants, animals, biotic communities, and ecosystems" (BSFO 1985).

The Centennial project reflected the "coming of age" of the Big Sky Field Office, a transition marked by several developments. One of these was the increase in staff which began in this period. A Montana Natural Heritage Program was established in 1985 and placed within the Natural Resource Information System in the Montana State Library in Helena. The initiation of formal planning at the state level (first the Centennial Project and then a Strategic Plan prepared in 1986) reflected this maturing as well. The fourth development in the mid-1980's was publication by TNC national headquarters of more detailed and comprehensive guidance in the form of "functional" manuals: Natural Heritage Program Operations (1982), Stewardship (1984), Field Office Operations (1984), Preserve Selection and Design (1987), and Protection (1988).

**Identification**

Despite establishment of the Montana Natural Heritage Program, the Identification function and the relationship between Heritage and the Field Office in Montana does not fit exactly the mold suggested by national guidance. According to the latter--at least in its ideal form--the Heritage staff provides element identification and location information, from which follow decisions on what to protect and how to do it. In other words, protection and stewardship flow naturally
from Heritage identification. This has not exactly been the case in Montana. As noted above, protection projects had already been undertaken or were in motion before the Heritage program was established. Moreover, the Heritage staff has tended to focus primarily on public land (both state and federal). This is in large part a reflection of funding sources, since most of money for the program now comes from agency contracts (Genter pers. comm.; Shelley pers. comm.). The Heritage-Field Office relationship is unusual in that Heritage staff members work for two masters. They are Conservancy employees, but because of funding sources and organizational structure, they are not driven primarily by Field Office desires.

This is not to say the Heritage Program is not fulfilling TNC objectives. Obviously, much of Montana's natural heritage is located on public land. It is important, therefore, to know what elements exist on this land and to bring them to the agencies' attention. One of TNC's stated objectives for both protection and stewardship is to work with private landowners and public land managers to protect and manage element occurrences on non-TNC properties. In this sense the work of the Heritage Program is especially important because, until recently, protection of rare species and communities was not high on any agency's agenda. Heritage staff are also engaged in the development of community classification types which will not only inform BSFO decisions, but should have broader applicability as well (DeValice pers. comm.; Bird pers. comm.).
Heritage does prepare the annual Scorecard reports and conducts the annual meeting which assists the Field Office in forming its protection efforts. In addition to this scorecard report, it annually prepares and sends to appropriate state and federal agencies a list of critical species present on their lands. In addition to its responsibilities to the Field Office and fulfilling its contracts to state and federal agencies, the Heritage staff also maintains the extensive database files required by TNC and provides information on critical EOs and related data to both public and private organizations that request it (Beer pers. comm.).

While Heritage focuses on public land, identification on private lands throughout the state has come from a variety of sources. One of the most important of these sources has been botanist Peter Lesica, who has been studying, locating and mapping the vegetation of Montana for years and who started contracting with the Conservancy in 1982. Many of the early conservation easement properties, especially those along the Blackfoot River, were evaluated initially by another private contactor, Bugbee and Associates. Crown Butte, Pine Butte Swamp and, initially, Safe Harbor Marsh were brought to TNC's attention by agencies which sought to acquire the sites themselves but were unable to do so due to shifts in priorities and focus. The actual availability of Safe Harbor Marsh was brought to the Conservancy's attention by an ardent birder and zoologist who had been actively involved in census studies in that area for a long time.
Protection

The Protection Planner (along with the recently created position of Director of Lands Conservation) for the Montana Field Office is responsible for prioritizing protection efforts on private land, determining which methods are most appropriate, and then guiding the actions necessary for implementation. In addition, this position is the primary organizational link with state and federal public land management agencies. Because of the amount of public land within Montana, this latter responsibility has been a primary focus. TNC relations with government agencies in Montana have centered around two areas: (1) cooperative programs involving both specific protection methods and, more broadly, efforts to encourage agencies to become more actively involved in protection programs on their lands, and (2) support for an active Montana Natural Areas program.

The Nature Conservancy traditionally has engaged in cooperative programs in which it acquired land and then resold it to an appropriate state or federal agency (or on rare occasions to another private organization). As of June 1990, it had completed 19 such projects in Montana, which placed some 147,000 acres into a protected status. (See Appendix 6 for list of Cooperative Projects.) TNC also has active leases with the Montana Department of State Lands to manage school trust lands located within the preserve boundaries at Pine Butte Swamp and in an area in eastern Montana for which a preserve design has been prepared and a conservation easement already taken. (Bird pers. comm.) BSFO is currently
negotiating with the Bureau of Land Management on their first cooperative management effort involving the Meeteetse Spires Preserve and an adjacent piece of land BLM has nominated to be an Area of Critical Environmental Concern (Hall pers. comm.).

In addition to these specific projects, the Protection Planner is tasked specifically with investigating methods by which to integrate maintenance of biological diversity into the goals and operations of appropriate state and federal agencies. In keeping with the increased focus on biodiversity among conservation groups and consequently within the public agencies, each of the relevant land managing organizations now has a "mandate" of some type for this work. While levels of interest and commitment differ among them, the Conservancy is currently involved in two arrangements intended to strengthen both commitment and consequences. A Heritage staff member is assigned full-time to the Forest Service's Region 1 office to help with that agency's rare plant program and to tighten the link between the Forest Service and State Natural Heritage Programs (Shelley pers. comm.). Similarly, MTFO and the BLM are cooperating on development of a river systems protection program in Montana. Spearheading this program is a BLM employee co-funded by the BLM and the Conservancy and working out of the Montana Field Office (Hall pers. comm.).

The second thrust of TNC's efforts to enhance protection of natural diversity on public lands has been to encourage a Montana Natural Areas Program. The Montana legislature passed a Natural
Areas Act in 1974, but for years no funding was allocated nor an agency tasked with primary responsibility. In the mid-1980's BSFO took on responsibility for keeping this program before the public and for encouraging its implementation. It sponsored a three day conference in 1986 to bring together interested public and private parties and thereafter hosted an annual informal gathering. In 1990 twelve agencies and organizations signed a Memorandum of Understanding (MOU) creating an Interagency Natural Areas Committee. Among the eight objectives of this new organization: "To protect representative samples of Montana's flora, fauna, and landforms, for purposes of education, research, and maintenance of biological and geological diversity" (Wood 1991).

An unusual aspect of TNC operations in Montana compared to many states involves protection efforts on tribal lands. One of the Protection objectives listed in both the 1986 and 1988 Strategic Plans is to "secure and implement a range of tools and techniques sufficient to protect all ranked elements on tribal lands" (BSFO 1988). This has been, however, an area in which only limited progress has been made. Distrust and lack of cooperative experience with outside organizations on the part of the tribes partly account for this. So, too, do the factors of limited personnel within MTFO and the distance between the major reservations and the Field Office in Helena. Moreover, it has proven difficult to determine appropriate strategies since each of the reservations has its own unique situations, problems, ecological issues, and past experiences (Bird, pers. comm.).
MTFO's thrust has been to establish an effective program on the Flathead Reservation to demonstrate the ability to cooperate and the advantages such interaction offers to the tribes. Since 1989 MTFO and the Confederated Salish and Kootenai Tribes have been cooperating on an intern program in which TNC provides funding for a tribal member to pursue natural resource conservation on the reservation. MTFO and the Confederated Tribes are currently negotiating a cooperative management agreement at Safe Harbor Marsh, located within the Flathead Reservation. The Conservancy has also conducted biological evaluations on the Blackfoot Reservation, at the Tribe's request, and prepared a preserve design for one area. It is seeking Fish and Wildlife Service funding in this project for conservation easements to protect an unusual prairie grassland/aspen community (Bird pers. comm.).

The Protection Planner directs preserve designs, negotiations and other activities to protect EOs on non-public property in addition to reservations. Besides acquisition and establishment of preserves (addressed under Stewardship, below), the predominant protection tools have been conservation easements and registration. (There is currently one management agreement in effect at Meeteetse Spires.) Because acquisition is an expensive and time-consuming proposition, the Montana Field Office restricts purchase to those tracts which contain the most critical EOs and for which TNC is the best organization to manage the property (Hall, pers. comm.). In most cases, conservation easements are considered as effective as fee title,
particularly at sites where TNC already owns property (Bird pers. comm.).

Cost is sometimes a factor in protection decisions. For example, efforts to acquire property at Trudeau Warm Springs have been unsuccessful because the Conservancy is unwilling to meet the price the landowner has set. The owner also wants TNC to purchase more acres than the latter believes necessary. There are sites on which the Conservancy would like to have taken conservation easements, but has settled for registration because of an inability to reach agreement with the landowner (Bird pers. comm.).

The Conservancy holds conservation easements on 22 projects in Montana, one of which, the Blackfoot River Corridor, includes 15 separate tracts and another of which contains 3. (See Appendix 4 for list of easements, including acreage and elements protected.) The reasons behind these easements have varied; they have not always been targeted for the protection of Heritage-classified elements. TNC involvement in the Blackfoot River Corridor, for example, was intended to protect an entire river system on the one hand and to establish the Conservancy as an effective partner in the protection of natural diversity in Montana on the other (Kiesling pers. comm.). These easements do provide for riparian and wetland protection in general as well as habitat for bald eagles (Haliaeetus leucocephalus) and grizzly bears (Ursus arctos horribilis) and Howell's gumweed (Grindelia howelli).
Other easements have been the result of fortuitous instances in which a landowner sought to enhance long-term protection of a property which was strategically located to complement a state or federal wildlife protection effort or itself encompassed a more or less self-contained ecosystem. Several of the easements which list "Elk Winter Range" or "Grizzly Bear" under "Element Protected" fall into the former category. The large easements at Spanish Peaks and Sixteenmile Creek, donated by Ted Turner, represent the latter opportunity.

Conservation easements may also be the first step toward the eventual creation of a preserve. Such is the case with the signing of a 160 acre easement at Egan Slough, a wetland area just north of Flathead Lake. This agreement was signed in 1986; subsequently, BSFO has prepared a preserve design package projected to encompass 700 acres. Easements are currently held at sites for which preserve designs have been completed in Sheridan County (proposed Comertown Prairie Pothole Preserve) and Flathead County (proposed Whitefish Spruce Swamp). Several of these easements cover species or communities not found on TNC-owned property. These include pothole prairie grassland communities, Piping Plovers and Whooping Cranes at Lone Tree Lake, Le Conte's sparrow, Spurred Gentian and kidney-leaved Violet on the Whitefish Spruce Swamp tracts, and Columbia watermeal and water bullrush at Egan Slough.

The Big Sky Field Office has also registered 30 privately-owned tracts at 22 sites. (See Appendix 5 for list of Registry Sites.) Registry
sites are most often used to provide some protection to locally important species or plant communities. While this instrument does not provide so firm a level of protection as acquisition or easement, it does indicate awareness on the part of the landowner and provides a means whereby the Conservancy can keep tabs on elements. As with conservation easements, registry sites sometimes harbor elements which are not located on any of the more forcefully protected tracts.

Because "we have always known that our opportunities were with big chunks," (Bird pers. comm.) the Montana Field Office is well-positioned to respond to national headquarters' growing emphasis on mega-preserves and bioreserves. For example, the Field Office has been working since 1983 to establish a large prairie grassland preserve in eastern Montana which might ultimately include 15-20,000 acres in a mix of private and public ownership.

The emphasis on larger systems is also reflected in MTFO's Watershed Protection initiative. The goal of this program "is to identify and protect species, habitats and communities which are closely tied to riverine environments and which are threatened by extinction" (Hirschenberger 1990). In addition to acquisition of key properties, MTFO will encourage and assist landowners to implement activities which would complement a preserve project. It will also inform the general public, organizations and special interests on issues involving water law, aquatic systems and riparian area management. The Montana Field Office is heavily involved in the Conservancy's efforts in the Greater Yellowstone Biosphere Reserve. The long term
impact of this involvement on other aspects of TNC operations within
Montana is unclear.

**Stewardship**

According to the BSFO 1986 Strategic Plan, its Stewardship
program has three objectives: (1) Compilation of information on
critical elements and preparation of Element Stewardship Abstracts to
provide a suitable basis for EO and preserve management; (2)
Development and implementation of management and/or monitoring
plans for properties over which TNC has a stewardship responsibility;
and (3) Development and implementation of stewardship programs to
encourage and provide assistance to public agencies, Indian tribes and
private landowners for protection of critical elements on non-TNC
lands.

TNC management decisions are to be based in large part on the
biology of critical elements. Until the past year, however, only one of
the critical elements identified in Montana or even specifically located
on a preserve had an Element Stewardship Abstract. Although the
office in Helena does contain a "Species File" on each ranked species
of animal and plant, and some which are not ranked (such as noxious
weeds), in many cases these contained little more than a one-page
data sheet published by the U.S. Fish and Wildlife Service. In the past
four years, however, the Director of Stewardship has made a
concerted effort to remedy this deficiency.
One of the most obvious aspects of the management plans prepared for the Conservancy's Montana preserves has been the recent emphasis placed on the design and execution of studies to enhance the biological knowledge of these critical elements. In 1989 the Director of Stewardship noted that of the 32 species of plants and animals ranked G1, G2, S1, or S2 on BSFO preserves, easements and registry sites, only 4 species were being systematically monitored on a regular basis. That year he requested and received a grant to develop short- and long-term monitoring studies on selected EOs and to prepare ESAs on the most critical elements. (Hall 1989) The criteria for element selection were rarity, perceived threat, groupings of EOs, present monitoring activity, ESA status (whether or not an ESA existed and the comprehensiveness of such a document), and the status of appropriate stewardship planning (with emphasis on those EOs for which a management plan already existed or would be drafted in the near future) (Hall 1990a). Eventually 17 of the critical plant species ranked S2 and above were targeted. This project, conducted between June and October 1990, centered on the preserves at Pine Butte Swamp, Dancing Prairie, and Swan River Oxbow as well as two conservation easements at Whitefish Spruce Swamp.

By November 1990, ESAs had been drafted on 15 plant species, although as of April 1991 they were still awaiting review by the Director of Stewardship prior to being forwarded to the Western Regional Office and then to national headquarters for inclusion in the BCD database (Hall 1990b). In addition to the draft ESAs, on-going
monitoring programs to enhance biological understanding of several of the most critical species are in place for three species at Whitefish Spruce Swamp, five species or plant communities at Pine Butte Swamp, and three species at Swan River Oxbow. In addition to the programs funded specifically by this 1990 grant, the Land Steward has incorporated monitoring programs into each of the Preserve Stewardship/Management Plans drafted since 1987. These programs are designed to enhance the depth of knowledge of species or communities or to evaluate the effectiveness of stewardship prescriptions.

This emphasis on monitoring is the result, primarily, of the personal interest of the Montana Director of Stewardship. It also reflects a significantly enhanced interest on the part of the Conservancy in knowing "what's out there" and evaluating the effectiveness of stewardship efforts. One source of this interest was a consensus reached at the Western Regional Stewardship Conference in 1988 that the Conservancy needed to get a better handle on those species, communities and ecosystems for which it had assumed responsibility. To do so required a recognition that monitoring was "the most important thing" to focus on and a serious financial commitment by TNC. In the past three years, grant money allocated by TNC national and regional sources has been earmarked primarily for this purpose (Hall pers. comm.).

The Director of Stewardship has gone beyond element monitoring and initiated two programs with larger foci. The first is a
"hierarchial monitoring strategy" scheduled from May 1991 to December 1992 which will address preserve components at three levels: species, community and ecosystem. The results of this study "will be integrated with knowledge of abiotic fluctuations (e.g. hydrologic monitoring) in order to help direct stewardship decisions" (Hall 1990c). The second project is a baseline monitoring program for riparian communities and streambank conditions using infrared and true color aerial photography. This study, to run from June 1991 to January 1993, will address both preserves and conservation easements. It will delineate canopy and ground cover, bare soil, acreages, streambank conditions, and community boundaries. The importance of this approach is suggested by the fact that riparian communities are present on 33 preserves and easement tracts (Hall 1990d). Knowledge and techniques gained from this project will be valuable also during selection, implementation and monitoring of sites in the Watershed Protection initiative.

