

Abstract

This land conservation plan was designed to guide the conservation efforts of Grand Traverse Regional Land Conservancy (GTRLC) and other groups in the twelve uppermost subwatersheds of the Manistee River in northwestern Lower Michigan. The project team conducted two levels of analyses using a geographic information system to prioritize lands for conservation according to ecological criteria. First, the team used eight conservation drivers to identify large land areas (>500 acres) of highest ecological importance (termed Conservation Focus Areas, or CFAs) within the entire study area. After ranking CFAs based on ecological importance, feasibility of protection, and size, the team then prioritized parcels (>40 acres) within the three highest-ranking CFAs in Kalkaska County according to their conservation value. The team ultimately identified over 12,000 acres within 63 parcels to focus GTRLC's protection efforts in the upper Manistee River watershed. As support for the plan and to improve implementation activities, the team inventoried social and political factors that will influence conservation in the study area and analyzed threats to the ecological integrity of the landscape. Additionally, the team documented the plan's strengths and limitations and discussed implementation considerations.

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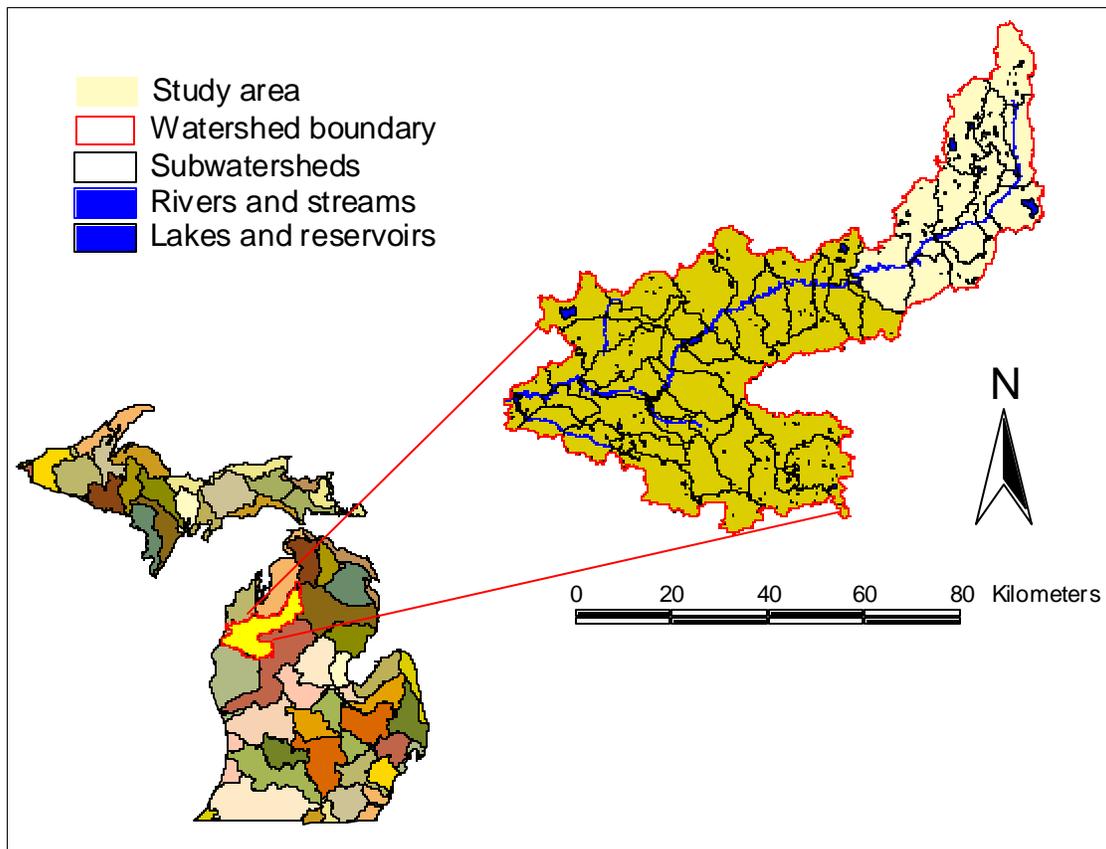
EXECUTIVE SUMMARY

Project Origins

The Manistee River watershed in northwestern Lower Michigan contains important ecosystems and a number of valuable natural features. Unfortunately, development and changing land use threaten the ecological integrity of much of the watershed. The Grand Traverse Regional Land Conservancy (GTRLC) and other conservation organizations and agencies have recognized the importance and vulnerability of the region and have begun to push for larger scale protection efforts in the watershed. As GTRLC looked to expand its own efforts in portions of the watershed, it recognized the need for a plan that evaluated the relative conservation value of the entire area and prioritized the best lands for protection.

