Livingston County's Inventory of Unique, Fragile, and High-Quality Natural Areas

I. Introduction

Natural features have always played a critical role in guiding development in Livingston County. Historically, settlement occurred on uplands that were dry and suitable for raising crops. Initial land surveys in Livingston County reported wetlands so widespread that military holdings that were destined for Civil War veterans were transferred out of the area; veterans were instead rewarded with holdings in Missouri. While early wetland estimates were exaggerated and many wetlands have since been drained or filled, natural features continue to influence development patterns across the region.

Livingston County has thousands of acres of natural lands including high quality forests, prairie remnants, ecologically diverse wetlands, unique topographical and glacial features, and the specific habitats of numerous rare and endangered species. Public land managers and private landowners share the responsibility of managing these natural resources.

Many of Livingston County's communities have expressed the desire to document their natural resources and high quality natural areas. Doing so will help to plan growth in a way that meets their residents' desires to protect the rural and natural qualities that so many value. This documentation can improve local planning a number of ways including: aiding the comprehensive planning process, supporting ordinance development, improving the implementation of existing ordinances, and identifying the most valuable ecological resources in local communities for protection.

Protecting the County's ecological resources has a number of significant benefits to County residents and businesses. Economic, environmental, recreational, and educational.

Identifying Livingston County's high quality natural areas is not a simple process. The County is over 300,000 acres in size with a significant portion of land in a relatively natural state. Furthermore, identification alone is not entirely useable as the protection of all the County's natural areas is not a

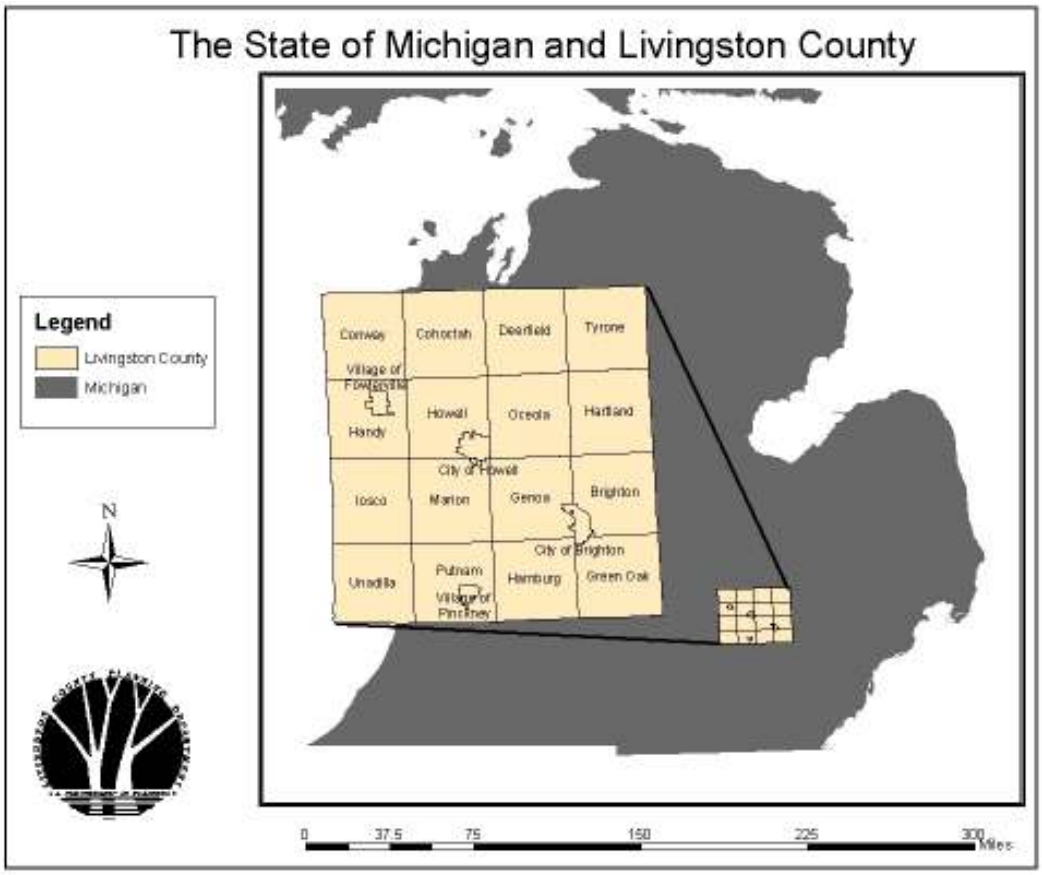
realistic outcome. Growth and development will continue on undeveloped land in Livingston County for decades to come. It therefore becomes necessary to not only identify the County's natural areas, but to prioritize them so that protection efforts for the most valuable areas can be most effectively and efficiently implemented.

Livingston County

Humans have inhabited the area that comprises Livingston County for centuries, perhaps even thousands of years. Evidence suggests that a number of Native American tribes including the Oddawa, Chippewa, and Potawatomi all spent time in the Livingston County area. These populations were the first to hunt, fish and actively manage the land through agricultural practices and controlled burning to manage wildlife habitat. The Native Americans also established numerous foot and horse trails that traversed the Livingston County area. Many of these trails were transformed over time to today's major transportation routes.

The area began to be explored and settled by Europeans in the early and mid 1800s. It was during this time that the US government negotiated treaties with tribal members to gain ownership of the land. The area currently contained within Livingston County was transferred to US ownership through a treaty conducted in 1807 in the City of Detroit. The first permanent residents of Livingston County settled in the south and southeastern regions due to their relative proximity to the Detroit area. The first European settler in the County was Colonel Solomon Peterson who settled on Portage Creek (Honey Creek) in 1828 in what is now Putnam Township. Livingston County was officially established in1833 after Governor George B. Porter approved an act to establish its official boundaries. The County continued to organize itself and grow as people moved into the area.

Livingston County is comprised of 16 townships, two cities, and two villages. The County encompasses approximately 568 square miles, or 363,521 acres. It is bordered by Shiawassee and Genesee Counties to the north, Ingham County to the west, Washtenaw County to the south, and Oakland County to the east.



Livingston County is situated between a number of urban population centers including Detroit, Ann Arbor, Flint, and Lansing. This makes it a desirable location for those looking to reside in a more rural environment while commuting into the urban centers for employment. However, the rural character of portions of the County is being lost to development at an alarming rate. The 2000 census revealed that Livingston County is the fastest growing county in the State for the fifth year in a row. From 1990 to 2000 the county grew from 115,645 to 156,951 residents, an increase of just over 35%. This dramatic increase in population is not equally distributed across the county. Although no local municipalities in Livingston County decreased in population from 1990 to 2000, some experienced only small population gains; the Village of Fowlerville, the City of Brighton, and Unadilla Township all grew by less than 15%. Conversely, the townships of Iosco, Conway, Oceola, Hartland, and Hamburg all increased in population by at least 50% during the same timeframe.

While some areas of the County are experiencing severe development pressures, others remain overwhelmingly rural. For instance, 4 of the 16 townships (Cohoctah, Conway, Iosco, and Unadilla) have less than 100 resident per square mile. These rural areas of the County tend to be found in the western and northwestern parts of the County. Conversely,

four townships (Brighton, Genoa, Green Oak, and Hamburg) in the southeastern portion of the County all have greater than 400 residents per square mile. Although the County is experiencing rapid growth the overall population of Livingston residents is relatively small. The 2000 census revealed that there are 156,951 Livingston County residents. This figure makes Livingston County the second least populated of the six counties generally considered as the Detroit Metropolitan region; Monroe County is slightly less populated. The third least populous is Washtenaw County with 322,895 residents, which is more than two times the number of residents as Livingston County.