The increased emphasis on monitoring has been mirrored in an expanded approach by MTFO to the execution of stewardship responsibilities in other areas as well. With only a few exceptions, the "paper trail" for all of the preserves established since 1987 has followed the basic outline provided by national guidance: initial field surveys -- site stewardship summary -- preserve design package -- management plan. Until recently, Conservancy acquisitions were more reactive than self-generated; that is, the Field Office was responding to opportunities as they arose rather than being in a
position to have its own objectives and identified goals drive the process. In contrast, building on the groundwork which was being laid in this earlier period, MTFO has now developed at least an informal list of top priority sites. There are, in fact, currently twelve completed preserve design packages on file. In keeping with the goal of expanding coverage throughout the state, these are located in seven counties (including six away from the Rocky Mountains).

Since 1987, all aspects of stewardship as it pertains to MTFO preserves have been expanded considerably. (Preserve management will be addressed in detail in the following chapters). Such an expanded effort, however, has not been evidenced with regard to conservation easements and registry sites. Administratively, the most glaring deficiency falls in the realm of records preparation and management. Since neither the Protection Planner nor the Director of Stewardship has specific administrative support, this is not surprising. Nor is it critical. More serious is the lack of management attention paid to conservation easements and registry sites.

Of the 22 easements, since 1987 only 8 have received detailed monitoring with completed forms to indicate current conditions, trends since last inspection, and management needs. Of these sites, four have come under Conservancy stewardship in the past three years. The files of four others indicate they were looked at in 1988, but this evidence consists only of ground photographs and/or handwritten notes; there are no site stewardship summaries or formal monitoring inspection reports. Competing priorities (read lack of staff
time) have also precluded the execution of annual or bi-annual legal and ecological monitoring called for in the most current site stewardship summaries (Hall pers. comm.; Bird pers. comm.). It should be noted that some of the easements are monitored at least informally in conjunction with other stewardship or protection activities. Moreover, there is evidence of a prioritization at work here. In particular, those easements which receive the least attention are generally those which were taken for reasons other than the protection of critical species or communities. Those which harbor higher priority elements or, as in the case of the Blackfoot River project, which are subject to the greatest potential abuse receive greater attention. For the most part, registry sites have been left to their own devices, with the hope that landowners will contact the Conservancy as might be necessary.

The third objective of stewardship in Montana is "development and implementation of stewardship programs to encourage and provide assistance to public agencies, Indian tribes and private landowners for protection of critical elements on non-TNC lands." By and large, this task has received only limited attention. Those responsible for stewardship (primarily the Director of Stewardship and the Protection Planner) interact routinely with a variety of state and federal agencies, tribal departments, private organizations, and landowners. These include the Montana Department of State Lands, the Department of Fish, Wildlife and Parks, the Department of Natural Resources, the U.S. Forest Service, the U.S. Fish and Wildlife Service,
the Bureau of Land Management, the Confederated Salish and Kootenai Tribes (and more limited with other tribes), county commissioners, Ducks Unlimited, and the Rocky Mountain Elk Foundation. For the most part, relations with these groups have been effective and productive. With few exceptions, though, these interactions have involved stewardship on TNC properties rather than "the critical management needs of occurrences of significant species and systems not on our properties" (TNC 1984).
Chapter 3

TNC PRESERVES IN MONTANA

The Conservancy currently has stewardship responsibilities at eight preserves in Montana. (See Appendix 3 for list of preserves and Appendix 2 for a map of their locations.) The largest, Pine Butte Swamp, encompasses more than 18,000 acres (13,000 of which TNC holds in fee title). Pine Butte is the only preserve with a resident manager; the others fall under the direct responsibility of the MTFO Director of Stewardship (redesignated Director of Lands Conservation in 1991). The smallest preserve, on the Blackfoot River, is only six acres. Of these eight, the Blackfoot River property and Lindbergh Lake Pines are essentially being handled as conservation easements. The first was acquired during the push to complete the Blackfoot River Corridor project and is tentatively being considered for sale to a conservation-minded buyer. The latter was purchased on behalf of the Conservancy as a way to prevent an impending logging operation in the Swan Valley; it contains no critical elements or unusual communities (Hall pers. comm.). The remainder of this paper will focus on the six major preserves.

Although the descriptions which follow address the preserves in detail, they do not clearly suggest several themes which are apparent when one surveys the processes by which the preserves were selected.
and designed. In the first place, with the exception of Pine Butte, the documents which preceded the existing management plan clearly identified the critical elements and their ecological significance, the threats which might confront EOs or the preserve at large, and factors which might affect stewardship of the proposed preserve. In addition, they provided at least an initial assessment of management actions required to accomplish the preserve's objectives and highlighted what additional information was needed for proper long-term management decisions.

Second, the dynamic nature of the database system and its effect on management planning become obvious if one tracks the various documents which have led to the establishment of each preserve. Reading through all the documents on any preserve one notices shifts both in rankings and in emphasis given to aspects of the site. It is not unusual for the G/S ratings to change in the course of selection, design, and management planning. These shifts, almost always from a more threatened to a less threatened rating, result from the discovery of additional EOs either within the state or globally. Related to this phenomenon is the tentativeness with which certain ratings are given; this is especially the case with plant communities and reflects the absence of a universally accepted community type classification system.

At the same time, one also notices shifts in the relative emphasis placed on elements or communities within a proposed preserve. In part, this reflects changes in relative importance based on an
increasing level of information about all the parts of the preserve. At
times, however, it also seems to reflect the need to "justify"
acquisition on the basis of the Conservancy's traditional element
orientation when what, in fact, makes a site special is not so much the
presence of specific EOs as the entire "system." For example, while
the element justification for Dancing Prairie was the presence of the
G2/S1 Silene spaldingii (Spalding's catchfly), virtually all of the
paperwork describing this site and extolling its "Ecological
Significance" begins by stressing the unusual (but unranked because no
classification system yet exists) native prairie grasslands. Whether this
tendency will persist as the Conservancy continues to broaden its
focus and as a firmer community type classification is developed is a
moot point.

Finally, in contrast to the uniform completeness and
thoroughness of preserve designs, preserve stewardship plans
themselves are more variable and range from comprehensive to
incomplete to non-existent. There are several reasons for this
phenomenon. First, the preserve designs have been prepared by an
individual under contract and with the luxury of focusing on a single
project rather than being diverted by administrative responsibilities.
Second, at least one of the management plans remains in draft form
pending negotiations on a cooperative agreement for the preserve.
Third, fully mature management plans will only be possible following
the analysis of data which must come from studies and monitoring
programs written into these initial plans. In spite of the preplanning
and the theory of basing decisions on ESAs and other databases, in many instances initial management plans are drawn up on relatively limited information. Rather than constituting a flaw in the program, this situation underscores both the willingness to act in a timely fashion based on limited data and the usefulness of the Conservancy's classification and database management systems. The existence of an element file which indicates only that there are very few known occurrences of an element may provide the impetus for acquisition of one of those EOs. As information acquired over time is incorporated in the database, it can provide the direction needed for more complete and effective management prescriptions.

Although there are similarities among the preserves, each is in many ways unique. The descriptions which follow are intended to provide a verbal picture of each preserve, its key management requirements, and the steps MTFO is taking or has identified to meet these needs and thus fulfill its stewardship responsibilities. Information comes from the several selection, design and management documents prepared for the individual preserves. Unless noted otherwise, the requirements in the paragraphs labeled "Needs" are those identified by MTFO. The remarks in parentheses indicate what action, if any, the Conservancy has taken or is planning in response to identified needs.
**Crown Butte Preserve**

*Site Description.* Sitting atop a 900 ft laccolith rising above the foothills prairie just south of Simms, the 350 acres of Crown Butte Preserve provide an outstanding example of undisturbed native prairie grasslands and provide rich habitat for a wide variety of wildlife, especially raptors. Although it was not acquired until 1981, TNC's involvement with this property began in the mid-1970's when the Montana Department of State Lands was attempting to incorporate the butte into a nascent Natural Areas Program. When limited budgets and shifting priorities brought this effort to a standstill, the fledgling Big Sky Field Office made it a foundation project in its Montana Centennial Project.

*Ecological Significance.* Crown Butte contains no critical elements from the Conservancy's EO ranking system. Because of its geographically isolated position, however, it has not been subjected to the grazing pressure characteristic of Montana foothill prairies. Thus, it contains one of the region's most pristine examples of four grassland community types.

*Preserve Objectives.* To preserve the pristine native prairie grassland communities and to maintain this habitat for wildlife species, particularly raptors.

*Land Protection Needs.* Although one portion of the optimal preserve boundary remains in private hands, its location is such that no effort has been exerted to acquire the tract.
**Land Use.** Historically, the only grazing which occurred on the butte was done by stray cattle. The approach to the top has now been fenced. There is an oil/gas lease within the preserve boundaries, but MTFO has judged exploratory drilling or development unlikely.

**Cultural Features and Natural Hazards.** There are no man-made structures within the preserve boundaries and no natural hazards other than the rugged sides of the butte.

**Exotic Species.** There are no appreciable noxious weeds on the butte. *Bromus tectorum* (Cheat grass) is present, along with several other exotic plant species.

**Off-Site Considerations.** The surrounding land is used for grazing and agricultural purposes. There are oil/gas leases in the immediate area, but their development appears unlikely and would not affect the preservation of the native grasslands atop the butte.

**Site Management Needs.** (1) The historic role of fire in this region should be evaluated and, if necessary, a fire plan developed and implemented to maintain the vigor of the native grasslands. (No research on the role of fire has been undertaken, nor do plans exist for prescribed burns or fire control.) (2) Annual monitoring should be done to maintain fences and check on the spread of weedy species. (MTFO staff or volunteers walk the preserve at least once a year.)

**Monitoring Programs/Plans.** There are no formal monitoring plans for Crown Butte.
Access. The Conservancy encourages foot-visitor use of the preserve especially by conservation groups. Overnight camping, fires, disturbance of vegetation, and vehicle use are prohibited.

Miscellaneous. Crown Butte is essentially a self-contained preserve which requires limited management activity. The Conservancy has never prepared a management plan for it. Given the number of demands on MTFO resources (time, people, and funds), Crown Butte has generally had a low management priority. This has not had an appreciably negative affect.

Dancing Prairie Preserve

Site Description. Located in Lincoln County, Dancing Prairie has a primary boundary size of 440 acres and designated optimal size of 600 acres. It lies in an open prairie "island" in the Tobacco Valley between conifer forests of the Whitefish Range and the Purcell Mountains. The preserve is located on geological formations known as "drumlins," glacially formed mounds covered with a complex mosaic of native prairie grasses. A 160 ft ridge running northeast-southwest lifts the elevation from 2656 feet in the northwest corner to an uneven plateau sloping gradually to the east. The site was initially brought to the Conservancy's attention in 1979-80 by a University of Montana student and her advisor, who were conducting an honors project on the Columbian sharp-tailed grouse (Tympanuchus phasianellus). The last known dancing ground ("lek") for this subspecies in Montana was identified as one of the locations which has been incorporated into the
preserve. The Nature Conservancy's national office rejected the Field Office's efforts to initiate acquisition, charging the Columbian sharp-tailed grouse was doing well outside Montana.

Reasoning that the presence of this subspecies might be indicative of unusual habitat, botanist Peter Lesica decided to investigate the valley. In the process he discovered the world's largest population (approximately 10,000 plants) of *Silene spaldingii* (Spalding's catchfly). This plant, which the Heritage Program ranked G2/S1, was known from only 20 other locations worldwide, none of which had more than 250 plants. In addition, Lesica assessed the complex native grassland communities as G1/S1 based on the Heritage Program's draft community classification system. (By 1990, the Preserve Stewardship Plan had listed them tentatively as G3/S3.) The preserve planning process was initiated on the basis of this new information, and the initial tract was acquired in 1987.

*Ecological Significance.* (1) Two easily recognizable grassland community types which shade into a conglomerate which could be considered a third (as yet undefined) type; (2) The world's largest population of *Silene spaldingii*; (3) Site of the last known active "lek" of the Columbian sharp-tailed grouse in Montana.

*Preserve Objectives.* The overall objectives of the Dancing Prairie Preserve are to "preserve and, if possible, enhance" (1) the native prairie on the preserve, (2) the population of Spalding's catchfly on the preserve, and (3) the population of Columbian sharp-tailed grouse in the Tobacco Valley.
**Land Protection Needs.** At the time the management plan was prepared, the Conservancy had not yet acquired the 400 acre tract which contains both the lek and the largest population of *Silene*. Such acquisition was the most pressing protection need, and one which was resolved in 1990. Acquisition of up to 2,800 additional acres not currently included in the optimal boundary would provide winter habitat for the grouse.

**Land Use.** The area within the primary boundary has been only lightly grazed due to the absence of water and is in good condition. Grazing in the optimal boundary has been heavier, with some areas hard hit; but all are apparently recoverable. The threats of an increase in grazing and of possible subdivision were the driving factors impelling a BSFO request for special financial support from national headquarters for immediate acquisition.

**Cultural Features and Natural Hazards.** The only man-made structures within the optimal boundaries are fences. There are no natural hazards.

**Exotic Species.** Six exotic plant species are within the primary boundary, although none, with the possible exception of Viper's grass (*Scorzonera laciniata*), is currently considered a serious threat. Noxious weeds present within the optimal boundary which pose potentially serious threats are spotted knapweed (*Centaurea maculosa*), erect cinquefoil (*Potentilla recta*), and goatweed (*Hypericum perforatum*). Although not currently a problem, pheasant increases in the area could pose a threat to the grouse through
confusion during hunting season (the females are similar in appearance) and food competition.

**Off-Site Considerations.** Increased development and/or recreational use within the Tobacco Valley could preclude the re-establishment and maintenance of a viable grouse population.

**Element Management Needs.** (1) Quantitative data on grassland communities for proper identification of types and maintenance of to-be-defined life-form composition limits. (Transects were placed in 1990; belt transects will be read annually; and remapping will be conducted at 3 year intervals.) (2) Refinement of methods to prevent expansion/invasion by exotic plant species into the primary boundary; if evidence develops of increasing threat to primary boundaries, develop and implement a program of integrated pest management. (Exotic species have been mapped and pulled/sprayed annually since 1988; annual monitoring continuing.) (3) Information on reproductive and seedling establishment requirements of *Silene*, on the effects of fire and excess litter on this species and on its pollination agents/methods. The importance of enhancing the level of knowledge about this critical element was underscored by the admission that "Element 'management' at this time will essentially be the collection of data to further our knowledge of the species." (Belt transects established in 1987 and read annually; pollination study conducted summer 1990; fire/mechanical treatment experiments scheduled for summer 1991). (4) Surveys of grouse habitat and detailed evaluation of the success of efforts to re-establish this species throughout the valley.
(Working group established to survey habitat; population dynamics are being studied by an MSU graduate student.)

Site Management Needs: (1) Construction and maintenance of preserve fences to prevent trespass grazing. (Primary boundary fences were installed in 1987 and 1988 through agreement with current owner before TNC acquisition of property.) (2) Based on initial experiments and literature review, development and implementation of prescribed fire and possibly mechanical treatment programs to maintain and enhance the grassland communities. (A burn prescription has been approved by the Regional Office, and controlled burns are scheduled on already identified plots in the fall of 1991 and spring of 1992; a monitoring plan is in place to evaluate the effects of both treatments on the grasslands and on Silene.)

Monitoring Programs/Plans. For the native grassland communities, the following monitoring actions have been planned and, unless otherwise noted, are completed or in progress according to schedules defined in the Stewardship and Monitoring Plans: (1) Monitoring of exotic species via frequency transects and periodic mapping; (2) Monitoring of prairie communities by composition and frequency transects; (3) Assessment of experiments on use of fire and mechanical treatments to reduce litter buildup and rejuvenate native grass species.

The following programs are in place to provide informed management decisions on Spalding's catchfly: (1) Continuation of data collection and analysis on species demographics and life history
through transects established in 1987; (2) Monitoring and evaluation of the effects of prairie grassland management actions on Silene; (3) Pollination agents and methods were identified in 1990.

Columbian sharp-tailed grouse population and habitat surveys are conducted periodically by volunteers and on a designated schedule by MTFO staff. State officials monitor the area during hunting season.

**Access.** The Preserve Stewardship Plan emphatically states TNC wants the preserve "to serve as an environmental education classroom and location for research of the elements that the preserve harbors."
The preserve will, however, be closed from 15 March to 15 June to protect grouse during their breeding season. Prohibited activities, except as needed to achieve preserve objectives, are: overnight camping, fires, vehicle use, hunting, collection of specimens, artificial feeding of wildlife, cutting of trees or brush, and pets except for seeing eye dogs.

