

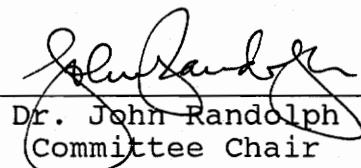
**A COMPARISON OF PRESERVATION PLANNING TECHNIQUES: TWO
CASE STUDIES**

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requirements for the degree of
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INTRODUCTION

PROBLEM STATEMENT

Protecting land through preservation has been practiced for centuries. Special and unique natural areas have been spared development and destructive uses by their designation as parks, nature preserves and sanctuaries. A primary reason for conservation is a desire that sensitive land be left in a natural state, free from human-induced changes. The function of many preserves is also to protect rare or endangered species of plants and animals.

Traditionally, protecting land has been achieved by simple acquisition of an area by (or donation to) an organization founded to preserve and protect special natural areas. Once acquired, land was generally considered to be permanently protected. However, it has been recognized that the ecological integrity of many places is threatened by activities occurring outside of the preserve. Traditional protection efforts are not always effective by themselves. Innovative techniques and regional planning efforts are also required for effective long term preservation.

Recognition of threats to nature preserves from outside the boundaries can be linked to changes in the regions of ecology. Understanding these changes is important to the preservation of these areas, because preservation criteria for many preserves are based on ecological principles, and the criteria used to guide preservation are being expanded. Ecological theory now states that ecological systems are not closed but open, and subject to influence by other systems and processes, including human impacts. Also, humans are

increasingly considered a part of, rather than outsiders to, these systems (Fiedler & Jain, 1992).

The level of protection for existing preserves is also being assessed by protection agencies. The reevaluation of protection is putting into practice the new concepts of ecosystem management by looking beyond the isolated preserve to the entire ecosystem in which it is contained, and to human influences. For instance, preservation criteria using specific rare or endangered species have expanded to involve the broader concept of biodiversity. Protecting the biodiversity of an ecosystem is now the focus of many protection plans.

The planning aspect of protecting special areas has thus increased in complexity. Traditional, single-site methods of protection are not adequate for protecting ecosystems that are regional in scale and cross political boundaries. A broad approach combining regional and environmental planning is needed to develop plans for the protection of these areas.

PURPOSE OF PAPER

The purpose of this paper is to explore planning techniques and approaches to land conservation, and conservation of environmentally sensitive areas in particular. Two preserves of a private, non-profit land trust, The Nature Conservancy, will be used as case studies for this purpose. One case study will present a traditional preservation approach, and the second will describe a much different attempt to preserve unique ecosystems. A comparison of the two cases will illustrate the similarities and differences of land preservation techniques from simple acquisition to

broader elements of ecosystem planning. The implications for planning to protect sensitive areas will be discussed as influenced by ecological, environmental and regional planning theory.

The Nature Conservancy is a relevant example for this study because its conservation criteria are founded on scientific data and can be linked to a "...solid, and rapidly evolving, theoretical base...(in which) our understanding of ecology has come to a stage...where the theory and the associated analytical models can stand up to...scrutiny" (Eagles 1984, p. 10). This includes understanding that "...humans are integral parts of ecosystems and, thus, are bound by the same laws that govern all natural ecosystems despite the increasing ability and opportunity to modify nature" (Thomas, 1980, abstract).

ORGANIZATION OF PAPER

Chapter Two presents the theoretical basis for this paper. First, a rationale for conservation is discussed, followed by the section "What Should be Preserved"? This section focuses on the scale of preservation as altered by new thinking in ecology. The final section outlines elements of planning for preservation of ecosystems.

In Chapter Three the case studies, their differences and similarities are described. The conclusion in Chapter Four analyzes the case studies in relation to elements of ecosystem planning.

THEORETICAL BASIS FOR PRESERVATION

RATIONALE TO PRESERVE NATURE

Why preserve nature? What justification is there for preserving land from harmful uses? Why should "critical habitats", (Thomas, 1980 p. 124) be preserved from development? Thoughts on these questions are echoed by numerous authors.

The explosion of human population, which doubled between 1950 and 1986 to 5 billion (Colby, 1989), and the accompanying development, environmental pollution and degradation has created serious consequences for the continued health and integrity of the natural environment. Pollution of the air, water and land causes inferior quality of the basic processes that support life. Use of natural resources for human consumption often results in the destruction of that resource and the natural areas that support it. It has been established that diversity of species is diminished once development takes place, and consequently the loss in diversity of plant and animal species may be irrevocable (Frome, 1984).

Michael Frome calls "diversity and variety...the cornerstones of survival" (1984, p. 58). The term biodiversity has been defined as

...the variety of life and its processes. It includes the variety of living organisms, the genetic differences among them, the communities and ecosystems in which they occur, and the ecological and evolutionary processes that

keep the functioning, yet ever changing and adapting
(Noss and Cooperrider, 1994, p. 5)

Preserving biodiversity has become the focus of many attempts to preserve nature. Baldwin (1985) discusses diversity and stability as one of four main ecological principles, and shows that a stable environment leads to diversity, and a diverse environment is healthier and better able to adapt to change. Hence, the question why preserve nature now becomes a question regarding preserving biodiversity.

Thomas (1980) identifies four reasons to preserve habitats for present and future uses: for food, fiber and shelter; for a scientific knowledge base; for healthy gene pools through diversity; and utilitarian uses such as education, training and research opportunities. The benefits of preserving biodiversity on ethical, moral, aesthetic and material levels are stated by Spellerburg (1992). Parallel arguments are made by Eagles (1984), who states that there are utilitarian, altruistic and moral benefits to protecting environmentally sensitive areas. In Wilson, 1988, Norton ascribes commodity, amenity and moral values to biodiversity.

The above arguments can be grouped into four categories of value for preserving biodiversity, as discussed by Noss and Cooperrider (1994). These are: direct utilitarian, indirect utilitarian, recreational and aesthetic, and intrinsic, spiritual and ethical.

Direct utilitarian values of nature are those which have direct benefits to humans. Examples of these are medicinal uses of plants for pharmaceuticals, and resource harvesting, such as timber. Indirect utilitarian values include all the

benefits natural systems provide in maintaining the natural functioning of life, such as producing oxygen, influencing climate activity (rainfall and temperature), and breaking down waste. Baldwin (1985) states that although it is difficult to quantify the benefits of clean air and water it is an inherent human right to a clean environment. Recreational and aesthetic values are the most obvious, in that hikers, sportspeople and most of the general public value nature for the sheer enjoyment of being in or looking at it.

It is the argument of Noss, et. al., and others that the intrinsic value of nature is the most viable and compelling reason to preserve it. This argument supports the idea that protecting nature for nature's sake is justification enough for preservation, because "all natural things have value" (Noss, 1994, p. 23). Humans have a moral responsibility then to respect other species. Ehrenfeld (in Wilson, 1988) writes that "value is an intrinsic part of diversity; it does not depend on the properties of the species in question, the uses to which particular species may or may not be put, or their alleged role in the balance of global ecosystems. For biological diversity, value is" (p. 214).

There have been many attempts at valuing biodiversity and nature through economic analyses. In order to do this one must first determine the value of a species plus the value of all other species that depend on it (Norton in Wilson, 1988). This is difficult because "at present, we do not have sufficient knowledge to calculate the value of most species" (Norton, in Wilson, 1988, p. 202). Economic analyses assign value to nature based on human preference and willingness to pay for a commodity. The cost of present resources are discounted by future interest rates, which in part determines

the value of that resource for future (or present) use. However, as already stated, assigning value to natural resources and biodiversity is difficult due to the complexity of the systems and the interactions of the species. For purposes of this paper then, economic rationale are acknowledged as important arguments to preserve nature, but ones that are difficult and complex to quantify.

United Nations Resolutions

The United Nations has acknowledged the importance of a global conservation effort. The acceptance of this attitude by world leaders was evident beginning in 1972 with the United Nations Conference on the Human Environment in Sweden, and most recently in 1992, in Rio de Janeiro, Brazil with the UN Conference on Environment and Development (UNCED, or Earth Summit). The Stockholm conference declared, and the Rio Conference reaffirmed, that there is a need "for a common outlook and for common principles to inspire and guide the peoples of the world in the preservation and enhancement of the human environment" (United Nations, 1974; Johnson, 1992).

Summary

From the perspective of human health, safety, and welfare, there are compelling reasons to preserve natural areas from development. Natural resources provide food and water, the basic means for survival. Legislation in the United States, such as the Endangered Species, Wilderness and National Environmental Policy Acts is evidence of the value humans place on nature and biodiversity. Preserving biodiversity through conservation of scenic areas, rare species, open space, forests, lakes and rivers can be

justified based on tangible values, but perhaps the most convincing reasons for preservation are based on the intrinsic value of all species. Human spiritual and ethical reasoning places immeasurable value on this type of commodity.

WHAT SHOULD BE PRESERVED?

Preservation Criteria

How are natural areas selected for preservation? A shift from traditional methods, such as acquisition and donation, to an ecosystem approach to preservation planning is influenced by modern ecological theory. This theory provides a broad basis for preservation criteria. Ecology is defined as "the study of the relationships of living organisms with their environment" (Thomas, 1980, p.8). The "whole", or combined functioning, of these relationships is an ecosystem. "Ecosystems are the fundamental units in which the complex interactions between living things and their environment take place...[it] is the level at which those relationships can be described and studied directly" (Thomas, 1980, p. 18).