In the spring of 2001, a group of seven graduate students (hereafter referred to as “the team”) at the University of Michigan’s School of Natural Resources and Environment contacted the GTRLC and agreed to develop such a plan for the upper portions of the Manistee River watershed as their Master’s project (Figure i). Both parties stressed the importance of developing a plan that had immediate on-the-ground utility for GTRLC in its efforts to protect significant tracts of land in the region.

Figure i : Location of Manistee River watershed and the study area within Michigan and in relation to other Michigan watersheds



Mission, Goals, and Objectives

To guide its work and provide an intellectual and conceptual framework for the overall analysis, the team first developed a mission statement, goals, and specific objectives. The project's mission statement is as follows:

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.

Building on this mission, the team established three overall goals for the project.

1. *Conserve Areas of High Ecological Importance* – This goal establishes that the team judges a land area's conservation value based on its ecological value relative to the surrounding landscape. 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.
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. While the project's first goal identifies important lands, this goal evaluates the spatial context of those lands – how they relate to one another within the larger matrix.
3. *Identify and Delineate Threats to Ecological Systems and Processes* – An analysis of threats is a highly valuable part 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. This goal seeks to present the extent, severity, and location of key threats, and where possible, illustrate their geographic and causal relationships to identified areas of conservation importance.

The team developed the following specific objectives to complement and enforce the overarching project goals.

Objectives for Goal 1: Conserve Areas of High Ecological Importance

- Protect hydrologic integrity of upper Manistee River watershed
- Conserve wetland ecosystems
- Conserve riparian ecosystems
- Maintain biodiversity
- Protect a diversity of local ecosystems
- Conserve natural areas that exhibit a high degree of integrity and resiliency

Objectives for Goal 2: Promote Spatial Integrity of the Landscape

- Conserve unfragmented landscapes
- Promote the expansion and connectivity of existing protected areas
- Target large land parcels

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

- Examine, analyze, and where possible, map threats to the study area's ecological systems and processes

Social and Political Context

Understanding that the success of any conservation effort depends, in part, on working with relevant government agencies, businesses, interest groups, and the general public, the team researched the critical social and political issues within the study area. The key findings of this chapter are as follows:

- **Historical and Traditional Land Use** – Like in the rest of Michigan, massive logging operations felled great tracts of virgin forests in the study area in the late 1800s and early 1900s. The ecological impact of the timber harvest and associated intense and widespread fires is still evident through much of the study area.
- **Current Land Use** – Recreational and natural resource-based industry dominates the land use in the study area today. Residential development covers only a small portion of the region, but it is growing faster than any other use and will have an increasingly significant effect on the study area in the coming years.
- **Land Ownership** – Public lands represent over half the study area. As manager of the bulk of those lands, the Michigan Department of Natural Resources, represents the largest and most important landowner in the area. As subdivision increases, an increasing number of people own smaller tracts of land.
- **Demographics** – Population density in the study area is much lower than the state average, but the population is growing at a faster rate than the state as a whole. The population of the study area has nearly tripled since 1970. As a whole, the study area's population is slightly less educated, less affluent, older, and less racially and ethnically diverse than the population of the entire state.
- **Government Influences on Land Conservation** – There are a number of environmental regulations and programs at the federal, state, and local level that aim to protect important ecological features and processes. Few of these regulations afford absolute protection and most private land in the study area is still vulnerable to development. While most citizens, interest groups, and governmental entities espouse a desire for environmental protection, especially at the local level, most master plans lack the basic zoning and regulatory provisions necessary for successful implementation.
- **Stakeholder Analysis** – There are numerous groups with various interests in the protection and use of the study area's land and natural resources. While the groups often bring different and sometimes conflicting perspectives to key issues, there is a clear need and opportunity for GTRLC and others interested in conservation to collaborate with a wide range of interests.

Ecosystems and Hydrology of the Upper Manistee River Watershed

The evaluation and analysis of the study area's ecology is based on a three-tiered hierarchy of ecosystems developed by the Michigan Natural Features Inventory. The largest of these is the climatically unique northern half of Lower Michigan. The smallest of these is the Grayling Outwash Plain, which covers over 4,000 square miles. The study area falls within the boundaries of each of these ecosystems. Within the study area, there are 17 unique local landscape ecosystem types at the Landtype Association ecosystem-scale.

