Mink River Estuary: A Landscape Approach to Protection

1995

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Project Background

The Mink River is unique freshwater estuary opening into Lake Michigan and located at the tip of Wisconsin's Door Peninsula. The near pristine integrity of the plant communities and the lack of human disturbance in the wetland complex makes the Mink River Estuary Reserve a natural area of regional significance. In the early 1970's the Coastal Zone Management Program considered the Mink to be one of the highest quality estuaries in the upper Great Lakes.

The National Estuarine Sanctuary program explored conservation actions and protections to apply to the Mink River Estuary and for a variety of reasons was unable to pursue long term conservation goals for the area. The Nature Conservancy was then asked to assess the area for potential protection activities. The Conservancy had a long history of private land protection in Door County and was familiar to many local conservationists. This history enabled the Conservancy to work cooperatively with area landowners to find protection solutions for the estuary.

The Coastal Zone Management Program's initial investment in the area included funding a study by Forest Stearns and Janet Keough. This report proved invaluable in helping the Conservancy formulate early protection goals. [Stearns and Keough, 1982] The Conservancy's land acquisition efforts began in the early 1970's. The Conservancy currently owns and manages over 1600 acres in the river corridor and surrounding uplands.

In the early 1970's the Conservancy's conservation goals for the Mink River Estuary were largely concerned with water quality. The largest threat to continued high water quality was potential runoff from logging, agriculture and recreational development. Today some of the threats to the wetland corridor that were of concern in the early 1970's have been alleviated by Wisconsin's exemplary wetland protection rules and regulations. In the early days of the Mink River project, the permanent protection of the lowland forest in the river corridor was a top protection priority.

The effort to protect the lowland forest has been successful with a majority of the sensitive riparian areas owned and managed by the Conservancy, with an additional 400 acres covered by cooperative agreements with private landowners. Private landowners in the watershed of the Mink River include many local families with two or more generations of ties to the land. These families have been the hallmark of the Conservancy's protection efforts in the Mink River Estuary.

Many long-standing families in the corridor sold land to the Conservancy early on in the project to insure perpetual protection of lands so carefully stewarded by their parents and grandparents. The Conservancy was able to stabilize traditional

land use patterns in the corridor in light of rising taxes and the increasing pressures associated with population growth and in-migration.

According to Wisconsin Department of Administration population projections for the Town of Liberty Grove, which includes most of the watershed of the Mink River Estuary, the number of people in the Town will increase by 50% by the early 21st Century. This projected growth represents a potential threat of further fragmentation of the landscape and significant changes in the traditional land use patterns of the area. It is this anticipated population growth that spurred the Conservancy into considering the need for a broader look at the landscape supporting the Mink River Estuary Reserve.

The abundant richness of the Mink River Estuary has coexisted with the human community since European settlement in the mid-1800's. The Conservancy's efforts have served to stabilize the river corridor in light of a change in human patterns on the landscape. This study, funded by the Wisconsin Coastal Management Program, allowed the Conservancy to assess the larger landscape which supports the biotic richness of the Mink River Estuary and assess threats to supportive natural processes and to develop strategies to cope with undesirable conversions in traditional land use patterns.

Natural Area Protection - A Blending of Theory and Practice

The Nature Conservancy owns and manages the largest system of privately held nature reserves in the world. The Conservancy was founded by scientists and has remained committed to designing conservation action plans based on the best available information. The Wisconsin Coastal Management Program shares this approach as evidenced by its early sponsorship of the Stearns and Keough report--the first study to systematically observe and record the ecological processes supporting the biotic diversity of the Mink River Estuary. The Conservancy's conservation actions have been largely driven by the Stearns and Keough study for over two decades.

In the past ten years a new discipline has emerged from the many strands of science concerned with the understanding of ecological processes and functions. The science of Landscape Ecology blends scientific theory and practical, on-the-ground applications in an effort to use the best available information to protect biological diversity, while at the same time monitoring our actions and measuring our effects on the landscape. The Nature Conservancy is a leader world-wide in applying science-based, direct action conservation strategies to protect the best examples of natural diversity.

