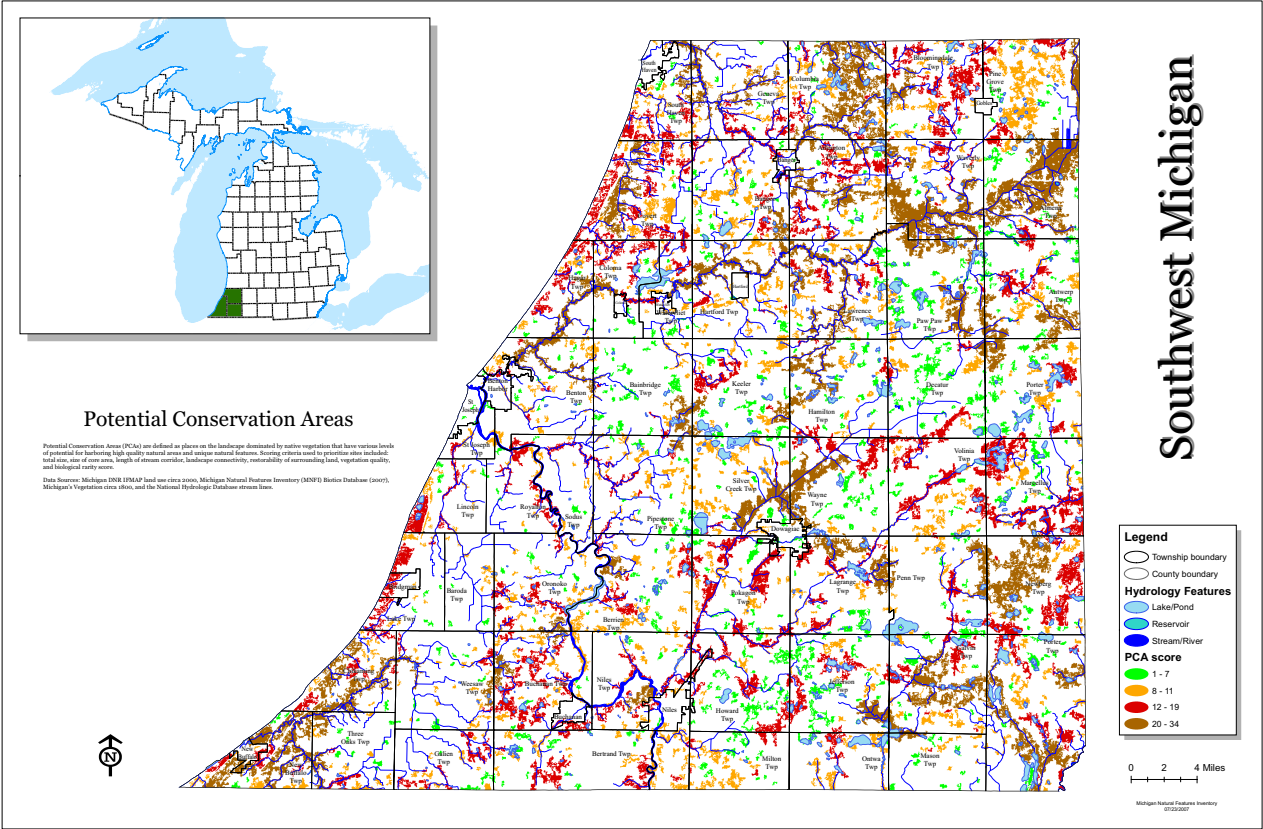# Berrien, Cass, and Van Buren Counties Potential Conservation Areas

Providing Ecological Information
For a Green Infrastructure Plan

Southwest Michigan

Potential Conservation Areas

Potential Conservation Areas (PCAs) are defined as places on the landscape dominated by native vegetation that have various levels of potential for harboring high quality natural areas and unique natural features. Scoring criteria used to prioritize sites included: total size, size of core area, length of stream corridor, landscape connectivity, restorability of surrounding land, vegetation quality, and biological rarity score.

Data Sources: Michigan DNR IFMAP land use circa 2000, Michigan Natural Features Inventory (MNFI) Biotics Database (2007), Michigan's Vegetation circa 1800, and the National Hydrologic Database stream lines.