Groundwater inputs dominate the hydrology of the Manistee River watershed, and the river is characterized by cool, stable flows. In fact, the Manistee is considered one of the most stable rivers in the country. The primary reason for groundwater's driving role in the system is that the watershed's soils consist primarily of highly permeable sands. These sandy soils increase infiltration rates and minimize surface run-off.

Threats and Their Sources

The study area contains numerous activities and agents that threaten the ecological integrity of its lands and waters. Using a framework originally developed by The Nature Conservancy as part of its 5-S methodology for conservation planning, the team identified and assessed the key threats and their sources in the study area. The most serious threats to the study area are development (primarily residential), oil and gas drilling (primarily in the northern portions of the study area), incompatible logging (forests managed solely for timber with little attention to maintaining a diversity species and stand composition), and invasive species (chiefly plants and insect defoliators).

Methods for GIS Data Manipulation, Analysis, and Evaluation

To prioritize lands for protection, the team established a lengthy but straightforward methodology for data manipulation, analysis, and evaluation. The overarching approach separated the analysis into two main phases operating at two different scales. The first phase involved prioritizing lands for protection at the regional scale. Lands identified as high priority formed discrete units called Conservation Focus Areas (CFAs). The second phase consisted of prioritizing individual land parcels within the larger CFAs.

Phase One: Regional Scale

In this phase, the team analyzed the entire study area using a geographic information system (GIS). Conservation drivers represented the foundation for this analysis. Conservation drivers are spatial representations of the project's objectives. The conservation drivers used in this project are:

- Areas of high groundwater accumulation
- Wetland ecosystems

- Riparian ecosystems
- Element occurrences
- Rare landtype associations
- Pre-settlement vegetation
- Large tracts of unfragmented natural areas
- Expansion and integrity of protected areas

Based on the established criteria, the team weighted each CFA to differently value certain portions of the study area. Once each individual driver was scored, the team overlaid all eight data layers to create a composite grid for the entire study area. The eight individual drivers had possible individual scores of 0, 5, or 10 points, such that cumulative grid cell scores potentially could have ranged from 0 to 80 in multiples of five. The highest scoring grid cell in the study area received a total of 65 points.

When the team first combined the individual driver grids to create the composite grid, the results were reported using raw scores. In order to interpret these scores, analyze patterns on the larger landscape, and divide the study area into areas of low, medium, high, and highest priority, the team reclassified the full range of scores into four categories. Reclassification was performed using Natural Breaks.

The team delineated the Conservation Focus Areas by digitizing polygons around clusters of high and highest scoring grid cells. Once established, the team ranked the CFAs based on their mean score (area weighted average of composite grid cell scores), size, shape, conservation opportunity, and conservation feasibility.

Phase Two: Parcel Scale

The team examined, analyzed, and scored every private parcel 40 acres or larger associated with the top three CFAs in Kankaska County. The parcels were scored based on three different criteria: ecological score, number of acres in natural cover, and their contribution to the connectivity of the landscape.

To prioritize parcels for protection, the team considered more than the parcel's individual score. In keeping with its emphasis on protecting large, contiguous landscapes, the team also considered the parcel's relationship to the CFA and, when applicable, the landscape feature before determining its final priority. As such, the team recognized three basic hierarchical levels to parcel prioritization: 1) the CFA, 2) the landscape feature (a sizable, intact natural area), and 3) the parcel itself.

- *CFA* – Each CFA was ranked, and that ranking served as the foundation for parcel prioritization.
- *Landscape Feature* – When determining parcel priority within a given CFA, the team used landscape features to provide a second level of ranking hierarchy.
- *Parcel Score* – Lastly, to determine relative conservation priority within a landscape feature, the team used the parcel's final score.

Results

The team delineated a total of 18 different Conservation Focus Areas, all of which it ranked according to the criteria outlined above. These CFAs total over 39,770 acres, or roughly 12 percent of the study area. The largest CFA, North Branch, is located in central Kalkaska County and covers nearly 8,000 acres. The smallest, Deward, covers less than 600 acres and is located in western Crawford County. Figure ii depicts the study area's CFAs.

For the parcel analysis, the team examined all privately owned parcels 40 acres or larger in the top three CFAs in Kalkaska County – North Branch, 28 Lakes, and Black Creek. Ultimately the team identified 63 parcels totaling over 12,000 acres within these three CFAs. These parcels can serve as immediate conservation priorities for the Grand Traverse Regional Land Conservancy's efforts in the Manistee River watershed. Additional detail on prioritized parcels is not available due to privacy issues associated with the data.

Figure ii : All Conservation Focus Areas (CFAs) with ecological ranks displayed