Livingston County's Natural Resources

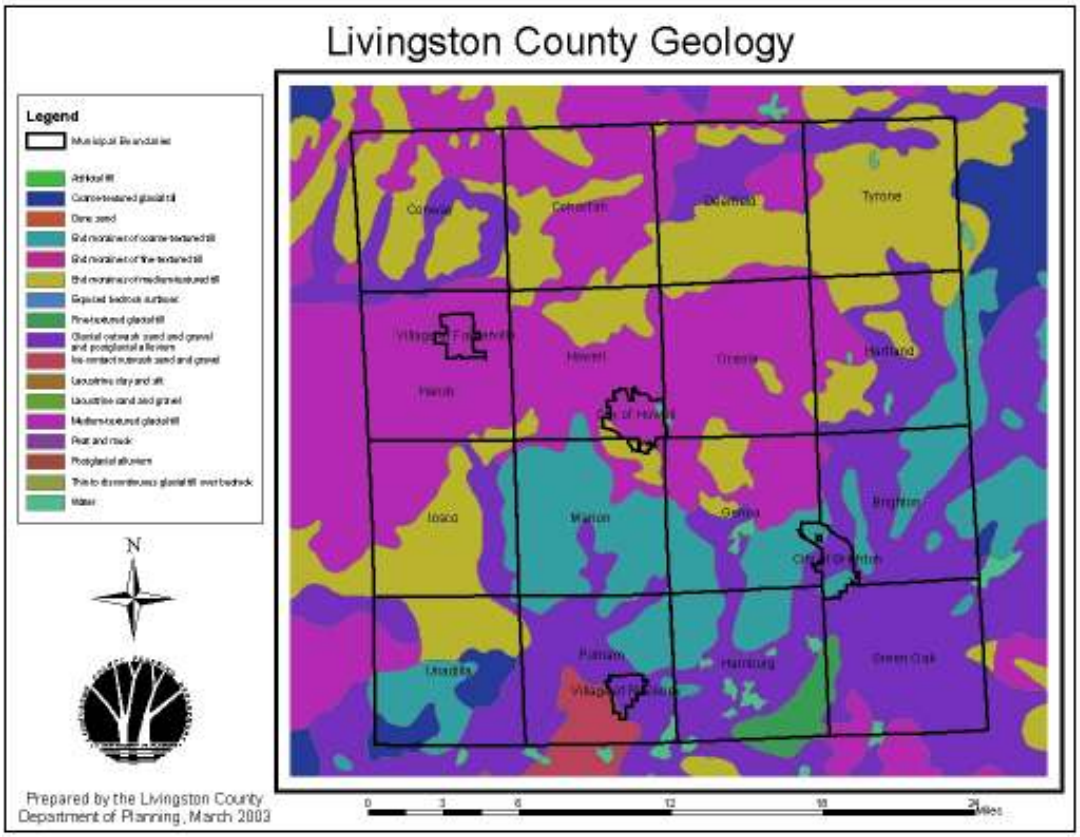
In spite of the relatively rapid rate of development in the region there is still a large amount of high quality natural land within the County's borders. While there is land use/land cover data available for the entire County, this information is only somewhat accurate and is relatively outdated. It therefore was necessary for the Department of Planning to map and inventory the County's natural areas. This was done through quantitative and scientific methodology to define, map and analyze the highest quality natural areas in the County. The local communities in which these resources are found can use these results to take appropriate steps for land use planning and natural resource protection efforts.

Before any analysis can take place, the broad environmental characteristics of the County should be discussed. The following section discusses various elements of environmental concern: soils, topography, hydrology, and land use/land cover.

Geology and Soils

Livingston County has a wide range of soils. As with any area of Michigan, Livingston County's soil characteristics were driven by glacial process thousands of years ago. In general, the northwestern region of the County is relatively flat with mixed soil types. This area is characterized by glacial till plains and medium textured end moraines. Till plains and moraines are areas where glacial processes deposited soil material of various sizes. The mixture of variously sized soil particles increases the soils' ability to hold moisture and nutrients and is therefore an area where agricultural practices tend to be focused. The southeastern portion of the county is characterized by areas of glacial outwash plains caused by melting glaciers whose runoff sorted soils into layers of similarly sized particles. These well-sorted soils may be coarse soils that allow rapid

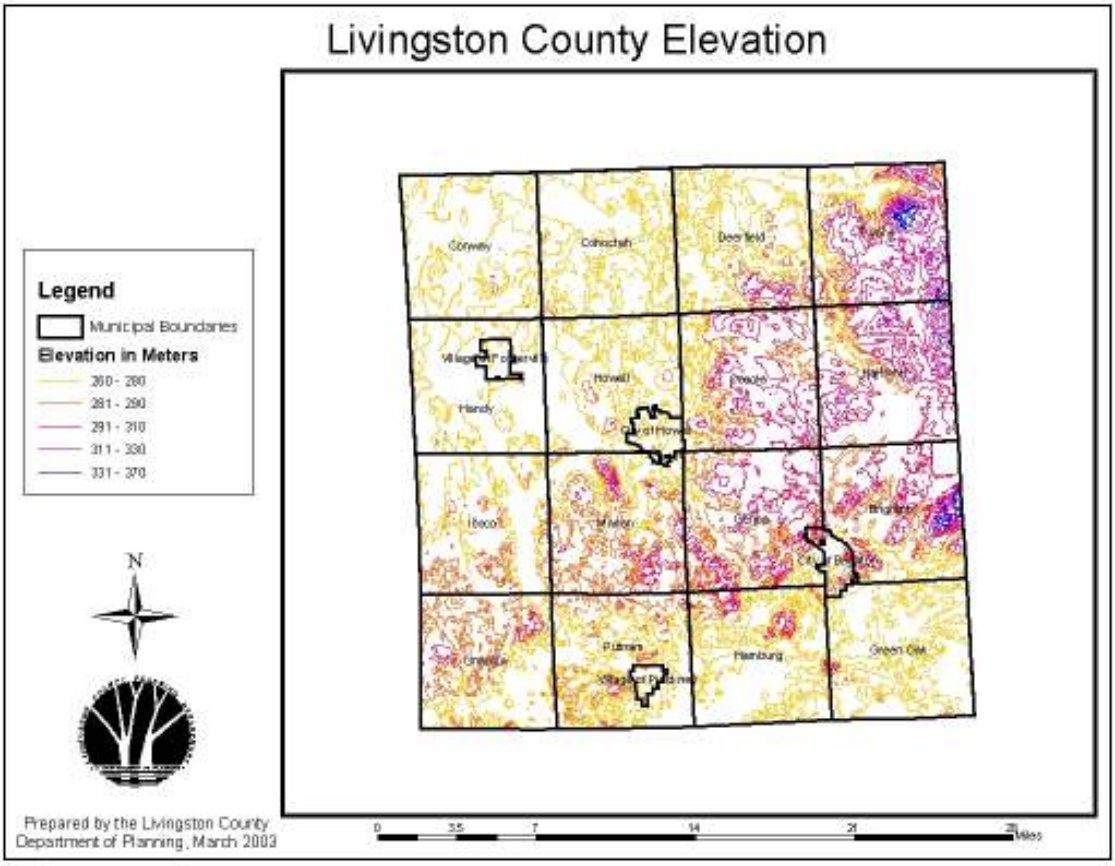
infiltration of surface water to groundwater aquifers. Conversely, this area may also include fine silts, mucks, and clays that have lower permeability rates. Separating these two regions is a region of coarse-textured end moraines with low to moderate permeability. These end moraines are areas where glaciers unloaded huge quantities of rock and soil material in one place. These glacial processes gave this area of the County its elevated topography.



While large-scale generalizations can be made across the County, soil types are usually dealt with on a site-specific scale. In other words, even the most accurate countywide data must be checked with on-site surveys to determine soil types and specific formation locations.