Legend
- Township boundary
- County boundary

Hydrology Features
- Lake/Pond
- Reservoir
- Stream/River

PCA score
- 1 - 7
- 8 - 11
- 12 - 19
- 20 - 34

0   2   4 Miles

Michigan Natural Features Inventory
07/23/2007

Prepared by:
Michigan Natural Features Inventory

Submitted August 29, 2007

Prepared for:
Southwest Michigan Planning Commission

Berrien, Cass, and Van Buren Counties Potential Conservation Areas Report

Providing Ecological Information For a Green Infrastructure Plan

August 29, 2007

Prepared by:
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MNFI maintains a continuously updated information base, the only comprehensive, single source of data on Michigan's endangered, threatened, or special concern plant and animal species, natural communities, and other natural features. MNFI has responsibility for inventorying and tracking the State's rarest species and exceptional examples of the whole array of natural communities. MNFI also provides information to resource managers for many types of permit applications regarding these elements of diversity.

Table of Contents

Berrien, Cass, and Van Buren Potential Conservation Areas

Introduction

Natural resource conservation is a fundamental component of a community's long-term environmental and economic health. Natural resource areas perform important natural functions such as water filtration and they provide recreational opportunities and wildlife habitat that enhance the overall vitality of a community. Abundant natural resources once surrounded population centers in the area. Now, much reduced in size, natural resource areas are becoming encircled by development. These remaining sites are the foundation of Berrien, Cass, and Van Buren Counties' natural heritage; they represent the last remaining remnants of the areas native ecosystems, natural plant communities and scenic qualities. Consequently, it is to a community's advantage that these sites be carefully integrated into the planning for future development. Striking a balance between development and natural resource conservation and preservation is critical if Berrien, Cass, and Van Buren Counties (BVC region) are to maintain their unique natural heritage.

Successful land use planning requires more than simply protecting small preserves and trusting that they will remain in their current condition indefinitely. Many human activities such as road construction, chemical and fertilizer application, fire suppression, and residential development can have a detrimental impact on populations of plants, animals, and insects and the natural communities in which they live. Changes in zoning, building codes, and technology can cause areas that were once considered "safe" from development to be exposed to development. In order to maintain the integrity of the most fragile natural areas, a more holistic approach to resource conservation must be taken, an approach that looks beyond the borders of the site itself. What happens on adjacent farmland, in a nearby town, or upstream should be considered equally as important as what happens within the preserve.

This report identifies and ranks Potential Conservation Areas (PCA's) remaining in Berrien, Cass, and Van Buren Counties. Potential Conservation Areas are defined as places on the landscape dominated by native vegetation that have various levels of potential for harboring high quality natural areas and unique natural features. In addition these areas may provide critical ecological services such as maintaining water quality and quantity, soil development and stabilization, pollination of cropland, wildlife travel corridors, stopover sites for migratory birds, sources of genetic diversity, and floodwater retention. **However, the actual ecological value of these areas can only be truly ascertained through on the ground biological surveys**. The process established by the Michigan Natural Features Inventory (MNFI) for identifying potential conservation areas, can also be used to update and track the status of these remaining sites. MNFI recommends that local municipalities in Berrien, Cass, and Van Buren Counties incorporate this information into their comprehensive natural area mapping services. The site map and ranking data can be used by local municipalities, land trusts, watershed councils, and other agencies to prioritize conservation efforts and assist in finding opportunities to establish an open space system of linked natural areas in the region.

Materials and Interpretation Methodology

Identification of potential conservation areas in the BCV region was conducted using the Michigan Department of Natural Resources, 2000 IFMAP (Integrated Forest Monitoring Assessment and Prescription) Land Cover Data, MNFI's Circa 1800 Vegetation, MNFI's database (BIOTICS), and the State of Michigan Framework stream and roads data layers. The IFMAP Land cover data for Michigan was derived from classification of Landsat Thematic Mapper (TM) imagery. Image dates from 1997-2000 were used to identify land cover classes. Natural land cover classes for the PCA analysis were obtained from running a filter on the IFMAP land cover data set. The filter removed all patches less than 4 pixels in size, and replaced them with the nearest neighboring value.