The Wisconsin Chapter's efforts in Door County are informed by the Conservancy's systematic assessment of the biological

diversity of the Great Lakes Basin. In 1994, The Nature Conservancy developed a database of the rare, threatened and endangered species and natural communities in the Basin. The information was then entered into a Geographic Information System which allowed the mapping of "hot spots" of biological diversity in the Great Lakes. The Door Peninsula stood out as an area high in concentrations of species of concern, including globally rare species found only in the Basin. [The Nature Conservancy, 1994]

The Wisconsin Chapter systematically reviews existing conservation plans for its statewide network of privately-owned natural areas in an effort to stay current with the best available information regarding ecosystem-based conservation and management. Mink River was deemed to be a high priority for careful review based on the biological richness of the site and the increasing threats from changing land use patterns. The Wisconsin Chapter's approach to conservation is rooted in a rich legacy of natural resource scholars and practitioners.

Wisconsin has long been a leader in practical applications of ecosystem-based thinking. Aldo Leopold encouraged us to liken ecosystem management to watch repair when he warned us not to "throw away the parts." John Curtis furthered this legacy with his classification of natural communities in The Vegetation of Wisconsin. In defining the landscape in terms of the associations based on soils, underlying substrate, climate and vegetative cover, Curtis supplied a solid foundation for the Wisconsin Department of Natural Resources State Natural Areas program. The goal of the State Natural Areas program is to protect representative examples of Wisconsin's native diversity associated with the six distinct eco-regions of Wisconsin [Hole and Germain, 1994].

It is in this Wisconsin conservation tradition that the Wisconsin Coastal Management and The Nature Conservancy have rooted their conservation efforts. The Wisconsin Coastal Management Program's support of the study of the natural and human communities that make up the Mink River Estuary has allowed the Conservancy to assess land use in the area and develop strategies to encourage the continuation of those patterns that support the biotic and cultural richness of the area.

Project Design

It is on the foundation of a dynamic, inter-disciplinary approach that the Conservancy's ecosystem protection and management strategies are formulated. By utilizing an inter-disciplinary team, the Conservancy blends the best available scientific theories with practical knowledge based in hands-on management of natural areas. This approach is particularly suited to the Mink River Estuary. The goal of the project was to carefully review past protection efforts in light of the best available science and make revisions in strategies that will best insure long-term viability of critical natural features of the watershed.

The first step in building a functional ecological model of the Mink River Estuary was to review existing information and identify gaps in that knowledge base. The Mink River study team collected information via a variety of avenues including review of WI-DNR Bureau of Endangered Species records, individual studies associated with the Mink, interviews with local professional and amateur naturalists, literature searches on key species and systems and field assessments of areas where existing information was inadequate.

The study team then compiled and presented this data in a threats analysis workshop. The list of key features gleaned from this research formed the framework for the discussions of the workshop.

The team incorporated the findings of the workshop into the overall project, with particular emphasis on refining the ecological boundaries of the study area. The threats analysis was instrumental in determining conservation strategies and priorities.

Another crucial element of the study was to include the community in the process. Successful ecosystem protection efforts must include the human community that depends on the landscape for economic and cultural survival. The main activity in this regard was a "neighbors" meeting held in the Liberty Grove Town Hall in July 1995. All the landowners in the study area were invited, by mail, to the forum to discuss the new approach to protecting the Mink River Estuary watershed. This was a most valuable interchange of information and concerns about the study area. The Conservancy's actions in the area have long been informed by the compelling conservation ethic of the local population. The neighbors meeting was a continuation of this fruitful partnership.

Finally, the team incorporated the scientific and sociological findings into a final report including a map of ecological boundaries, conservation strategies and a list of future needs. The Threats Analysis Workshop was the key framework on which the study results were based. A summary of that process is listed below. A list of sources relied upon throughout the study follows the report.

Mink River Estuary Threats Analysis Workshop

A workshop was held in July of 1995 to review the ecological boundary proposed by the Mink River study team and to assess the level of threat(s) to the natural features of concern within that boundary. The workshop was attended by a wide range of natural resource professionals, including professors from the University of Wisconsin system, Wisconsin Department of Natural Resources(WI-DNR) researchers, local conservation organization representatives and others with specialized knowledge of the Mink River Estuary.

