Chapter 2: Approach, Mission, Goals, and Objectives

OVERVIEW

This chapter consists of three main sections. The first section provides an overview of other conservation planning and prioritization approaches and summarizes what the project team learned from these existing efforts. The second section details the overall conservation approach that the team used to guide this project. The last section explains the project's mission, goals, and objectives, all of which influence the remainder of the project.

REVIEW OF PLANNING APPROACHES

Land trusts and other nonprofit environmental organizations in this country and abroad have instituted campaigns of various sizes to protect natural landscapes and their attendant resources. These conservation efforts are necessary due to growth of the human population and subsequent demand for land and natural resources.

In order to decide which natural areas are most important to protect, land trusts use a variety of prioritization approaches. Any given land conservation approach incorporates a systematic methodology to determine the most important areas to conserve within some larger area of interest. Most conservation plans are driven by situational elements such as the scale of the area in need of protection and the goals of the land trust for that area. Scales may vary from several acres to several million acres, while the goals may include the protection of a range of ecological, historical, scenic, and agricultural values. In addition to scale and goals, plans may also be driven by the resources available to the land conservation organization. Time, staff, data availability and quality, and financial resources can affect the scale at which a plan is developed and subsequently influence the chosen approach. The availability of these resources will affect how much land an organization can protect through acquisition, conservation easements, or lobbying for changes in local land use policies. Given the resource constraints associated with conservation and the seemingly infinite number of conservation opportunities, organizations clearly benefit from utilizing a systematic method for prioritizing natural areas for conservation.

In the current literature, the two types of approaches most commonly utilized are species/community level approaches and landscape level approaches. Both approaches have proven to be effective in planning and implementation. The goals and objectives of the final plan will ultimately determine the type of approach chosen for a particular project.

SPECIES/COMMUNITY LEVEL APPROACHES

Natural areas have often been characterized and evaluated in terms of the rare species, exemplary communities, or other unique features they contain. Scientists have learned that individual species harbor unique genetic material and are important components of functional ecosystems (Noss, 1987), making the preservation of species of undeniable importance (Knight, 1998). Such scientific evidence has supported a strong push for conserving biodiversity in the United States and around the world.

With the passage of the Endangered Species Act and the development of state and global threatened and endangered species lists, the public began to understand and advocate for protection of individual species and community types. The Nature Conservancy's heritage program introduced the "elements of diversity" concept and helped promote the view that the content of an area (i.e. what species and communities are found within a fixed space) was of prime conservation importance (Noss, 1987). With The Nature Conservancy leading the way for other land trusts, conserving biodiversity through the protection of individual species and communities has dominated most land conservation efforts to date.

Proponents of the species level approach in land conservation stress that it is an approach that the public easily grasps. People inherently understand and feel more emotionally connected to individual species, especially charismatic species, than they do to large ecosystem processes. For example, people more easily understand efforts to save a marsh wren (*Cistothorus palustris*) than they do efforts to protect groundwater recharge areas. In addition, species gain more public support because people can see the results of conservation efforts more clearly with the survival or improvement of a population (Knight, 1998). Along the same line, the species level approach tends to secure more funding because funders understand how to evaluate the success of the approach, such as by tracking the change in species numbers over time. However, critics of this approach maintain that because the species approach focuses on only a small number of species, it fails to protect the natural processes that maintain ecological functions across the landscape. Overall, the approach may prove ineffective in safeguarding the ecosystems on which the species depend if it is not imbedded in management at a landscape level (Knight, 1998).

Example of Species/Community Level Approach:
The Nature Conservancy (TNC, 2000)

The Nature Conservancy (TNC) is one of the leading land conservancies in the United States and internationally. Its mission is "to preserve the plants, animals, and natural communities that represent the diversity of life on Earth by protecting the lands and water they need to survive." To adhere to its mission, TNC developed a framework methodology for guiding its efforts. This methodology also guides the efforts of many smaller land trusts.

Driven by its mission statement, TNC seeks to protect biodiversity by using two complementary planning activities. An ecoregional plan identifies a portfolio of priority sites within a particular TNC-delineated ecoregion. A site conservation plan then more closely examines the prioritized sites within the ecoregion and offers on-the-ground conservation strategies. Each of the selected sites contains a subset of the entire ecoregion's biodiversity so that in theory, the conservation of all sites will collectively safeguard the biodiversity unique to that ecoregion.

Because the aim of both the ecoregional plan and site conservation plan is to prioritize conservation activities, the differences between the types may not be readily apparent. For clarification, Table 2.1 outlines the key differences between ecoregional plans and site conservation plans.

Table 2.1: Key differences between The Nature Conservancy's interrelated planning approaches – the Ecoregional Plan and the Site Conservation Plan

Plan Characteristics	Ecoregional Plan	Site Conservation Plan
Purpose	Preliminary assessment – generates a portfolio of sites for conservation activity.	Detailed assessment – refines conservation targets and design strategies to abate threats for those targets.
Scale	Covers an entire ecoregion, which often covers multiple states.	Covers an area of biological significance within an ecoregion. Acreage covered varies widely. Site boundaries are generally based on logical spatial grouping of common ecological characteristics.
Prioritization of land areas	Always included; analysis generates a portfolio of sites.	May or may not be included, depending on site characteristics. If land areas are prioritized within the site, additional site conservation plans may need to be developed for those "nested sites."
Identification of conservation targets and threats to those targets	Fairly detailed analysis, but detail is limited by extensive geographic scope.	Highly detailed analysis.
Selection and prioritization of strategies	Often uses strategies that would affect multiple sites. An example is working to influence taxation to further encourage donation of conservation easements.	Often uses geographically specific strategies; An example is to obtain a conservation easement on the Smith property.
Products	Written report and maps.	Written report, maps and an Excel workbook.