The study area for the BCV region was delineated by buffering the three counties by one kilometer. A buffer was applied to prevent potential conservation areas (PCA's) located along the county border from incorrectly receiving a lower score. Delineation of potential conservation areas was done through analysis in a geographic information system with emphasis placed on: 1) intactness, 2) wetlands and wetland complexes, 3) riparian corridors, and 4) forested tracts. PCA's were identified by focusing on wetland and forested land cover and eliminating as much development (including roads), active agriculture, and old fields as much as possible. Water was included only if it was surrounded by other PCA land cover types. All natural land cover types were combined, and major roads were buffered by 30 meters and removed. The resulting blocks of natural vegetation were then converted into a shapefile. Boundaries were defined by hard edges such as roads, parking lots, developments and railroad beds. All potential conservation areas were identified and delineated regardless of size. Municipal boundaries were not utilized to delineate site boundaries unless the boundary corresponded to a defined hard edge, such as a road. Once all sites were delineated, sites under 20 acres were removed from the shapefile.

Site Selection and Prioritization

Following the delineation of PCA's, a more rigorous level of examination was undertaken based upon specific spatially based criteria to prioritize sites. Spatially based criteria that were determined to be important indicators of ecological health included: total size, size of core area, length of stream corridor, landscape connectivity, restorability of surrounding lands, vegetation quality, and biological rarity score. Each criterion was then divided into several different categories, or levels, which were translated to a numerical score. Each site was then assessed and compared to other sites based upon the sum of the scores for each criterion. Actual scores for the BCV Region sites ranged from 1 to 34 (out of a possible 41).

Description of Criteria

Total Size - The total size of a site is recognized as an important factor for viability of species and ecosystem health. Larger sites tend to have higher species diversity, higher reproductive success, and improve the chances of plant and animal species surviving a catastrophic event such as a fire, tornado, ice storm, or flood.
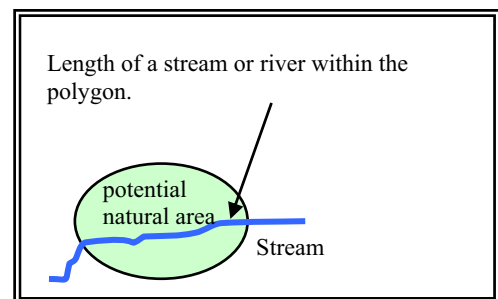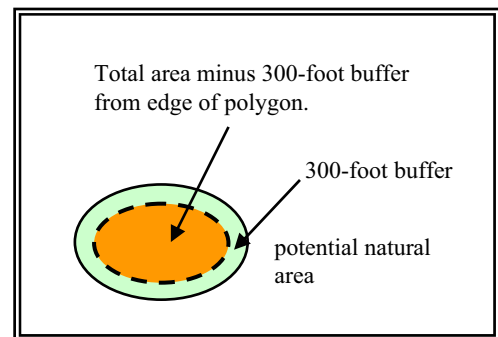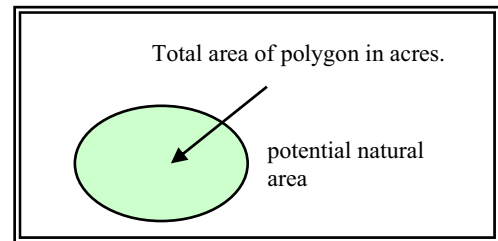
Size is defined as the total area of the resultant polygon.

Size of Core Area - Many studies have shown that there are negative impacts associated with the perimeter of a site on "edge-sensitive" animal species, particularly amphibians, reptiles, and forest and grassland songbirds. Buffers vary by species, community type, and location, however most studies recommend a buffer somewhere between 200 and 600 ft. to minimize negative impacts. Three hundred feet is considered a sufficient buffer for most "edge-sensitive" species in forested landscapes.

For this project, core area is defined as the total area minus a 300-foot wide buffer measured inward from the edge of the polygon. Core area is different from total area of the site because it takes into account the shape of the site. Typically, round shapes contain a larger core area relative to the total site than long narrow shapes.

Stream Corridor (length) - Water is essential for life. Streams are also dynamic systems that interact with the surrounding terrestrial landscape creating new habitats. Waterways also provide the added benefit of a travel corridor for wildlife, connecting isolated patches of natural vegetation, particularly in fragmented landscapes.

Sites that are part of riparian corridors were given a score 0-6 points depending upon the length of stream or river that was present at the site.