The workshop followed a model the Conservancy has developed to assess conservation objectives in key project areas. That model applies a systematic approach to landscape-scale conservation which considers five distinct avenues of inquiry including: the natural systems and processes that support the natural feature(s) of interest; the stresses to those systems; the sources of stress, or threats; strategies to address protection of natural systems by eliminating or mitigating sources of stress and measures of success which monitor conservation actions and their long term effectiveness for the protection of natural features of concern.

Natural Systems The key natural systems were those identified as integral to the viability of the natural features of concern within the Mink River Estuary study area. The natural key natural processes that tie the Mink River Estuary and the surrounding landscape together are based in water.

The estuary itself is dependent on the **fluctuation of water levels** that result from the **seiche** effect driven by the tidal action of Lake Michigan. The changing water levels maintain the diverse array of natural communities in a stable but ever-changing pattern throughout the river corridor. The periodic inundation of the expansive marshes in times of high water sets back the successional displacement by woody shrubs. The varied and expansive mix of natural communities provides habitat for many different plants and animals.

The changing water levels are also integral to the mixing of the nutrient-rich groundwater entering the system via a series of discharge areas throughout the corridor and the water of Lake Michigan. It is this mixing of waters that provides the conditions necessary to maintain the productivity of the estuary.

Water may also be a key contributing factor supplying critical nutrition to the vast stream of **neo-tropical migrant birds** utilizing the Door Peninsula each spring and fall. Preliminary results from a Nature Conservancy study in Michigan's Great Lakes coastal areas suggests the warm, near-shore waters in spring supply an abundant source of invertebrates to migrating birds. The warm, near-shore waters provide an excellent habitat for many species of insects which hatch out in consort with migrating birds such as the many species of warblers to pass through Door County each spring.

The coastal ribbon of boreal-like forest is also dependent on the climatic conditions created by Lake Michigan. The mix of plant species making up these coastal forests is similar to conditions not found elsewhere in Wisconsin, with the exception of the Lake Superior coastal area. Further studies are expected to confirm anecdotal accounts of northern bird species, such as the Canada warbler and others not common elsewhere in Wisconsin, utilizing

the boreal-like forests which frost much of the shoreline. Additionally, the coniferous strip of forest in the coastal areas is believed to play a critical role for many species in spring and fall migration when other food sources area scarce.

The **gradient** of natural communities from the bluffs of Ellison Bay to the cobble beaches of Lake Michigan captures representative examples of most of the features of the northern Door Peninsula. The land gradually slopes from the northwest to the east following the tilt of the Niagara escarpment. Cold air drains from the uplands to the wetland areas moving moisture across the landscape. A gradient of forest communities extends from the lowland forest edging the wetland complex, through northern mesic forest to the north and east, and then into the northern dry--mesic forest at the northwestern corner of the Door Peninsula. This continuum creates a variety of habitats for plants and animals and allows for the opportunity to preserve biodiversity and the natural processes necessary to maintain viable populations of species. A corridor of contiguous forest from the northern coast to the riverine wetlands allows for better dispersal and seasonal movements of the inhabitants as well as minimizing the risks of predation and competition from edge species encouraged by a more fragmented landscape. The opportunity to protect such a rich continuum of Great Lakes-dependent natural communities is unavailable elsewhere on the peninsula and no similar presentation is known elsewhere in the Great Lakes.

The identification of these natural processes was instrumental in determining the adequacy of the initial ecological boundaries proposed by the study team. Once the boundaries were agreed upon, the next step was to assess the threats to the natural processes and the sources of potential stresses to these systems.

Stresses and Sources of Stress The threats to the key natural features used to define the study area boundaries are varied in their sources. The section below will identify the most significant stresses and their sources for each natural process or system considered critical to the viability of species and natural communities of concern in the study area.

Hydrologic regimes, or the inputs and patterns of water movement throughout the study area are susceptible to stress from a variety of sources. **Stabilization of water levels** in Lake Michigan would have a devastating effect on the diverse wetland complex in the study area. Without the periodic flooding to keep shrub invasion and other successional patterns in a dynamic balance the system would become less diverse, or monotypical over time. The fluctuating water levels result in a rich mosaic of natural communities with an abundance of habitat niches to support numerous species.