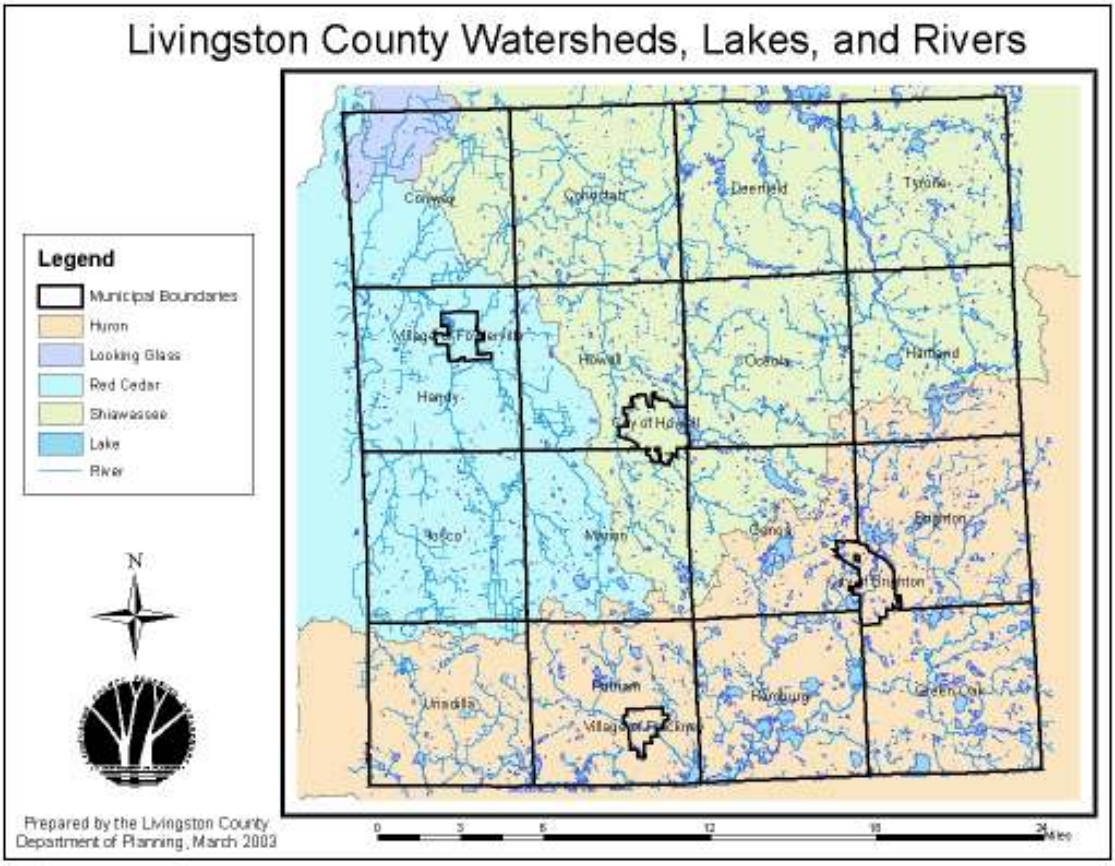
Topography

Livingston County's topography is defined in part by a geologic ridgeline that runs southwest to northeast through the County. This formation was caused by glacial processes thousands of years ago that created a series of coarse-textured end moraines. Much of the County land south and east of this feature can be characterized as somewhat flat to rolling hills with numerous lakes and wetlands. The lands to the north and west of the moraines are generally even more flat and are more conducive to agriculture and grazing.



Hydrology

Livingston County is situated in the upper reaches of four watersheds. The Red Cedar, the Looking Glass and the Shiawassee Rivers begin in central Livingston County. The Red Cedar flows to the north and west and drains into the Grand River watershed, one of the largest in the State, which continues west and eventually drains into Lake Michigan. The Looking Glass flows north and west for approximately 40 miles until it joins the Grand River near Portland, MI. The Shiawassee River flows north out of Livingston County where it joins the Saginaw River and empties into Saginaw Bay. The third major river that is found in Livingston County is the Huron River. The Huron River begins in southwestern Oakland County and flows southwest into Livingston County. The southern half of Livingston County serves as a headwaters region for a number of high quality creeks that drain into the Huron River including Ore Creek, Honey Creek, Hay Creek and others.



In addition to the Red Cedar, the Shiawassee, and the Huron Rivers there are countless tributaries, streams, creeks, drains and ditches. Though it may be hard to believe, there are over 1000 linear miles of flowing surface water in the County. Many of these miles are made up of ditches and drains that have been constructed to drain wet areas so they can be used for agriculture.

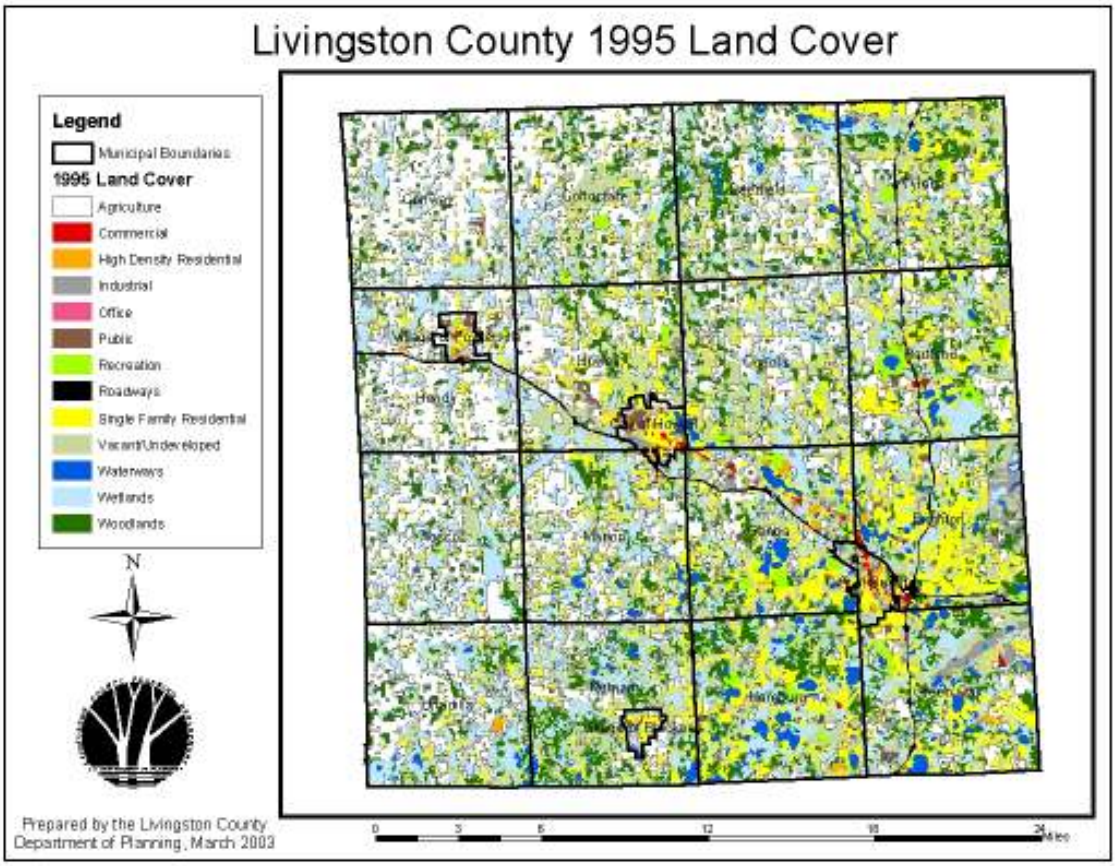
Many of the County's rivers and streams are connected to one of the nearly 500 lakes and ponds found across the County. The majority of these are found in the southeastern quadrant of the County. The County's lakes range from very small ponds (less than an acre) to large lakes (greater than 300 acres) such as Lake Chemung and Woodland Lake.

Another important component of the County's hydrology is its groundwater resources. Groundwater is important not only from an ecological perspective but also for human health. All the residents of Livingston County, whether served by a municipal water system or by a private well, depend on groundwater. Groundwater is also critical for the protection of surface water resources. Many of the County's lakes and

rivers depend on groundwater to keep temperatures low and flow stable. Local or regional groundwater pollution can cause human health concerns by contaminating the drinking water supply and can cause ecological problems for the species that depend on clean water quality. The construction of impervious surfaces reduces groundwater recharge, which in turn can create flow reductions in the County's lakes and rivers.

Land Use/Land Cover

Livingston County represents one of the fastest growing regions of the nation. To accommodate this growth many large areas of the County have been developed with single-family homes, businesses and public facilities. In spite of this growth there are still large areas of the County that are in a relatively natural state. While it can safely be said that there is no land in Livingston County that has not been altered by human influence, there are still numerous areas that are much the way they were 200 years ago.