In an essay entitled "The New Paradigm in Ecology" (Fiedler, et. al., 1992), the authors discuss changes in ecological theory. The Classical Paradigm of Ecology, called the equilibrium paradigm, has two emphases: "the stable point equilibrium" and the closed system. The stable point is the climax stage in community succession which is attained naturally within complete, closed, self-regulating systems. Because these systems were thought to be complete unto themselves, it was assumed that simply excluding human impact would be an adequate conservation method. However, the

classical ecological paradigm has been challenged by what is called the contemporary, or nonequilibrium, paradigm in ecology (Fiedler et. al., 1992).

The contemporary paradigm was developed as natural communities were found to have "multiple persistent states...or ways to be" (Fiedler, 1992, p. 71); the idea of one climax stage has been modified. "Patches" of climax, or equilibrium, within a single system are acknowledged. The recognition that natural systems are influenced by their surroundings and "subject to physical disruption from a wide range of natural forces and events" (Fiedler, 1992, p. 71) changes the perception that natural systems are closed, and indicates "changing boundary conditions, the order of events within them, and the influence of adjacent or distant systems" (Fiedler, 1992, p. 71).

Because succession is considered to be influenced by multiple causes, the scope of ecology now includes the influences, impacts and disturbances of humans. Jones (1987) identifies the main impacts of humans on ecosystems as: simplification due to removal and extinction of species, clearing, modifying and destroying habitats and degrading the environment. Defined further, ecosystems are "natural systems which are open to material and energy flow, comprised of living and non-living components interacting with each other in a dynamic, self-perpetuating complex" (Thomas, 1980, p. 122).

Humans are users of natural resources, and including this factor into the ecosystem process highlights the need for land use planning. Using ecosystems as a "bridge between ecological theory and land use planning" (Thomas, 1980, p. 67)

presents new implications for conservation. Preservation should concentrate on all of the processes that support a species, rather than on the species alone. Within the ecosystem concept then, general criteria for selecting preserves have been outlined by both Spellerberg and Jones. These include identifying the value of an ecosystem and its species by the:

- 1) Rarity or scarcity of species
- 2) Aesthetic and scenic appeal
- 3) Diversity of species
- 4) Historical value
- 5) Land use classification
- 6) Present state of naturalness

These are very general site selection criteria. The process of site selection is beyond the scope of this paper but is the vitally important first step of preservation.

PLANNING FOR PRESERVATION

Regional and Environmental Planning

Because ecosystems cross political boundaries, planning for nature preservation is complicated by the increased scope of the area being protected. Regional and environmental planning provide the basis for ecosystem planning. While conservation criteria imply a need for new strategies with a broader scope to protect sensitive areas, isolated nature preserves are becoming a way of the past. New concepts to preserve threatened areas are emerging. Life magazine reported on "cooperative conservation", which is a

...concept of bringing groups together-linking federal, state, local and private interests in one landscape- (this) was a hallmark of the first flowering of American environmentalism. Back then,...they forged agreements...Teddy Roosevelt and...Gifford Pinchot really came up with the new environmentalism, and then it got lost. Conservation devolved into a contentious us-versus-them thing. But now [U.S. Interior Secretary Bruce] Babbitt in particular is urging us to go back to this earlier idea. (Life, October 1993)

Conservation was a central principle in early regional planning theory, use of which would

create conditions that would establish a harmonious relationship between humans and nature, grounded in a bio-ethics that would show a deep respect for the limits of human intervention in 'natural' processes and limit the 'cancerous' growth of cities. (Friedman and Weaver, 1979, p. 5)

The Regional Planning Association of America (RPAA) promoted the idea of "achieving internal regional balance through an environmental mix of wilderness and rural and urban habitats" (Friedman et. al., 1979, p. 31). Indeed, they believed that the city could only function with a proper balance between these environments. A region was believed to be what the new ecology calls an "ecological patch", a "real place, created by a particular group of people in interaction with their environment" (Friedman et. al., 1979, p. 31). The philosophical mix of conservation and development was to be spread by "communal education through political action" (Friedman et. al., 1979, p. 33).

As government responded to the Great Depression in the 1930's, however, the original idea of a balance between development and the environment in regional planning gave way

as the Tennessee Valley became an "experiment" in developing a rural area by using its natural resources "for human use" (Friedman et. al., 1979, p. 33). The focus of regional planning changed again as the United States politically and economically became a world power after World War II. This growth was accompanied by "ties to an ever-expanding demand for goods and services in the market" (Friedman et. al., 1979, p. 6). Natural resources became a means for meeting this demand.

Environmental planning emerged as an attempt "to integrate ecological concerns into societal decision making", and "to strike a balance between ecological capability and societal desirability" (Eagles, 1984, p. 43). A synthesis of environmental planning, new ideas in ecology, revival of old ideas of regional planning and persuasive reasons to conserve nature is what Thomas calls ecosystem planning. Eagles (1984) summarizes the needs of planning for ecosystems:

The planning and management of natural ecosystems by local levels of government is an emerging policy development...Each of the municipalities studied has developed a unique set of institutional arrangements for the local legal and political environment...The regional-level municipal governments are in the forefront of this policy development...Most Environmentally Sensitive Areas require regional-level consideration for inventory, delineation and management... (they) are often too large for adequate consideration by one municipality. They cross municipal boundaries, are influenced by regional watersheds and airsheds and are best understood as a component of a regional ecosystem (pp. 132-133).

Elements of Ecosystem Planning Process

Thomas (1980) defines the purpose of ecosystem planning as to "guide human needs toward the best use of ecosystems, not always the best social or economic use" (p. 117). What is the ecosystem planning process? At best it is a synthesis of several planning approaches. In particular a combination of types, comprehensive/rational, adaptive and social learning, participatory and advocacy planning seem to meet the requirements for planning for ecosystem protection (Briassoulis, 1989). Briefly, these planning processes are described below.

Comprehensive/Rational. This approach has three stages: 1) analysis and identification of environmental, social and economic problems and status of the site; 2) identification and development of solutions to the problem(s); 3) selection of solutions based on scientific criteria. Experts and planners play key roles in this process and are expected to be working for the public good. This approach assumes that the political and power structures are in place to support a planning process (Briassoulis, 1989).

Adaptive planning strives for "successive and continuous adaptations of human activities" (Briassoulis, 1989, p. 386) to environmental and socioeconomic conditions that change over time. An important characteristic is that the process be flexible to accommodate new information that will be used to revise plans and goals, thus allowing for the changing nature of ecosystems. Human use of ecosystems is guided by identification of the most sensitive areas. There is continuous interaction among planners, scientists and other interested parties. The three stages of adaptive planning

have been outlined as: 1) plan or policy development; 2) implementation; 3) plan metamorphosis (Briassoulis, 1989).

Social learning theory supplements the adaptive planning approach. Friedman (1987) writes that social learning "begins and ends with action, that is, with purposeful activity" (p. 181). The focus of social learning is on actions and "purposeful activity" that "task-oriented action groups" (p. 185) choose to take. Learning from experience occurs as obstacles to achieving an activity are overcome. This begins a cycle of learning. For environmental problems this is appropriate because we must learn from our mistakes and learn our way out (Princen and Finger, 1994). As environmental degradation affects a person's feeling of well being, that is when food and water shortages threaten survival, large groups will experience these feelings and will learn that change is needed. Society then learns to change collectively (Princen et. al., 1994).

Participatory planning uses mediation and conflict management to find solutions and achieve desired outcomes. The approach to a problem is to find a "win-win" solution among parties that are voluntarily participating. The most successful problem-solving instances of participatory planning have focused on small, local problems (Briassoulis, 1989).

In the advocacy approach, solutions are sought for environmental problems that promote the philosophy and agenda of those seeking change. A strict approach of this type usually leads to the most influential group "surviving". This approach is one-sided in that the values and viewpoints being promoted by a group are usually either pro-environment or pro-

development, and data is manipulated to support the particular argument being expressed (Briassoulis, 1989).

Listed below is a compilation of the planning processes described above. The comprehensive process provided the general framework. Recommended elements for a natural area planning process were common to the work of Thomas, Eagles and Spellerberg. These are also incorporated into the process. The outline below is not intended to be static or systematic in that flexibility and adaptation are necessary for this type of planning. Ecosystem planning is intended for implementation after an area is selected for preservation.

Elements of Ecosystem Planning Process

I. Analysis of environmental, social and economic problems and conditions based on ecosystem needs.

- A. Data collection and analysis
 - 1. Inventory and identify threats and trends; evaluate use and impacts to sustain equilibrium
 - 2. Inventory and monitor species; classify ecosystems based on natural features and historical elements
- B. Problem identification. Use analysis to prioritize preservation efforts.