Total area of polygon in acres.

potential natural area

Total area minus 300-foot buffer from edge of polygon.

300-foot buffer

potential natural area

Length of a stream or river within the polygon.

potential natural area

Stream

Landscape Connectivity - Connectivity between habitat patches is considered a critical factor for wildlife health. High connectivity improves gene flow between populations, allows species to recolonize unoccupied habitat, improves resilience of the ecosystem, and allows ecological processes, such as flooding, fire, and pollination to occur at a more natural rate and scale. Landscape connectivity was measured in two ways, *percentage* and *proximity*.
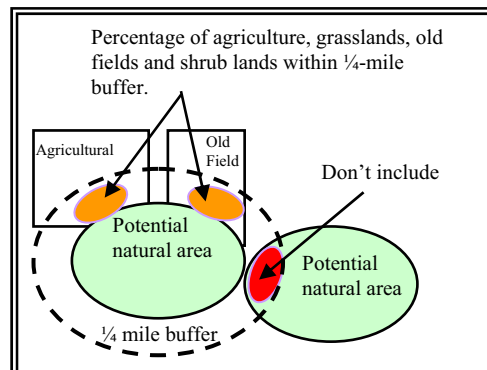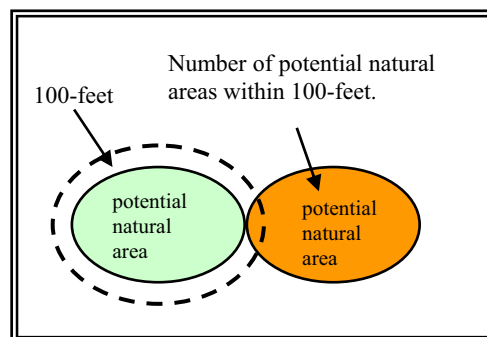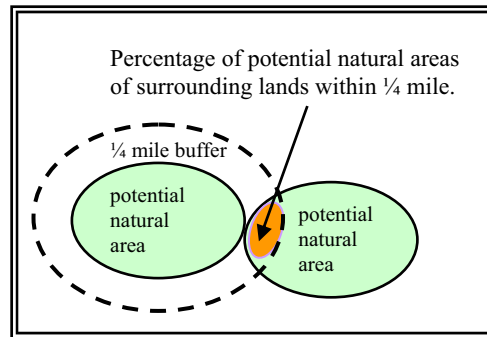
Percentage
Landscape connectivity was measured by building a ¼-mile buffer around each polygon and measuring the percentage of area that falls within other potential conservation areas.

Proximity
In addition to measuring the area around a polygon that is considered natural, connectivity can also be measured by the number of individual potential conservation areas in close proximity to the site. The greater the number of polygons in "close proximity," the higher the probability for good connectivity. Close proximity was determined to be 100 feet. One hundred feet was chosen as the threshold based on digitizing error and typical width of transportation right-of-ways, pipelines, and power line corridors.

Restorability of surrounding lands - Restorability is important for increasing the size of existing natural communities, providing linkages to other habitat patches, and providing a natural buffer from development and human activities.

Restorability is measured by the potential for restoration activities in areas adjacent to the delineated site. First, a ¼-mile buffer was built around each site. Potential conservation areas as defined by MNFI, located within the buffer area were then removed, and the percentage of agricultural land, grasslands, shrub lands and old fields within the remaining buffer area was measured.

Percentage of potential natural areas of surrounding lands within ¼ mile.

¼ mile buffer

potential natural area

potential natural area

Number of potential natural areas within 100-feet.

100-feet

potential natural area

potential natural area

Percentage of agriculture, grasslands, old fields and shrub lands within ¼-mile buffer.

Agricultural

Old Field

Don't include

Potential natural area

Potential natural area

¼ mile buffer

Vegetation Quality – The quality of vegetation is critical in determining the quality of a natural area. Vegetation can reflect past disturbance, external impacts, soil texture, moisture gradient, aspect (cardinal direction of slope), and geology. Vegetative quality however is very difficult to measure without recent field information. As a surrogate to field surveys, a vegetation change map comparing the 2000 IFMAP land cover data layer (appendix 2) to the MNFI circa 1800-vegetation data layer (appendix 1) was created. The resulting potential unchanged vegetation can then act as an indicator of vegetation quality.