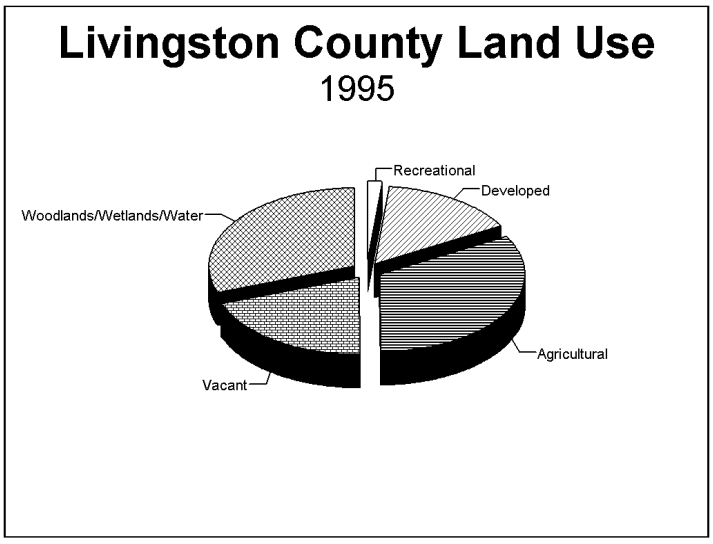


The vast majority of the County's non-natural land is agricultural land. According to SEMCOG data released in 1998, the County has over

120,000 acres of agricultural land, which is roughly one third of the County. While some of this land may no longer be in active agricultural production, it has all been cleared and cultivated. While agriculture serves a number of valuable services to local communities, it is not ecologically valuable and is therefore not considered a natural area within this analysis.

The next largest category of land use in the County is natural lands, in the form of waterways (lakes, ponds, streams, etc.), wetlands, and woodlands. According to the SEMCOG data, these land uses account for over 110,000 acres or just under one third of the County.

With roughly 70,000 acres, or 20 percent of the County, vacant land is the third largest land use category. Much of this land was in agricultural production in recent years, but has since gone fallow. While these lands have restoration potential and may become valuable prairie habitats in the future, they were generally not included in this prioritization project. The natural state of vacant land fluctuates greatly throughout the data used for this project. Some areas labeled as vacant are clearly wetlands, while other areas appear more agricultural in nature. Lands labeled as vacant were only included into natural areas after close visual inspection of aerial photographs.



The last major category of land use in Livingston County is developed land. This includes residential, commercial, and industrial areas, and public infrastructure such as roads and highways. This category currently includes just less than 60,000 acres, or 15 percent of the County. However, it should be noted that recent increases in population and development

are causing this category to increase while most of the other categories are decreasing.

The remaining land in this categorization is public and recreational land, which totals roughly 6,000 acres or 2 percent of the County's land.

Methodology

This project relies heavily on Geographic Information Systems (GIS). GIS uses digital geographic data to analyze spatial relationships. Various types of data can be represented on the computer screen and very specific information can be stored about each on-screen object. For example, each natural area within the County has a specific size, land cover type, distance from other natural areas, and other spatial data associated with it. This information can be used to prioritize one natural area versus another.

The first step in inventorying and prioritizing the County's high quality natural lands was to identify them. There are two realistic methods for conducting this identification process – 1) to use existing GIS land cover data produced by the Michigan Department of Natural Resources and updated by SEMCOG in 1995,or 2) to use aerial photographs from 2000 to manually identify natural areas. Method #2 was chosen for two reasons. First, aerial photographs are more recent. This is very important in an area like Livingston County that is experiencing such rapid growth. Second, the accuracy of the 1995 land cover can be questionable at times. Therefore, Staff spent many hours analyzing aerial photographs across the County identifying natural areas.

Natural areas usually contain forested areas and/or wetlands. However, they may also include retired agricultural land that has developed into a prairie or other natural landscape. Natural areas do not include roads, driveways, parking lots, structures, lawns, golf courses, agricultural lands, or other non-natural land uses. Often times, only a road or even a driveway separates two natural areas. While many animal species are able to cross these man-made obstacles, many other types of natural elements cannot. Therefore, to the extent possible, man-made features were not included in natural areas.

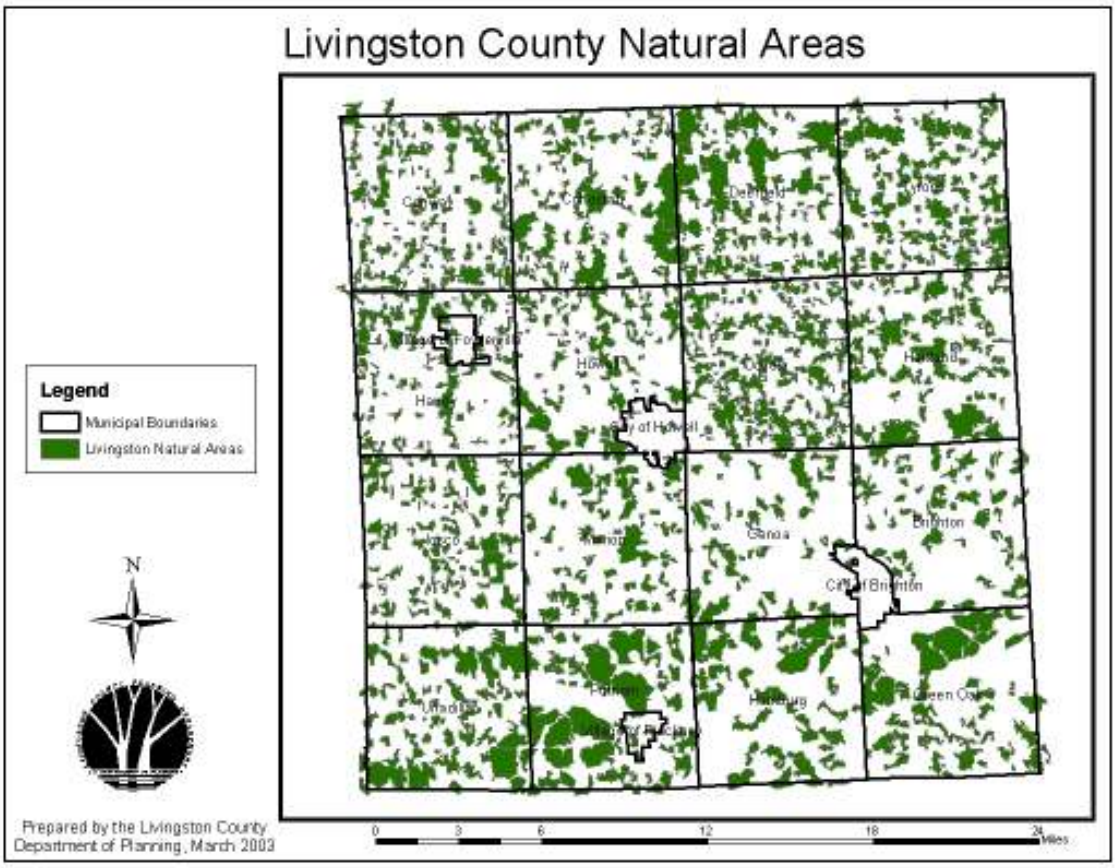
Interpretation of the aerial photographs can be difficult at times, and there are bound to be site-specific errors that can be found through on-the-ground data gathering. Additionally, the aerial photographs used for this process were taken in the year 2000; certainly some of the natural

areas identified for this project have since been cleared and developed. Lastly, there has been no ground-truthing done for this project. This on-the-ground verification is an important next step that residents and municipalities should consider before using this project's findings. However, Planning Department staff feels that the aerial photograph method for identifying the County's natural areas is the most efficient and effective method and is a valuable tool to provide direction for future projection efforts.

# of Natural Areas	1086
Total Acres	99,259
% of County	26.5%
Largest Area	1,774 acres
Smallest Area	1 acre
Average Size	91.4 acres

The natural area identification process resulted in 1,086 natural areas spanning all reaches of the County. Together the natural areas encompassed nearly 100,000 acres or just over ¼ of the County. The natural areas range in size from over 1,700 contiguous acres of roadless natural land cover, to areas less than 5 acres in size. The average size of the County's natural areas is roughly 90 acres.

These natural areas include both public and private lands. Some of the largest remaining natural areas are found within the County's State Recreation and Game areas. However, there are also extensive areas of privately owned land that have been identified as natural areas. In many instances a single natural area may include portions of numerous private parcels, while other natural areas may be owned entirely by one landowner.