TNC has designed its planning efforts to be scale-independent in order to protect species and species assemblages by protecting the places where they live. TNC conservation sites range in size from a few acres to millions of acres. This emphasis on ecological communities and species, and most especially on targets such as imperiled or endangered species, species of special concern (vulnerable, declining, disjunct distributions, or endemic), and focal species (keystone, wide-ranging, and umbrella species) has formed the cornerstone of TNC's efforts over the past few decades

The Shiawassee-Huron-Clinton Headwaters and Shiawassee River project in southeast Michigan provides an example of a conservation plan designed using TNC's framework (TNC, 2001). The goal of this project was to protect the area's biodiversity in the face of development pressures associated with nearby urban growth. To work towards this goal of biodiversity protection, TNC identified approximately 30 different species and natural communities as targets, including bog bluegrass (*Poa paludigena*), Blanding's turtle (*Emydoidea blandingii*), and eastern massasauga rattlesnake (*Sistrurus catenatus catenatus*). TNC also identified threats to the viability of the species and communities including habitat destruction and conversion, habitat fragmentation, and modified water levels. By assessing the location of the species and communities as well as the threats using GIS, TNC identified land areas most important to the conservation of biodiversity at the site.

Supporters of TNC's methodology stress that it has been effectively applied worldwide with positive results and thus serves as a framework to guide land conservation efforts. Critics, however, argue that it is extremely data intensive and requires expertise that some land trusts are not able to attain due to limited resources. Critics also stress that its focus on species conservation limits its ability to address the conservation of the larger ecosystem (Knight, 1998).

LANDSCAPE LEVEL APPROACHES

While species approaches focus on individual species and communities, landscape ecology approaches focus on spatial patterns and connections that maintain healthy ecological structure, composition, and function. For example, while a species approach might involve looking for marsh wren and dealing with a site-by-site evaluation for the species, a landscape ecology approach would examine semi-submerged marsh habitat that would include marsh wrens as well as a host of other species and the various processes affecting the marshes.

The field of landscape ecology evolved in Europe as a result of a holistic approach adopted by ecologists, geographers, landscape planners, designers, and managers in their attempt to integrate natural, agricultural, human, and urban systems (Neveh et al., 1984). The term "landscape ecology" was introduced in 1938 by German geographer-biologist Carl Troll. According to Troll, "The concept of landscape ecology is born from a marriage of two scientific outlooks, the one geographical (landscape) and the other biological (ecology)." Troll stressed that landscape ecology seeks to incorporate humans and their influences on the landscape into the overall analysis (Vink, 1983).

According to Forman and Gordon (1981), a landscape is "a heterogeneous area where a cluster of interacting stands or ecosystems is repeated in similar form" while landscape ecology is the "study of interactions and fluxes of energy, mineral nutrients, and species among clustered stands and ecosystems." Landscape ecology involves studying the land's influences on and interactions with the organisms (plants, animals, and humans) that inhabit a particular tract of land or particular landscape (Vink, 1975).

Landscape ecology is a promising approach to planning because of its emphasis on the interface between humans and nature and its recognition of change as a fundamental landscape component (Hersperger, 1994). In recent years, it has become more evident that landscape planning, and thus landscape ecology, need to be integrated with many other aspects of regional planning (Neveh *et al*., 1984). Proponents of the landscape level approach assert that long-term maintenance of biodiversity requires a strategy that considers regional biogeography and landscape pattern above local concerns. In recent years, ecologists have gained a greater understanding of interactions between the biotic and abiotic components of landscapes. The literature now acknowledges that individual ecosystems, the traditional focus of ecology, should not be seen as separate entities considering that almost all ecosystems exchange energy, mineral nutrients, and species (Noss, 1983). Realizing that ecosystem functions are dependent on ecosystem structures and that ecosystems in themselves are not closed systems, there has been increased movement in the scientific community to promote the preservation of spatial connections among ecosystems. These connections maintain important ecological structures such as corridors for animal movement and vital ecological functions such as hydrological flux and storage (Knight, 1998). Thus, it has been suggested that the landscape mosaic may be a more appropriate unit of study and management than single sites or ecosystems (Noss, 1983).

This growing understanding of the importance of maintaining the spatial connections between ecosystems is pushing many land conservation organizations to shift their focus toward the conservation of spatial and ecological integrity of landscapes instead of considering only the maintenance of biodiversity. Furthermore, if the goal is maintenance of biodiversity, a logical approach is to preserve a diversity of life-sustaining ecosystems, rather than focusing on the habitat requirements of a single, rare species.

While it seems that many land conservation organizations, including TNC, are trying to shift their focus to landscape level conservation, several factors have challenged the actual on-the-ground implementation.

- State and federal policies that provide funding for species-based protection efforts encourage species-based approaches.
- Public and private funders are also reluctant to fund landscape level approaches because of the current lack of consensus on how to evaluate progress of such large scale projects effectively.
- A lag in public education concerning the importance of landscape scale conservation may be contributing to delays in implementation.
- Implementing landscape level conservation on a large scale, especially for a land trust trying to piece together private parcels, is exceedingly difficult.

To meet these challenges scientists and land managers need to stress that maintenance of intact ecosystems, ecosystem processes, and natural disturbance regimes is more critical to ecosystem health than the preservation of individual species (Knight, 1998).

Example #1 of Landscape Level Approach:
Pinckney-Waterloo State Recreation Area conservation project
(Brammeier *et al*., 1990)

The Pinckney-Waterloo State Recreation Area conservation plan was developed as a Master's project at the University of Michigan, Ann Arbor. Working with the Potawatomi Land Trust (PLT) and Michigan Department of Natural Resources, the project identified key private lands within and around the Pinckney and Waterloo State Recreation Areas (SRAs) in southeast Michigan and developed strategies for protection.

The goal of the project was "to identify priority lands for conservation around the SRAs and to develop protection and conservation strategies that will minimize fragmentation and development impacts to these areas." From this goal emerged the conservation subgoals of expanding conservation of the SRAs, minimizing human impacts, and protecting ecologically important areas. Specific conservation objectives supporting those goals were grounded in landscape ecology and included conserving a diversity of landscape ecosystems, locally rare landscape ecosystems, lands nearest pre-settlement condition, large tracts of land, rare plant communities, endangered and threatened species, and groundwater recharge areas.

The main product of this project was a conservation priority model. The model combined knowledge of ecosystem components and the ecological effects of land development into a GIS in order to identify high, medium, and low priority land areas for conservation. The conceptual model translates conservation goals and objectives into scorable conservation criteria, as outlined in Table 2.2. The project used GIS to distribute and tally scores on a grid of the study area based on the conservation criteria and GIS data inputs. Each cell accumulated points and was given a final score. Cell scores were then tallied within cell clusters and given a rating of low, medium, or high priority. Priority rankings were based entirely on final scores of cell clusters (land areas). This three-tiered ranking system (low, medium, or high priority) was fairly simplistic compared to a full numeric ranking. However, this system counteracted the uncertainty in the absolute scores that resulted from the somewhat subjective assignment of the weights for individual conservation criteria.