Percentage

Vegetation quality was measured by calculating the percentage of the site that contains potentially unchanged vegetation. This allows small sites with a high percentage of potentially unchanged vegetation to score points.
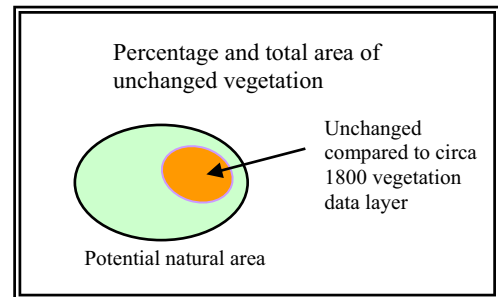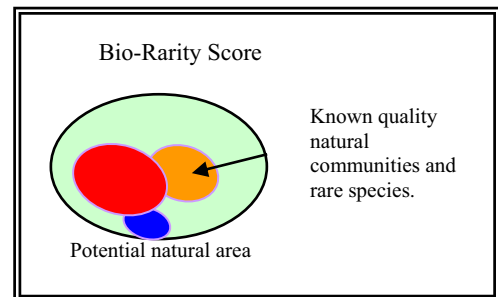
Area

Vegetation quality was also measured by calculating the area of potentially unchanged vegetation that falls within each site. This balances the bias of small sites with a high percentage of potentially unchanged vegetation by awarding points based on actual area covered.

Bio-Rarity Score - The location of quality natural communities (appendix 6) and rare species tracked by MNFI are often, although not always, indicative of the quality of a site. The occurrences in and of themselves are important.

The Bio Rarity Score (appendix 5) is based on the cumulative score of each element occurrence (EO) found within a site Each EO is scored based on its likelihood of being found (appendix 4), global rarity, state rarity, and condition or viability. For example, a much higher score would be awarded to a population of Mitchell's satyr, which is globally and state imperiled, and in good condition, compared to a population of box turtle, which is globally secure and rare in the state, and in fair condition.

Percentage and total area of unchanged vegetation

Unchanged compared to circa 1800 vegetation data layer

Potential natural area

Bio-Rarity Score

Known quality natural communities and rare species.

Potential natural area

Note: The number of points assigned for each criterion is in Table 1. An element occurrence is an occurrence record of a federally and/or state listed species, state special concern species, exemplary and/or rare natural community, or another type of natural feature such as a unique geologic formation or bird colony.

Table 1. Site Criteria

CRITERIA	DESCRIPTION	DETAIL	PTS
Total Size	Total size of the polygon in acres. ❑ *Size is recognized as an important factor for viability of species and ecosystems.*	20 - 40 ac.	0
		>40 - 80 ac.	1
		>80 - 240 ac.	2
		>240 ac.	4
Size of Core area	Acres of core area. - Defined as total area minus 300 ft. buffer from edge of polygon. ❑ *Greater core area limits negative impacts on "edge-sensitive" animal species.*	0 - 60ac	0
		>60 - 120 ac	2
		>120 - 230 ac	4
		>230 ac	8
Stream Corridor (length)	Length of a stream or river within the polygon. ❑ *Stream corridors provide wildlife connections between patches of habitat.*	0	0
		>0-400 m	1
		>400-800m	2
		>800-1600m	3
		>1600-3200m	4
		>3200 m	6
Landscape Connectivity Percentage	Percentage of potential conservation areas within 1/4 mile. - build 1/4 mile buffer - measure % of buffer that is a potential conservation area	0 - 11%	0
		>11 - 22%	2
		>22 - 33%	3
		>33%	4
Proximity	Number of potential conservation areas within 100 ft. ❑ *Connectivity between habitat patches is considered a critical factor for wildlife health.*	0	0
		1	1
		2	2
		3	3
		4+	4
Restorability of surrounding lands	Restorability of surrounding lands within 1/4 mi. - build 1/4 mile buffer - subtract potential conservation areas from buffer - measure % agricultural lands and old fields ❑ *Restorability is important for increasing size of existing natural communities, providing linkages to other habitat patches, and providing a natural buffer from development.*	0 - 35%	1
		>35 - 65%	2
		>65%	3