II. Identify and develop solutions to problems. Use mediation to develop "win-win" solutions.

III. Select solutions based on scientific criteria.

- A. Plan and program development
 - 1. Develop conservation plans that consider ecosystem-scale threats/processes and use a wide variety of strategies.
 - 2. Use interdisciplinary team of experts, fostering cooperative communication (workshops)
 - 3. Initiate "Interinstitutional relations" (Ford Foundation, 1974, p. 16) and cooperative

partnerships to foster holistic, systematic problem solving using a common understanding (Thomas, 1980, p. 142). Establish greater role for universities

4. Mediate/manage conflicts

B. Implementation of solution(s)

1. Conflict management

IV. Monitoring and Evaluation

A. Plan metamorphosis into future solutions. Establish an interdisciplinary approach to management under ecological principles, using ongoing research and scientific knowledge to protect critical habitats and preserves.

An important underlying element in ecosystem planning is that the process be cooperative and regional in scale so that adjacent land uses are considered. This includes joint-agency planning and active participation in the planning and regulatory process of surrounding local, state and federal jurisdictions. Formal agreements with private landowners are a vital aspect of this process. Land conservation trusts are often the most experienced organizations to undertake preservation planning, monitoring and stewardship on this scale.

Profile and Role of Land Conservation Trusts

The number of land conservation trusts (a form of non-governmental organization, or NGO) has rapidly increased in the last decade. Of 889 trusts in the United States in 1992, a third were formed since 1987 (Martens and Peterson, 1992). Most land trusts, formed at the grassroots level, are "small, community-based non-profit organization(s) with tax exempt status, a board of directors and staff that protect land through acquisition or by using protective easements" (Martens et. al., 1992, p. 45). Land trusts are "private organizations

with essentially public purposes" (Malamut, 1987, p.5). They often become "extensions of government staffs" (Martens, et. al, 1992, p. 44) working for the public good, as local governments often do not have the staff, expertise or budget to accomplish what the land trust can.

Land trusts engage in diverse preservation missions. The scope of work ranges from "local to national issues and from urban to rural and wilderness concerns" (Malamut, 1987, p. 2). Generally a trusts' mission focuses on a specific goal, such as preserving farmland and open space, protecting water quality, creating greenways, parks and urban gardens, protecting endangered species in nature preserves, preserving historical sites and the rural character of small towns. Funding for land trusts generally depends on fund-raising campaigns and membership dues. Staffing ranges from paid professionals to volunteers. Large, nation-wide land trusts like The Nature Conservancy operate much the same as smaller organizations (Martens, 1992).

The growth of land trusts can be linked to increased pressure on undeveloped land from development interests. Most land trusts combine visions of the natural landscape with efficient, cost-effective community based operations. They strive to protect land (and simultaneously community character) by working directly with land owners. Land trusts rely heavily on the use of conservation easements to accomplish their mission. A conservation easement is a restriction on a deed limiting development of the land. The terms of the easement are negotiated between the land trust and landowner. This arrangement serves both the landowner who, by donating or selling this restriction, gains income or a charitable contribution tax-benefit, and the land trust, who

for less than the cost of full acquisition has preserved land (Martens, 1992).

Because land trusts operate as private, independent entities, their ability to purchase land is characterized by greater flexibility and timeliness than government agencies exhibit. Trusts operate with more fluid budgets and fewer bureaucratic ties and political agendas. Many times landowners react more favorably to an approach from a land trust than from government. The approach a land trust takes may become one of conflict mediation that balances "private demands and public agendas" (Malamut, 1987, p. 5). Through this role a land trust can accept a greater level of political and economic risk than is permissible for most government agencies (Malamut, 1987).

By pioneering innovative and experimental approaches to preservation land trusts set examples and are perhaps the leaders in the field of land preservation today. This role is emphasized by the growing importance and influence of NGO's world-wide. Princen and Finger (1994) write that the emergence and growth of NGO's in the 1980's indicates the urgency and unpredictable nature of the global environmental crisis. They go on to say that incremental solutions do not work and that social learning is our way out. NGO's are taking the lead as "agents of change" (p. 11) by transforming knowledge about environmental problems to political action and economic development. The "transformation spurred by NGO's...is a transformation through social learning that results from translating ecological knowledge and local-global relationships" (p. 228). These organizations are independent experimenters with economic and social change that "envision a sustainable society" (p. 11) and raise public awareness.

CASE STUDY ANALYSIS

INTRODUCTION

In this case study analysis, two preserves of a private, non-profit organization, The Nature Conservancy (TNC) are used to illustrate preservation techniques for sensitive natural areas. Theoretical differences in the techniques as they relate to preservation planning will be discussed.

First, the mission, organization and current protection philosophy of TNC are described. Second, the history, natural features and preservation methods of the preserves, Falls Ridge Preserve and Clinch Valley Bioreserve, are presented. Falls Ridge Preserve was acquired in what is considered a "traditional" manner. Clinch Valley Bioreserve is distinctly different in that protection strategies incorporate an ecosystem philosophy into the planning process. The analysis focuses on differences and similarities in the preservation techniques of the case studies and is summarized in Table 1.

An attempt to illustrate the ecosystem planning process against strategic planning for the Clinch Valley Bioreserve is made in the Conclusion. The results are outlined in Table 2.

THE NATURE CONSERVANCY

Background, History and Mission

The Nature Conservancy (TNC), founded in 1917 as a special committee of the Ecological Society of America, became an independent non-profit "action-oriented organization" in 1946, and was incorporated in 1951 in the District of Columbia

for scientific and educational purposes (Jenkins, 1991). Its mission is to "preserve plants, animals and natural communities that represent the diversity of life on Earth by protecting the lands and water they need to survive" (Carr and Duensing, 1983). The Nature Conservancy has offices in every state in the United States, and operates programs in the Caribbean, 17 Latin American countries and in the Pacific. Over 5,438,000 acres have been preserved since its founding, and over 1,600 preserves are maintained by TNC.

The main objectives of The Nature Conservancy are: to identify and locate sensitive lands providing habitats for rare species; to protect those habitats through direct land acquisition or by assisting other organizations in preservation efforts; and to manage the Conservancy's 1,600 preserves through stewardship. Financing for these activities comes from membership dues, individual and corporate contributions, grants and recovery of expenses (The Nature Conservancy, 1991).

Approach to Conservation: Preservation Criteria and The Natural Heritage Program

The Nature Conservancy prioritizes its land acquisition and preservation goals using an "internationally distributed database containing the largest inventory of plants and animals in the world" (Anthes, 1990). This database, the Biological and Conservation Data System, was begun in 1974 on a centralized mainframe system. The system was decentralized to each of the Conservancy's 50 state field offices. Once established, the operation of these offices was turned over to a local institution, usually a government agency responsible for natural resource management and protection. This cooperative partnership between the Conservancy and state offices is called the Natural Heritage Program (NHP).

Internationally, the Conservancy has established the Conservation Data Center Network (CDC), which combined with the NHP total 82 data centers (The Nature Conservancy Fact Sheet, 1991). This program provides information not only to the Conservancy but also to institutions responsible for conservation planning, natural resources management, environmental impact assessment and sustainable development planning (The Nature Conservancy Fact Sheet, 1991).

The Biological and Conservation Data System indicates the rarity of plant and animal species, communities and other significant ecological features of the country or region in which each center is located. The system includes 45 files with 2,000 data fields of information on ecosystems, watersheds and species habitats, locations, conservation status and management needs, and areas managed by the National Park Service and U.S. Forest Service (Anthes, 1990). A key piece of information in this system, the element occurrence, identifies 65,000 plant and animal species in 400,000 locations. From the element occurrence a ranking, based on a species' threatened or endangered status, is generated. Each state's data center thus has a "scorecard" which is a ranking of indigenous species in descending order of endangerment. This systematic ranking system is the means by which the Conservancy's local, regional and global preservation priorities are determined (Anthes, 1990).

The Nature Conservancy provides technical support and training, computer technology, data inventory and management methodology, administrative support and procedure manuals to each data center. These data bases are continually updated and modified as new information and technology become available. This system has a wide range of applications beyond conservation planning, including development planning, park and protected area management and research and education

(The Nature Conservancy Fact Sheet, 1991).

The Virginia NHP data center is the Virginia Department of Conservation and Recreation's Division of Natural Heritage (DCR-DNH). The main goal of this office is to protect the Commonwealth's biological diversity. Consistent with the function of the data center network of the NHP, the main task in achieving this goal is to conduct a comprehensive inventory of the natural diversity in the state. The result is a status and location listing (element occurrence) of the most significant, threatened and endangered species in the Commonwealth. The format of the list is as follows:

Column 1: Scientific name
Column 2: Common name
Column 3: Global rank
Column 4: State rank
Column 5: Federal status
Column 6: State status (Personal Communication, Bill Gladden, TNC)

Responsibility for protection and listing of federal and state endangered and threatened species in Virginia falls among several federal and state departments, namely, the Virginia Department of Conservation and Recreation, the U.S. Fish and Wildlife Service, Virginia Department of Game and Inland Fisheries, and Virginia Department of Agriculture and Consumer Services. The Department of Natural Heritage works closely with these agencies and provides recommendations to them for species which need protection as a listed endangered or threatened species. Cooperation is also strong between DNH, the Nature Conservancy, Virginia Society of Ornithology and other conservation groups, local governments and individuals seeking to protect the natural heritage of Virginia. (Personal Communication, Bill Gladden, TNC)

Small Scale versus Large Scale Protection: The Last Great Places Program

Traditionally, The Nature Conservancy has worked to protect biological diversity by purchasing land that harbors diverse species. Often the preserves were small, and aimed to separate nature from humans. In May, 1991, TNC announced twelve models of conservation under the name of "Last Great Places". This program reflects a holistic approach to land preservation in which bioreserves are preserved while human economic and cultural needs are met. TNC defines a bioreserve as an area "where conservation of biodiversity can be carried out at the landscape scale" (Jenkins, 1991, p. 2), containing entire ecosystems that are representative of the region.