The protection of **water quality** in the system has been an

important objective from the beginning. The introduction of toxins into the system would effect the integrity of species throughout the trophic chain. A federally endangered dragonfly, the Hines Emerald or Somatochlorai hineana, has been documented in the Mink River corridor and would be greatly compromised by reduced water quality.

Another threat to water quality is through increased sedimentation. Sedimentation reduces water clarity and thus reduces light available to aquatic vegetation and it loads an excess of nutrients into the system. The early reserve design sought to protect the lowland forest in the Mink River corridor to act as a filter to trap toxics and sediments and keep them from entering the estuary. The early design has proved to be effective with regard to reducing the threats from increased sedimentation and to a lesser extent, the introduction of toxins.

The **quantity** of water entering the system in the form of groundwater is essential to the viability of the estuarine system and the fen-like plant communities dependent on the nutrient-rich discharge. The early reserve design did not adequately address the protection of groundwater discharge by the omission of protection aimed at critical recharge areas in the uplands surrounding the Mink River Estuary. Although there has been no formal groundwater mapping in the watershed, the topography and location of discharge areas suggest key upland features in need of protection. The most significant threat to water quantity in the system is dense development in the uplands. Poorly placed development may affect groundwater quantity in two ways. Removal of vegetation and creation of impermeable surfaces in recharge areas interferes with the system's capacity to capture surface waters. Dense development may also pose a threat through the mining of groundwater to supply well water to residential and commercial developments. There are areas in southeast Wisconsin where densely developed subdivisions have experienced decreased quantities as additional wells are mining the aquifer.

Neo-tropical migrant birds are a key natural feature of the Door Peninsula with from 500 to 1000 species documented in the Mink River corridor in a given season. The largest threat to these migrants lies in the **fragmentation** of habitat. The expansive marshes of the Mink River and the continuous ribbons of forest cover along the Green Bay shoreline in the northern part of the study area currently provide critical habitat for migratory birds. Fragmentation of habitat due to increased subdivision and development is a very real threat in light of the population growth projected for the Town of Liberty Grove. Forestry practices also may contribute to fragmentation of key areas. Much of the forested shoreline in the study area is currently supporting migratory bird habitat. Changes to these current land use patterns are likely as the population grows and properties change hands and are potentially subdivided and cleared for development.

The gradient of communities in the study area supports the entire range of biological diversity that characterizes this ecosystem. The areas of gradual blending or grading from one community type to the next have been determined to be "hotspots" of diversity. The gradually changing characteristics such as moisture and aspect provide opportunities for species survival in extreme conditions such as times of drought. **Fragmentation** is the largest threat to the biotic richness found along these landscape gradients. The main source of fragmentation in the study area is subdivision and development. Land conversion for agricultural production, while historically a source of fragmentation, is not a major threat in the study area. The trend appears to be moving way from agricultural land uses toward residential subdivision and development. The expected population growth will likely accelerate fragmentation and reduce future options to maintain connective corridors of gradually changing habitat types.

Strategies The boundary revision recommendations within this report are founded on a blend of the best available science and a realistic assessment of the likelihood for success of on-the-ground conservation actions. The human community within the Mink River ecosystem has coexisted in a largely compatible manner with the elements of biological diversity. The challenge of this project is to encourage the continuance of land use patterns that protect and enhance important natural features while continuing to provide the cultural and economic opportunities essential to the well-being of the human community.

The Nature Conservancy has worked cooperatively with the people of Liberty Grove throughout the history of this project to protect important natural features in a manner that also facilitates the continuance of traditional land use patterns. The Conservancy has utilized a variety of conservation tools to achieve the goals of the project. Most familiar in the toolbox is **land acquisition**. Acquisition remains an effective tool for protecting core natural areas that area best left undisturbed, but owning and managing all the land in the ecological boundary is neither practical or necessary.

The application of particular strategies must be determined by assessing the appropriate level of protection for the conservation target and the needs of the people associated with the land that supports the features of concern.

The strategies listed below are accompanied by examples of how they might be employed. The individual strategies may have many applications and aren't limited to these examples.

Communication and Education The Town of Liberty Grove has a tradition of valuing and protecting the natural resource base of the community. The conservation ethic of the community is long-standing. The Conservancy's success in this project is rooted in the acceptance and support the community has for natural resource conservation.