While this plan worked well for the objectives of the project, an important disadvantage of the resulting ranking model was that a land conservation group may end up with numerous high priority areas with little information on how to choose between them. Such a choice may be necessary if resources are not sufficient to work in all the areas. In addition, the actual weights and application of the values were based on subjective judgments of the planners. This subjectivity should be kept in mind when evaluating the absolute scores of different conservation areas.

Example #2 of Landscape Level Approach:
Sterling Forest Conservation Plan (Lathrop e*t al.,* 1998)

Two conservation land trusts, the Trust for Public Land and the Open Space Institute, initiated the Sterling Forest Conservation Plan to prevent large-scale commercial and

Table 2.2: Conservation criteria for Pinckney-Waterloo State Recreation Area conservation project (Brammeier *et al.,* 1998)

Goal	**Goal 1 – Improve protection of lands within SRAs)**	**Goal 2 – Minimize human impact)**	**Goal 3 – Protect important ecological areas)**
Criterion	only areas within 1mile of SRA considered in ranking	agricultural lands (+1)	areas within rare ecosystem-moraines (+1)
		within 100m of urban areas (-1)	areas with land cover nearest to pre-settlement (+1)
		within 100m of agriculture (-1)	forestland (+3)
		within 420ft of lake (+1)	prairie/range (+3)
		within 50m of county or state roads (-1)	wetland (+3)
			areas with rare plant communities (+1)
			areas with threatened or Endangered species- 1-5/section (+1), >5/section(+2)

residential development on the 17,900-acre Sterling Forest located on the New York-New Jersey border. The primary goals of the project were to preserve the essential characteristics of the Sterling Forest landscape including unfragmented forests, uncluttered views, and native biological diversity and to allow for limited development that minimized on-site and off-site environmental impacts.

To reach these goals, the project established targets that helped identify areas within the forest where development would have the least impact on the environment. Targets included development limitations due to soil conditions, steep slopes, floodplains; non-point source pollution potential due to proximity to water/wetlands; habitat fragmentation due to distance from existing roads and development; sensitive wildlife habitats; and visibility from the Appalachian and Sterling Ridge Trails. These targets, especially reducing habitat fragmentation by conserving those areas farthest from existing roads and development, support a landscape level approach that aimed to maintain spatial connectivity between habitat types and ecological functions.

To analyze the targets used to prioritize lands for development, the project gathered data and mapped the five targets. Each target was ranked and mapped on a scale from 1 to 5 according to how severely development would affect the environment with 1 = very slight impact, 2 = slight impact, 3 = moderate impact, 4 = severe impact, 5 = very severe impact. Using GIS, the project overlaid all target layers with their rankings to allow the authors to identify areas that could be developed with the least impact on the environment.

LESSONS LEARNED FROM EXAMPLES

The planning approaches of the aforementioned projects exhibit many similar steps in their methodology but vary in the specifics, as outlined in Table 2.3. Overall, their differing targets and weighting schemes reflect the varying scope of the conservation goals. The plans also differ in scale, a factor that is driven by conservation goals and the resources and overall vision of the project managers. Although the species-based and landscape ecology-based plans differ in their basic approaches and corresponding goals, they do exhibit some commonalities in terms of the steps each plan took to prioritize lands for protection. These commonalities include:

1. <u>Establishing conservation goals</u> – Each project established conservation goals according to the mission statements and overall vision of the involved organizations and the nature and extent of the existing conservation opportunities and challenges.

2. <u>Designating conservation targets</u> – Conservation targets serve as the actual features or functions of a given area that need protection for the project to reach its established goals.

3. <u>Utilizing a weighting scheme to prioritize conservation areas</u> – Projects use a weighting system to rank the targets according to the overall score of the targets in particular areas.

Table 2.3: Comparison of conservation planning approaches

Approach	Scale	Goals	Targets	Weighting scheme
Species Approach: The Nature Conservancy's Ecoregional Planning Process (TNC, 2000)	TNC-delineated ecoregion.	Conserve the diversity of species, communities, and ecological systems in each ecoregion.	• Native plant and animal species • Imperiled or exemplary natural communities	• Rank the targets for viability according to three factors – size, condition, and landscape context • Assign each target a classification of "very good," "good," "fair," or "poor" for each of the factors
Species Approach: The Nature Conservancy's 5-S Planning Process (Poiani *et al*., 1997 and TNC, 2000)	"Scale-independent" but focused on site conservation planning of areas identified through the ecoregional planning process.	Protect biodiversity.	• Imperiled or exemplary natural communities • Endangered, threatened, or special concern species • Focal species	• Targets ranked for viability according to three factors – size, condition, and landscape context • Assign each target a classification of "very good," "good," "fair," or "poor" for each of the factors
Landscape Ecology Approach: Sterling Forest Planning Process (Lanthrop *et al*., 1998)	"Landscape scale" – Sterling Forest is 17,900 acres or 28 square miles.	Protect unfragmented forests, scenic views, and native biodiversity; identify areas that could be developed with the least effect on the environment.	• Limitations to development due to soils and terrain • Non-point source pollution potential • Habitat fragmentation potential • Aesthetic impact • Sensitive wildlife habitat areas	Targets ranked for development conditions due to: • soil conditions/slope • non-point source pollution potential due to proximity to water/wetlands • habitat fragmentation • sensitive wildlife habitats visibility from the Appalachian and Sterling Ridge Trails.
Landscape ecology approach: Pinckney-Waterloo Planning Process (Brammeier *et al*., 1998)	Approximately 30,000 acres within SRAs in southeast Michigan; study area includes a one mile buffer around state recreation areas.	Expand conservation of the SRAs, minimize human impacts, protect ecologically important areas.	• Areas adjacent to or providing Lakeshore connectivity between SRAs • property and other areas with high development potential • Rare ecosystems, lands nearest to pre-settlement condition, near-natural land cover types, and large tracts • wetlands, groundwater recharge areas locally rare plant communities and endangered / threatened species	Areas were ranked according to: • their distance from certain desired (+) or undesired (-) human impact areas their inclusion (+) of important ecological areas.