The goal of Last Great Places, an Alliance for People and the Environment, is to "foster an alliance that will both preserve nature in these places and allow people to sustain themselves economically" (The Nature Conservancy, 1991, p. 2). The basic concept of Last Great Places is to protect a core critical habitat by surrounding it with multi-use buffer zones. Buffer zones support human activity and development that enhance the preservation of the core habitat. To achieve this, TNC will undertake comprehensive biodiversity planning. This means creating partnerships among diverse groups; working with local universities in research and planning; establishing soil conservation programs; preparing management and development plans consistent with limitation of the area; and increasing environmental awareness of people.

The Last Great Places Program may become a model for large-scale conservation. The United Nations Director for Environmental Programme has said "the U.N. and other international bodies have proposed such an approach to conservation for some time...however, this is the first time

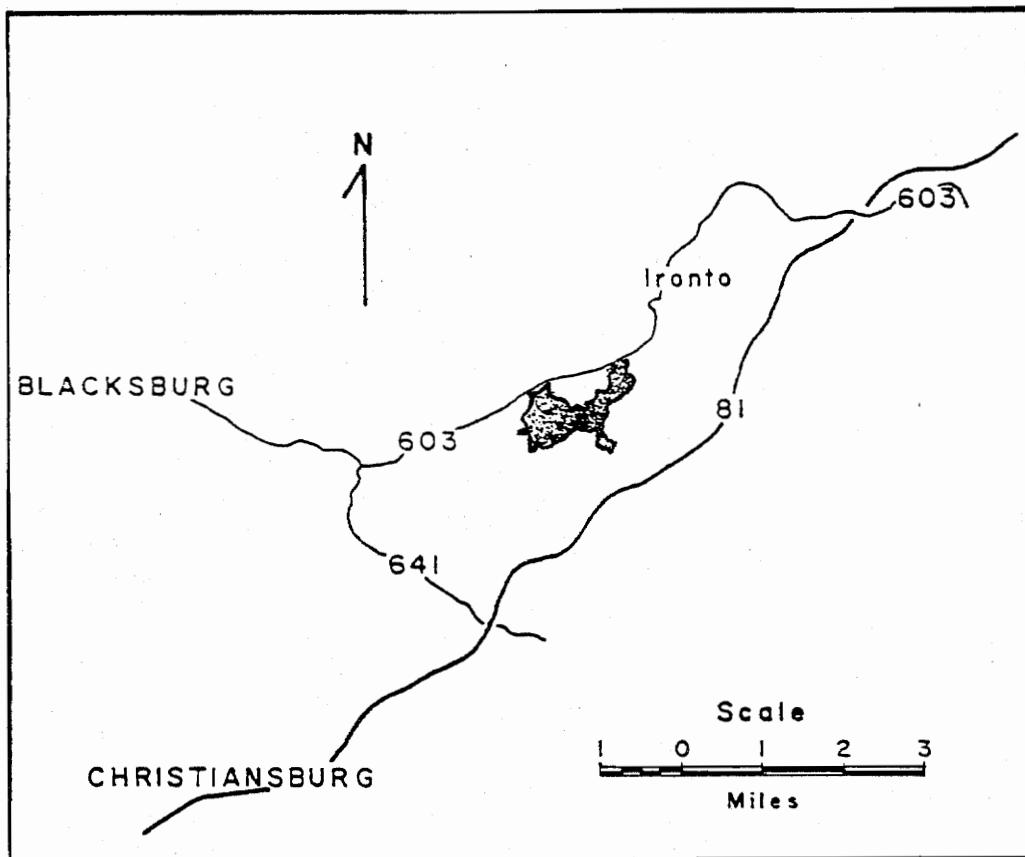
such theories have been applied in practice by a major conservation organization" (Jenkins, 1991, p. 2). The next section highlights two Nature Conservancy preserves. The first, Falls Ridge Preserve in Montgomery County, Virginia, is an example of the traditional small scale, donation approach to preservation. The second, Clinch Valley Bioreserve, is an example of an attempt by TNC to implement the Last Great Places Program.

FALLS RIDGE PRESERVE

Background and Description

The Falls Ridge preserve, consisting of 655 acres, is located in Montgomery County, Virginia (see Map 1). This land became a Nature Conservancy preserve in 1975 through an initial private donation of 227 acres. Additional donations and the purchase of 180 acres of adjacent land completed the preserve (Center for Environmental Studies, 1978). As it's name suggests, this preserve is "part of a steep, rugged ridge that rises from the valley of the north fork of the Roanoke River, southeast of Blacksburg" (The Nature Conservancy, Information Sheet, 1991); it is also uniquely characterized by an 80 foot high spring-fed travertine (limestone) waterfall. There is a considerable amount of biological diversity on this property, including a number of rare plant species, as a result of a geological fault intersecting the land, creating two different soil classifications, and significant climatic differences between the sides of the mountain (The Nature Conservancy, Information Sheet, 1991).

A desire that the "natural beauty and tranquility of the area be preserved for posterity" (Center for Environmental Studies, 1978) motivated the original donation to The Nature Conservancy by Mr. Bill Bradley. The 1978 Ecological Baseline Study states that the wide diversity of species is due to the variety of habitats and that the two combined make this a "valuable area to protect and maintain, as areas with such diversity are becoming increasingly scarce" (Center for Environmental Studies, 1978, p. 13). Since this initial study, several rare plant species have been identified on the



MAP 1
FALLS RIDGE PRESERVE
source: The Nature Conservancy

preserve. The most significant, Addison's Leatherflower (*Clematis addisonii* Britton) is endemic to Virginia and is extremely rare (Personal Communication, Bill Gladden, TNC). Currently fourteen sites of this species are known in Botetourt, Montgomery, Roanoke and Rockbridge Counties, with most of the plants occurring in Montgomery County.

Although C. addisonii is not under consideration as a federally listed endangered species, the Virginia Natural Heritage Program has ranked it as G2/S2, indicating its scarce status. (A G2 ranking indicates there are either 6-20 element occurrences or between 1000 to 3000 individuals or between 2000 to 10,000 acres. A G1 ranking is the rarest status. [Noss, 1994]) It is recommended that it be state listed as endangered (Terwilliger through Gladden). The major threat to unpreserved populations of this species is roadbuilding, as many of the larger groups exist on roadbanks; however, threats to C. addisonii at Falls Ridge are few (Element Occurrence Monitoring Plan information provided by B. Gladden).

Preservation Methods

At present, and in the most narrow view, the Falls Ridge Preserve's microhabitat is fairly well protected from development or other threats outside of the preserve. This is because a majority of the adjacent land is steep, undevelopable slopes that is privately owned in large parcels. On a larger scale, however, questions over the preserve's boundaries arise. This concern is influenced by the "edge effect", or weed encroachment from nearby farms. Although native, these weeds may require active management control. The boundary issue is also important because the Division of Natural Heritage recently identified several federally listed endangered species on sites that are nearby Falls Ridge. The DNH is working to identify other potential sites of these species. A fly-over of the area was scheduled for the Fall of 1993 (Personal Communication, Bill Gladden, TNC).

In the immediate future, the preservation of Falls Ridge Preserve will remain primarily a function of stewardship and

management to maintain it in its present state. An annual monitoring visit is conducted to assess the general health and population level of *c. addisonii*. Acquisition of additional surrounding acres may be considered, depending on whether or not other endangered species are identified nearby and the proximity to Falls Ridge. At this time there is not sufficient information to predict how the boundaries of the preserve may change. If they do, traditional methods of simple acquisition will most likely be used. (Personal Communication, Bill Gladden, TNC)

Public and Private Institutional Agreements

Currently, there are no formal institutional arrangements established for this preserve. The main uses are recreational, by Conservancy members and visitors, and educational. Occasionally the preserve has been used by scientists and students as a research site. A goal for the future is to establish the preserve as a research station for educational institutions in exchange for information collected about the site.

The primary working arrangement The Nature Conservancy has regarding Falls Ridge preserve is with the State of Virginia Division of Natural Heritage. It is an attempt to exchange information between the two offices so that their preservation and acquisition priorities complement each other. Philosophical differences regarding fire management, maintenance and succession of species exist between the two organizations; conflicts in preservation priorities may arise if communication is not maintained.

Funding Efforts

Preserve management is funded by The Nature Conservancy. Volunteers provide most of the labor needed to maintain trails and inventory species. The Conservancy employs a part-time preserve manager to monitor visitation and coordinate volunteer groups. The manager lives on the preserve in the Bradley house. Housing is provided as the manager's compensation.