With almost 100,000 acres of natural land identified in the County it is apparent that some level of prioritization must be done to try to differentiate the highest quality natural areas from smaller, lower quality natural areas. Given the complexity of the natural environment, this determination can be difficult at times. However, using existing research and other similar efforts in the Southeastern Michigan region, Staff developed a number of criteria that could be executed using GIS to prioritize the County's natural areas. Many of the criteria share the same broad goals: identify the most sustainable, diverse, unique, and ecologically healthy environments. While some criteria may focus on only one of those goals, taken together the 10 criteria (described below) help local residents and decision makers know the location of the County's highest quality natural areas. The 10 criteria are:

- Natural Area Size
- Natural Area Core Size
- Presence of Riparian Areas
- Presence of Wetlands
- Geologic Diversity
- Proximity to Other Natural Areas

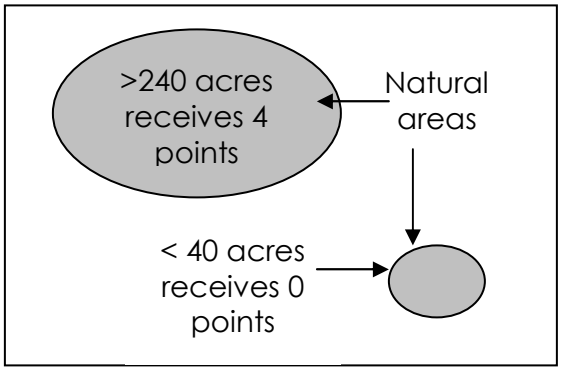
- Connectivity to Other Natural Areas
- Restorability of Adjacent Lands
- Presence of Once Dominant, Now Rare Land Cover Type
- Presence of Remnant Circa 1800 Land Cover Type

Using GIS, each natural area can be assigned a score that determines its prioritization ranking. These final scores are produced by summing the point totals from each individual criterion. For instance, depending on a natural area's size it is assigned a score of 0, 1, 2, or 4 points. Likewise, depending on whether a natural area contains a river or stream it is assigned a score of either 0 or 2 points. These scores are tallied to produce a final score. These scores are then grouped into three categories: Priority I, Priority II, and Priority III, depending on how many points each natural area has accumulated.

Each criterion is based from similar projects completed in the area. These include the "2002 Oakland County Potential Conservation/Natural Areas" project and the Huron River Watershed Council's Bioreserve project. Using the same criteria as neighboring projects should help to provide consistency across the region in conservation efforts. The following criteria make up the final score.

1) - Size

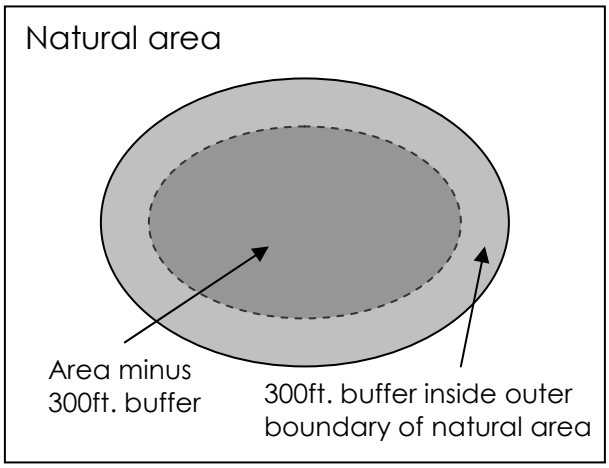
Size is an important aspect of the ecological viability of a natural area. Small "islands" of natural vegetation are unlikely to be able to sustain continued ecological health and diversity. Conversely, large natural areas are more likely to be more diverse, have better sustainability and are more likely to be able to overcome a catastrophic event such as fire, flood, wind storm or disease.



The County's natural areas have a wide range of sizes, from over 1,700 acres to less than 5 acres. Using threshold values used by the Oakland County project, areas larger than 240 acres were awarded 4 points, areas between 80 and 240 acres were assigned 2 points, areas between 40 and 80 acres were given 1 point, and areas less than 40 acres in size were given no points.

2) - Core Area

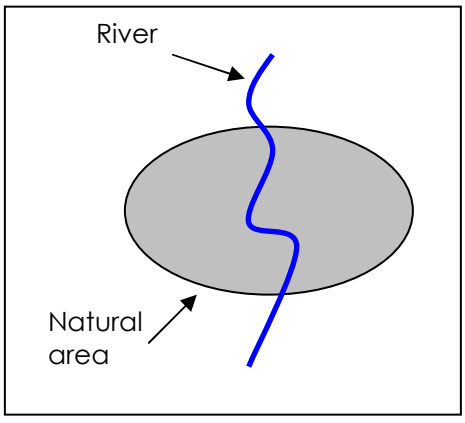
The Core Area criterion is similar to the size criterion; however, it also takes into account a natural area's shape. Core area is important for many species' survival. The perimeter of any natural area can be described as edge habitat. These areas are the transition area between a man-made environment such as a lawn, street or agricultural field and the interior of the natural area. Edge habitats attract certain predator and invasive species that can negatively impact the survival rate of native species. Using these principals, long elongated or lobbed natural areas will have more edge habitat and less core habitat as a similarly sized, round area.



To measure the core area of a natural area a 300-foot wide "buffer" was subtracted from the overall acreage of all the natural areas. Therefore some of the smallest, or most elongated natural areas that spanned less than 600 feet across would have no core area. Points were assessed using the same threshold values as the size criteria. Areas with core areas larger than 240 acres were awarded 4 points, areas with core areas between 80 and 240 acres were assigned 2 points, areas with a core area between 40 and 80 acres were given 1 point, and areas with less than 40 acres of core area were given no points.

3) - Riparian Habitat

There are over 1,000 miles of rivers, streams and ditches in Livingston County. While many of these may be little more then a trickle of water through man-made drainage ditches, all of the County's rivers and streams play an important role in the County's ecological health and water quality. Riparian habitat, the area adjacent to rivers and streams, helps to filter water as it runs over the land into the stream. These areas also serve as wildlife corridors for both aquatic and terrestrial

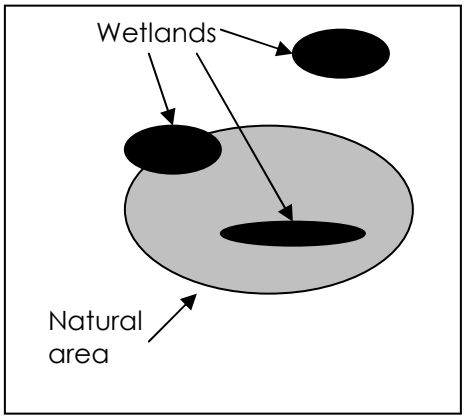


animals to travel from one area to another. Lastly, riparian habitat frequently has more ecological diversity than many upland habitats.

Points for the Riparian criteria were assigned according to the presence or absence of a river, stream or drain within a natural area. Any natural area that contained any flowing water received two points while those that did not received no points.

4) – Wetlands

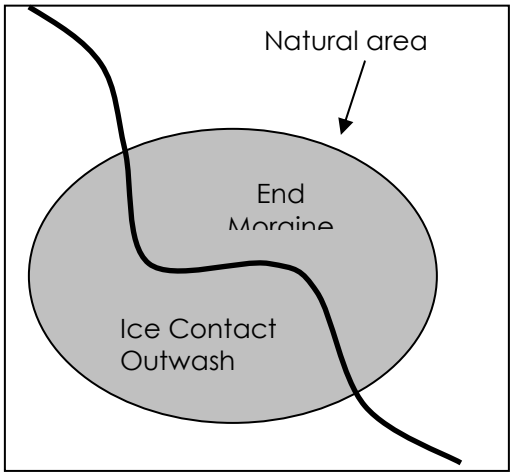
Many of the County's natural areas remain today due to the fact that they are inaccessible or cannot be developed for other land uses. The most common reason for this is saturated soils and the presence of wetlands. Although wetlands are not suitable for many land uses they often represent high quality and highly diverse natural habitats. In addition to the wide range of native species found in wetlands, wetlands serve as living filters that can help improve water quality downstream. Additionally, wetlands are critical for recharging wetlands and reducing storm water flows.