**Miscellaneous.** MTFO has undertaken a major effort to restore Columbian sharp-tailed grouse into the Tobacco Valley. Between 1987 and 1990 more than 60 birds were transplanted from Canada and released on the preserve and surrounding lands. A committee on sharp-tailed grouse composed of representatives from USFWS, USFS, BLM, MTFWP, and TNC has been created as part of this effort, with Montana Fish, Wildlife and Parks the lead agency. This project illustrates both the willingness of the Conservancy to maximize the ecological value of its preserves and the pragmatic attitude it brings to these efforts. Having spent thousands of dollars to restore this subspecies into what
had been prime habitat, the Management Plan suggests that if this transplanting effort is unsuccessful, "It may be an indication that suitable habitat is not being successfully preserved or that factors other than lack of habitat are causing the decline." If either of these proves to be the case, "It is not desirable to continue to bring birds into the Tobacco Valley." (Since this assessment was written, there has been recruitment within the grouse population.)

Meeteetse Spires Preserve

Site Description. This preserve, only now in its initial stages, is projected to contain 4,300 acres within its primary boundaries, with an optimal area of 5,900 total acres. It lies at the eastern edge of the Beartooth Mountains approximately five miles south of Red Lodge. Elevation ranges from 2,300 ft to 4,400 ft. The proposed preserve encompasses an exceptional variety of habitats and plant communities since it extends from an enormous limestone scarp across broad and relatively gently sloping alluvial fans and outwash plains to mesic aspen forest and wet meadows dependent upon a water table which rises to near ground level. As a result of its unique combination of geology, elevation, and precipitation patterns, the area contains Douglas fir and aspen forests, desert and mountain sagebrush grasslands, and wet meadows. Peter Lesica "discovered" this unusual combination while searching for the rare plant *Shoshonea pulvinata*. After almost two years of negotiations, in 1989 a donor offered 320 acres as a gift to the Nature Conservancy. Subsequent to this, uncertainty has arisen over
whether the Conservancy will in fact acquire this property. More recently, another landowner has signed a registry agreement on part of the preserve.

Ecological significance. (1) The area's unique combination of topographic, hydrologic, and edaphic factors has resulted in "an unusually diverse assemblage of plant communities" which remain in "relatively pristine condition." (2) It contains the largest of only three known populations of *Shoshonea pulvinata* (G2-G3/S1) in Montana. This plant, which is being considered for listing as threatened or endangered by the U.S. Fish and Wildlife Service, is the only member of its genus known to science; there are fewer than twelve locations known globally. The primary boundary also contains *Townsendia spathulata* (spoon-leaved Easter daisy, rated G3/S2 by Heritage), four other plant species occurring at the northern limit of their geographical distribution, and several Northern Rocky Mountain limestone endemics.

Preserve Objectives. Because a preserve stewardship plan has not been prepared for this site, there are no clearly articulated objectives. According to the Site Basic Record, however, objectives could be defined as: (1) Protection of an area of unusually high biological diversity in relatively pristine condition, (2) Protection specifically of *Shoshonea pulvinata* and *Townsendia spathulata* as well as other plant species of limited distribution in Montana.

Land Protection Needs. Despite ongoing efforts, TNC has only one 640 acre registry agreement within the preserve boundaries.
Acquisition of additional tracts remains indefinite at the moment. Ideally, grazing in the aspen groves and on the wet meadows should be managed, reduced or eliminated. These communities are on BLM land outside the primary boundary, however, and that agency is unlikely to cease grazing.

**Land Use.** While the proposed preserve has been grazed historically, with heaviest activity around the aspen groves and wet meadows, the limestone scarp which harbors the largest *Shoshonea* and *Townsendia* populations has only been lightly gazed. Almost all of the preserve's habitats can be restored to near-pristine condition. There are mining claims located within the primary boundary. It is unlikely they would be developed in the limestone cliffs which form the heart of the preserve, but could prove a threat to the critical elements should this occur.

**Natural Hazards and Existing Structures.** The only man-made structure is a dam which forms a large stock-pond. The steep cliffs could be hazardous.

**Exotic Species.** There are many exotic plant species on the preserve, but none poses a serious threat to the biological communities.

**Off-Site Considerations.** Changes in water tables and flow patterns which might result from development or increased agricultural use could affect the aspen and wet meadow communities.

**Element Management Needs.** Although no document yet lists this as a need, ESAs should be developed for *S. pulvinata* and *T.*
to provide information necessary for detailed management planning.

**Site Management Needs.** (1) Evaluation of the historic role of fire in the area is necessary for the development of an appropriate burn program. (No action.) (2) Hydrology of the preserve and surrounding lands should be studied. (No action.) (3) A large amount of fencing will be required to prevent trespass grazing and control access to portions of the preserve. (This requires the development of a comprehensive range management plan by the Bureau of Land Management, which has proposed a 960 acre Area of Critical Environmental Concern (ACEC) adjacent to the eastern portion of the preserve.)

**Monitoring Programs/Plans.** Because of uncertainty regarding key portions of the preserve, the Director of Stewardship has elected not to prepare monitoring plans for this site at this time.

**Access.** MTFO seeks the development of a small visitors' parking area and a walking trail to improve public access into the preserve. Because of the relative inaccessibility of the critical elements, the Conservancy is not opposed to use of the area for picnicking, hiking or hunting.

**Miscellaneous.** As of April 1991, TNC held only a registry agreement on 640 acres of the proposed preserve. There are currently ongoing legal discussions regarding the status of an important tract which was to have gone to the Conservancy. In addition, the Conservancy is negotiating with the BLM for a
cooperative management agreement covering projected TNC property and the Bureau's proposed ACEC.

**Pine Butte Swamp Preserve**

*Site Description.* The "flagship" Conservancy preserve in Montana and one of the largest in the United States, Pine Butte Swamp currently protects some 18,000 acres by the combination of fee-title (13,183 acres), state leases (2,509 acres) and conservation easements (2,334 acres). No formal Preserve Design has ever been completed, but the optimal boundaries might ultimately contain more than 35,000 acres. The preserve is a combination of mountains, foothills, plains and wetlands along the East Front of the Rocky Mountains approximately 25 miles west of Choteau. Visually, the focal point of the preserve is Pine Butte, a rocky, 500 ft promontory at the base of which lie two fens (collectively referred to as "the swamp" or "the fen" unless distinction is necessary between the Durr and the McDonald fens). The swamp, covering some 4,000 acres, is surrounded by a mix of plant communities, including foothill prairie grasslands, limber pine savanna, spruce/fir stands, mountain-fed streams, and aspen/willow groves. Pine Butte provides seasonal or year-round habitat for more than 40 mammal and 165 plant species; at least 110 species of birds nest in the preserve or pass through on migration.

*Ecological Significance.* (1) Unusual boreal swamp and surrounding wetlands provide key spring/fall habitat for grizzly bears.
(2) The preserve harbors one other rare animal species, eleven rare plant species, and two special plant community types. (3) The foothills bunchgrass prairie which surrounds the swamp is considered in unusually good condition. (4) The wide range of plant communities provides a great variety of habitat for many wildlife species.

Preserve Objectives. The primary objective is to maintain the natural diversity and stability of the wetland complex to ensure "the presentation of the fen, the rare plants and the productive habitat for the grizzly bear." The secondary objective is to "maintain and enhance the natural diversity and productivity of the foothills prairie grasslands."

Land Protection Needs. The most pressing need is acquisition of the sole non-TNC tract which intrudes into the Durr Fen; continued grazing on this property threatens the natural plant communities. Acquisition of an identified tract straddling the Teton River would enhance protection of prime grizzly bear habitat. In addition, there are several tracts on which acquisition or easements would simplify management by consolidating land within the preserve's boundaries.

Land Use. The foothills grasslands have been grazed in the past, and portions are still leased for livestock grazing and haying. Some portions of the Durr fen were used as hay meadows at one time. There are still oil/gas leases within the preserve boundaries.

Cultural Features and Natural Hazards. Several older buildings and one new metal barn are being used to store preserve equipment.
A small trailer and unused outbuildings remain at one location as per the purchase agreement with the tract owner. An historic school building has been moved to the southern edge of the preserve and is being used as the center for an active education program. The swamp contains deep, water-filled holes and marshy ground. The butte's east slope is steep and could be a hazard.

**Exotic Species.** Several noxious weed species exist within the preserve boundaries, including Canada thistle (*Cirsium arvense*), leafy spurge (*Euphorbia esula*), and the first onset of spotted knapweed. None of these currently threatens key portions of the preserve, but each could be a serious threat in the long term. Crested wheatgrass was planted in a field along the west side of Pine Butte, but is not considered a threat to grassland communities elsewhere on the preserve. There are numerous other exotic plant species, but none are considered serious threats to the native species communities.

**Off-Site Considerations.** Reduction of grizzly bear habitat and movement corridors through development or oil/gas activities could affect the ability of this species to use the swamp and surrounding wetlands. Local opposition to the grizzly bear may affect the ability to integrate the preserve into the community and impede land and animal management efforts. Changes in water flow patterns from the Teton River into the swamp could adversely affect the swamp and adjoining wetlands.

**Element Management Needs.** (1) Preparation of ESAs and more precise locations of EOs to provide a firmer basis for management
planning. (Five ESAs currently drafted; monitoring program in place for 5 plant species; survey of EO locations partially conducted in 1990, with completion scheduled for 1991; species files established in Preserve office in 1984 and updated in 1988.) (2) Continued monitoring of grizzly bear use to provide guidance for proper habitat manipulation; improve grizzly bear habitat as necessary by prescribed burning, planting of forage species, carrion-feeding, travel corridor improvements. (On-going with Montana Fish, Wildlife and Parks, and US Forest Service). (3) Establish long-term monitoring program to evaluate range trend of foothills prairie; modification of grazing program based on results of monitoring. (No action planned at this time.)

Preserve Management Needs. (1) Complete analysis of preserve's hydrologic system. (Latest study completed spring 1991; meeting scheduled with hydrologists and lawyers in July 1991 to assess status and future actions.) (2) Determine and implement optimal methods to control noxious weeds. (Scheduled to implement modified weed control program, with less use of chemical controls, in summer 1991.) (3) Assess desirability of continuing cattle grazing (leases up for renewal in 1992) and possibility of running bison instead. (Preserve Manager evaluating both options; seeking input from manager of Niobrara Preserve, Nebraska, which contains a bison herd.)

Monitoring Programs/Plans. Monitoring programs were initiated in 1990 on 5 critical wetlands elements; will be expanded in
1991. No long-term monitoring program is currently scheduled for the foothills prairie grasslands.

**Access.** Pine Butte Swamp represents the classic potential conflict between accessibility and EO protection. Use of the preserve for educational programs is an important aspect of community relations and development projects for the Conservancy. On the other hand, excessive traffic may affect the ecological and physical structure of the sensitive fens and reduce grizzly bear use of the swamp and wetlands. To balance these objectives, the Preserve Manager had identified off-limit areas and limited access to portions of the swamp's periphery and to the native grasslands. Hunting and fishing are permitted with the permission of the manager, but vehicle traffic is limited, and camping and fires are prohibited.

**Miscellaneous.** Pine Butte has suffered from a lack of continuity, having had four managers (or sets of managers) since 1981, interspersed with periods without a resident manager. It is the most complex ecologically and the most demanding in terms of routine management. It is also the only site at which community relations is the number one stewardship issue.

**Safe Harbor Marsh**

**Site Description.** This preserve, located north of Polson in the southwest corner of Flathead Lake, encompasses 142 acres of excellent condition low elevation fresh water marsh and surrounding meadow and conifer forest vegetation. The hour-glass marsh is
bounded on the west by rolling, forested hills and on the east by steep slopes and cliffs. The flat southern portion contains a mix of meadow and conifer forest. A 650 ft outlet stream connects the northeast corner of the marsh with Flathead Lake. TNC involvement in the area began in the late 1970's when it tried to assist MDFWP to acquire the marsh. The marsh has been well known for years as an area of high breeding and migratory bird diversity. Ms. Marcy Bishop, a National Park Service employee who has conducted bird counts there for years, initially advised the Conservancy of the possibility that this property might be available. Big Sky Field Office acquired the land in 1989.

Ecological Significance. This preserve is unusual in that it contains no critical elements contained in the Conservancy's classification system. Instead, BSFO justified acquisition on the basis that "this tract provides a variety of habitat requirements in a compact area. The interface between wetlands, meadows and coniferous forest supports an exceptional diversity of both avian and vegetation species."

Preserve Objective. According to the Stewardship Management Plan, the site "is to be managed as a natural area in an effort to perpetuate the diversity of habitats that support the existing bird and wildlife populations."

Land Use. Grazing has occurred in the forest and meadow portions of the preserve; continued grazing would contribute to the degradation of vegetation through the introduction and spread of exotic plant species.
Cultural Features and Natural Hazards: Vehicle tracks cut across the western and southern portions of the preserve, and old goose nesting platforms remain around the marsh. Steep cliffs on the east side of the marsh could be hazardous to climbers.

Exotic Species. Seven exotic plant species exist within the preserve boundaries, of which at least three have the potential to pose a serious threat to the marsh: marsh sow-thistle (Sonchus uliginosus), quackgrass (Agropyron repens), and Canada thistle (Cirsium arvense). Spotted knapweed (Centaurea maculosa) is present on the drier north section.

Off-Site Considerations. Increased recreational and home development could affect bird diversity as well as the hydrologic system which supports the marsh. Logging operations in the immediate area could adversely affect bird diversity. Water level fluctuations in Flathead Lake could affect the hydrologic regime.

Site Management Needs. (1) Better understanding of the preserve's hydrologic regime and the relationship between the marsh and Flathead Lake/Kerr Dam. (No action scheduled pending cooperative management agreement with Confederated Salish and Kootenai Tribes.) (2) Elimination of exotic plant species and the prevention of further infestation through implementation of a weed control program to be initiated in 1990. (No action.) (3) Installation of new fencing to prevent trespass grazing and vehicle traffic and removal of unnecessary interior fences. (Completed in 1989.) (4) Development of a cooperative management plan with the Confederated
Salish and Kootenai Tribes. (Draft Stewardship Management Plan has been sent to Tribal headquarters.)

Access. The Nature Conservancy intends to encourage public use of this preserve "to provide a safe, quality natural area recreational experience." Trails will be developed to guide visitors. Vehicle traffic will be prohibited as will overnight camping, fires, and hunting.

Monitoring Programs/Plans (All in abeyance pending cooperative management agreement): (1) Monitoring of continued habitat diversity will be accomplished with aerial photos taken at five year intervals, annual ocular surveys of plant communities (including mapping of exotic infestations), and annual breeding bird censuses. (2) Monitoring of exotic plant infestations through mapping and collection of quantitative data; periodic ocular reconnaissance to determine unauthorized vehicle use and possible trespass grazing. (3) Initiation of a water balance study; one result of this study would be establishment of a long-term monitoring schedule for both the lake and the groundwater.

Miscellaneous. One of the long-term objectives of the Nature Conservancy in Montana is to establish effective cooperative relationships with the several tribes in the state. Because of interest on the part of the Confederated Salish and Kootenai Tribes in this marsh, the Montana Field Office is negotiating a cooperative agreement for management of Safe Harbor. Management of the preserve would be primarily the responsibility of the Tribes, with the Conservancy offering technical advice, ecological and biological
information, and assistance as required. The Stewardship Plan drafted in May 1990 has not been formalized pending negotiations on the cooperative agreement, nor have specific monitoring plans been drawn up or implemented.

**Swan River Oxbow Preserve.**

*Site Description.* Swan River Oxbow is located approximately two miles south of Swan Lake on the east side of the Swan River. Its 392 acres, purchased in 1986, constitute both primary and optimal boundaries. Most of the preserve is situated in the delta formed where the river enters the lake, and the entire site has a very high year-round water table with numerous seeps and springs. One of the preserve's main physical features is an oxbow long since cut off from the Swan River. Some parts of the oxbow contain water throughout the year, while others have a distinctly vernal character. The preserve also contains spruce- and cottonwood-dominated forest communities. Its ecological significance was identified by Peter Lesica during a biological evaluation following the then-owner's self-initiated offer to sell the property to the Conservancy.