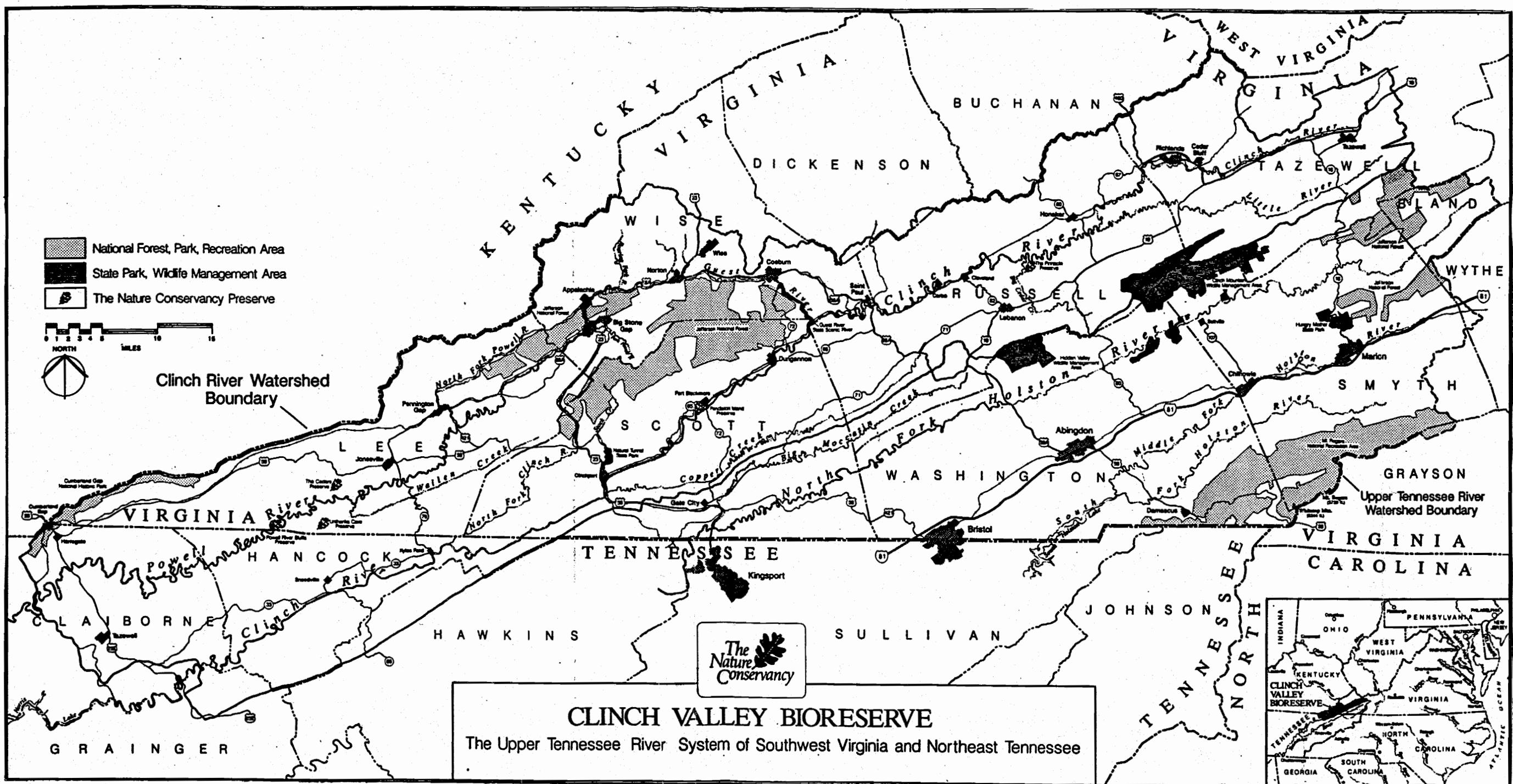
CLINCH VALLEY BIORESERVE

Background and Description

The Clinch Valley Bioreserve is within the Appalachian Range of the Cumberland Plateau, where the Clinch, Powell and Holston Rivers flow through Southwestern Virginia to form the Tennessee River (see Map 2). Although most of the Tennessee River has been dammed (by the Tennessee Valley Authority in the 1930's), the three rivers of its headwaters have not, and represent "the last free-flowing sections of...this once expansive wild river system" (The Nature Conservancy, 1992). The river basins support four primary ecosystems that contain over 20 federally endangered species and 136 globally rare species; because of this diversity the area has been characterized as the "cradle of biodiversity for the eastern United States" (The Nature Conservancy, 1992).

Although most of the aquatic diversity of the Tennessee River has been lost due to damming, the Clinch and Powell rivers of the Bioreserve contain some of the most diverse mussel and fish fauna in the United States. More specifically, TNC is involved in the Clinch Valley watershed because of the rare and endangered mussels, the over 1200 caves (110 of Virginia's biologically significant caves are within the boundaries), and unique terrestrial environments on karst features and limestone cliffs (The Nature Conservancy, 1992).

The Nature Conservancy has undertaken preservation efforts in the Clinch Valley Bioreserve since 1984, when two preserves, Powell River and Pendleton Island, were acquired. Six additional preserves have been acquired since 1984. In August, 1992, the Nature Conservancy's Virginia Chapter



submitted to TNC's headquarters a strategic plan that presented evidence of the area's significant biodiversity. Subsequently, the 2,200 square miles and 1,000 miles of river corridor within the boundaries of the Bioreserve were approved as one of the Last Great Places (The Nature Conservancy, 1992). The Strategic Plan contains the protection plan for the bioreserve.

The four main types of ecosystems in the Bioreserve are riverine, subterranean, palustrine and terrestrial; all are interconnected by water. Water flows in an intricate pattern through karst areas, limestone bluffs, and sink holes of terrestrial areas, into the subterranean and riverine systems. This complex natural system has created environments where "nearly one-half of the freshwater mussel species listed in the United States by the U.S. Fish and Wildlife Service" (The Nature Conservancy, 1992, p. 16) live; of these mussel species 14 are federally listed as endangered, 11 more are candidates for listing and a significant proportion are globally rare (The Nature Conservancy, 1992).

Three species of fish within the bioreserve are listed as threatened and three others are listed as state endangered and occur only in the Clinch and Powell Rivers. Other rare vertebrate riverine species are a salamander and turtle species and several aquatic insects. Within the subterranean ecosystem in the Bioreserve are 1250 caves, almost half of the caves in Virginia. Twenty-eight caves are ranked as containing outstanding biological diversity significance. There are over fifty globally rare species in this ecosystem, including three federally listed endangered bats (The Nature Conservancy, 1992).

Preserving fresh water mussels presents unique challenges, partly because little is known about their needs and life cycle. It is known that reproduction is complex in that a number of environmental conditions must be present. Fresh water mussels require a host fish on which the glochidia, or larvae, attach until mature enough to drop off and anchor themselves to a permanent spot (some species live more than 50 years). The "recolonization" rate is slow, and mussels are very susceptible to numerous threats from predators (muskrats), water pollution, dredging and siltation, and poaching (The Nature Conservancy, 1992).

Land Use and Economy

Coal and agriculture are the primary industries in the region. The rugged terrain characteristic of the region means that the land most suitable for development is along the flat river corridor. Thirty-five percent of the land in these river basins is in agricultural use, mainly for beef cattle and tobacco (The Nature Conservancy, 1992).

The population within the Bioreserve has decreased in the last decade, in contrast to an overall state-wide increase. Personal income in 1986 was one-third the national average. Forty percent of Virginia's coal is produced in the five counties in the Bioreserve. Unemployment in the region is high (8.0%), and is expected to increase in the coal industry in particular, thus leaving a large gap in an already depressed economy. Unemployment and related issues are identified as the driving force behind development of some of the most sensitive land in the Bioreserve (The Nature Conservancy, 1992).

Threats

The primary challenge to long term preservation of the Clinch Valley Bioreserve is water quality. Currently, the major threats to water quality in the Bioreserve are sewage discharge, point source pollution, agricultural runoff and stripmining runoff. Other major threats are exotic mussel species and poachers. The presence of mussels is an indicator of water quality because mussels act as natural water filters. Water downstream from healthy mussel beds is generally cleaner than upstream. Historical threats to the area were coal mining, agriculture and dam construction. These practices permanently altered the ecosystems in the Tennessee River Basin (The Nature Conservancy, 1992).

In order to understand the threats to these ecosystems, TNC developed a Threat Analysis Table. The basis for this ranked table is the Commonwealth of Virginia hydrologic unit system. This system is used by states and the federal government to analyze non-point source pollution. Twenty-four "subwatersheds" were identified, and a weighted ranking score, (from very high to low) was then assigned to each identified threat in that ecosystem. However, TNC requires more detailed information on which to make conservation decisions and added an understanding rank (from very high to low) to each threat. Based on this ranking, priorities were assigned to the threats and a hypothesis developed for each that attempts to fill in information gaps. From this threat ranking a protection plan was developed (The Nature Conservancy, 1992).

Strategic Plan

The Strategic Plan is made up of eleven sections. These are: Introduction; Ecological Components of the Bioregion;

Major Threats to Ecological Resources; Goals and Strategies; a Research Plan for the Bioregion; a Protection Plan; a Communications and Public Outreach Plan; Administrative and Organizational section, and Model Conservation Activities. Two sections are confidential, containing funding and budget information. Two appendices detail specific areas targeted for conservation, and TNC's "conservation partners".