Historic land use patterns have been largely compatible with the biological richness of the area. The Conservancy may be in a position to provide linkages between local traditions and new members of the community. Many new residents of the area have a deep appreciation of the natural beauty of the area, but don't have the benefit of the kind of knowledge and intuition developed over generations of association with the land. The Conservancy can "bridge the gap" by learning from the long-time residents and providing information and local history to new members of the community.

Migratory bird habitat along the shoreline of Green Bay in the northern part of the study area is currently well provided for. Although the area has a high degree of residential development, the residents maintain the natural vegetation which supports migratory birds. Although current land use is compatible with the habitat requirements of migratory birds, there is no assurance that this pattern will remain stable over time.

A series of materials and presentations designed to provide information to landowners regarding the habitat requirements of migratory birds may help to stabilize current conditions. The assumption being that most people will make good decisions if they have good information.

Conservation restrictions recorded with the deed of a given tract of land can provide perpetual, legally binding protection measures for land which is privately owned and managed. This tool is suited to a wide range of conservation objectives but works particularly well for families who would like to insure the present condition of their land even after transfer of ownership by sale or bequeath.

Conservation restrictions or easements can stabilize current land use patterns and densities by limiting the subdivision of a given parcel of land. There are several key properties within the project area that area in close proximity with core natural areas. The current densities may be compatible with the conservation objectives for the natural areas nearby, but ten dwellings on the same forty acre tract may not be. The Conservancy has already purchased one property in the project area and placed permanent restrictions on the deed which prohibit further subdivision and resold the land. The new owner may improve the existing dwelling but is prohibited from subdividing the land. This same owner may sell or bequeath the property and the restrictions, which are recorded with the deed, will apply to all subsequent owners of the property.

The use of conservation easements and restrictions provides for private ownership and use of important land while also limiting the density of development to current patterns.

Voluntary cooperative agreements between private landowners and The Nature Conservancy facilitate the sharing of information and management advice for sensitive natural features. When a landowner elects to become a member of the Conservancy's Registry program they are entered into a computerized, conservation database which allows the Conservancy to offer the latest information regarding a particular species or natural feature. For example, if a Registry participant has a population of rare orchids on her land, the Conservancy can provide the landowner with the most current information regarding the orchid. The landowner has access to the best available information and at the same time maintains complete control over her property. The Conservancy does not hold a legal interest in the property and does not have physical access without prior permission from the landowner.

Success, how do we measure our progress in protecting biological diversity? The Conservancy used to be able to measure success in terms of dollars spent and acres acquired. Working at the landscape scale renders this measure inadequate. The Mink River Estuary Reserve is part of a working landscape that provides spiritual and economic sustenance for a community. We can't own it, so how do we measure success?

The ecological boundaries developed in this project are based on a set of assumptions grounded in the latest and best scientific theories. The science of ecosystem management and protection is relatively new and many of the assumptions remain untested. The challenges presented by accelerating development and the resultant habitat loss will not take a day off while conservation organizations conduct "further studies."

If we are to preserve the opportunties that currently exist on the landscape to protect the natural processes and functions we must often act quickly. The great challenge of ecosystem analysis and protection is to build in research and monitoring protocols that will test our assumptions and measure our success.

The Conservancy has worked in the Mink River Estuary for over two decades. We discovered in the course of this study that we have many more questions than answers with regard to the biota of the study area. While we have a fair amount of information regarding the rarest of species within the project, we have very little baseline data on the more common natural features.

One of the unexpected conservation objectives to come of this study is the goal of developing scientifically valid protocols for monitoring the biological diversity of the study area over time. Projects such as these are the living laboratories where ecosystem management principles will be applied and refined. It is our responsibility to develop research and monitoring programs that will measure our success against our stated conservation objectives.

Conclusion

The Wisconsin Coastal Management's support of this project provided The Nature Conservancy with the resources necessary to systematically assess the protection strategies for the Mink River Estuary Reserve and refine those strategies in keeping with the best available conservation planning information.

Conservancy staff have been concerned about the accelerating rate of change in local land use patterns for several years, but until this time did not have the resources necessary to conduct a thorough investigation incorporating the principles of landscape ecology and ecosystem management.