*Ecological Significance.* The key critical element on the preserve is *Howellia aquatilis* (water howellia), which is ranked G2/S2 by the Montana Heritage Program. It also contains populations of round-leaved pondweed (*Potamogeton obtusifolius*, G5/S1S2) northern bastard toadflax (*Geocaulon lividum*, G4/S1), Buckler fern (*Dryopteris cristata*, G5/S1), and small yellow lady's slipper
(Cyprepedium calceolus var. parviflorum, G4T3/S2). Both grizzly bears and bald eagles frequent the area, which also provides habitat for numerous other wildlife species.

Preserve Objectives. The primary objective is to "preserve, perpetuate, and if possible increase the size of the present population of H. aquatilis." Secondary objectives are to "preserve, perpetuate and if possible increase the size of the present populations of other rare plants . . . [and] maintain or improve the condition of vegetation communities and wildlife habitat."

Land Protection Needs. Since all of the elements targeted for protection are located within the existing primary boundary, there is no requirement for additional protection measures.

Land Use. Previous owners had conducted logging operations on the land, and portions of the tract had been planted for rice and reed canarygrass. There are no immediate threats from trespass grazing.

Cultural Features and Natural Hazards. Existing fences are in various states of repair. Several historic building sites are present, only one of which contains a standing structure. Natural hazards include open water, the potential presence of bears, and falling trees.

Exotic Species. The number one threat to this site is the presence of the aggressive weed Phalaris arundinacea (reed canarygrass), which is located adjacent to the best howellia community. Other exotic plant species are present, but are not considered threats.
**Off-Site Considerations.** The property is bounded by the Swan River, a National Forest, and a National Wildlife Refuge. Potential off-site developments which could affect the preserve are logging or other activities which would change hydrologic flows and water quality.

**Element Management Needs.** (1) Acquisition, through mapping and monitoring, of a thorough knowledge of the extent, location, demographics, and trends of EOs. (Mapping and monitoring of selected elements were begun in 1989; the remaining elements were mapped and monitoring initiated in 1990.) (2) Gathering of information through field research and literature review to prepare ESAs intended to "provide for informed management." When coupled with monitoring results, this information "will indicate if active management of the elements is desirable or possible." (ESAs for *H. aquatilis* and two other elements are in draft form.) (3) Maintain and improve EOs by reducing the threat from reed canarygrass or by increasing the size and density of the populations; additionally, develop quantifiable element-specific objectives by the spring of 1990. (Quantifiable element-specific objectives have not yet been prepared; efforts to reduce reed canarygrass have been unsuccessful to date.)

**Site Management Needs.** (1) Document hydrologic dynamics of the preserve to provide the basis for an application for in-ground flow rights by the end of CY90 and to allow for realistic assessments of threats to water quantity and quality. (Hydrologic study initiated in 1989; scheduled for completion in 1991; water right may be a dead issue). (2) Elimination or reduction of reed canarygrass by mapping
exotic plant species in and adjacent to the preserve and exploring ways to control reed canarygrass beginning in 1989. (Annual monitoring begun in 1989; first attempt to actually reduce infestation was unsuccessful.)

*Monitoring Programs/Plans.* MTFO has prepared a Monitoring Plan for Swan River Oxbow Preserve which outlines a general baseline report on the preserve as a whole as well as collection of "specific data on the element occurrences" and "the various factors which may influence them." Additionally, the Monitoring Plan notes that once the Montana Heritage program defines a community classification and ranking system, "the preserve should be mapped in relation to this."

*Access.* Because of the various hazards present, this preserve is the only one on which access is granted on a "permission only" basis. This has been done primarily to protect the Conservancy from liability problems. The preserve is closed to hunting.
Chapter 4

FACTORS INFLUENCING PRESERVE MANAGEMENT

The selection, design and management of preserves involve consideration of a host of factors, some specific to a particular preserve but many relevant to more than one. For purposes of discussion and analysis these may be broken into ecological and non-ecological considerations. The former, in turn, may be subdivided into those over which a manager may have an influence, and those which he may have only a limited ability to affect directly, but which may affect the operation and even the continued existence of a preserve even though they are often located outside that preserve's boundaries. Ecological factors include hydrology, natural resource development, degradation of surrounding lands, grazing, exotic species infestations, and fire management. The two most significant non-ecological factors which affect preserve planning and management in Montana are community relations and financial considerations.

Hydrology

One aspect which stands out immediately in reviewing TNC preserves in Montana is the key role hydrologic factors play in determining the fundamental character of several preserves. It is not surprising, therefore, to see the emphasis the Conservancy places on coming to grips with the dynamics of these hydrologic regimes.
One of the earliest studies of Pine Butte Swamp noted, "The maintenance of the integrity of the wetland hydrology, both in terms of water quality and quantity, is the key to maintenance of the wetland in its present or in an improved state" (Lee and Jonkel 1981). Accordingly, many of the early studies the Conservancy contracted at Pine Butte involved hydrologic considerations. In 1982, Big Sky Field Office awarded a contract to Earth Resources Associates (ERA) to provide a description of the hydrologic features and the system which supports the swamp (McAllister, 1982). One purpose of this study was to enhance the ecological understanding of the system as a whole, while a second was the more management-oriented goal of providing a capability to predict potential impacts of threats to the preserve which might result from oil/gas exploration, subdivision of nearby land, or enhanced agricultural activities. The following year ERA received a new contract to perform a small sensor maintenance and analysis project to update the hydrologic monitoring system.

In 1987 the Conservancy allocated funds for a University of Montana thesis project designed to continue collection and interpretation of data. By the end of 1990, gauging of the Teton River, of groundwater levels between the river and the fens, and of the fens themselves had been going on for three years. In addition, a water balance of the Pine Butte wetlands had been conducted in 1989 (Carr pers. comm.). In early 1991, recognizing that "a quantification of how the two fens respond to changes in the flow of the Teton River is necessary to produce a viable management plan," the Preserve
Manager successfully requested grant money to have a consultant analyze the available data. The objectives of this effort were to assess "seasonal and annual variation in flow in the Teton River and groundwater levels . . . to compare variability between monitor sites and quantify the response of the fens to water levels in the Teton River" (Carr 1990).

The effort to quantify the hydrologic regime and specifically the relationship between the river and the preserve's two fens had another purpose than simply understanding the system. It was also intended to provide the justification upon which to apply for a water right on the Teton River to assure future availability of water. In the fall of 1990, absent the complete study but possessed of sufficient information to demonstrate the long-term existence of the swamp depended on underground flow from the river, the Conservancy initiated the process of applying for a water-flow right. During this period, however, the Montana courts ruled in a similar case that when no man-made diversion was involved in directing underground water flows from a surface body of water there were no grounds for granting a right of diversion. Faced with this situation, the Preserve Manager has scheduled a meeting of hydrologists and water rights lawyers in July 1991 to address three questions: (1) Is it feasible to continue to pursue subsurface water rights? (2) If not, what are the implications for preserve management? (3) If such action is not feasible, what should be the level of hydrologic monitoring in the future (Carr pers. comm.)?
Pine Butte is not the only preserve on which the Conservancy has recognized the criticality of the hydrologic system and consequently sought to improve its understanding of such systems and their relationships to critical elements and ecosystems. The primary reason for Swan River Oxbow Preserve is the presence of *Howellia aquatilis*, a species dependent on an aquatic environment. The Swan River Oxbow Management Plan underscored the relationship between the hydrology of the area and the preserve's key critical element when it observed that, outside of possible action against reed canarygrass, "it appears that long term protection of water quality and quantity [sic] may be the best management we can provide for this species." The Conservancy recognized the fundamental role of water in this ecosystem from their initial efforts at acquisition. In the initial Site Stewardship Summary (1987) the first four "Threats" identified directly involved hydrologic considerations: possible reductions in subsurface flow, possible increases in overland flow, possible high sediment content in overland flows, and possible changes in water quality with subsequent adverse affects on element occurrences.

In 1990, using equipment and funds donated by two private companies and the efforts of a graduate student at The University of Montana, MTFO initiated a study to monitor water quality within the preserve and adjacent areas and to determine the hydrologic dynamics of this site. When this study was initiated, one objective was to provide the basis for requesting a water right if such was deemed appropriate. Based on the ruling mentioned above, this issue remains
unclear. The value of the study to preserve management has already been demonstrated, however, since the insight it has provided on water flow patterns has convinced the Director of Stewardship to retain a portion of the preserve which had been slated for sale as a trade land (Hall pers. comm.).

The third preserve at which a particular hydrologic regime is THE reason for the existence of the features which make the area special is Safe Harbor Marsh. The issue of the relationship between the water level of Flathead Lake (and manipulation of Kerr Dam) and the condition of the marsh was raised during the preserve selection and design process. The Management Plan noted the requirement to obtain a sound understanding of the preserve's hydrologic regime with the admission, "Though [sic] it seems obvious some relation exists between the water levels of the lake and marsh, it is not at all clear what this relationship may be." The same document also noted that, while there was no quantitative data available upon which to base a detailed assessment of the impact of changes on the hydrology of the area, a decrease in water quality and quantity would almost certainly produce "substantial negative effects." Such reductions, it continued, might result from an increase in the number of local septic systems, changes in the control structures on the channel between the lake and the marsh, or changes in the level of the lake resulting from regulation of Kerr Dam.

To clarify the preserve's hydrologic relationships, the Preserve Management Plan proposes a long-term monitoring schedule for both
the lake and the groundwater stage. Development and implementation of such a project has been deferred pending approval of the draft Management Plan by the Confederated Salish and Kootenai Tribes and the signing of a cooperative management agreement. It is not clear, however, and MTFO has not addressed this question squarely, what actions the Conservancy might take in the event such monitoring indicated a negative impact on the preserve from a long-term or critical change in the lake's water level.

**Natural Resource Development**

An issue of special importance to TNC decisions to acquire or otherwise manage property in states such as Montana is that of natural resource development. Development of resources such as oil, gas or timber on properties on or close to proposed or established preserves may adversely affect the continued viability of critical EOs. Mineral and timber rights are not always attached to the land itself. In many cases owners from whom the Conservancy has acquired or is considering acquiring property have already signed long-term leases, usually for oil and gas exploration and development. The Conservancy Protection Manual cautions field staff to consider carefully the status of mineral/timber rights and the potential impact of natural resource development during both the protection and stewardship processes.

Potential oil and gas development is a concern at several Montana preserves. The East Front of the Rocky Mountains has long been a focal point for exploration, and this interest has had
ramifications for Pine Butte Swamp. When the Conservancy acquired the initial tracts for the preserve, it was unable to obtain the oil and gas rights. That TNC was aware of the potential problems which might arise from this situation was demonstrated by a memo written by the Western Regional Director. This memo expressed concern over the potential impacts which might result from polluted water, drilling mud, waste products, noise pollution, and unrestricted movement across the fragile ecosystem (Beebe 1978).

During the early years of the 1980's, the Conservancy continued to wrestle with the issue of oil and gas exploration along the East Front with only limited success. For example, in the fall of 1982 the Field Office learned the Bureau of Land Management was considering the granting of leases on land TNC intended to incorporate into the preserve. The Western Regional Director wrote to BLM to "go on record against any disturbance of the Preserve" until on-going studies of the hydrology of the area and the habitat and movement requirements of the grizzly bear could clarify the real impact which might be expected from exploratory drilling and, possibly, development (Nutter 1982). The BLM responded that there would be no surface occupancy within the proposed boundary of the preserve, but did not address questions of water quality or quantity. Several months later the BLM advised the TNC State Director they were preparing to grant leases on land within the preserve itself with the provision of no surface occupancy. Again, the Conservancy was unable to prevent this action. However, they did persuade the drilling
company to conduct seismic tests during the winter when the bears would be in hibernation and the frozen ground would support the necessary equipment (Kiesling pers. comm.).

That the Conservancy continued to look for ways to prevent mineral development on its Pine Butte property was indicated by an internal BSFO memorandum which raised the question of whether they might be able to use water right restrictions to limit such activity. The Conservancy insisted vigorously that the owner of a large tract near the Butte relinquish his mineral rights as part of an acquisition agreement they were negotiating. Nor has the Conservancy confined its concern for the impacts of development to its own properties. Correspondence in the files at Pine Butte and Helena indicate a clear and continued interest in oil and gas activities along the entire Rocky Mountain East Front, including written comments on proposed BLM and Forest Service leases, EIS documents regarding the leasing of state lands, and copies of Forest Service Decision Notices.

Although the area around Crown Butte was also a target for exploration in the late 1970's and early 1980's, the nature of the laccolith made activity on the preserve itself unlikely. When notified by the BLM of its intent to approve leases in the area around the Butte with stipulations of no surface occupancy, the State Director was able to respond that the Conservancy was "delighted you are taking into account the natural values of the Crown Butte area. Your proposed stipulations square nicely with our notions of how the area ought to be managed" (Kiesling 1984). Likewise, mining claims within the
Meeteetse Spires preserve are unlikely to affect the critical elements cloistered atop the limestone scarp (Hall pers. comm.).

Another aspect of natural resource development which may affect a preserve is off-site logging. Both the Safe Harbor Marsh and Swan River Oxbow Management Plans address the potential impact of such activity. In the case of the former, the result could be reduced avian habitat diversity. For the latter, it might be increased overland flow and/or reduced water quality. The Land Steward commented on a Forest Service timber sale in the Swan Valley, questioning the impact on water quality of the Swan River preserve. The Forest Service considered this comment, but concluded the sale would not adversely affect either quantity or quality of water in the preserve (Hall pers. comm.). The Conservancy has also initiated an "outreach" program, albeit in its initial stages, to discuss development issues with neighbors adjacent to Safe Harbor Marsh. (As an aside, the question of logging is considered very carefully during the negotiations of any conservation easement.)

Degradation of Surrounding Land

One of the most important external ecological factors which can potentially affect a preserve is the deterioration of adjacent land to the point where the preserve becomes not just the only protected land in an area but an isolated "island" in a "sea" of development. This possibility is particularly important in the case of critical animal species since preserves themselves often provide only a part of a
species' requirements. The Conservancy has been aware of this phenomenon and has attempted to influence developments around its preserves to the extent it can. The development of natural resources could result in the creation of "island" preserves. So too could recreational and residential development. Just as it has attempted to address potential changes resulting from resource-related activities, the Conservancy has tried to address the potential impact of these other types of development.

In its request for acquisition support at Dancing Prairie, the Big Sky Field Office stressed not only impending increases in grazing pressure but also the recent subdivision of nearby property into 20 acre homesites. All of the documentation on this preserve stresses the recreational potential of the Tobacco Valley based on natural conditions and the presence of Kootenai Reservoir. The Preserve Design Package noted that while cost of development would be high, the attractions of the area "make development a real threat to the elements we are seeking to protect." One way in which the Conservancy is demonstrating its attention on external situations is in its approach to the Columbian sharp-tailed grouse. Recognizing that a healthy population of grouse requires more land and a greater variety of habitat than TNC could purchase, the Field Office is evaluating alternative means to ensure habitat (especially critical winter habitat) throughout the Tobacco Valley.

Safe Harbor Marsh may be the best example of an island preserve in the midst of development, a condition recognized from
the beginning of the acquisition process. One of the justifications offered for this project was that the few remaining wetlands in the Flathead Basin "are threatened by ever-increasing agricultural, logging and recreational development . . . ." The Site Basic Record which accompanied the acquisition proposal stated clearly the area surrounding the proposed preserve is used extensively for recreation and that it is near a high-visitor town. Support for the high Urgency Rating given the site was the fact that "recreational homesites are rapidly encroaching," while the draft Management Plan suggests this activity could "significantly effect [sic] the integrity of the preserve."

This plan proposes the Conservancy "hold annual meeting[s] with adjacent landowners to discuss appropriate management of preserve and surrounding private lands." Although discussions have been held with individual landowners, there have been as yet no formal meetings (Hall, pers. comm.).