OVERALL APPROACH OF THE UPPER MANISTEE RIVER WATERSHED CONSERVATION PLAN

After reviewing the literature and studying several planning and prioritization approaches in some detail, the project team determined that no single approach could independently satisfy the needs of the Upper Manistee River Watershed Conservation Plan. The lack of a comprehensive blueprint for the project is not surprising. Indeed, one of the biggest lessons from the review of other approaches and past projects is that the specifics of any one approach depend on the goals and objectives of a given project. In turn, those goals and objectives vary in scope and scale depending on the challenges and opportunities of the area and the resources available to planners.

Each of the reviewed approaches, however, did provide the team with helpful guidance and instruction in the development of its plan. First, the project team decided to use a landscape ecology-based approach, as opposed to a species-based approach. There were four main motivations behind the team's decision.

1. <u>Conserve ecosystem structure, function, and composition</u> – Scientific evidence supports that a landscape ecology approach is necessary to adequately protect the interactions within a single ecosystem and between multiple ecosystems (Noss, 1983). Species-based approaches are far less likely to protect these interactions.

2. <u>Meet GTRLC's goals</u> – GRTLC aims to protect lands of significant conservation value. While the species-based approach may be appropriate for goals focused on a relatively small number of species or communities, a landscape-based approach better serves the larger goal of conserving important lands and their associated ecosystem structure, functions and composition.

3. <u>Consider project scale</u> – While this project focuses only on the upper portion of the watershed, GTRLC has expressed interest in eventually working on conservation efforts across the entire Manistee River watershed. Especially when working on a spatial scale as large as the Manistee River watershed, it is helpful to structure protection efforts around larger ecological processes and connections rather than individual species occurrences.

4. <u>Emphasize a proactive approach</u> – One problem associated with devising conservation plans to protect threatened and endangered species is the high level of uncertainty regarding the species' actual locations and true habitat needs. Given the limited coverage of most field data and the resources needed to secure new information, these gaps in knowledge are often exceedingly difficult to close. The project team believes that it is more effective to focus efforts on the protection of the larger system to minimize uncertainty and maximize impact. One important side benefit of such an approach is the conservation of ecological components that are not currently recognized as needing protection (Noss, 1983). This is the essence of a pro-active strategy and helps planners get ahead of problems rather than constantly moving from one crisis to another.

In keeping with the methodologies utilized by all conservation plans investigated, the team developed an overarching mission and several associated conservation goals and objectives. The mission, goals, and objectives are described in more detail in the following section of this chapter. The project team also developed conservation drivers (this project's equivalent to what many other projects term "targets") to spatially represent these goals and objectives and to direct their implementation on the ground. Finally, the project employs a weighting scheme to guide the prioritization of lands within the study area. For more information on conservation drivers, the weighting scheme, and data manipulation, see Chapter 7.

After determining that the project would 1) use a landscape ecology-based approach; 2) develop a mission, goals, and objectives; 3) represent and analyze those goals and objectives using conservation drivers; and 4) prioritize lands using those drivers and an associated weighting scheme, the project team then considered questions of scale and product.

While both landscape ecology-based and the species-based approaches proclaim at least some independence from questions of scale, in their real-world expressions, projects using landscape ecology often focus on conservation efforts at a regional scale while projects centered around species often cover more localized sites. For GTRLC, conservation at both the regional and local (parcel) scale is important. GTRLC requires conservation planning at the regional level to help direct its efforts to certain portions of the watershed. GTRLC also needs prioritization at a landscape scale because most of its protection strategies involve working with individuals or small groups of landowners. In an attempt to meet the full range of GTRLC's needs, the team designed this project to consist of two main phases operating at two different scales (Figure 2.1).

Phase One: Regional Scale – In this phase, the team analyzed the study area (see Chapter 3) and ranked the entire matrix of lands as low, medium, high, or highest priority. The team then delineated discrete units called Conservation Focus Areas (CFAs) around clusters of lands designated high and highest priority.

Phase Two: Parcel Scale – In this phase, the team analyzed parcels within the CFAs and ranked the parcels in order of conservation priority. This ranked list of parcels helps direct GTRLC to specific landowners to discuss a variety of voluntary conservation options.

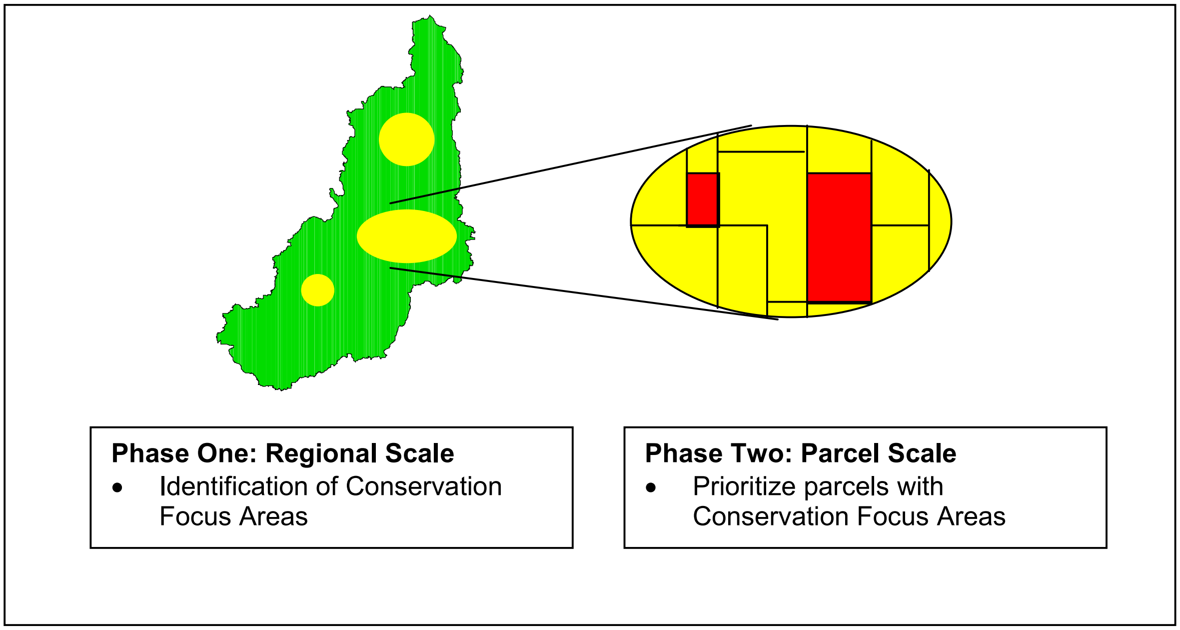
In summary, the basic approach for the Upper Manistee River Watershed Conservation Plan is as follows:

1. Utilize a landscape ecology-based approach to guide the overall design, implementation, and analysis of the project.

2. Develop goals and objectives, generate associated conservation drivers, and prioritize lands for protection according to a cumulative, weighted analysis of those drivers.