Points for the Wetland criteria were assigned depending on the presence or absence of a wetland as identified from National Wetland Inventory data. Any natural area that completely or partially contains a wetland received two points while those that did not received no points.

5) - Geologic Diversity

The formation of Livingston County's natural features began thousands of years ago when glaciers covered the area. The advancing and melting patterns of the region's glaciers created the various patterns and layers of today's soils. These soil characteristics are critical to what types of ecosystems, hydrology, vegetation patterns, and animal habitats are found in different areas within the County.



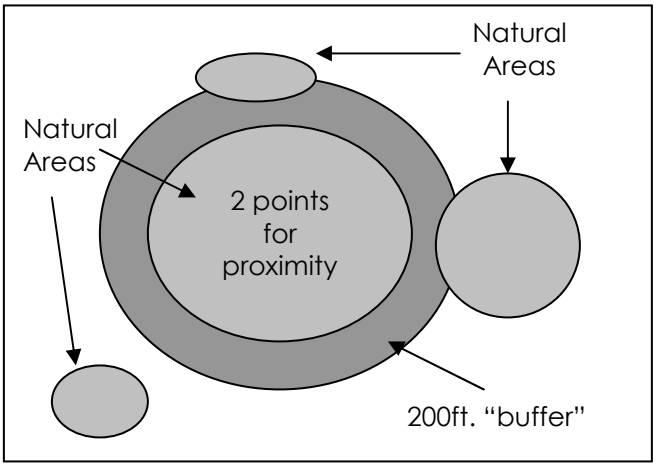
Using a map produced by the MDNR, Staff associated each natural area with its corresponding

geology type. These geology types include: coarse-textured glacial till, end moraines of coarse-textured till, end moraines of medium textured till, fine-textured glacial till, glacial outwash sand and gravel and post-glacial alluvium, ice-contact outwash sand and gravel, and lastly medium textured glacial till. While many natural areas fell entirely within one glacial type, others fell partially within two or even three different geology types. It can be inferred those areas that contain multiple glacial types will have a greater ecological diversity since that area will be suitable for a wider range of species. Any natural area that contains more than one glacial type received 2 points, those that are entirely contained within one glacial type received 0 points.

6) - <u>"Proximity" to Other Natural Areas</u>

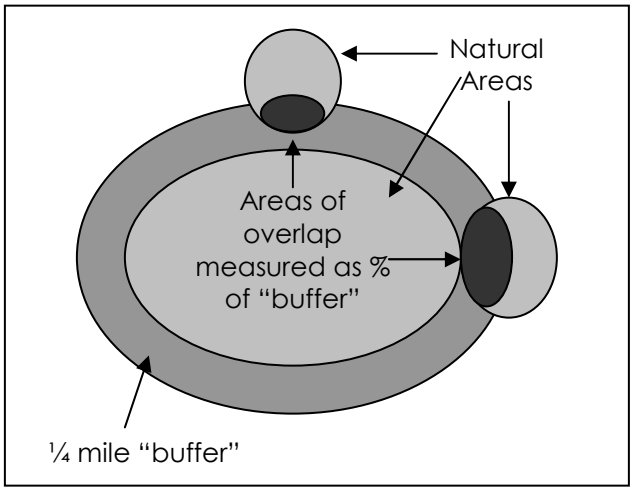
Some of the County's natural areas are extremely isolated from other natural areas. Large residential or agricultural areas may completely surround these isolated natural areas. Wildlife species living in these areas are faced with the prospect of traveling across un-natural landscapes in order to reproduce or find food. Conversely, many of the County's natural areas are very close to numerous other natural areas; only a road or even a driveway may separate them. Wildlife species are more likely to successfully travel from one area to another in this situation. This successful migration from one natural area to another will improve reproductive success and result in healthier and more diverse natural areas.

To assign points for this criterion Staff created a 200-foot "buffer" around all of the County's natural areas. Using GIS Staff was able to calculate the number of other natural areas within that 200-foot distance. One point was assigned for every adjacent natural area within 200-feet. Any natural area that had four or more areas within 200 feet was awarded the maximum score of four points.



7) - <u>"Connectivity" to Other Natural Areas</u>

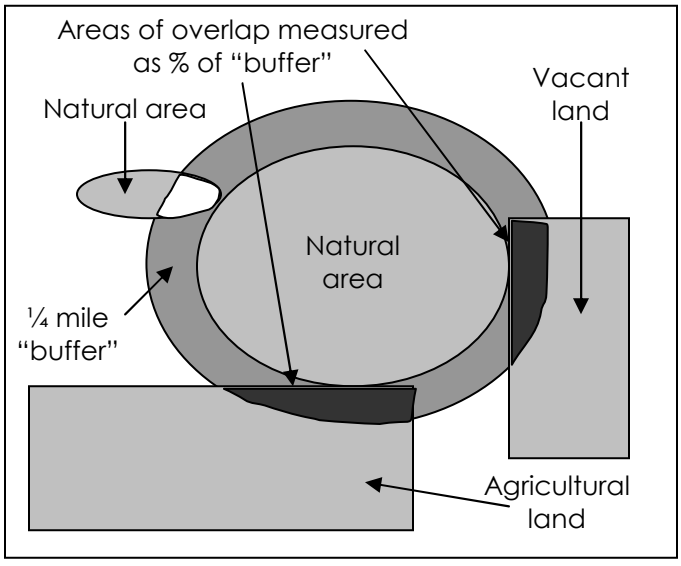
A similar and related criterion to the "proximity" criterion, "connectivity" also attempts to give priority to those areas that have a larger amount of nearby natural land. Again, this is important for successful movement of plant and animal species from one area to the next. Where the "proximity" criterion counted the number of nearby natural areas, the "connectivity" criterion examines the percent of nearby natural land.



Using GIS, a one-quarter mile "buffer" was created around the County's natural areas. The overall area of that buffer was calculated as well as the area of the buffer that overlapped into nearby natural areas. A percentage was then calculated and used to assign points. Natural areas that had less than 11% of land within ¼ mile identified as natural land received 0 points; 11-22% received 2 points; 22-33% received 3 points; and all natural areas that had more than 33% of the land within ¼ mile identified as natural received 4 points.

8) - <u>"Restorability" of a Natural Area</u>

The land that surrounds the County's natural areas varies widely. Some natural areas are adjacent to subdivisions with mowed lawns and manicured landscaping. Other natural areas are adjacent to major roads and commercial centers. However, the majority of the County's natural areas have some agricultural land nearby. While agricultural land typically has very low biodiversity and can be the source of nutrient or chemical run-off from pesticides and fertilizers, they can provide corridors for some species and can be relatively easily restored to more natural ecosystems. With minimal investment most agricultural land can be

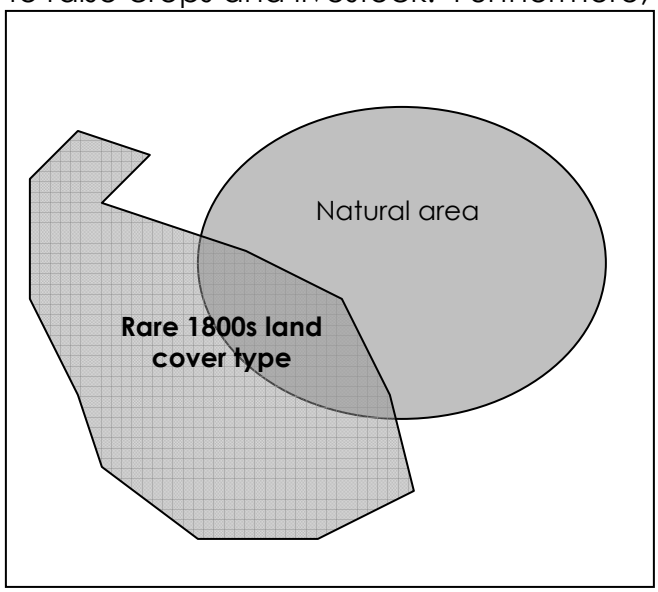


transformed into a healthy prairie ecosystem within a matter of a few growing seasons. This potential for restoration can be important for the potential expansion of existing natural areas as well as providing links between natural areas.