Perhaps the broadest example of concern for the surrounding area is demonstrated at Pine Butte Swamp Preserve. The primary objective of this preserve is to help meet the requirements of the grizzly bear. It was never intended to be a self-contained habitat "unit." The Conservancy has provided financial support to, collected data for, and reaped the benefits of a series of studies which have addressed bear behavior, biology and habitat requirements outside the boundaries of the preserve as well as inside. It has played an active role in commenting on both state and federal actions and plans along the East Front. It has worked, albeit with limited success, within the
local community to protect the bear as well as to explain its role in these efforts. Clearly, the Conservancy views itself as a partner in efforts to protect the grizzly bear and in a more general sense to maintain the Northern Rocky Mountain ecosystem.

**Grazing**

Historically, one of the major impacts on lands which now comprise TNC preserves in Montana has been livestock grazing. The consequences of this activity, the desire to reduce its impact, and the decision to prohibit or continue its use are, therefore, important stewardship issues.

Grazing and the related issue of haying occupy a significant percentage of the file drawers of Pine Butte Preserve. Probably no other single subject has been so fully addressed. Although the foothills prairie grasslands were recognized early on as an unusual community, they had not only been grazed historically, but were under such use when the Conservancy began to acquire tracts in the area, as were portions of the Durr and McDonald fens. One of the conditions of several of the initial acquisition agreements was continued lease grazing by the sellers. A significant portion of the preserve's revenues, moreover, come from grazing and haying leases. Finally, in an area in which ranching has been a way of life for several generations, cessation of grazing on such a large piece of land would be a matter of public concern. On the other hand, one of the Preserve's objectives is "to maintain and enhance the natural diversity and productivity of the
foothills prairie." A great deal of effort, therefore, has gone into grazing management.

The first evaluation of range condition and range trend, completed in the summer of 1979, addressed the initial acquisitions as well as properties not yet under contract (Olson 1979). Evaluating range conditions from Poor to Good, the study offered recommendations for future management. The broadest of these was that grazing be eliminated from the fen and surrounding marshlands since these areas had little grazing value but high wildlife habitat value which was being adversely affected by livestock. Conservancy-held portions of the swamp have not been grazed, except by trespass cattle, since that time.

Noting range trend was downward, the study suggested early spring grazing rather than overstocking was responsible for this situation. Accordingly, the Conservancy does not allow cattle on any of its leased pastures until mid-June. The report also recommended a rest-rotation system and variable grazing seasons for each pasture, a policy which has been implemented, with frequent modifications, since the early 1980's. The Conservancy has made it clear to leasees the Preserve Manager must be the determiner of how many cows go on what pastures and when.

The Conservancy did not follow all the recommendations of this initial study or a follow-on one by the same individual (Olson 1980). Both reports suggested the two best options for restoring range condition were no grazing at all or summer lease grazing only on the
upland ranges with no haying or grazing of the hay meadows near the Durr fen. Conservancy policy has been to lease upland pastures and to allow haying around the southwest portion of Durr and west end of MacDonald fens and winter grazing of these hay meadows.

Concern for proper grazing and pasture management in this period was reflected in efforts (unsuccessful in the end) to get the Conservancy's leading expert on prairie grassland management to visit Pine Butte and several other preserves in the Northwest. In the middle of the 1980's an ambitious monitoring project was initiated for the foothill prairies, but the demands of day-to-day operations and the recognition that gross indicators of condition and trend were sufficient for the Conservancy's purposes soon ended this program.

Through most of its ownership, Conservancy efforts regarding the foothills prairies at Pine Butte have been focused more on administration and range improvements than on monitoring or scientific research. There has been, for example, no continual monitoring program nor even a record maintained of the locations of the early permanent transects upon which initial evaluations and recommendations were made.

Philosophically, the Field Office is refining its policy toward grazing and the purposes for which it might be continued at Pine Butte and elsewhere. In a press release prepared in 1988 the Montana Land Steward defined the Conservancy's overall approach to grasslands as one of maintaining and, where appropriate, restoring native grasslands and simulating to the extent possible native ungulate
use. Since it is "seldom publically and economically" feasible to run bison, cattle are sometimes used to "mimic" this impact. Regardless of the species or system used, the objective is "managed grazing" to achieve the "biological objective of perpetuating the natural grassland ecosystem." With one eye toward the always present factor of community relations, the release concluded the Conservancy "seriously considers the context of our land protection activities in relation to the agricultural communities of the West . . . . The preservation and restoration of natural lands has to include considerations of the human culture in the area" (BSFO n.d.).

It was largely the threat of increased grazing pressure on a tract which had escaped intense grazing in the past that provided the impetus for the Big Sky Field Office to seek immediate acquisition of property in the Tobacco Valley (Dancing Prairie Preserve). In addition, the Preserve Design Package listed occasional trespass grazing into unfenced portions of the proposed preserve as "a major consideration." In this instance, BSFO moved swiftly to alleviate the problem. Even before final purchase of the key 400 acre tract, the Conservancy secured an agreement from the then-owner to erect a fence around this property at Conservancy expense. While holding an option for an additional 160 acres within the primary preserve boundary, the Conservancy was able to gain the consent of the landowner to control trespass grazing by completing another fencing project. According to the current management plan, grazing will not
take place within the optimal boundary of the Dancing Prairie Preserve.

Grazing has occurred in the forested western portion of Safe Harbor Marsh, and the Stewardship section of the Preserve Design Package listed fencing as a requirement to prevent cattle wandering onto the preserve. In this case, the threat was judged to be the potential spread of exotic plant species rather than adverse impact directly on forage species. Fencing of the west and south portions of the preserve occurred shortly after acquisition.

At Meeteetse Spires those areas which contain critical elements, especially *Shoshonea* and *Townsendia*, are too remote to be threatened by grazing. While most of the remaining sections have been grazed, only the wet meadows and riparian areas have been overgrazed, and most of these can be recovered to "near-native conditions" with proper management. Under the draft cooperative management agreement, responsibility for development of a range management plan will lie with the BLM since most of the grasslands fall within its jurisdiction. With the exception of the aspen communities, which BLM has so far declined to include in the ACEC, the Conservancy has no objection to continued grazing under a proper management plan (Hall pers. comm.).

**Exotic Species Infestations**

According to Dr. Joan Bird, Protection Planner for The Nature Conservancy in Montana, "weeds" are the number one ecological threat
to Conservancy projects in the state. In particular, they pose critical problems for the integrity of natural communities and the continued existence of rare plant species in western Montana. (Bird pers. comm.) Identification of undesirable exotics and measures for their reduction or elimination are fundamental aspects of both preserve designs and preserve management plans. At Pine Butte Swamp concern with this problem is illustrated by the manpower, time and money expended to control noxious weeds. The primary target of this effort has been leafy spurge, although increasing attention is being paid to Canada thistle and spotted knapweed. After several years of intensive use of herbicides, the Conservancy appears about to shift to a policy of containment rather than eradication. The Preserve Manager is also considering a cooperative program with the Montana Department of State Lands against what are still relatively small inroads of spotted knapweed (Carr pers. comm.).

Nor are the other preserves immune to noxious weed infestations. In his initial vegetative study on the proposed Dancing Prairie Preserve Peter Lesica observed goatweed (Hypericum perforatum), erect cinquefoil (Potentilla recta), and spotted knapweed within the optimal boundary and warned one or more of these "could become a serious threat to the near-pristine condition of the grasslands" within the primary boundary. In addition, the presence of Viper's grass (Scorzonera laciniata) within the primary boundary raised questions since, while "little is known about the ecology of this species in Montana," it does appear to be spreading rapidly in other
states. The subsequent Preserve Management Plan for Dancing Prairie lists as the first Element Objective for the Native Prairie Grasslands: "1. Prevent further expansion and/or invasion by exotic species within the primary preserve boundary." Species composition and frequency are to be monitored within this area along with periodic mapping of existing infestations within the optimal boundary. The Preserve Monitoring Plan calls for use of permanent transects to measure canopy coverage and frequency of exotics along with other species. Re-mapping will occur at two year intervals "unless expansion of particularly noxious exotics takes place at a more rapid pace than expected." Should such expansion occur, the Director of Stewardship is tasked with developing an integrated pest management program through some combination of mechanical and biological treatments, with herbicides used "only when absolutely necessary and as a last resort."

The major identified threat within the Swan River Oxbow Preserve is *Phalaris arundinacea* (reed canarygrass), which threatens both *Howellia aquatilis* and *Geocaulon lividum*. The first Site Stewardship Summary called for monitoring of the size and possible expansion of reed canarygrass. Monitoring began one year after the preserve was acquired and has continued since. In 1990 the State Director of Stewardship attempted to eradicate *Phalaris* stands using a method successfully employed against canarygrass in North Carolina. This effort was unsuccessful, however, and alternatives are currently being sought (Hall, pers. comm.).
Safe Harbor Marsh's most serious noxious weeds do not yet exist in the marsh itself, but on the drier sites surrounding it. Of the exotic species present, marsh sow thistle (Sonchus uliginosus), quackgrass (Agropyron repens) and Canada thistle (Cirsium arvense) "pose the most serious threat[s] to the integrity of the plant community."

Additionally, spotted knapweed has gained a toehold in the northern portion of the preserve, while common speedwell (Veronica officinalis) has been identified in the forested area west of the preserve. All of these species are listed as "Stewardship Concerns" in the Preserve Stewardship Plan, which calls for "plan[ning] and implement[ing] exotic plant control program" by spring 1991. As of April 1991, however, no action has been devised for controlling the spread or reducing the presence of any of them.

Crown Butte's isolated location and lack of significant grazing have combined to limit the presence of weedy species. The 1984 Site Stewardship Summary did include under Preserve "Threats/Needs" development of a weed control plan, implementation of an annual "weed pull," and establishment of an experimental plot to monitor exotic species growth and possible control methods. With increases in stewardship responsibilities and commitments statewide, none of these needs have been met. However, MTFO staff members monitor this site informally at least once a year, and the most common exotic species present is Bromus tectorum (cheatgrass). There have been no threatening exotic species identified on the Meeteetse Spires site.
Fire Management

The Nature Conservancy's Stewardship Manual states, "Before European settlement, fires were a natural and recurrent event in many localities." Thus, "if a natural fire regime is to be maintained, intentional burning must be instituted." Management of four of Montana's preserves involves consideration of the historic role of fire and the possible need for prescribed burns.

Prescribed burning is a part of the management strategy at Pine Butte. The 1986 Stewardship Plan laid out a foothills prairie controlled burn program whose primary objectives were to "simulate a natural fire cycle" and to eradicate fire sensitive invader species. Secondary objectives were to reduce litter build-up, increase nutrient availability, and encourage better livestock distribution. Despite the ambitious burning schedule and monitoring program laid out in this plan, however, only two prescribed burns have been carried out since 1986 (Carr pers comm.). This limited activity appears the result of a combination of factors: lack of manpower during appropriate periods, disagreement within the Conservancy over the priorities for burning, and the lack of focus which characterized management of the preserve in 1988 and 1989.

The 1986 Plan observed that reintroduction of fire into the wetland portions of the preserve would have to wait for a better understanding of the ecological processes of these areas. It also called for a fire history study to determine the average fire cycle as the basis for subsequent development of a burn program for the fens. This
study was never conducted. Nevertheless, the 1989 Stewardship Plan adopted a more aggressive approach. Here the change or reduction in range and diversity of plant communities resulting from the removal of the natural fire cycle was listed as a "Current Threat." Accordingly, a prescribed burn justification statement as well as an approved burn plan were to be completed by the end of 1990. These would be followed by a monitoring plan intended to evaluate the success of controlled burns which would be conducted in the winter and spring of 1991. Interestingly, a fire history for the wetlands at Pine Butte was not scheduled to be completed until the end of 1991.

Subsequent to the preparation of this plan, a leading fire management expert (Dr. Ron Wakimoto of The University of Montana) expressed doubts about the methodology for the proposed fire history study. Peter Lesica also expressed concern that burning of the fens might provide the opportunity for exotics to encroach into these wetland areas. In view of this uncertainty, the Preserve Manager does not contemplate controlled burns in the swamp in the near future (Carr pers comm.). The 1989 Plan also reviewed the literature on the role of fire in foothills prairie grasslands and once again laid out a prescribed burn policy. Here, too, burns are being held in abeyance pending further analysis.

The open nature of Dancing Prairie suggests fire has had a role in the development and maintenance of resident plant communities. To ascertain just what this role might have been, the initial Site Stewardship Summary recommended a study on the fire history of
Columbia River Basin grasslands. Although a complete analysis of such grasslands has not yet be undertaken, the Stewardship Plan suggests "some form of manipulation" will be necessary to maintain or improve the general health of the prairie ecosystem. According to this plan, cessation of fire (and subsequent buildup of litter) has probably contributed to the decadence of the grasslands and perhaps also to the limited establishment of *Silene* seedlings. Consequently, the plan calls for an evaluation of the use of fire in conjunction with mechanical treatments to reduce litter buildup and stimulate seedling establishment.

Because of concern for possible effects on *Silene*, initial burns are to be conducted only on small experimental plots and compared to mechanical treatment and control plots. A fire prescription program -- to include selection of experimental plots -- was to be developed in 1988 and implemented the following year. Although BSFO was unable to meet this schedule, experimental burns are now scheduled for both the fall of 1991 and the spring of 1992. For safety as well as public relations, prescribed burning will not replicate exactly natural fires, many of which were started by lightning in the dry conditions of late summer and were characterized by strong headwinds which carried them great distances. The requirement to avoid these conditions reflects the difficulties of trying to replicate natural events within the constraints of an "unnatural" world.

The Preserve Design for Meeteetse Spires cites literature which suggests fire generally plays an important role in aspen communities
and in structuring shrub steppe communities such as exist on this site. It recommends an assessment of the historic role of fire and, if appropriate, development and implementation of a burn plan. Since these communities lie largely on BLM land, however, the Conservancy will have only a limited role in this process. With regard to Crown Butte, the Director of Stewardship has observed the Conservancy probably should burn portions of the grasslands, but added the generally healthy condition of these communities has relegated such activity to a low priority (Hall pers comm.). Similarly, although the 1984 Site Stewardship Summary identified the need to develop a fire suppression plan, this has never been done.

Other Potential Ecological Influences

MTFO is aware that there are ecological developments other than those addressed above which could adversely affect preserves. Among these are disease or insect infestations. The Management Plan for Safe Harbor Marsh is the only document that raises these possibilities and does so in the context of potential concerns which could arise from outside the preserve. The Director of Stewardship has opted not to allocate resources (especially time) to develop possible "counters" to as-yet-non-existent threats. Should a probable threat from either disease or insect infestation arise, TNC recognizes the requirement to divert resources (Hall pers comm.).

Another category of potential, but not yet present, threats includes water or air pollution. The hydrologic monitoring underway
at Pine Butte and Swan River Oxbow and identified as necessary at Safe Harbor, is intended in part to flag the presence of or a trend toward water pollution. What steps might have to be taken to avert or reduce a perceived threat of this nature would depend on the particular situation. Therefore, there have been no specific prescriptions prepared. There are no activities currently underway or planned specifically to monitor air pollution. It may be, however, that by their attention to endemics and to species existing at the edge of their habitat ranges, as well as by the several more encompassing monitoring projects, the Conservancy's Montana Field Office might contribute to the overall understanding of "macro-ecological" events (Lesica pers. comm.).

**Community Relations**

One aspect of stewardship which cannot be overlooked is relations with local communities: "How to deal with the neighbors; that's the challenge" (Lesica pers. comm.). Local opposition or even indifference can adversely affect not only the ease with which tasks can be done but also the ability to provide adequate protection for critical elements or preserves.

The issue of community relations at Pine Butte Swamp has a long history, and a mixed one. The State Director who took over this project after several years of negotiations admitted the Conservancy was late off the mark in getting public support in the Choteau area. As a result, there were unfounded, but believable, rumors that the Nature
Conservancy was introducing large numbers of grizzly bears, that Pine Butte Swamp was to be the "dumping ground" for problem bears from other areas, and that the Conservancy was attempting to turn the East Front into a wilderness (Kiesling pers. comm.). This early lapse, especially in an area which is not particularly noted for its openness to conservation imposed from outside, resulted in the Conservancy's fighting an uphill battle. While public relations have been addressed in all of the planning and management documents, it would appear personalities rather than programs have been the primary factor in the ups and downs which have characterized Conservancy-Choteau relations.