3. Prioritize lands for protection in two phases and at two scales.

Figure 2.1: Project analysis – two phases, two scales



MISSION, GOALS, AND OBJECTIVES

The team designed a three-tiered hierarchy of mission, goals, and objectives to guide its efforts on the project. The project mission provides the overarching purpose for the work and links the academic exercise to real-world application. Nested beneath the mission, the goals further refine the mission and define more specific areas of emphasis for the project. Finally, action-oriented objectives expand the project goals and lay the foundation for development of mappable conservation drivers. Figure 2.2 depicts the relationship between project mission, goals, and objectives.

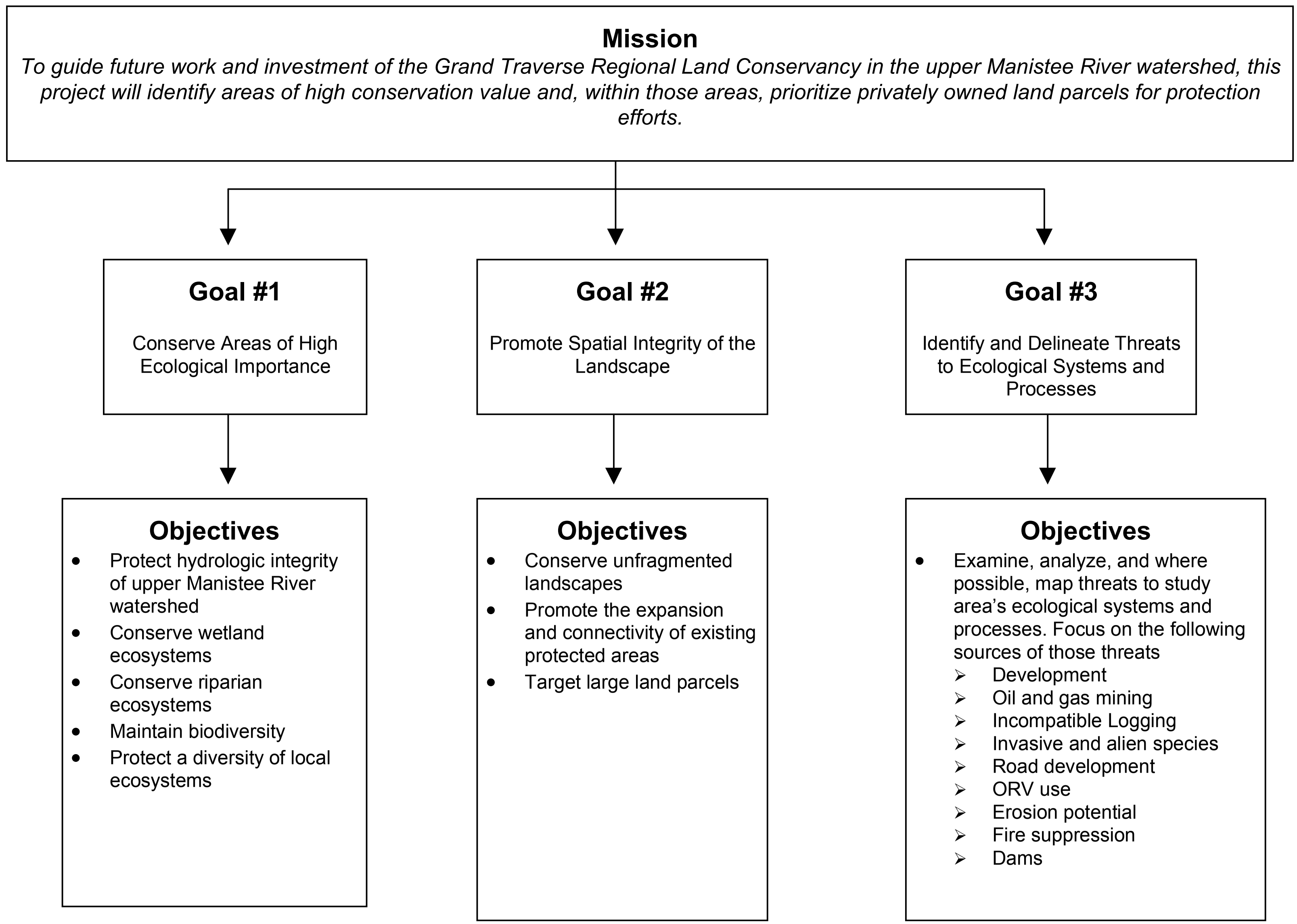
PROJECT MISSION

Working with GTRLC, the team developed the following project mission:

> *To guide future work and investment of the Grand Traverse Regional Land Conservancy in the upper Manistee River watershed, this project will identify areas of high conservation value and, within those areas, prioritize privately owned land parcels for protection efforts.*

Two elements of the project mission warrant further discussion. First, the mission clearly establishes that the primary purpose of this project is to assist the efforts of GTRLC and others working in the Manistee River watershed. The project team felt strongly that its

Figure 2.2: Relationship of mission, goals, and objectives



Master's project should serve a purpose beyond academic requirements and personal interest. The team wanted the project to help future on-the-ground conservation efforts, and such an emphasis is central to the project mission.

Second, the mission clearly establishes that the focus of the project is areas of high conservation value. There are many other reasons to target land for protection or special management. For example, one might emphasize economic interests and identify forests that have the best potential for viable timber operations. In another case, one might select areas of exceptional recreational value and seek to preserve or enhance access and recreational opportunities. While not discounting the value of economic, recreational, or other interests, this project focuses on protecting land for its ecological value, and the emphasis of this approach in the mission is reflected throughout the project goals and objectives.