In the Goals section there are five goals, one for each of the four types of ecosystems and a fifth seeking to influence local and state governments to implement biodiversity conservation. Each goal is accompanied by science and protection strategies. The cornerstone of the goals section is scientific research, complimented by the planning aspect of inter-agency and group coordination necessary to implement protection programs. All strategies are measured by benchmarks that give specific tasks, completion dates and partners. The stress or threat that each strategy addresses is noted.

Several aspects of the goals section required further elaboration and separate plans were developed for each. The Research Plan outlines specific studies still needed to determine ecological processes and stresses. A description of the study, the cost, partners and target dates are included. The goal of the Communication/Public Outreach Plan is to "advance the mission of The Nature Conservancy in the Clinch Valley" (The Nature Conservancy, 1992, p. 73). Educating the seven "principal audiences" identified in this plan about the significant biological and natural resources of the bioreserve is the main strategy of this plan. Media publicity will be important in fostering the plan's success.

The constituencies identified in the Communications and Public Outreach plan are: local farmers/landowners; major donors; business leaders in the community; Southwest Virginia Conservancy members; Conservancy Members across the State; Government officials/state agencies and other environmental organizations. Other important alliances are listed in an appendix, "Conservation Partners". Over 40 potential partners (federal, state and local conservation groups working in the Bioreserve area) are ranked based on priority of help needed and current level of assistance and cooperation.

One of the main differences in the Nature Conservancy's approach to conservation through the Bioreserve concept is the realization that "traditional...protection strategies, i.e., land acquisition, will not, in many cases, sufficiently protect the resources to ensure their long term survival and viability" (The Nature Conservancy, 1992, p. 93). The Conservancy has developed Model Conservation Activities that stress innovative strategies. The Strategic Plan states that these may be "exportable to other Conservancy programs"; within the new concept of ecosystem planning they may be useful to other agencies and conservation groups as well. These activities include basic ecological research in the Bioreserve, a Riparian/Karst ecosystem protection program (includes the Cave Registry and Riparian Restoration Programs), partnerships with atypical partners, inter-regional cooperation and sponsoring an annual technical conference (The Nature Conservancy, 1992).

Bioreserve Preservation Criteria

Preservation criteria are determined by the ranking process as discussed in the Strategic Plan. Thirty five

natural areas have been selected for protection. Multiple tasks are required for preservation, aside from preserving the most threatened species. Creating partnerships is becoming as important a task in protecting the area as preserving a specific site.

Public and Private Institutional Agreements

"Forging creative partnerships among landowners, residents, businesses, industries, governmental agencies and private organizations is a key component" to the new types of protection strategies being used in the Bioreserve (The Nature Conservancy, 1992, p. 94). Eagles (1984), defines institutional arrangements as:

...forms of government, agencies, civil and criminal laws, legislation and other means of influencing human behavior and effects on land use...(they) are social phenomena which often have an indirect and unappreciated effect on land use and landscape (p. 37).

For TNC, institutional agreements are partnerships for cooperative planning with Federal, State and local agencies to carry out research, protection and restoration activities. The Conservancy's federal agency partners will be the "primary resources for grants and technical assistance in conducting scientific research within the Bioreserve" (The Nature Conservancy, 1992). Local Planning District Commissions and Economic Development Commissions are some of the most active partners to date.

Cooperative research with their conservation partners in the Bioreserve is one of TNC's main activities. The Nature Conservancy's role as coordinator among the research partners includes obtaining some funding, through federal grants and

private donations, but the primary role will be one of support and coordination among other groups conducting research in the Bioreserve (The Nature Conservancy, 1992).

There are over 40 conservation partners listed in the Strategic Plan; the most active and successful partnerships to date, as described by Nature Conservancy personnel, will be included in this case study.

One of the first attempts at partnership coordination was made soon after the TNC's Abingdon office opened, when TNC sponsored a retreat for all the agencies working in the Bioreserve. This has evolved into an annual technical conference for regional scientists and agency personnel; the Conservancy also uses this as a forum in which to spread its conservation agenda. (The Nature Conservancy, 1992).

A high priority threat to the riverine ecosystem is non-point source pollution from livestock. In order to combat this threat, TNC is working with the U.S. Fish and Wildlife Service and the U.S. Department of Agriculture, Soil Conservation Service to implement the Riparian Restoration Program. The goal of this voluntary program is to "provide funds for farmers to exclude cattle from waterways and restore native vegetation in riparian corridors" (The Nature Conservancy, 1992).

As of October, 1993, eight farms had fencing completed and eight more were being planned, for a total of 10-15 miles of protected river corridor. Under this program, the Conservancy pays 100% of the fencing cost to farmers. In return, farmers sign a contract, similar to a voluntary conservation agreement, that the conserved area will be left

undisturbed for ten years. The contract may be renegotiated at the end of the term. The criteria for selecting fencing projects are location and rarity of species in the river (Personal Communication, Bill Kittrell, TNC).

A significant result of this conservation program has been the positive reception by farmers. The Conservancy's approach to landowners, combined with funding provisions, has created a "win-win" approach to conservation. The favorable perception of TNC has been spread by "word of mouth", and has served to increase trust and enhance its credibility and presence among landowners in the Bioreserve. The one on one approach TNC takes in working with landowners has had the effect of instilling a conservation ethic among the farmers participating in the fencing program (Personal Communication, Bill Kittrell, TNC).

The U.S. Soil Conservation Service operates a similar program, where 75% of cross-fencing is paid for by SCS. Referrals to SCS are made by TNC. Cross-fencing provides farmers with rotational grazing options that help to increase yield in cattle. Fencing cattle out of streams not only reduces incidence of water-borne diseases in cattle but also decreases siltation and erosion of the stream bank. Complementing this program is a karst protection program that TNC plans to enter into with the EPA. The goal of this will be to "implement agricultural best management practices in karst terrain" (The Nature Conservancy, 1992). In turn this will enhance The Conservancy's Cave Registry program. Additionally, a member of TNC is on the board of the Powell River Project, which is conducting studies on water quality in coal mine reclamation areas.

Cumberland Plateau Planning District Commission

Cumberland Plateau PDC and The Nature Conservancy began working together approximately four years ago in Russell County to protect The Pinnacles preserve. The Pinnacles is a 90 acre preserve that was originally bought in the late 1970's by the Russell County Board of Supervisors, to be developed as a park. Prior to TNC's involvement, Russell County had sought recognition of The Pinnacles from the State of Virginia as a state park. These efforts were unsuccessful. Early work in developing the park involved the PDC, representing Russell County, with local governments and the Youth Action Conservation Corps (YACC) (which received funds for disadvantaged youth), in building shelters and trails (Personal Communication, Jim Baldwin, Cumberland Plateau PDC).

The Nature Conservancy's first involvement in The Pinnacles preserve was an inventory of the area's species. Several globally rare species were found in the Pinnacles. This discovery brought the State into partnership with Russell County and TNC, and the three are now working to make the area into a combination State park and nature preserve, where recreational use will be permitted near the nature preserve. In the preserve, use will be restricted to foot traffic with an emphasis on protection, observation and educational experiences (Personal Communication, Jim Baldwin, Cumberland Plateau PDC).

The three-way partnership makes this a unique park in the State park system. Russell County first donated the property to TNC; TNC is now negotiating for additional land to buffer the area. The Nature Conservancy will then donate the park to the State and Pinnacles will be managed under a cooperative

management agreement between the two entities (Personal Communication, Jim Baldwin, Cumberland Plateau PDC).

The Nature Conservancy's involvement in Russell County has extended beyond the Pinnacles boundaries. Promoting awareness of the rare resources in the area has generated inter-governmental interest and citizen support for environmentally friendly business, ecotourism and protection of the natural resources in the area. Specifically, The Center on Rural Development, a nine county coalition which includes Cumberland Plateau and Lenowisco PDC, sponsored a strategic planning effort focusing on small business development in Southwest Virginia and Eastern Tennessee. A primary discovery of this process has been the potential for developing ecotourism/education as a major industry because of the rare and endangered species in the area. A Nature Conservancy representative sits on the Ecotourism Committee. Developing ecotourism and education coincides with adventure tourism (an action-oriented experience) and the Ecotourism Committee is looking for ways to combine the two. The primary market group are college and university students. Adventure activities include rafting, repelling, and spelunking combined with education on mussels. The model is National Geographic's adventure/education trips.

Environmentally friendly businesses are being promoted such as logging with horses, the damaging impacts of which are less because of minimal erosion and plant disturbance, and "ecoconstruction", which encourages the use solar design in local construction.

The research and preservation work of TNC in Russell County has increased awareness among the local governments and

the citizens of the natural resources and rare species in the Pinnacles and surrounding area. From this awareness an appreciation for preservation and protection has emerged and is evident in the higher level of cooperation TNC is receiving from local people in support of their efforts. The commitment TNC gives to support projects sets an example that leads to further private commitment and public support.