It would seem the current philosophy of hiring "people-persons" to manage the preserve while contracting out strictly scientific projects may be the correct approach in this situation. At any rate, the recent past has evidenced a marked increase in efforts to reach out to the local community. These efforts have included not only a major educational program in the local schools, but active membership in the Chamber of Commerce, talks to local organizations, and even acceptance of the chair of the County Weed Control Board by the Preserve Manager. The preserve is open for hunting and fishing, and the policy of permission based on "first come, first on" gives the greatest opportunity to local sportsmen. The decision to continue grazing and haying leases has been partly based on the desire to integrate the preserve with the local ranching community. Finally, as
at all its preserves, TNC pays all local taxes even though its non-profit status technically exempts it from doing so.

Having learned from the Pine Butte experience, the Montana Field Office has placed greater emphasis on local support in designing and managing its newer preserves. One major reflection of this approach is the emphasis in all management plans but one (Swan River Oxbow) on accessibility and especially on using the preserve for educational and research activities. The Stewardship Plan for Dancing Prairie emphatically states, "We would like the preserve to serve as an environmental education classroom" for local primary and secondary schools and offers the possibility of field trips and nature walks "as time and volunteer commitment allow." The preserve is closed only during grouse breeding season (15 March to 15 June). One of the objectives of establishing a working group to survey and evaluate grouse requirements and possible habitat is the desire to involve local people in this program.

Since Safe Harbor Marsh does not contain any critical elements, a major thrust of the management of this preserve involves visitor access and community interaction. The Site Basic Record suggests the preserve provides a place for the "local population" to use for educational and recreational purposes and offers "another exploration site for visitors to the area." At Meeteetse Spires Preserve, the location of the critical elements has enabled the Conservancy to recommend enhanced accessibility to the preserve and the ACEC. MTFO has no objection to the idea of putting a trail through the ACEC
for access to Forest Service land and has, in fact, encouraged the BLM to install a small parking area and visitor kiosk.

**Financial Constraints**

Another category of "non-ecological" influences on the management of preserves is covered by the umbrella term "financial constraints." Exactly how financial considerations impinge upon management planning and operations is difficult to assess. In large part, planning is done within the parameters of known available dollars, so there is rarely a quantifiable "shortfall." Moreover, the management of existing preserves is not so constrained by financial considerations as one might expect. TNC policy is that Field Offices' development projects for preserve acquisition must factor in 20 percent of the purchase price for continuing stewardship costs. This money goes to an endowment trust from which preserve funding is drawn.

Nevertheless, if one translates "financial limitations" into "lack of time"--or to put it another way, "insufficient number of qualified people"--the impact of this factor becomes more obvious both in preserve management and even more in other areas of stewardship responsibility. In this sense the most obvious effect on existing preserves in Montana is the lack of management plans for Crown Butte and Meeteetse Spires. In both cases, while circumstances reduce the impact of this neglect, with funds to hire staff or contract these projects the documents would be useful. The inability formally to
evaluate each preserve with an annual site stewardship summary is another consequence of limited funds. The lack of any progress toward converting the objective of encouraging visitor access into available programs or information which might best balance public use and support with minimal impact on preserve components is not critical at the moment. However, increasing public interest in these properties may create problems. The preserve manager at Pine Butte Swamp--the most "visible" preserve--already spends a great deal of his time on visitor control (Carr pers. comm.).

There are other implications of financial limitations as well. One factor in the decision to continue livestock grazing at Pine Butte has been and undoubtedly will continue to be the revenue it generates for the Preserve. The inability to secure funding has delayed several proposed monitoring projects. Studies on the role of fire at Crown Butte and Dancing Prairie have been delayed indefinitely due to lack of time (read "funds"), as has the development of a controlled burn plan at Crown Butte.

A reverse way to look at the influence of financial considerations on preserve stewardship is to consider what has been accomplished in the past two years with the infusion of grant money. This list includes the research for and preparation of 15 ESAs for critical elements, the establishment of on-going monitoring projects for 15 elements at 4 sites, the completion of a pollution study on Silene spaldingii, and the initiation of 2 large-scale monitoring programs which encompass ecological processes and conditions at several
locations. Without outside funding, these projects would not have been possible at this time.
Chapter 5

THE EFFECTIVENESS OF TNC STEWARDSHIP IN MONTANA

Stewardship is fundamental to the preservation of natural diversity. It is, however, the most difficult of the Conservancy's functions to evaluate. Some of what it does cannot be quantified, and much of what is measurable may take years to come to fruition, if it ever does. This difficulty in measuring stewardship tasks may be one reason why TNC has tended to concentrate on the other objectives: development, identification, and protection. The former State Director recalled that in his first years in Montana the emphasis was all on "acres and dollars," because these were quantities one could measure and compare (Kiesling pers. comm.). Reflecting the trend throughout the Conservancy nationally, for example, "management plans" remained largely collections of species lists well into the 1980's. Stewardship was perceived as defending the land rather than actively managing the components of the ecosystem of which the preserve was a part (Humke pers. comm.). The lack of a Land Steward/Director of Stewardship during much of this period also contributed to the limited stewardship advances made within Montana. The Field Office accomplished a great deal in this period, but its consequences--and its objectives also--fell more in the area of
good relations and groundwork than on stewardship *per se*. 

Nevertheless, the groundwork was being laid which provided the foundation for a significantly enhanced stewardship program that would begin in the mid-1980's.

**Selection and Design**

In the ways it selects and designs preserves, the Montana Field Office has come a long way from the period when, by its own admission, it "opportunistically pursued protection priorities set by federal and state agencies in cooperative projects not tightly tied to natural diversity goals." (MTFO 1986) Since publication of the Preserve Selection and Design Manual (January 1987), MTFO has followed the intent, if not always the precise letter, of national guidance. Continuing to work with government agencies and other private and non-profit organizations, the Conservancy has based these efforts more firmly on criteria linked to the maintenance of biological diversity. While identification of current and potential preserves has not always come from the Heritage Program, decisions are based largely on Element- and EO-rankings provided by TNC biological database systems.

In most cases, however, preserve acquisition to date has been largely opportunistic. The Field Office more often has reacted to circumstances than initiated developments. It was, for example, the landowner who initiated the process by which Swan River Oxbow became a preserve. Similarly, although the Conservancy had been
aware of the unusual character of the marsh north of Polson, the owners' desire to sell was not generated by impetus from Helena. The fact that the preserve design for Safe Harbor Marsh was completed after acquisition suggests the reactive nature of this project. The same can be said of Dancing Prairie.

On the other hand, the alacrity with which BSFO elected to take advantage of these opportunities demonstrates their awareness of the importance of the sites. In the case of Dancing Prairie, it also illustrates the value of the element classification and EO-ranking systems, for these criteria provided justification for acquisition. In contrast, purchase of Safe Harbor Marsh—which does not have specific elements—demonstrates the system's flexibility to accommodate non-specific but clearly ecologically valuable properties.

Nor have all acquisition projects been initiated by external events. Peter Lesica's excitement over the unique combination of species and plant communities convinced the Protection Planner to initiate contacts with landowners in the Meeteetse Spires area (Bird pers. comm.). The number of letters now on file attest to the vigor with which the Field Office has pursued this project. The existence of twelve completed preserve designs and the contacts MTFO staff have established with appropriate landowners in each case indicate an increasingly assertive posture.

Four major preserves have been acquired since publication of the Preserve Selection and Design Manual: Dancing Prairie, Meeteetse Spires, Safe Harbor Marsh, and Swan River Oxbow. While the
"standard" sequence and number of documents leading up to a stewardship plan have not been competed in every instance, there is ample evidence to indicate that selection and design (whenever it has come) have been based on the best information available at the time and that this information was adequate for the decision. Preserve designs have been comprehensive and detailed. Each has addressed the essential issues national guidance requires: selection of primary and optimal boundaries based on ecological needs; identification of elements (as well as extensive inventories of plant, although not always of animal, species); indications of existing and potential threats to elements and to preserves; and suggestions on stewardship needs--including recommendations for collection of additional information.

For the two earliest preserves--Crown Butte and Pine Butte Swamp--the selection and "design" processes differed. Although the Conservancy did not conduct a formal biological evaluation prior to acquisition of Crown Butte, the Field Office had been working with the Bureau (now Department) of State Lands for several years and had copies of geological, ornithological and vegetative studies conducted throughout the 1970's as well as a copy of the "Proposed Master Plan for Crown Butte State Natural Area" prepared by the Bureau of State Lands. From an ecological perspective, the Conservancy was well informed on the value of this site. Crown Butte had the additional, if non-ecological, advantage of being available at a time when the Conservancy was seeking a glamorous focal point upon which to launch its Centennial Project. Minutes of a Board of Directors meeting
(November 7, 1987) suggest this was not an insignificant consideration: "TNC nationally and state-by-state has learned that it is easier to market the work of The Nature Conservancy by leading with glamorous projects. . . ." Underscoring the role of public relations in the general selection process was the comment that one purpose of the Centennial Project was "to find some biological treasure in each geographical region [emphasis added] in Montana."

Initial selection and design of Pine Butte Swamp Preserve were less systematic and less complete in the extent of scientific information available. In this sense, it was the epitome of the successful opportunitism which characterized early Conservancy operations in Montana. Pine Butte also exemplifies the dynamic nature of preserve design--and subsequent management. Acquired primarily for grizzly bear habitat, it has proven over time to harbor numerous other elements and unusual plant communities. Despite the absence of a formal evaluation via full field surveys, site stewardship summaries and preserve design package, a great deal of thought and planning went into determining the future look of the preserve. A map encompassing the projected boundaries was competed in 1979, the year of initial acquisition. Moreover, a considerable number of species lists, field inspections, and general surveys--particularly of the swamp--were done, some of them before acquisition began. The first formal evaluation of the prairie uplands, with recommendations for management, was completed in the fall of 1979. Peter Lesica
conducted the first extensive vegetative inventory of the swamp in 1982.

**Preserve Management: Planning**

In contrast to the uniform completeness of the several preserve design packages, management plans for the six major preserves vary in format and, more importantly, in completeness. Nevertheless, if one includes all the preparation and paperwork leading up to formal management plans, it is clear MTFO has a good sense of what needs to be done on its preserves. It also recognizes both ecological and non-ecological considerations which may, and do, influence the existence and functioning of the preserves' ecosystems and their components and which therefore require management attention. While differing somewhat in format—a matter of style rather than substance—the management plans for Dancing Prairie and Swan River Oxbow are the most comprehensive in their descriptions of the preserve and its biotic and abiotic components and in their directives for management actions. Additionally, both are complemented by a detailed monitoring plan.

Pine Butte Swamp is the only preserve which is now in its second management plan. It took eight years after acquisition began to develop the first stewardship plan. In part this lapse reflected the Nature Conservancy's earlier *laissez faire* approach to preserve management, which often consisted of little more than species lists, maps, and perhaps a site stewardship summary. Personnel limitations
within the Field Office also reduced the time available for this project. A third factor was probably the frequent turnover of managers between 1981 and 1985, during which time there were three different managers as well as a period of almost a year when there was no resident manager. Both of the plans which have been implemented at Pine Butte have been a mixture of scientific information and management prescriptions. Yet in both the information tends to overwhelm the prescriptions. These plans have been more ambitious than those of other preserves and less successful in meeting their targets. This has been in large measure due to the greater ecological complexity of Pine Butte Swamp Preserve. It also reflects a two year period during which personnel difficulties resulted in a lack of focus and ultimately led to selection of a new management team (the fourth in eight years).

Crown Butte and Meeteetse Spires still lack preserve management plans, and the plan for Safe Harbor Marsh is incomplete. The circumstances reflect both ecological and non-ecological considerations. Crown Butte requires the least active management. This condition, combined with the more pressing stewardship responsibilities at other preserves, has relegated preparation of a management plan to the "nice to have" category. During its first several years, however, when active measures had to be taken, BSFO did complete and to a large extent execute Site Stewardship Summaries. Additionally, the preserve is visually monitored at least once a year.
Meeteetse Spires contains more items of biological interest than Crown Butte, including specific critical elements. Nevertheless, the generally remote location of the site, the absence of immediate threats, and the isolated position of the most critical EOs reduce the requirement for immediate preparation of a management plan. From an administrative standpoint, moreover, until the uncertainty regarding the disputed tract is clarified, TNC has no land to manage, the "preserve" consisting for the moment of a single registry agreement.

From an ecological perspective, Safe Harbor Marsh requires active management and hence merits a completed management plan and an accompanying monitoring plan. In this case, non-ecological considerations have taken precedence. The Field Office has had to balance the desire to collect ecological information quickly against the objective of establishing a cooperative relationship with the Confederated Salish and Kootenai Tribes. The latter may provide great benefits over the long term not only for this preserve but also for conservation efforts throughout the Flathead Reservation. In turn, success in this endeavor may provide the model for similar arrangements with other tribes throughout the state. Moreover, the draft plan is "incomplete" only in the sense that it has not been fleshed out and is not accompanied by a monitoring plan. It does delineate the overall objective, describe the site, and identify major stewardship concerns, including noxious plants, natural hazards, hydrologic uncertainties, and on- and off-site threats to wildlife. It
also includes—in outline form but clearly highlighting what needs to be done and why—specific stewardship objectives, the management actions necessary to achieve these objectives to the extent those actions can be identified, and the types of monitoring required to provide data for more precise prescriptions and to evaluate the effectiveness of management actions.

**Preserve Management: Implementation**

Collectively, the preserve management plans as well as the preserve designs are "active documents," prescriptive rather than merely descriptive. They reflect a philosophy that effective stewardship often requires "hands on" management. They set forth objectives (both preserve-wide and element-specific as appropriate), identify required actions, and for the most part lay out how and when these actions will be carried out. This "hands on" philosophy continues into the implementation of the plans, into the actual operation of the preserves. The use of prescribed burning to restore vigor in grassland communities at Dancing Prairie and Pine Butte, the rapid fencing of primary boundaries at Dancing Prairie, the attempt to reduce reed canarygrass at Swan River Oxbow, and the efforts to establish water rights exemplify this active management approach.

Although much of the stewardship effort in Montana has been directed toward plant species and communities, several of MTFO's most active projects pertain to animals. At Pine Butte, maintaining "productive habitat for the grizzly bear" has included planting trees
and shrubs to increase forage, allowing the placement of carcasses on
the preserve for early spring carrion, and implementing a "travel plan"
to reduce human disturbance. The Montana Field Office initiated
planning and implementation of the program to release Columbian
sharp-tailed grouse into the Tobacco Valley and is a member of the
technical committee investigating additional habitat within the
Tobacco Valley.

Management activity has not been a case of action for action's
sake. There is a strong sense of caution running through the
stewardship program and a clear intention to base decisions on the
best scientific information. Assessment of the impact of fire on *Silene*
prior to initiating a major prescribed burn program at Dancing Prairie
is one reflection of this. So, too, is the reluctance to spray Canada
thistle because of its proximity to parts of the swamp at Pine Butte and
the shift in the leafy spurge control program to a more limited level at
that same location. A major purpose of the extensive monitoring
program across the preserves is to gather better information upon
which to make more effective stewardship decisions. In that sense,
even what might appear to be relatively "passive" activities--the
collection of information through monitoring and the preparation of
ESAs--are active in that their objectives include more effective
management prescriptions where appropriate.

On the other hand, BSFO has not always met the national
requirement for preparing an annual Site Stewardship Summary for
each preserve, and there is no evidence either regional or national
offices much care. This lapse does not seem particularly important at the present time given the small number of preserves and the ongoing work which is routinely done on them. Staff and qualified volunteers are around the areas enough to evaluate conditions generally and in many cases are actively monitoring the critical aspects. As operations continue to expand and attention is subjected to more and more diversions, establishment of annual completion of site stewardship summaries may become more important.

**Preserve Management: Monitoring**

One of the most impressive aspects of MTFO's stewardship program is the ecological monitoring which has been initiated, planned, or at the least identified as necessary for effective element and preserve management. Collectively, the MTFO monitoring program encompasses three objectives: (1) Expanding knowledge about specific elements from which to prepare Element Stewardship Abstracts and to develop the most appropriate management prescriptions; (2) Establishing baselines which will provide an accurate assessment of current conditions and offer standards against which subsequent data can be compared; (3) Evaluating the effectiveness of treatments and management prescriptions.