The increasing pressures on the natural systems supporting the biological diversity found within the study area, we believe, will continue to grow. The information collection and analysis made possible by the support of the Wisconsin Coastal Management Program will allow the Conservancy to preserve landscape protection opportunities through the efficient application of resources in the areas most threatened with irrevocable change.

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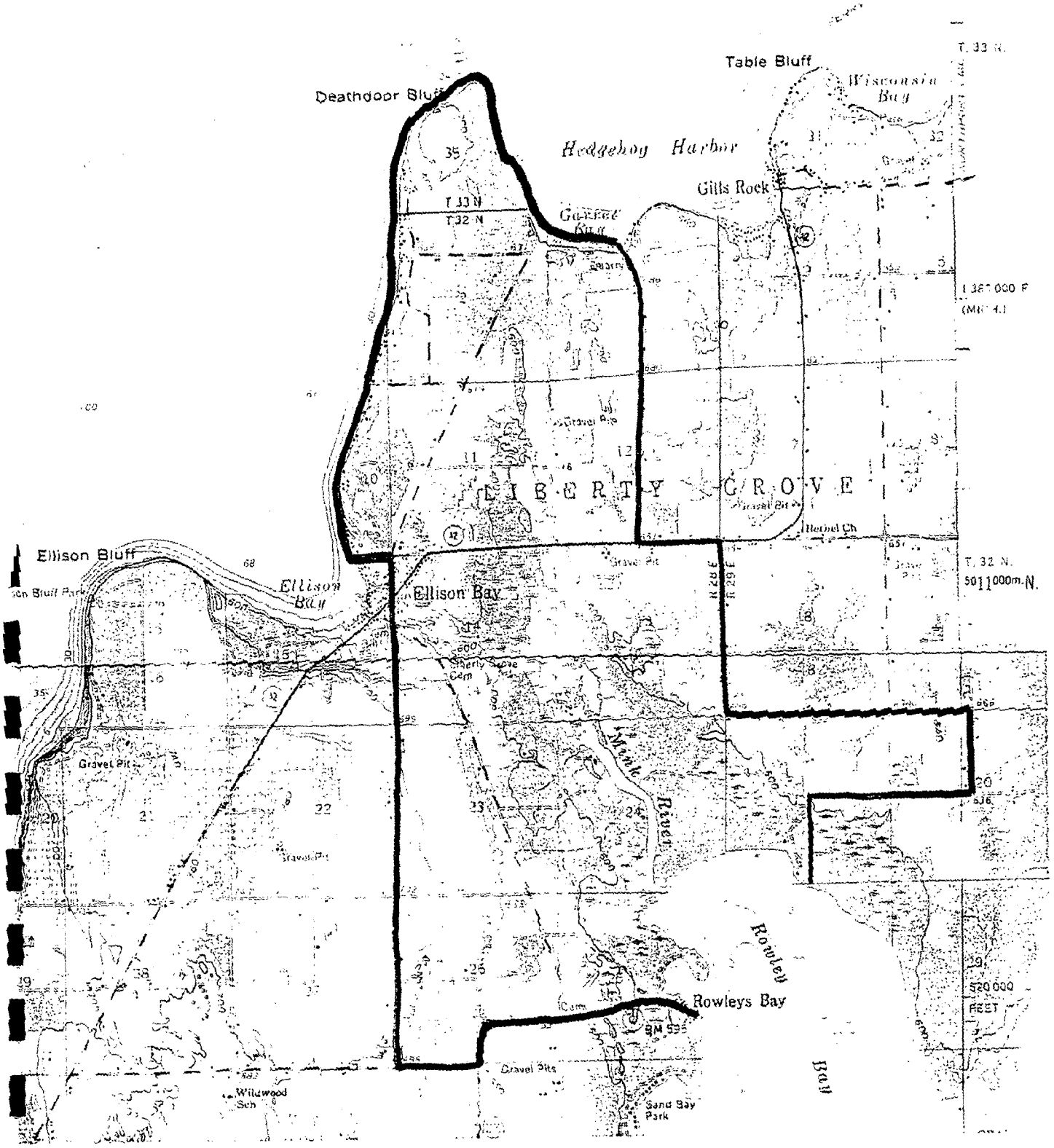

Mink River Estuary: A Landscape Approach to Protection
Ecological Boundary Map