The information TNC has provided to Cumberland PDC has had an impact on the planning projects and processes of that agency. With the help of TNC, the PDC is moving toward more environmentally sensitive planning by using environmental inventories and information. Revisions of local comprehensive plans within the PDC will include inventories of rare species. With this as a goal the PDC is changing the way they plan as an agency. The majority of the PDC's work has been implementation of infrastructure and economic development projects; the recent cooperative efforts with TNC has added an environmental aspect to the planning process, where future growth is planned for with consideration of the environment and consequences development will have. Another example of greater awareness of environmental consequences is remediation of direct discharge into rivers from sewer systems in Richlands and Tazewell. Both have applied for Community Development Block Grant projects to build new treatment plants (Personal Communication, Jim Baldwin, Cumberland Plateau PDC).

LENOWISCO Planning District Commission

LENOWISCO PDC encompasses Lee, Norton, Wise and Scott counties; most of the area falls within the Bioreserve boundaries. The Nature Conservancy is informally involved with this PDC in a number of ways, focusing around conflicts between economic development and Bioreserve protection. Of

primary issue is the site of a new federal prison in Lee County. In an area with a high poverty level, building of the prison offers opportunities for permanent jobs and economic growth. Because the primary focus of the PDC is on economic development, the assistance given the PDC by the Nature Conservancy is unusual because environmental considerations are not the focus of most economic development plans (Personal Communication, Skip Skinner, LENOWISCO PDC).

The prison site conflict quickly became a "jobs versus the environment" issue over an endangered species, the Lee County Cave Isopod. Steep, rugged terrain limits the number of appropriate sites and the original site selected for the prison was rejected by the US Fish and Wildlife Service under the Endangered Species Act. Local officials became frustrated and discouraged by delays and the "extreme" effects of the Endangered Species Law on their economy. The situation was aggravated by the fact that the species became listed after the original site was selected. At that time consideration for any rare or threatened species had not been given. The Nature Conservancy intervened to "strike a balance" between these extremes (Personal Communication, Bill Kittrell, TNC).

The Nature Conservancy is attempting to promote eco-development by showing how protection and development can be compatible. By working to identify a site that is suitable for the prison, TNC has shown local officials that there is scientific rational behind the Endangered Species act, and not merely extremist environmental posturing. Part of the challenge to TNC has been combating the perception that protection is contrary to prosperity. Now, through the negotiating role they have played, local officials in this PDC have come to view TNC with a new respect and are more

supportive of their efforts in the Bioreserve (Personal Communication, Skip Skinner, LENOWISCO PDC).

A strategy TNC is using in this area to educate people regarding the resources and sensitive nature of the area. The message is to show TNC's support of the prison and the jobs it will create while helping to find an appropriate site (Personal Communication, Bill Kittrell, TNC).

Education and Research

Educating and seeking support from the public is an important and somewhat new role for the Nature Conservancy. The foundation of the riparian restoration and fencing program is education of farmers about benefits to be gained by using best management practices. In Lee County, educational materials have been distributed to all of the teachers, 4-H and civic groups. Another education goal of the Bioreserve staff is initiating the establishment, in conjunction with Virginia Tech University, of a long term ecological research station, funded partly by the National Science Foundation. A potential site is 400 acres and a lodge once owned by CSX railroad. The research station would operate similarly to extension farms and be used for field experiments in innovative agricultural techniques and water research.

In addition to scientific research, an integral piece of information necessary for planning is an analysis of economic and social conditions. The Nature Conservancy will undertake this type of research as well, emphasizing effects from the decline in the coal mine industry with the goal of mitigating "job versus the environment" conflicts (Personal Communication, Bill Kittrell, TNC).

Funding Efforts

Funding for protection strategies in the Bioreserve will come from a number of sources, as noted in the Strategic Plan. Fundraising will be supported from Nature Conservancy headquarters. The Conservancy has identified a pool of major donors, and will recognize those donors in their communications/public outreach plan. Public funds and grants from state and federal governments will also be sought (The Nature Conservancy, 1992).

ANALYSIS

The Falls Ridge Preserve and Clinch Valley Bioreserve case studies present two distinctly different preservation challenges. The Nature Conservancy acquired Falls Ridge Preserve under traditional means: donation by an individual motivated to permanently preserve his land. Fortunately the rare species protected within Falls Ridge face no immediate threats, partly due to the steep, rugged surrounding terrain, and partly to current ownership of adjacent land. This case study is an example where traditional methods of land preservation have been successful. Threats to rare species are minimal. Falls Ridge is not a regional ecosystem and does not require region-level planning for its continued preservation. Cooperation with the State of Virginia's Division of Natural Heritage will be on-going to ensure continued preservation of c. addisonii and other rare species that may be located in close proximity to Falls Ridge.

Although Falls Ridge is currently protected, the use and sale of surrounding property by adjacent landowners should be monitored. The protection of this property could be enhanced by looking at the larger ecosystem, especially since occurrences of c. addisonii fall outside of its boundaries. Support of other species that live on the preserve should also be considered in future management plans.

The protection work at Falls Ridge is primarily focused on maintenance and stewardship. It is not a regional ecosystem and there are no immediate threats to this preserve that make planning for expansion necessary. This is in sharp contrast to the protection and preservation of the Clinch Valley Bioreserve. Threats are immediate and imminent to endangered species that are spread over a large area crossing

several political boundaries. These boundaries were determined not by land ownership but by the characteristics of a regional watershed. Within the boundaries are four main types of ecosystems. Many of the species TNC is working to protect within this Bioreserve are endangered mussels. Therefore, protecting and improving water quality in the Clinch Valley Bioreserve is the focus behind most of the goals and strategies of the Strategic Plan.

The dynamic, interactive nature of the ecosystems within the Clinch Valley Bioreserve present the greatest contrast between the two case studies. Although the ecosystems in the Bioreserve are distinct, water is the common linking denominator, and the endangered species are water-dependent. The rare species at Falls Ridge is not water-dependent; the falls are a point of natural beauty on the property that in part inspired the initial donation.

The scale of Clinch Valley Bioreserve is large not only in acreage but in complexity of the planning process. Planning must not only focus on expanding the core critical areas but must influence land uses in the Bioreserve outside of the preserves. Traditional preservation methods (acquisition and donation) will be used in combination with innovative strategies that employ a variety of techniques (The Nature Conservancy, 1992).

Although the scale of protection for these two areas requires different protection strategies and approaches, there are similar primary elements critical to preserving unique natural places, beginning with an inventory of species. Second, traditional techniques such as acquisition or donation remain the basic element for preservation. Control or

influence over land use in the critical habitat must be obtained to reduce immediate threats. Third, cooperation and coordination between entities working to protect environmentally sensitive areas are needed. However, close examination of the case studies reveals that the importance of these elements differs greatly between the studies. This difference is due to scale, size and complexity.

Cooperative arrangements among groups working to protect the resources in the Clinch Valley Bioreserve is an important distinction between the two studies. The Nature Conservancy has identified over 40 groups that are interested in and are working in the Bioreserve due to the great diversity of the natural systems and features. The levels of cooperation between TNC and these conservation partners are assessed in the Strategic Plan.

Good examples of effective multi-party and multi-jurisdictional efforts are shown in several of TNC's partnerships. The major partnerships are: the local government (through Cumberland Plateau PDC), State and TNC partnership of the Pinnacles Preserve; groups meeting at the Annual Technical Research Conference; the Riparian Restoration Program assistance from the U.S. Fish and Wildlife Service and Soil Conservation Service; TNC's involvement with the Center on Rural Development's ecotourism committee, and with the Powell River Project; and associations with the Planning District Commissions and the State of Virginia Division of Natural Heritage.

The scale and complexity of the natural systems within Clinch Valley Bioreserve make planning for preservation more difficult than management of Falls Ridge. Given the

impossibility of TNC acquiring all of the land within the boundaries, the goals and strategies employed must aim to influence land use without obtaining direct control over the land. Critical elements to these strategies are: education of landowners, voluntary cooperative agreements with private landowners, local, state and federal government agencies, and coordination and support of scientific research. The activities that take place on land in the Bioreserve have a large impact on the quality of water. Most adverse impacts to water quality such as erosion, agricultural runoff, industrial pollution, toxic spills, are man-made, and require constant monitoring.

In Table 1, a comparison of the preservation methods used by The Nature Conservancy in Falls Ridge Preserve and Clinch Valley Bioreserve is presented.