PROJECT GOALS

To support its mission, the project has three main goals:

1. Conserve areas of high ecological importance
2. Promote spatial integrity of the landscape
3. Identify and delineate threats to ecological systems and processes

These goals are a direct extension of the project mission and serve to elucidate and expand the project team's definition of "areas of high conservation value." Moreover, these goals provide the justification for the more specific conservation actions outlined in the project objectives.

Goal 1: Conserve Areas of High Ecological Importance

This goal links conservation value directly to ecological value. In the simplest terms, this goal is based on the premise that some lands possess certain characteristics and features that make them more ecologically valuable than other areas in the surrounding landscape. Projects might measure this value in several different ways:

- <u>Role in Larger Ecological Processes</u> – The lands in question could be especially important to the maintenance of key ecological processes such as fire, flooding, or groundwater recharge.
- <u>Rarity</u> – The lands harbor threatened or endangered species or could consist of a rare or uncommon association of landforms and vegetative communities.
- <u>Biologically Diverse Ecosystems</u> – Certain ecosystems tend to support a higher abundance and diversity of species than others. Riparian areas, for example, are known worldwide to be rich in biological diversity and important for species movement and dispersal.
- <u>Health and Integrity</u> – While almost all lands suffer from some degree of human-induced disturbance, certain lands are clearly more healthy and ecologically intact

than others. Lands that contain vegetation that resembles pre-settlement conditions and still support historic ecological functions, including natural disturbance regimes, are assumed to be of higher value than those that do not.

Goal 2: Promote Spatial Integrity of the Landscape

Spatial integrity is based on principles of landscape ecology and refers to the idea that the context of the landscape is as important as its composition. The shape, size, and spatial relationship of all components of the larger landscape affect the ecological value and associated conservation importance of those components (Dale, *et al.*, 1999). While the project's first goal identifies important lands, this goal evaluates the spatial context of those lands, and how they relate to one another within the larger matrix.

An example helps illustrate this point. The project's first goal, to conserve areas of high ecological importance, may push the project to identify two tracts of northern hardwood forests approaching pre-settlement conditions as high priority. The second goal of promoting spatial integrity guides the project to refine that analysis and give added priority to the larger tract.

Identifying spatial patterns in the landscape and promoting those that are favorable to the long-term maintenance of ecosystem health is a key component of successful conservation planning (Dramstad *et al*., 1996). Put another way, it is important to consider the context of a given landscape (its use, structure, and surroundings) in addition to simply evaluating its elements and composition (Noss, 1987). The project's second goal therefore complements and strengthens the first goal, and enables the project to consider larger ecosystem processes and functions along with ecosystem structure and associated biotic and abiotic components.

Goal 3: Identify and Delineate Threats to Ecological Systems and Processes

Threats lie at the core of any conservation effort. Indeed, if the landscape and its associated biotic and abiotic features and physical processes were not threatened by some human activity or agent, no conservation effort would be necessary. Unfortunately, a variety of factors threaten many of the study area's most notable natural features, such as the cold, stable flows of the river and the high percentage of non-urbanized land cover. A conservation plan for the area must consider these threats, both in terms of their impact on lands proposed for protection and whether the suggested protection strategy is sufficient to address and mitigate these threats in key areas. This project goal seeks to present the extent, severity, and location of key threats, and where possible, illustrate their geographic and causal relationships to identified CFAs.

Note that threats do not contribute directly to the identification and prioritization of lands to conserve in this plan. Threats will serve, however, as a complement to the recommended conservation actions for private lands within the CFAs. By examining the spatial relationship and relative severity of threats to lands identified for protection, GTRLC can further refine its priority actions on the ground. Chapter 7 provides a more thorough explanation of the role of threats in the overall analysis.

PROJECT OBJECTIVES

Under each project goal, the team developed a number of different objectives. The key purposes of the objectives are to 1) expand the project goals and provide more concrete directives for the project and 2) establish a foundation for the development and use of mappable and quantifiable conservation drivers. Each project objective is listed below, followed by a short explanation and justification for its selection.

Objectives for Goal #1 - Conserve Areas of High Ecological Importance

1. *Protect the hydrologic integrity of the upper Manistee River watershed*
   Many consider the Manistee River system one of the healthiest in the state, and its protection represents an obvious priority for conservation efforts in the study area. The Manistee River has also been called one of the nation's most stable rivers; steady groundwater inputs play a defining role in the hydrology of the upper Manistee (US Forest Service, 1983). A significant body of evidence suggests that the ecological integrity of the Manistee River and its tributaries depends on the continued integrity of these groundwater inputs (Rozich, 1998). Indeed, cold, stable groundwater inputs produce the river's distinctive hydrologic stability, temperature, biological, and chemical characteristics. A shift from a groundwater-dominated system to a system that receives significant surface water inputs would dramatically affect these characteristics. For example, increased inputs from warmer, surface water run-off would raise stream temperatures, increase sedimentation, reduce flow stability, and produce more erosion. All these changes would negatively affect the system's ecology. It is clear that protection of the Manistee River and its associated ecosystems depends on the protection of the area's groundwater resources.

2. *Conserve wetland ecosystems*
   Wetlands play a key role in the watershed's hydrology. Therefore, one might consider their conservation covered under the first objective. The team believes, however, that wetland values are distinct and important enough to merit a separate objective.

   Once viewed as worthless land, over the last several decades wetlands have enjoyed a positive reevaluation, first by the scientific community and somewhat later by policy makers, regulators, and the general public. While society still struggles to formulate and implement the policies and management plans necessary to protect wetlands, there is near nationwide acceptance that wetlands are important and worthy of attention. While the dynamics behind this changing national view of wetlands are likely complex and variable, the facts supporting the change are relatively straightforward. Wetlands provide a number of important services and functions to our society. They provide critical habitat for a wide range of plants and animals, from commercial fisheries and game species, to endangered amphibians, birds, and insects. At a larger scale, wetlands reduce the frequency and intensity of flood events, help maintain water quality by filtering pollutants and trapping sediments, regulate the distribution of many important nutrients and atmospheric gases, and provide aesthetic and cultural values (Mitch and Gosselink, 2000). Like many parts of Michigan, the study area's ecosystem and biological diversity are often the highest in and around wetlands (Simpson, *et al*., 2002).