The drafting of ESAs in 1990 for 15 of the 32 elements ranked S2 and above and the projected completion of this project in 1991 are evidence of the efforts being made to understand the elements under the Conservancy's stewardship. The transects for monitoring
composition and frequency set up in 1989 and scheduled to run for 4 years at Dancing Prairie, Pine Butte Swamp, Swan River Oxbow and the easements at Whitefish Spruce Swamp will provide baseline data for trend comparison. For Safe Harbor Marsh, where activity is on hold pending the cooperative agreement, the draft management plan calls for aerial photography at 5 year intervals to map habitat expansion or contraction, mapping of exotic plant infestations and collection of quantifiable data preparatory to designing and implementing a weed control program, and the continuation of the annual breeding bird census.

Monitoring programs have been established to evaluate specific management actions. The experimental burns scheduled for the fall of 1991 at Dancing Prairie, for example, will be assessed for their impact on reducing grassland litter buildup and on improving the vigor of the grass communities as well as for their effect on *Silene spaldingii*. This particular situation offers an interesting example of the value of a nation-wide database system. The presence of some 10,000 *Silene* plants at this location allows the Conservancy to conduct an experimental burn with unknown results--results which can then be available for *Silene* management elsewhere.

Those monitoring projects which have been implemented are characterized by a clear explanation of their objectives, detailed procedures for conducting them, and specific schedules for execution. Each of the study plans for the fifteen elements funded by special grant money in 1990, for example, includes detailed descriptions of
the transects (along with maps, aerial photos, ground photos, and drawings of the target species), precise instructions on how to conduct the survey and what data to collect, and a discussion of the appropriate analysis methods.

Preserve Management: Ecological & Non-Ecological Factors

In both its prescriptions and its monitoring programs, MTFO evidences a sense of awareness of both the ecological and the non-ecological factors which may impinge upon the maintenance of natural diversity. At the same time, the lack of action in some areas as well as the nature and purposes of many of the monitoring projects underscore some of the limitations of attempting to manage for biodiversity. The very fact that a large percentage of monitoring activity is directed at learning what one needs to know before one can initiate effective management suggests the gaps in current scientific knowledge and at least hint at the time which may be required to fill in these gaps. The Director of Stewardship admitted a major impetus behind his emphasis on monitoring was that, "It's almost scary the places we protect and don't know what's happening" (Hall pers. comm.).

A related issue is the question of what steps the Conservancy might take to prevent or alleviate the impact of off-site developments which might affect a preserve. An awareness of adverse trends such as reduced waterflow, increased air pollution, disease, or insect infestation may provide a warning which cannot be acted upon. On the
other hand, there are steps the Conservancy can take—and in some cases has taken—to influence these potential intrusions. One such recourse which should not be overlooked is persuasion. Discussions with the Forest Service, as for example at Swan River Oxbow, or with mineral developers as at Pine Butte, or even with private landowners may influence decisions or affect the manner in which they are implemented. A second approach is the use of cooperative agreements with neighboring landowners and land managers. These might take the form of joint efforts like that with the BLM at Meteetse Spires, conservation easements or registrations with private landholders, or cooperative management agreements that lay the groundwork for more extended cooperation such as the effort at Safe Harbor Marsh.

A third course of action is to focus, where possible, on more extensive areas since large preserves generally are better able to bear up under external impingements. MTFO is making efforts in this regard as well. Of the 12 designs completed for identified potential preserves, 3 are between 1,300 and 1,600 acres, and 2 others encompass more than 12,000 acres each. The projects envisioned by the Watershed Protection initiative probably will not encompass entire ecosystems, but the strategy of combining acquisition with assistance to other landowners represents yet another approach to enlarging defensive perimeters.

Underlying so many aspects of preserve selection, design and management that it is difficult to address separately is the issue of
financial constraints. It seems fair to say that, while the objectives and processes of the Conservancy—and especially of its ecological functions—are science-driven, what actually gets done is financially-determined. National guidance itself reminds staff members, "What we are after is the most protection at the least cost" (TNC 1987). The requirement to include long-term stewardship costs when evaluating potential preserves and determining total costs is a recognition that managing for natural diversity is an expensive undertaking. The requirement that Field Offices come up with the money necessary for acquisition and management of potential preserves ensures they consider carefully which sites are most critical. On the other hand, this policy also imposes limitations in a "development-poor" state such as Montana.

In terms of the management of TNC-properties and assistance in the proper stewardship of critical elements on non-TNC properties, financial limitations often have a greater impact on operations than acquisition. And the operations most likely to be affected are those directed at non-preserve activities. The inability to monitor conservation easements and registry sites on a more frequent basis, the delay in undertaking monitoring studies, the lack of material related to preserve access and use, and the absence of formal involvement in non-TNC properties all reflect the inhibitions imposed by financial limitations. Admittedly, it is difficult to state flatly that financial shortages are the sole reason for what does not get done. On the other hand, MTFO has demonstrated a clear understanding of the
requirements and responsibilities for management of its properties as well as a sense of prioritization in trying to complete identified tasks and to achieve designated objectives. It seems reasonable, therefore, to assume they would do more if they had additional resources.

Preserving natural diversity is a complex undertaking in which management is only one—albeit a critical one—of the component processes. The experience of the Nature Conservancy in Montana suggests that the preservation of natural diversity requires an understanding of ecological and non-ecological factors, approaches to offset or to take advantage of these factors, development of a firm scientific base upon which to make management decisions, and the ability to prioritize one's efforts to meet a range of objectives both at the state and the preserve levels.
Chapter 6

LITERATURE REVIEW

There is a large body of work dating from the early 1970's which addresses critical issues in the design of nature preserves. Initially much of this literature dealt with the applicability of island biogeographic theory and species-area relationships (MacArthur and Wilson 1967) to continental nature reserves. Several researchers (especially Diamond 1975, Diamond 1976, Diamond and May 1976, Terborgh 1974 and 1976, Wilson and Willis 1975, Whitcomb et al. 1976, and Picton 1979) sought to apply this theory to provide principles for the proper size and shape of nature preserves. In general, these individuals concluded that island biogeography theory combined with the concept of species-area relationship dictated: (1) one large preserve would retain more total species than several smaller ones of the same total area; (2) reserves should be as circular as possible to reduce edge effect and maximize interior movement; and (3) reserves should be located as closely together as possible to similar reserves to enhance the opportunity for immigration and refreshing of gene pools.

Game (1980) and others (Blouin and Connor 1985, Pickett and Thompson 1978, Higgs 1981) argued island biogeography theory could lead to a variety of sometimes conflicting designs. More broadly,
other ecologists questioned the applicability of island biogeography to continental nature preserves (Simberloff and Abele 1976 and 1982, Abele and Conner 1979, Gilbert 1980, Margulis et al. 1982). Much of this earlier literature does not pertain directly to TNC preserves because the objective for reserve design was usually to maximize the number of species in any given reserve, in contrast to the Conservancy's premise of designing a preserve around designated species or communities.

Similarly, a great deal of the literature on how best to select sites for preservation takes a different tack from the Conservancy's element-oriented approach, focusing instead on the evaluation of areas. This process was well underway in Great Britain in the early 1970's and included methods proposed by Tubbs and Blackwood (1971), Helliwell (1973), Goldsmith (1975), and Gehlbach (1975). Each of these methods involved weighting of various qualities, with ecological significance of a potential site the primary consideration. Wright (1977) offered a more comprehensive perspective by placing relatively greater weight on non-biological (i.e., social, political and financial) considerations.

In the United States, Adamus and Clough (1978) reviewed the criteria most often employed for selection of natural area preserves and argued the advantages of focusing first on rare and endangered species and unique plant communities rather than simply broad natural areas. This approach had already been adopted by The Nature Conservancy (Jenkins 1976, Bourgeron 1986, Genter 1986). In a
review and assessment of nine methodologies for assessing preservation potential of species and/or ecosystems, Margulis and Usher (1981) stressed the attention placed on five criteria: diversity of species and habitat, species rarity, naturalness, size and location, and threat of human influence. Slatyer (1975) suggested the validity of two kinds of reserves: representative and unique, noting each played different roles. Wilcox and Murphy (1985) argued what is of greatest importance is not how much is being preserved but what--reinforcing the importance of a species- or community-specific approach. Recently, Noos (1983a, 1983b, 1987) has argued for selection and management based on broad landscape considerations in addition to species and ecosystems.

A major related issue--and one which TNC has only begun to address explicitly with its broader focus on ecosystems--is whether the object of preservation efforts should be, as Westman (1990) phrased it, "ecosystem structures" (species composition and community physiognomy) or "ecosystem functions" (ecological processes and their rates). Frankel (in Schonewald-Cox 1983) at one point suggested decisions on species versus ecosystems must be made on a case-by-case basis. In another article on the genetic aspects of conservation, he concluded the ecosystem must be "the real target of conservation." Norton (1986) emphatically stated habitat (ecosystem) preservation is more important than species preservation because the former serves more purposes.
The old debate over the optimal size of nature reserves tended to center on the issue of whether one large or several smaller reserves of similar total area best preserved the maximum number of species. There is now general agreement that larger preserves provide more protection than smaller ones, but this observation is more frequently raised in relation to the buffering protection which size provides from external impingement. Specifically disagreeing with the "single large over several small" argument, Quinn (1985) nevertheless accepted that "the value of larger parks is certainly justified" on the basis of the added buffer they provide. At the 1987 Montana Natural Areas Conference Simberloff (1987) argued in favor of large areas because they provide more opportunities for successful management. Soule (1986), addressing the effects of fragmentation, suggested reduction in size increases vulnerability to external pressures while warning that "dorsal" effects (impacts from agents in, of and through the atmosphere) will become increasingly significant.

In simulation trials for assessing conservation reserve design, Rapoport et al. (1986) concluded "the spatial distribution of species" is more important than any geometrical configuration. Wilcove, McLellan and Dobson (1986) stressed habitat heterogeneity is more important than size alone, but argued for making preserves as large as possible to defend against the "constant encroachment" which will come over time. Helliwell (1976) noted there were advantages to both large and small preserves, but concluded areas with high habitat diversity are more valuable than sites with uniformity.
The literature which addresses primarily preserve management focuses on several themes, about which there is a significant level of agreement. Because many of the authors cited below have dealt with several of these themes in a single article and also because the themes are expressed in related literature touching on preserve management, it is useful to summarize these themes before referring to specific works.

The first of these themes is that today's world requires active management of nature reserves. The era of "acquire and forget"--if there ever was one--is definitely over. This philosophy is best expressed by Wilcove, et al. (1986): "Conservationists must realize that the battle is not over once the land has been saved. Indeed, it has just begun." Given this requirement for involvement, the logical follow-on is a clear understanding and articulation of the objective(s) toward which the reserve should be managed. Every recommendation for management planning lists this as the number one requirement. To the extent possible, management plans, prescriptions and decisions must be based on scientific information, which implies ongoing research efforts to fill in the many gaps in our knowledge of species, communities and ecosystems. At the same time, however, managers may have to act on the basis of incomplete information--although they must approach such decisions cautiously.

Another idea which is increasingly stressed is that management decisions must be species-specific; the older approach of looking at ecosystems as wholly integrated units is no longer sufficient. This, in
turn, ties back to the cry for more scientific knowledge, since those species which are most in need of protection are, by virtue of their rarity, often those about which we know the least. Finally, there is the nearly universal assumption that management cannot ignore the non-ecological considerations of protecting and managing nature reserves.

In one of the most comprehensive articles on this subject, Soule and Simberloff (1986) reflected this growing consensus that the primary factors involved in the acquisition and management of land for the preservation of species or ecosystems are: (1) a clear understanding of the objective to be achieved at a given preserve, (2) the specific biological and ecological characteristics of the target ecosystem or species, (3) the location of potential preserves (including the external environment and the possible influences which might be placed upon the preserve), and (4) the financial, organizational and social costs of managing a given property.

Linn (1976), specifically addressing master planning for national parks, highlighted the first requirement as clearly stated objectives, followed by adequate information on the resources to be protected. Eidsvik (1977) defined the two critical factors in nature park planning as a systematic approach guided by definite objectives and sound judgments based on tested alternatives and information: "The data base is essential to the development of management plans." Slatyer (1975) suggested a three-tiered approach focusing on management of human activities, manipulation of vegetative structure and composition, and protection of viable populations of specific
organisms. As do others, he stressed the requirement to base management on scientific data.

White and Bratton (1980), observing the greatest threats to species and ecosystems today are "man-made changes and poor management," stressed that effective management requires a firm sense of objectives and priorities, clear policies on critical issues, and scientific research intended to provide information for managers. They listed common management problems and significant threats to both species and ecosystems within nature reserves. In another publication the same year (Bratton and White 1980), these authors postulated five essential phases for basic rare plant management: inventory, selection, monitoring, protection, and manipulation. In line with their emphasis on active management, they asserted managers may have to act on incomplete information, although they should be cautious in doing so.

According to Eagles (1984), the components of a management plan should include objective(s), biophysical inventory of the site as well as adjacent lands, determination of the human impact, delineation of management priorities, and the establishment of adequate "institutional arrangements" to carry out the plan. Millar and Ford (1988) also stressed the importance of having not only proper information but a functioning management structure which can put that knowledge to use.

The need to base management decisions on the most complete ecological information available—and to increase that knowledge—runs
through the literature. In particular, numerous authors have stressed the importance of species-specific information as the basis for management decisions. White (1979) argued the manager must know the reason for endangerment to be able to formulate a protection strategy—which implies a basic knowledge of species' biology.

Stressing the importance of "habitat considerations" over either size or configuration, Simberloff (1982) added that determination of what habitat to set aside requires "detailed ecological knowledge of individual species." Sceptical of the theoretical, mathematical models being developed for preserve design, Nisbet (1978) suggested, "One must understand fully the natural history, ecology, and behavior of the [specific] species and its critical requirements." The emphasis in the last decade on minimum population size (see, for example, Shaffer 1981, Samson 1983, Soule and Simberloff 1986, Shaffer and Samson 1985, Brossard 1985) reflects the growing focus on species-specific knowledge as a primary basis for preserve selection, design and management.

White (1981), noting "the single most important obstacle to assessing change is that baseline data is either lacking or ambiguous," outlined the steps necessary for an effective monitoring program. Davy and Jefferies (1981) also suggested different types of monitoring programs to assess species' status and to understand the structure and function of target populations. Hall (1984) agreed most nature reserves are insufficiently monitored for managers to really known what is happening on them; he too laid out monitoring methods to
remedy this. Arguing that biological and ecological knowledge will never be complete and some natural processes are inherently stochastic, Loucks (1985) suggested a different approach: managers should operate on the premise that "surprise will be a continuing part of reserve management."

Even while stressing the importance of research and resultant ecological data as the basis for management decisions, Pyle (1980) noted economic and "practical" considerations will always be part of the equation of management decision-making. Because it will not always be possible to wait for "all the data," management must be "a mixture of . . . common sense, intuitive decision and scientifically enlightened procedure." In one of the best overall books on the management of nature reserves, Norton (1986) also remarked on the "deplorable lack of specific knowledge" about biological and ecological aspects of many endangered species, but argued for action in the face of imperfect information: "The proper response . . . is to make use of the knowledge that is available, to seek aggressively that which is not, and to design current actions to do as little harm as possible." His management model would start with the objectives and priorities for their attainment and include a scientific description of the current situation (including, presumably, the threats), as well as laying out research efforts to obtain data needed for the pursuit of the stated objectives.

The importance of viewing each preserve as a unique situation with its own problems and optimal management approaches is pointed
up by several studies. Soule (1986) noted that from a management perspective each nature reserve will be somewhat different and thus "there can be no substitute for constant vigilance," while Janzen (1983) cautioned managers to be wary of trying to apply "lessons" from other preserves. Based on the importance of species-specific requirements, Simberloff (1982) was more forceful: "Beyond the literature on habitat requirements of given species and the observation that larger total areas contain more species, ecology can provide no general guidelines."