TABLE 1
CASE STUDY ANALYSIS
PRESERVATION METHOD COMPARISON TABLE

	Falls Ridge Preserve	Clinch Valley Bioreserve
Description of Preserve		
Size/scale	665 acres; determined by ownership and property line	2200 sq. miles; determined by natural system boundaries
Complexity of natural systems	Variety due to topography	Diverse, dynamic and interactive; connected by water
Reasons to Preserve and Preservation Criteria		
Aesthetics	Primary (initially)	Secondary
Species Protection	Secondary (Rare Species) NH Program	Primary (Endangered Species) Natural Heritage Program
Other	Natural Area Protection	Preserve water quality

	Falls Ridge Preserve	Clinch Valley Bioreserve
Preservation Methods		
Acquisition	Primary method	Secondary method, used to protect most critical, core habitats
Institutional and cooperative arrangements	Secondary; some work with State of VA DNH.	Primary method. Conflict mgmt.; pro-active and action-oriented
Preservation plan	A management plan guiding stewardship and maintenance	Outlines protection strategies. Main working document guiding protection.
Future Preservation Focus		
Research	Informal; will receive greater attention as a goal in the future	Primary element for setting protection priorities
Education	Informal; will receive greater attention	Primary element for implementing Riparian Restoration and Cave Registry Programs
Stewardship	Ongoing; maintenance provided mainly by volunteers	Will become more important; focus on education, river conservation and compatible development

CONCLUSION

Preserving unique and sensitive natural areas has been practiced for many centuries by setting them aside from impacts of human development. Whether from a desire that a beautiful area be left natural or to protect rare species of plants and animals, the idea was that once acquired permanent protection was assured. As these areas have come under increased pressure from ballooning human populations, pollution and demand for developable land, continued protection is not guaranteed. The field of ecology has been influential in setting criteria for protection. Now, ecological theory brings humans into the equation as inhabitants that impact natural areas and ecosystems.

Understanding that preserving natural areas and species often requires protecting ecosystems that are large in scale and complexity has direct implications for preservation planning. The size and interactive nature of ecosystems makes planning more difficult. Planning to preserve the natural integrity of the whole system, rather than the most sensitive parcel, will enhance the quality of life for humans as well as other species supported by it. Although the process of identifying ecosystems is the topic of another paper, its importance is acknowledged as the beginning of a plan for preservation.

The case studies in this paper show that traditional methods such as acquisition and donation remain important preservation techniques. The influences on natural areas from outside the boundaries illustrates the dynamic nature of protection planning. To summarize ideas in protection

planning brought about by the ecosystem concept, the planning processes described in Chapter Two are applied to The Nature Conservancy's Strategic Plan for the Clinch Valley Bioreserve and shown in Table 2.

The major stages in this process are those of the rational/comprehensive planning process. Step One, Analysis of Condition, an inventory and evaluation of the threats, land uses and species in an ecosystem is used to prioritize conservation plans. To do this, TNC has developed a Threat Analysis Ranking for the major hydrologic units (subwatersheds) in each type of ecosystem. Species Ranking of the Natural Heritage Program and by the research priorities outlined in the Strategic Plan are used in the Data Collection part of Step One. This on-going process reflects advocacy and adaptive approaches to planning. Plan and Program Development and Implementation are part of the second step. TNC has developed goals for each type of ecosystem followed by specific science and protection strategies. Implementation also requires developing institutional relations and partnerships with expert and interdisciplinary partners. The Riparian Restoration and Cave Registry Programs are examples of these partnerships.

The final step requires monitoring and evaluation. Information from on-going research will help the plan to change and adapt to new conditions, goals and programs. Benchmarks assigned to each strategy is TNC's measure of evaluation, and many of these will be accomplished by coordinating the multiple efforts and research projects of the various groups working to protect these sensitive, critical habitats.

Underlying the steps in the process are certain fundamental concepts that make this approach successful. The first is establishing trust with landowners by committing resources and making decisions based on sound scientific knowledge. Complimenting this concept is public education and participation. Seeking public participation, providing education and disseminating information are important links to enlisting support for preservation and encouraging participation in measures that ensure a healthy environment. Third, drawing from the participatory planning approach the ability to mediate and manage conflicts is a necessary tool. This is especially important where there are "jobs vs. the environment" conflicts. A pro-active position is required for these strategies because of the urgency of the threats to the sensitive natural systems in the Bioreserve.

Non-profit organizations such as TNC are effective in undertaking this type of protection and planning. Often these groups are the catalyst to generating government involvement. The techniques that have been presented here can be applied to any land protection agency. In summary, to undertake ecosystem planning, the needs of humans must be a factor. To accomplish this, a combination of planning approaches will be used. Specific to ecosystem planning is need for an interdisciplinary approach that establishes partnerships with local, state and federal institutions and private organizations. Scientific, social and economic research programs, conflict management skills, adequate resources, flexible and creative ideas are important elements to planning for ecosystem preservation.

TABLE 2
CASE STUDY APPLIED TO ELEMENTS OF ECOSYSTEM PLANNING

Planning Process	Ecosystem Planning Process	Clinch Valley Bioreserve
rational advocacy adaptive	<p>Analysis of Condition</p> <p>Data collection</p> <ul style="list-style-type: none"> - inventory and evaluate threats - inventory species - classify ecosystems <p>Problem identification</p> <ul style="list-style-type: none"> - Prioritize 	<ul style="list-style-type: none"> - Threat Analysis Ranking - Natural Heritage Program - ongoing process <p>- Fed by monitoring information</p>
rational adaptive participatory	<p>Select solution based on scientific criteria</p> <p>Plan and program development</p>	<p>Strategic Planning; Model Conservation Strategies; Research Plans for each ecosystem</p>
adaptive social learning	<ul style="list-style-type: none"> - Institutional relations 	<ul style="list-style-type: none"> - Inter-institutional Conservation Partners; Influence Cumberland PDC comprehensive planning; other PDC support
advocacy	<ul style="list-style-type: none"> - Interdisciplinary teams 	<ul style="list-style-type: none"> - Annual Technical Research conference; Ecotourism Committee/Center for Rural Development

Planning Process	Ecosystem Planning Process	Clinch Valley Bioreserve
rational	Monitoring and Evaluation	
adaptive social learning	Plan Metamorphosis - Interdisciplinary approach to mgmt.	- Coordinate research among groups
social learning	- Conservation org. to manage	- Benchmarks measure progress

BIBLIOGRAPHY

- Anthes, Gary H. "Database keeps the Earth's inventory" in Computerworld, July 1990.
- Baldwin, Jim. Cumberland Plateau Planning District Commission. Telephone interview conducted November 15, 1993.
- Baldwin, John H. Environmental Planning and Management, Boulder and London, Westview Press, 1985.
- Carr, James H. and Edward E. Duensing, Land Use Issues of the 1980's, New Brunswick, N.J., Center for Urban Policy Research, Rutgers University, 1983.
- Center for Environmental Studies, VPI. "Falls Ridge Preserve - The Nature Conservancy Ecological Baseline Study", Blacksburg, Virginia, 1978.
- Colby, Michael E. The Evolution of Paradigms of Environmental Management in Development, SPR Discussion Paper No. 1, The World Bank, October, 1989.
- Eagles, Paul F.J. The Planning and Management of Environmentally Sensitive Areas, New York, The Longman Group Limited, 1984.
- Ford Foundation, The. The Art of Managing the Environment, New York, Ford Foundation, 1974.
- Friedman, John. Planning in the Public Domain: From Knowledge to Action, Princeton, Princeton University Press, 1987.
- Friedman, John and Clyde Weaver. Territory and Function: The Evolution of Regional Planning, Berkeley and Los Angeles, University of California Press, 1979.
- Fiedler, Peggy L. and Subodh K. Jain, editors. Conservation Biology, New York, Chapman and Hall, 1992.
- Frome, Michael. Battle for the Wilderness, Boulder and London, Westview Press, 1984.
- Gladden, William. Protection Specialist, The Nature Conservancy, Charlottesville, Virginia. Interview conducted September 16, 1993.

Helliwell, D.R. Planning for Nature Conservation, Chichester, West Sussex, Packard Publishing, 1985.

Jenkins, Robert E., Jr. The Bioreserve Concept, Abstract, Arlington, VA, The Nature Conservancy, 1991, p. 3.

Johnson, Stanley P. International Environmental Law and Policy Series: The Earth Summit: The United Nations Conference on Environment and Development (UNCED), London, Dordrecht, Boston, Graham and Trotman/Martinus Nijhoff, 1993.

Jones, Gareth E. The Conservation of Ecosystems and Species, New York, Croom Helm, 1987.

Kittrell, Bill. Clinch Valley Bioreserve Manager, The Nature Conservancy, Abingdon, Virginia. Interview conducted October 6, 1993.

Life Magazine, Cover Story, October, 1993.

Malamut, John. "Compromise Development" in Urban Land, March 1987.

Martens, Tom and Tom Peterson. "What is a Land Trust?" in American City and County, March 1992.

Nature Conservancy, The. Last Great Places Brochure, 1991.

Nature Conservancy, The. Fact and Information Sheets, Arlington, Virginia, 1991.

Nature Conservancy, The, Virginia Chapter. "Cinch Valley Bioreserve Strategic Plan", 1992.

Noss, Reed F. and Allen Y. Cooperrider. Saving Nature's Legacy, Washington, D.C. and Covelo, CA, Island Press, 1994.

Princen, Thomas and Matthias Finger. Environmental NGOs in World Politics, London and New York, Routledge, 1994.

Skinner, Skip. Lenowisco Planning District Commission. Telephone interview conducted November 15, 1993.

Spellerberg, Ian F. Evaluation and Assessment for Conservation, London, Chapman and Hall, 1992.

Thomas, Michael Robert. A Conceptual Framework for Ecosystem Planning and Management. A Dissertation submitted to Michigan State University, 1980.

United Nations. Human Settlements: The Environmental Challenge. A Compendium of United Nations Papers. United Nations, 1974.

Wilson, E.O., editor and Frances M. Peter, associate. Biodiversity. Washington, D.C., National Academy Press, 1988.