3. *Conserve riparian ecosystems*
   Riparian ecosystems are largely linear features and occur at varying widths along rivers and streams and around lakes. These ecosystems consist of lands that lie in the transitional area between the aquatic zone and the upland zone (Budd *et al.*, 1987). Like wetlands, riparian ecosystems are closely linked to the watershed's hydrology. Also like wetlands, the extent and diversity of their values warrant handling them under a separate objective. Riparian ecosystems provide a number of ecological values, including the following:
   - <u>Ecosystem diversity</u> – Riparian ecosystems typically encompass more diverse landforms and biological communities than are found in upland areas (Gregory, *et al.*, 1991).
   - <u>Water quality</u> – Vegetated riparian areas help maintain surface water quality by limiting erosion, filtering out contaminants and excess nutrients, and stabilizing stream temperatures. These functions are especially important in the headwaters and on smaller tributaries.
   - <u>Food supply</u> – Riparian ecosystems contribute greatly to the food supply of aquatic systems (Budd, *et al.*, 1987).
   - <u>Habitat</u> – As Budd (1987) states about riparian ecosystems, "there is no [other] habitat type upon which [a wider array of] wildlife is more dependent."
   - <u>Corridors</u> – The linear nature of riparian areas provides corridors for animal movement as well as animal and plant dispersal (Gregory *et al.,* 1991), a function that isolated wetlands and other patches do not offer.

4. *Maintain biodiversity*
   A growing library of scientific data paints a dim picture for the survival of much of the world's flora and fauna. Indeed, nearly every corner of the planet appears to be suffering from an accelerating loss of biodiversity. As the scale and impact of the problem have gained increasing attention over the last decade, many prominent scientists have increasingly stressed that this loss of biodiversity represents one of humankind's most daunting and urgent challenges (Wilson, 1992).

   As stated previously, this project avoids a species-based approach to land conservation. Instead, the team understands that species declines are symptomatic of larger problems. In other words, species are the "parts" that crumble when there is a problem with the "whole" (i.e. ecosystems) (Lapin and Barnes, 1995). Nevertheless, the team feels that maintaining biodiversity serves as an appropriate objective for this project for several reasons.

- The fauna and flora that account for biodiversity are an important compositional component of any ecosystem.
- The role of biodiversity in maintaining overall ecological health is increasingly acknowledged (Meffe and Carrol, 1997).
- Loss of biodiversity presents is an enormous and ubiquitous challenge that demands the specific attention of planners and conservationists.

5. *Protect a diversity of local ecosystems, especially those that are rare at the regional scale*
   Researchers at the University of Michigan and the Michigan Natural Features Inventory have worked over the last decade to delineate and map ecosystems in Michigan at several different spatial scales. These scales range from regional ecosystems that cover over half the state to localized ecosystems that cover only a few hundred acres (Albert, 1995 and Corner, 1999). This work has demonstrated the incredible diversity of local ecosystems and that much of this diversity results from the fact that smaller ecosystems are nested within variable combinations of larger, regional ecosystems. These studies also reveal that certain local ecosystems are quite rare. This ecosystem rarity helps prioritize efforts aimed at protecting a diversity of ecosystems, and by extension, a diversity of associated biotic and abiotic features.

6. *Conserve natural[1] areas that exhibit a high degree of ecological integrity and resiliency*
   Conservation biologists C.S. Holling and Gary K. Meffe (1996) have proposed a "golden rule" of natural resource management that urges managers and planners to "retain critical types and ranges of natural variation in resource systems in order to maintain their resiliency." Sickley *et al.* (2002) add weight to this argument by stating that "a natural system is healthiest when all of its inherent subsystems and components are maintained." The team asserts that maintaining ecosystem heath and resiliency ultimately depends on preserving the full range of ecosystem composition, structure, and function across the landscape, and therefore seeks to prioritize those lands which best capture those values.

Objectives for Goal #2 – Promote spatial integrity of the landscape

1. *Conserve unfragmented landscapes*
   Fragmentation can be defined as the dissection of the landscape by human-created openings of various sizes (Noss and Cooperrider, 1994). Fragmentation affects ecological processes in several different ways. Noss and Cooperrider (1994) describe six ecological processes that affect biodiversity and ecosystem integrity. A

[1] In using this objective, the project team understands that in recent years the scientific community has criticized use of the term "natural." There seem to be several reasons for the criticism. Some see the term natural as value-laden and one that tends to heighten, rather than reduce, the separation of humans from their environment. Others feel that humans impact all landscapes and thus "natural" has little meaning (McKibben, 1989). The team agrees with these criticisms, in part, but asserts that categorizing lands based on the integrity and value of overall land cover is an appropriate prioritization objective within the larger context of the project.

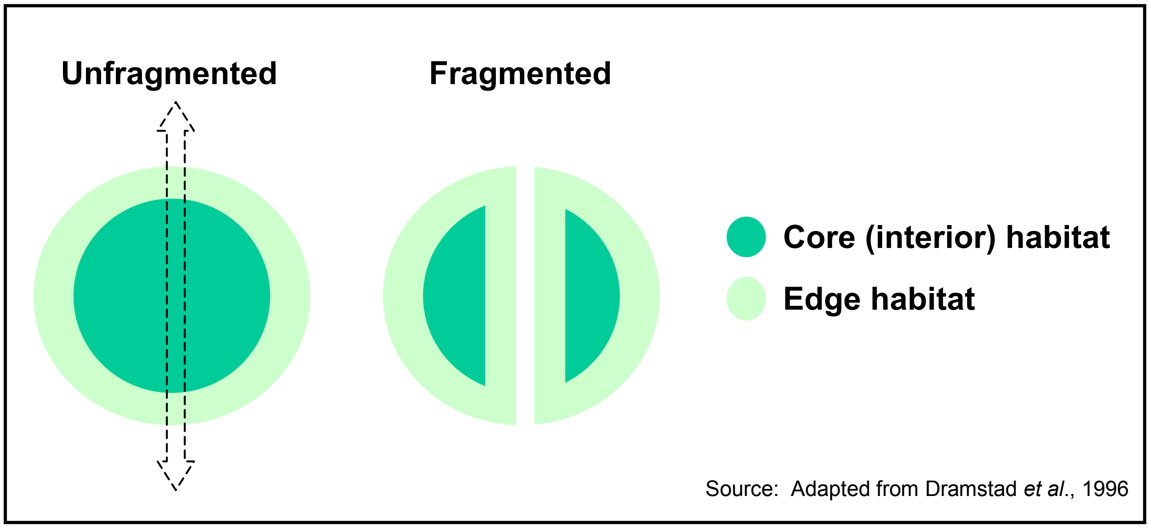
modification of their list including the impacts of fragmentation on each process are described as follows:

- Exposure – Removing vegetation can increase the amount of solar energy reaching formerly shaded forest floors. In addition, the creation of edge habitat changes the microclimate of a site by increasing its exposure to weathering elements such as sun and wind.
- Nutrient cycles – Species depend on nitrogen, phosphorus, and other nutrients for survival. Clearing land tends to accelerate nutrient loss through erosion.
- Hydrologic cycles – Depending on the topography, fragmentation can produce quicker or slower water transport. For example, road construction may impede drainage from a given basin. In contrast, removing hillside vegetation often increases surface drainage rates in the area.
- Disturbance regimes – Fragmentation alters the impacts of all natural disturbances, including fires, windstorms, landslides, and floods. For example, as subdivisions push further into previously intact forest tracts, fire suppression is almost always increased to protect the residents and their property. Levees and dikes designed for flood control can fragment riparian ecosystems and drastically alter the flood regime that is critical to the integrity of many riparian areas.
- Equilibrium processes – Noss and Cooperrider (1994) define an equilibrium condition as "one in which two opposite forces exist in a balanced state." While no natural system exists in true, permanent equilibrium, fragmentation tends to promote more frequent and less natural imbalances. For example, fragmentation tends to increase erosion, thus disturbing the equilibrium between soil loss and soil accumulation.
- Permanent disruption of successional cycles – Major disturbances set back the successional time clock of an ecosystem, returning it to an earlier successional state. Following natural disturbances, ecosystems eventually return to a pre-disturbance state over time. Theoretically, this process occurs in a perpetual cycle. However, ecosystems may not be able to respond to many modern, anthropogenic disturbances in the same way.

In addition to its effects on ecosystem processes, fragmentation harms ecosystem structure by removing biota from the landscape, reducing patch size, and increasing edge habitat. Rarely is an ecosystem itself lost completely, but instead it is so diminished in size and connectivity that it no longer possesses the same features and functions (Meffe and Carrol, 1997). For example, the great expanse of forests in the eastern United States has not been lost completely – indeed the region is still largely forested – but that forest is, in most locations, highly fragmented. Figure 2.3 illustrates how fragmenting a natural area produces smaller patches, reduces core area, and increases edge habitat.

Alterations to ecosystem structure and processes ultimately affect ecosystem composition. Increased edge promotes the invasion of many nuisance or exotic species that thrive in edge habitat or adapt well to disturbance. For example, parasitic cowbirds favor edge habitats and can reduce native songbird populations by laying

Figure 2.3: Effect of fragmentation on patch size, core area, and edge extent



their eggs in the nests of a wide range of other bird species (Webb 2002). In another case, altered fire regimes change composition by permitting the establishment of fire intolerant species, such as maples, in areas that historically burned with some frequency. Finally, reducing patch size alters composition by diminishing the utility of natural areas for native wildlife. For example, wolves in Wisconsin avoid areas where road densities exceed 0.6 km/km^2 (Thiel, 1985).

Given fragmentation's large-scale, deleterious impacts on ecosystem processes, structure, and function, the team feels that protecting unfragmented portions of the study area stands as a clear and important objective of the project.

2. *Promote the expansion and integrity of existing protected areas*
   Over half the land in the study area is publicly owned. The Michigan Department of Natural Resources manages most of these lands, the bulk of which lie in the Pere Marquette and Au Sable State Forests. Several other public agencies manage sizeable holdings, including the State Military Board, which owns thousands of acres in southeastern Kalkaska County. Protected private lands represent a much smaller, but nevertheless important, percentage of the existing landscape. Together, the existing protected lands in the study area provide a spatial framework around which to focus future conservation efforts on private lands. One way to counter trends toward an increasingly fragmented and disconnected landscape is to establish new protected areas adjacent to existing protected lands rather than preserving smaller patches surrounded by a larger developed or developable matrix. Protecting lands on the periphery of existing protected areas can increase core habitat, expand the buffer zone between non-compatible land uses, improve connectivity between patches, and enhance the likelihood of successful management prescriptions, including a reintroduction of near-natural disturbance regimes. Protecting private inholdings within an otherwise protected landscape can prevent additional fragmentation from intrusive development, enhance management options, and increase core habitat (Forman, 1986).

3. *Target large land parcels*
   When conducting prioritization efforts at the parcel level, targeting larger land parcels makes sense from both ecological and logistical perspectives. Logistically, GTRLC can work with relatively fewer individual landowners to protect larger tracts of land. On the ecological front, while few parcels in the study area are, by themselves, large enough to support and sustain ecosystem functions and processes, a tract of 100 acres, all else equal, possesses more conservation value than a similar tract of 10 acres.

Objectives for Goal #3 – Identify and Delineate Threats to Ecological Systems and Processes

The project team chose not to develop multiple, distinct objectives to support the goal of identifying and delineating threats as it did with the two previous goals because threats do not factor into the project's prioritization analysis as directly as the other goals. Most importantly, the spatial location and relative severity of threats did not immediately impact the team's decisions on the relative conservation value of portions of the study area. The team did, however, select a number of threats and their corresponding sources for further examination (Table 2.4). Chapters 6 and 7 describe how the project examined and evaluated threats.

Table 2.4: Examined threats and sources of threats in the study area

Threats	Sources of Threats
• Altered composition and structure	• Development
• Alteration of natural fire regimes	• Oil and gas drilling
• Alteration of hydrology	• Incompatible logging
• Ecological destruction or conversion	• Invasive and alien species
• Landscape fragmentation	• Road development
• Extraordinary competition or disease	• ORV use
• Erosion	• Incompatible agriculture or grazing
• Sedimentation	• Fire suppression
• Toxic contamination	• Dams
• Thermal pollution	• Contamination