Managers do not have the luxury of focusing all their attention within reserve boundaries. Kushlan's (1979) excellent analysis of hydrologic changes in the Florida Everglades stressed both the significance of externally-imposed disruptions and the potential conflicts between target species and ecosystem preservation. Hooper (1971) also emphasized the importance of location in terms of influences from the external environment. As Janzen (1983) noted, "No habitat preserve is immune to the effects of human activity outside its borders. . . ." Wood (1983) stressed potentially conflicting land uses around the preserve may severely constrain management. Reflecting a keen sense of the social context within which nature reserve management must operate, he warned that plans must include "peripheral considerations"--"be they physical, or, more often, social"--as well as clearly stated objectives and priorities, prescriptions to achieve these objectives, identification of threats and methods for avoiding or ameliorating them, and allocation of resources. In one of
the most effective arguments in favor of a broad approach to design and management, Schonewald-Cox (1988) addressed the importance of determining proper boundaries and stressed, "Success in protecting nature reserves is affected by more than the ecological characteristics within reserves." Accordingly, efforts at nature protection should combine anthropogenic disciplines (e.g., law, economics and sociology) with biological ones.
## Appendix 1

### TNC ELEMENT RANKING SYSTEM

<table>
<thead>
<tr>
<th>GLOBAL RANK</th>
<th>DEFINITION</th>
</tr>
</thead>
<tbody>
<tr>
<td>G1</td>
<td>Critically imperiled globally because of extreme rarity (5 or fewer occurrences, or very few remaining individuals), or because of some factor in its biology making it especially vulnerable to extinction.</td>
</tr>
<tr>
<td>G2</td>
<td>Imperiled globally because of rarity (6 to 20 occurrences), or because of other factors demonstrably making it very vulnerable to extinction throughout its range.</td>
</tr>
<tr>
<td>G3</td>
<td>Either very rare and local throughout its range or found locally (even abundantly at some of its locations) in a restricted range, or vulnerable to extinction throughout its range because of other factors; in the range of 21 to 100 occurrences.</td>
</tr>
<tr>
<td>G4</td>
<td>Apparently secure globally, though it may be quite rare in parts of its range, especially at the periphery.</td>
</tr>
<tr>
<td>G5</td>
<td>Demonstrably secure globally, though it may be quite rare in parts of its range, especially at the periphery.</td>
</tr>
<tr>
<td>GU</td>
<td>Possibly in peril range-wide, but status uncertain; more information needed.</td>
</tr>
<tr>
<td>GH</td>
<td>Historically known; may be rediscovered.</td>
</tr>
<tr>
<td>GX</td>
<td>Believed to be extinct throughout range; historical records only; continue search.</td>
</tr>
<tr>
<td>HYB</td>
<td>Subfertile or sterile hyrid.</td>
</tr>
<tr>
<td>RANK</td>
<td>DEFINITION</td>
</tr>
<tr>
<td>------</td>
<td>------------</td>
</tr>
<tr>
<td>S1</td>
<td>Critically imperiled in Montana because of extreme rarity (5 or fewer occurrences, or very few remaining individuals), or because of some factor of its biology making it especially vulnerable to extirpation from the state.</td>
</tr>
<tr>
<td>S2</td>
<td>Imperiled in Montana because of rarity (6 to 20 occurrences) or because of some factor of its biology making it very vulnerable to extirpation from the state.</td>
</tr>
<tr>
<td>S3</td>
<td>Rare in Montana (on the order of 21+ occurrences).</td>
</tr>
<tr>
<td>S4</td>
<td>Apparently secure in Montana.</td>
</tr>
<tr>
<td>S5</td>
<td>Demonstrably secure in Montana.</td>
</tr>
<tr>
<td>SU</td>
<td>Possibly in peril in Montana, but status uncertain; more information needed.</td>
</tr>
<tr>
<td>SH</td>
<td>Historically known in Montana; may be rediscovered.</td>
</tr>
<tr>
<td>SX</td>
<td>Apparently extirpated from Montana.</td>
</tr>
<tr>
<td>HYB</td>
<td>Subfertile or sterile hybrid.</td>
</tr>
</tbody>
</table>

**Other Codes**

<table>
<thead>
<tr>
<th>CODE</th>
<th>DEFINITION</th>
</tr>
</thead>
<tbody>
<tr>
<td>Q</td>
<td>Taxonomic questions or problems involved; more information needed; appended to global rank.</td>
</tr>
<tr>
<td>T</td>
<td>Rank for a subspecific taxon (subspecies or variety); appended to global rank for full species.</td>
</tr>
</tbody>
</table>
1. Dancing Prairie
2. Safe Harbor Marsh
3. Swan River Oxbow
4. Pine Butte Swamp
5. Crown Butte
6. Meeteetse Spires

MAJOR TNC PRESERVES IN MONTANA
# Appendix 3

## MONTANA NATURE CONSERVANCY

### PRESERVES

<table>
<thead>
<tr>
<th>Preserve Name</th>
<th>Acres</th>
<th>Protected Elements</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Crown Butte</td>
<td>376</td>
<td>Pristine Native Prairie</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Geologic Formation</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Raptor Nesting</td>
</tr>
<tr>
<td>2. Dancing Prairie</td>
<td>680</td>
<td>Spalding’s Catchfly</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Palouse Prairie Grassland</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Columbian Sharp-tailed Grouse</td>
</tr>
<tr>
<td>3. Meeteetse Spires</td>
<td>320</td>
<td>Shoshonea</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Spoon-leaved Easter Daisy</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Torrey’s Bitterweed</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Mountain Ninebark</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Northern Rocky Mountain</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Limestone Community</td>
</tr>
<tr>
<td>4. Pine Butte Swamp</td>
<td>13,183</td>
<td>Grizzly Bear</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Rare Plants</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Native Foothills Prairie</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Fen Swamp</td>
</tr>
<tr>
<td>5. Safe Harbor Marsh</td>
<td>132</td>
<td>Freshwater Pocket Marsh</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Exceptional Breeding Bird Diversity</td>
</tr>
<tr>
<td>6. Swan River Oxbow</td>
<td>392</td>
<td>Rare Plants and Lichens</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Grizzly Bear</td>
</tr>
<tr>
<td>7. Blackfoot (Sullivan)</td>
<td>6</td>
<td>Riparian Community</td>
</tr>
<tr>
<td>8. Lindberg Lake Pines</td>
<td>40</td>
<td></td>
</tr>
</tbody>
</table>
Appendix 4

MONTANA NATURE CONSERVANCY
CONSERVATION EASEMENTS

<table>
<thead>
<tr>
<th>Project Name</th>
<th>Acres</th>
<th>Element(s) Protected</th>
</tr>
</thead>
<tbody>
<tr>
<td>Blackfoot River Corridor</td>
<td>8915</td>
<td>Riparian Communities, Bald Eagle, Howell's Gumweed</td>
</tr>
<tr>
<td>15 tracts</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Eagle Creek</td>
<td>77</td>
<td>Elk &amp; Bear Migration</td>
</tr>
<tr>
<td>Egan Slough</td>
<td>160</td>
<td>Rare Aquatic Plants</td>
</tr>
<tr>
<td>Loon Lake</td>
<td>520</td>
<td>Common Loon, Marl Fen, Northern Bastard Toadflax</td>
</tr>
<tr>
<td>Nine Quarter Circle</td>
<td>200</td>
<td>Grizzly Bear</td>
</tr>
<tr>
<td>Pine Butte Easements</td>
<td>2,509</td>
<td>Grizzly Bear, Fen, Foothills Prairie</td>
</tr>
<tr>
<td>3 tracts</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Rock Point Ranch</td>
<td>840</td>
<td>Spring Creek, Great Blue Heron</td>
</tr>
<tr>
<td>Sargent Ranch</td>
<td>1,960</td>
<td>Grizzly Bear</td>
</tr>
<tr>
<td>Siebel Ranch</td>
<td>1,050</td>
<td>Bald Eagle</td>
</tr>
<tr>
<td>Shining Mountain Ranch</td>
<td>2,190</td>
<td>Elk Winter Range</td>
</tr>
<tr>
<td>Toussaint Ranch</td>
<td>520</td>
<td>Elk Range, Sandhill Crane</td>
</tr>
<tr>
<td>Conrad Point</td>
<td>77</td>
<td>Open Space</td>
</tr>
<tr>
<td>Lion Head Ranch</td>
<td>3,050</td>
<td>Falcon/Hawk Eyrie</td>
</tr>
<tr>
<td>Rumble Creek</td>
<td>90</td>
<td>Spruce/Fir Forest, Grizzly Bear Migration</td>
</tr>
<tr>
<td>Boulder River Delta</td>
<td>90</td>
<td>Riparian Communities, Bald Eagles</td>
</tr>
<tr>
<td>Whitefish Spruce Swamp</td>
<td>140</td>
<td>Rare Plants, LeConte's Sparrow Habitat, Spruce/Skunk Cabbage Community</td>
</tr>
<tr>
<td>2 tracts</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>


<table>
<thead>
<tr>
<th></th>
<th>Location</th>
<th>Acres</th>
<th>Species and Characteristics</th>
</tr>
</thead>
<tbody>
<tr>
<td>17.</td>
<td>B Bar Ranch</td>
<td>120</td>
<td>Grizzly Bear Habitat</td>
</tr>
<tr>
<td>18.</td>
<td>Gallatin River</td>
<td>68</td>
<td>Riparian Community River Corridor</td>
</tr>
<tr>
<td>19.</td>
<td>Spanish Peaks</td>
<td>107,120</td>
<td>Grizzly Bear; Rare Plants Critical Wildlife Range Riparian Communities</td>
</tr>
<tr>
<td>20.</td>
<td>Sixteenmile Creek</td>
<td>21,245</td>
<td>Critical Wildlife Range Riparian Communities</td>
</tr>
<tr>
<td>21.</td>
<td>Lone Tree Lake</td>
<td>280</td>
<td>Pothole Prairie Rare Plants Piping Plover</td>
</tr>
<tr>
<td>22.</td>
<td>Copper Gulch</td>
<td>107</td>
<td>Grizzly Bear Riparian Community</td>
</tr>
</tbody>
</table>
## Appendix 5

### MONTANA NATURE CONSERVANCY  
**REGISTRY SITES**

<table>
<thead>
<tr>
<th>Project Name</th>
<th>Acres</th>
<th>Element(s) Protected</th>
</tr>
</thead>
<tbody>
<tr>
<td>American Fork Meadows</td>
<td>100</td>
<td>Heart-leaved Buttercup</td>
</tr>
<tr>
<td>Black Bear Ranch</td>
<td>10</td>
<td>Spalding's Catchfly</td>
</tr>
<tr>
<td>Charley's Gulch</td>
<td>240</td>
<td>Sapphire Rockcress</td>
</tr>
<tr>
<td>Cromwell Island</td>
<td>264</td>
<td>Columbia River Crazyweed</td>
</tr>
<tr>
<td>Crystal Creek Bog</td>
<td>67</td>
<td>Poor Sedge; Bog Community</td>
</tr>
<tr>
<td>Egan Slough</td>
<td>309</td>
<td>Water Star-Grass; Water Clubrush; Pygmy Water Lily;</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Columbia Water Meal</td>
</tr>
<tr>
<td>Galloway's Lake</td>
<td>80</td>
<td>Piping Plover</td>
</tr>
<tr>
<td>Island Lake</td>
<td>50</td>
<td>Spurred Gentian</td>
</tr>
<tr>
<td>Kraft Creek Pond</td>
<td>78</td>
<td>Water Howellia</td>
</tr>
<tr>
<td>Manzanita Ridge</td>
<td>3</td>
<td>Green-leaved manzanita</td>
</tr>
<tr>
<td>Nimrod Warm Springs</td>
<td>2</td>
<td>Giant Helleborine; Foxtail Warm Springs</td>
</tr>
<tr>
<td>Retriever's Slough</td>
<td>30</td>
<td>Toothcup</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Columbia Water Meal</td>
</tr>
<tr>
<td>Ripple Mark Prairie</td>
<td>1,880</td>
<td>Douglas' onion; Dwarf Wooly-heads; Geological Significance</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Sinkhole Slough</td>
<td>120</td>
<td>Water Star-Grass; Short-pointed Sedge</td>
</tr>
<tr>
<td>Swan River Bench</td>
<td>4</td>
<td>Water Howellia</td>
</tr>
<tr>
<td>T Bench Ranch</td>
<td>5,620</td>
<td>Mountain Plover</td>
</tr>
<tr>
<td></td>
<td><strong>Whitefish Spruce Swamp</strong></td>
<td>146</td>
</tr>
<tr>
<td>---</td>
<td>--------------------------</td>
<td>-----</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>17</td>
<td></td>
<td></td>
</tr>
<tr>
<td>18</td>
<td><strong>Wildhorse Island</strong></td>
<td>6</td>
</tr>
<tr>
<td>19</td>
<td><strong>Meeteetse Spires (Towe)</strong></td>
<td>550</td>
</tr>
<tr>
<td>20</td>
<td><strong>Primm's Meadows</strong></td>
<td>80</td>
</tr>
<tr>
<td>21</td>
<td><strong>Rosebud Eagle Territory</strong></td>
<td>280</td>
</tr>
<tr>
<td>22</td>
<td><strong>Tabor Mountain</strong></td>
<td>80</td>
</tr>
</tbody>
</table>
## Appendix 6

### MONTANA NATURE CONSERVANCY
#### CO-OPERATIVE PROJECTS

<table>
<thead>
<tr>
<th>Project Name</th>
<th>Acres</th>
<th>Present Manager</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Beartooth Game Range</td>
<td>26,000</td>
<td>MT Dept of Fish, Wildlife and Parks (MDFWP)</td>
</tr>
<tr>
<td>2. Greycliffe Prairie Dog Town</td>
<td>98</td>
<td>MDFWP</td>
</tr>
<tr>
<td>3. Wildhorse Island</td>
<td>2,200</td>
<td>MDFWP</td>
</tr>
<tr>
<td>4. Mt. Haggin Game Range</td>
<td>79,000</td>
<td>MDFWP</td>
</tr>
<tr>
<td>5. Nevada Lake Elk Range</td>
<td>636</td>
<td>MDFWP</td>
</tr>
<tr>
<td>6. Poindexter Slough</td>
<td>430</td>
<td>MDFWP</td>
</tr>
<tr>
<td>7. TBM Ranch</td>
<td>1,250</td>
<td>MDFWP</td>
</tr>
<tr>
<td>8. Diastole Ranch</td>
<td>80</td>
<td>MDFWP</td>
</tr>
<tr>
<td>9. Lubrecht Forest</td>
<td>712</td>
<td>University of Montana</td>
</tr>
<tr>
<td>10. Goodrich Ranch</td>
<td>3,677</td>
<td>U.S. Forest Service (USFS)</td>
</tr>
<tr>
<td>11. Crazy Mountains</td>
<td>4,573</td>
<td>USFS</td>
</tr>
<tr>
<td>12. Bandy Ranch</td>
<td>1,233</td>
<td>USFS</td>
</tr>
<tr>
<td>13. NorthFork Flathead</td>
<td>60</td>
<td>USFS</td>
</tr>
<tr>
<td>14. Halfbreed Lake</td>
<td>3,246</td>
<td>U.S. Fish and Wildlife Service</td>
</tr>
<tr>
<td>15. Rattlesnake Creek</td>
<td>8</td>
<td>Missoula County</td>
</tr>
<tr>
<td>16. Cracker Lake</td>
<td>68</td>
<td>Elizabeth Elliott Foundation</td>
</tr>
<tr>
<td>17. TRM Ranch</td>
<td>6,200</td>
<td>Boone &amp; Crockett Foundation</td>
</tr>
<tr>
<td></td>
<td>Location</td>
<td></td>
</tr>
<tr>
<td>---</td>
<td>----------------------------</td>
<td>---------------------</td>
</tr>
<tr>
<td>18.</td>
<td>Robb Creek</td>
<td>16,500 Rocky Mtn Elk Found. MDFWP</td>
</tr>
<tr>
<td>19.</td>
<td>Blackfoot Valley Wetlands</td>
<td>1,225 USFS</td>
</tr>
</tbody>
</table>
LITERATURE CITED


Beer, M. Montana Natural Heritage Staff Member. Interview 30 November 1990.


Colorado Field Office. n.d. How the Conservancy differs from other environmental groups. Boulder CO.


______. 1990b. Memo to Jennifer Smith. no title. 6 November 1990.

______. 1900c. Grant proposal: A hierarchical strategy for selected Montana preserves. 28 November 1990.

______. 1990d. Grant proposal: Establishment of a monitoring baseline for riparian communities and streambank condition through false color infrared and true color aerial photography interpretation. 29 November 1990.


Humke, J. TNC Vice-President for Government Relations; formerly VP for Stewardship. Interview 10 May 1991.


Leitzell, T.L. 1986. Species protection and management decisions in