The "restorability" criterion uses the same ¼ mile "buffer" used in the "connectivity" criterion. However, the restorability criterion measures the percentage of the land (excluding other natural areas) within the "buffer" that has been identified by satellite imagery as either agricultural or vacant lands. The larger the percentage of vacant or agricultural land found within ¼ mile of a natural area, the more points it received. If less than 35% of the surrounding land (excluding other natural areas) was identified as agricultural or vacant the natural area received 1 point; 35-65% received 2 points; and if more than 65% of the land within ¼ mile of a natural area (excluding other natural areas) was identified as agricultural or vacant that natural area received 3 points.

9) - 1800s Land Cover

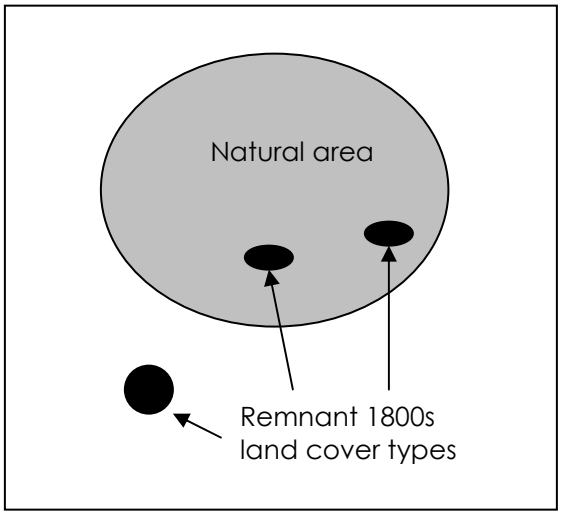
Livingston County looked far different in the early 1800s. In addition to the residential and commercial development that we have today, much of the County has been cleared to raise crops and livestock. Furthermore, much of what is today referred to as natural lands, looked far different before European settlement. Emergent wetlands have been drained, prairies replanted as woodlots, and woodlots cleared for farming then left fallow to slowly return to scrubland and eventually forests. It is unlikely that there is much land in the County that has structural and functional composition similar to the early 1800. Many of the County's once dominant ecosystems such as wet prairies, oak barrens and conifer swamps are now extremely rare. However, careful management of the natural areas where these ecosystems once existed could restore these unique habitats. The natural areas that contained these once prevalent but now rare ecosystems should receive additional priority.



Staff conducted an analysis to determine what types of ecosystems were once dominant but are now very rare. The analysis concluded that three broad categories fit this description: tree savannah, lowland conifers and emergent wetlands. Included in these broad categories are: black oak barrens, mixed oak savannah, mixed conifer swamp, shrub swamp/emergent marsh, and wet prairie. Natural areas containing land that once supported these ecosystems received 2 points.

10) – Remnant 1800s Land Cover

As previously described, the vast majority of the County's natural areas have undergone considerable change since the early 1800s. Land clearing, the draining of wetlands, agriculture, and the proliferation of non-native species has changed the ecological composition of the region's natural areas. However, there still exist small patches of land cover that resemble what was found there in the 1800s. These rare and unique areas are extremely valuable as they help to illustrate what our natural ecosystems should look like while also allowing native species an opportunity to flourish.



Any natural area that was found to contain land cover similar to what was present at that same site during the early 1800s was awarded two points. Those areas that do not contain these patches of historic land cover received no points.

II. Results and Analysis

Prior to examining the prioritization results, a few important considerations for the use of this study must be addressed. First, this study is based entirely on GIS data. The age and accuracy of the base data varies and therefore can produce inaccurate results. For example, identifying and digitizing the County's natural areas, perhaps the most important step in the process, was based on aerial photographs from the year 2000. In addition to some errors and incorrect interpretations that are inevitable when dealing with an area the size of Livingston County, there has surely

been a significant amount of development and clearing since the aerial photographs were taken.

Another consideration is that this study is unable to include site level data that is not available countywide. Although, site level data, such as stream monitoring results or species inventories, is available for certain areas, use of this information would bias the results to favor those areas where this data has been gathered. Site-level data should play a key role in natural area protection; however, it could not be used for this report.

Any of the natural areas identified in this project may be critical for protection regardless of its classification as a Priority I, II or III area. This project was conducted in order to help residents and decision makers focus site-level data gathering as well as broad level protection efforts. Once it is understood that this project is simply a tool to help focus further research and land use planning efforts, the results can be examined.

Criteria Scores

As discussed in the previous section, each natural area was assessed using 10 different ecological criteria. Each criterion awarded between 0 and 4 points per natural area. The following table displays the number of acres that received the different point values for all 8 criteria.

all values in acres	0 points	1 point	2 points	3 points	4 points	average score per area	average score per acre
size	9963	12922	34539		41835	1.0	2.5
core size	37189	13344	21933		26793	0.4	1.7
rivers	21299		77960			1.0	1.6
wetlands	2266		96993			1.8	1.9
geology	42555		56704			0.7	1.1
proximity	41959	23829	14629		10153	0.7	1.2
connectivity	47207		37631	11677	2754	1.2	1.2
restorability		8695	32374	58190		2.6	2.5
1800s #1	11433		87826			1.4	1.8
1800s #2	21953		77306			1.2	1.6

Cumulative Score

By adding the points assessed to each natural area based on the criteria discussed above, each natural area has been given a final score of between 0 and 29 points. This technique enables us to identify those areas that have high scores for multiple criteria. While some areas may

be high scoring in one or two of the 10 criteria, only those areas that are well rounded and receive high scores for many different criteria have high cumulative scores. Natural areas are then grouped into one of three classifications: Priority I, Priority II or Priority III.

Priority I

Priority I natural areas are those that have the highest cumulative scores (17 or higher). Therefore, according to the criteria discussed and the data used, these areas are the most ecologically valuable. They play an important role in the hydrological and ecological health of the County. These areas are in most cases larger than 150 acres, have at least some flowing water present, and have other natural areas nearby. While many of these areas include public land, there are numerous other Priority I areas that are entirely privately owned. Additionally, there is at least one Priority I area in every township in the County.

Priority II

Priority II areas are those that have a cumulative score of between 11 and 16. These areas are usually between 50 and 200 acres, although some are significantly larger or smaller. This is a diverse group of areas in that some have received the bulk of their points because of their location near other natural areas or because they are relatively large. Other areas have received many of their points from criteria that try to measure diversity such as the presence of rivers, geologic diversity, or presence of 1800s land cover types. These areas should not be dismissed from any conservation efforts due to their more average scores. Site-level investigation must be done on any site before land management decisions are made.

Priority III

Priority III areas have cumulative scores of 10 points or less and include the majority of the County's smallest natural areas. They are typically less than 40 acres. However, there are a number of areas that are greater than 100 acres but have failed to accumulate points for many other criteria. While these areas may be more isolated from other natural areas, they may still represent high quality ecosystems. Again, the only way to know the quality of an area for certain is to conduct site-level data gathering.

Cumulative Score Statistics

The following table contains data on the County's natural areas classified into the three Priority groups. Much of what is included in the table are averages between the many areas within each classification.

Priority I >17		Priority II 11 - 16		Priority III < 10	
# of Areas	170	# of Areas	423	# of Areas	493
Avg. Score	19.9	Avg. Score	13.1	Avg. Score	7.9
Total Acreage	53,290	Total Acreage	31,833	Total Acreage	14,136
Avg. Size	313.5	Avg. Size	75.3	Avg. Size	28.7

Analysis

It is important to analyze the results of this project to better understand what the prioritization is telling us. Many decisions had to made before the cumulative scores could be tabulated – relative scoring strategies, weights, thresholds, etc. – all play an important role in what priority an individual area is assigned.

The Role of Size

Two of the criteria specifically evaluate an area's size and award more points for being larger or having a larger core area. The concept that larger natural areas are more ecologically sustainable is a basic and generally accepted principal. While many of the other criteria focus on concepts such as ecological diversity, they can also be correlated to size. The larger a natural area is the more likely it is to contain a river, 1800 land cover, geologic diversity, or other criteria.

Private vs. Public Land

This project did not take into account political or ownership boundaries. Some large natural areas may be entirely in one ownership; conversely, another natural area of the same size may include more than 50 different landowners. While land ownership plays a major role in determining the future of a natural area, it is beyond the scope of this project to include ownership data into the prioritization.

Those familiar with the County's State owned land will quickly notice from looking at Map ## that there is a significant correlation between high-ranking natural areas and publicly owned land. This can be expected as many of the land uses excluded from the definition of a natural area – houses, lawns, agriculture, commercial areas – are not usually found on public land. Furthermore, public land tends to be less fragmented by roads and driveways. Therefore, many of the County's largest natural

areas are either entirely or partially within public land. Adding to this relationship is that much of the County's public land has had time to be preserved or restored to a natural state. The table below shows the relationship between the County's natural and public land.

The relationship between State land and the County's natural areas is illustrated by the fact that although only 6% of the County is State-owned, roughly 16% of the County's natural areas are on State land. Furthermore, while roughly ¼ of the County is identified as "natural land," over 2/3 of the County's State land is identified as "natural."

	County-wide	Public Land	Private Land
Acres	374,313	22,516	351,797
% of County	100%	6.0%	94.0%
Acres ID'd as "natural"	99,259	15,637	83,622
% of category ID'd as "natural"	26.50%	70%	24.30%
% of natural areas per category	100%	16%	84%
# of Areas*	1086	82	1004
Average size natural area (acres)*	91.4	308	73.7
Average score*	10.9	16.5	10.5

* areas completely or partically in public ownership included in "Public Land"

Natural Area Distribution

Visual inspection of the natural area map clearly shows that natural areas have been identified in all areas of the County. While some areas have more acres of higher scoring natural areas, all areas of the County have at least some natural land. While this project examines the entire County, local decision makers will likely focus on their community. Time after time, local decision makers who were involved with the creation of this project focused their attention on their community; the area where they have the ability and responsibility to help protect these lands.

Some decision makers and residents may be disappointed that their community lacks many high scoring areas, or that the majority of high scoring areas in their community are found on State land. These are understandable reactions but should not discourage action in any area of the County. This project compared areas across the entire County; therefore, while one area may be labeled as a Priority II area Countywide, it may be the most valuable area within a community. Decision makers should consider taking a closer look at any areas within their jurisdiction,

regardless of its final prioritization, that would help them to meet their community's desire to protect local natural areas.

On a similar note, many readers will notice that regions of the County have more large, highly scoring, natural areas. One of these regions can be found in southwestern Putnam Township where large tracks of contiguous natural areas can be found in and around Pinckney State Recreation Area, and University of Michigan property. This area generally has a high level of protection due to public ownership. Another region that stands out can be found in eastern Cohoctah and western Deerfield Townships. While much of this area is protected as the Oak Grove State Game Area there are also large areas of unprotected, yet highly scoring, natural areas in this region.

In many cases, a community may target specific areas for preservation, regardless of prioritization results. Many of these natural areas would be valuable as greenways or other public uses where residents can experience natural environments. Local leaders are encouraged to compare local natural areas identified in this project with current or future greenway plans.

Excluded Criteria

One additional criterion was analyzed for this project, but it was not included in the project's final results due to the reasoning below:

Element Occurrence Criteria

An "element occurrence" is a documented location of rare or threatened species or "species of concern." This data has been collected by the Michigan Natural Features Inventory, which is charged with protecting the State's rare and endangered species. While this data is valuable it is also very incomplete. Trained wildlife professionals have surveyed only a small portion of the County. There are large areas of the County that have no records of rare or endangered species. This does not mean that no rare species are there, only that no wildlife professional has surveyed these areas. Use of this data in the final scores for this project would skew the results to favor public lands and other areas that have been surveyed by wildlife professionals. Again, this is not to say that this information is not useful. A map has been provided that identifies areas containing an element occurrence. This information can be used to help focus the gathering of additional information on these sites.

Implementation

This report details the steps that were taken to identify and prioritize the County's natural areas. This information is provided to local governments and residents with the hope that it will be used to improve conservation efforts and protect the County's ecological resources, now and for future generations. There are two levels of actions that can be taken to help meet that goal – personal behavior modification and local policy implementation.

1) - Personal Behavior

County residents probably have the greatest ability to improve and protect the County's natural resources. The majority of the County's natural areas are privately owned and are therefore subject to private property rights. What a property owner does or does not do on their property is largely up to them.

Many everyday activities can influence local natural resources. Obvious examples include illegal dumping of chemicals and solid waste onto the soil or into storm drains or streams, and draining or filling wetlands. However, there are many more subtle activities that can impact local natural resources such as: using pesticides and nutrient rich fertilizers especially on suburban lawns and gardens; planting non-native and invasive landscaping specimens; clearing vegetation along ponds and stream banks; and allowing detergents such as dishwasher detergent or car-washing soap to enter local drains or even private septic systems.

Waste Management

Most people don't think too much about where their garbage goes after they leave it at the end of the driveway. However, when word begins to spread that a new landfill is considering moving around the corner people take an immediate interest. Recycling and reducing you waste flow can help extend the life of existing landfills, which in turn prolongs the creation of new landfills. Composting food waste in backyard compost piles or bins can also help reduce your waste stream while providing a nutrient rich addition to you garden or landscaping.

Stormwater Management

Stormwater is the water that runs off impervious surfaces when it rains or when snow melts. This water frequently picks up nutrients and other pollutions from streets, driveways and lawns before it ends up in nearby waterbodies. The more impervious surfaces an area has the more likely nearby lakes, streams and rivers are to be impacted. Local residents can

take a number of relatively easy steps to reduce the amount of stromwater runoff they produce on their property. Redirecting downspouts into the lawn or landscaping instead of onto the driveway allows the water to infiltrate into the ground instead of run into the stormdrain or roadside ditch. Rain barrels can also be used to capture the water from gutters; it can then be used later to irrigate your lawn or garden. Picking up pet waste from the lawn and disposing it with your garbage can also help reduce the impact of stormwater runoff.

Landscaping and Lawn Care

The types of landscaping and the steps that are taken to care for them can have an enormous impact on local natural areas. Caring for your lawn with zero phosphorous fertilizers and limited pesticides can help protect local water quality. Some people will even choose to replace their lawn with low maintenance native vegetation. This will actively improve their property as habitat for native plants and wildlife. Even relatively small parcels can play an important role for many native species. Lawn can be replanted with native species that attract a wide range of bird, insect and mammalian species or native flowers, shrubs and bushes can complement or replace a pre-existing lawn. These native landscapes can be aesthetically pleasing, beneficial to the environment, cost effective and easy to maintain – no more mowing the lawn, watering, or applying chemicals.

Long Term Protection

County residents may also want to consider the future of their land after it is sold. Many large undeveloped parcels in the County are prime targets for new residential development. From a financial perspective selling a piece of land to a developer may bring the highest profit; but the seller must also recognize that the original piece of land will most likely be drastically changed forever. However, there are alternatives. Property owners can work with local land conservancies to develop conservation easements that will restrict the type of development that can occur on their parcels for years into the future. This type of action is often referred to as "donation of development rights." Since the ability to develop a specific parcel has been lost, it may not have as high a resale value. However, property owners will have the satisfaction of permanently protecting their land. Furthermore, the property owner may be able to claim the loss of market value as an exemption on their taxes.

2) - <u>Local Policies</u>

Livingston County functions in an advisory capacity only. However, local governments are able to implement policies to protect our natural

resources. Therefore, we have provided a list of various tools that can be used in conjunction with the natural area map. While no one tool will sufficiently protect local natural areas, and some tools may not apply to all communities, they should all be considered as options. Possible tools include:

- Land Acquisition
- Purchase or Transfer of Development Rights
- Planned Unit Developments
- Wetlands Ordinance
- Natural Features Setback Ordinance
- Land Clearing Ordinance
- Natural Area Overlay Zoning
- Fertilizer Ordinance
- Public Education and Outreach

Many of these tools are highly complex and may have outstanding legal considerations. Therefore, it is beyond the scope of this report to adequately describe each individual tool. However, the Department is available to offer our expertise and guidance on these and other policy options to best protect our County's natural areas.