CRITERIA	DESCRIPTION	DETAIL	PTS
Vegetation Quality Percentage	Estimates the quality of vegetation based on circa 1800 vegetation maps and 2000 IFMAP land cover data (only done for Michigan sites). Measures the percentage of potentially unchanged vegetation within a polygon.	1 - 10% 10.1 -30% 30.1 – 65% 65.1 – 100%	0 1 2 4
Area	Measures the actual area within a polygon of potentially unchanged vegetation regardless of the size of the polygon. *The quality of vegetation is critical to determining the quality of a natural area.*	0 – 10ac 10.1 – 40ac 40.1 – 80ac 80.1 - 160 > 160ac	0 1 2 3 4
Bio Rarity Score	Known element occurrences increase the significance of a site and increase the bio rarity score. ❑ *The location of quality natural communities and rare species tracked by MNFI are often, although not always, indicative of the quality of a site.* ❑ *Values were determined using the Jenk's optimization formula.*	0 – 5.75 5.75 – 19.5 19.5 -41.5 41.5 -68	1 2 3 4
Note: Total possible points = 41			

Potential Conservation Areas were tallied for the BCV region as well as within each county. The tally of PCA's for the BCV region includes all of the PCA's within each county as well as those located within a one-kilometer buffer zone around each county. Only those PCA's which originate in one of the three counties and extend into the buffer zone were included in this analysis for the region. Those PCA's which are entirely outside of any of the three counties were not included. The analysis for each county only included the portion of the PCA's that were contained within the county and did not include any portion of the PCA that extended into the buffer area. PCA's that straddle more than one county were divided at the county line and were counted within each county. **Thus, the sum of the PCA's for the three counties will be greater than the number of PCA's in the BCV region.**

A total of 1,714 sites, totaling 273,883 acres were identified as potential conservation areas (PCA's) in the BCV Region. The acreage for only the portion of the PCA's that are completely contained within one of the three counties totals **264,483**. **This represents 24% of the total land base in the three-county area**. Each of the 1,714 delineated sites was scored based upon the criteria described in the following table. Total scores ranged from a high of 34 points (out of a possible 41 points) to a low of 1 point. The mean score was nine.

The site that received the highest score of 34 is located in Van Buren County in the Northeast corner of the county. It is located along the North Branch of the Paw Paw River in Almena and Pine Grove Townships. A portion of the site spills over into neighboring Kalamazoo County. It includes 7,408 acres in total size, with a core area of 3,495 acres. The site with the second highest score of 33 is also located in the northeast corner of Van Buren County in Lawrence, Paw Paw, Waverly, and Arlington Townships. It encompasses 8,907 acres in total size with a core area of 3,419 acres. Two sites with the third and forth highest score of 32 are located in Cass and Berrien County. The Cass County site includes 5,879 acres in total size and has a core area of 1,515 acres. It is located in the southeast corner of the county, and includes a large portion of the Crane Pond State Game Area. The Berrien County site is located in the southern portion of the county in Chikaming, New Buffalo, and Three Oaks Townships along the Galien River. It includes 2,683 acres in total size and a core area of 701 acres. Warren Woods State Park and Galien River County Park are both located within this site.

Once the total scores were tabulated, the next step was to determine a logical and reasonable break between high priority, medium priority, and low priority sites. Many potential natural area sites can be just one point away from being placed into another category. Natural break and equal interval classification are two legitimate methods for classifying sites. Equal interval classification, as defined for this project, is based on absolute values. It shows the value of each site relative to the highest (41) and lowest (1) possible values. Equal interval classification breaks all possible scores into equal classes regardless of actual scores. This eliminates the relative nature of scores when sites are compared only to other sites within a given area.

The natural break method is the default classification method in ArcView. This method identifies breakpoints between classes using a statistical formula called Jenk's optimization. The Jenk's method finds groupings and patterns inherent in the data by minimizing the sum of the variance within each of the classes. Based on the results of each method, MNFI recommends using the natural break method for the BCV Region. If the equal interval system were used, 25 % of the total acres and only 1% of the sites would fall into the priority one (highest quality) category.

As a result of applying the natural break method, 566 sites were placed in the low priority category, 738 sites were placed in the middle category, 365 sites were placed in the high priority category, and 45 sites were placed in the highest category. Breaking it down into percentages of total sites identified, **33% were labeled low priority, 43% were labeled medium priority, 21% of the sites were identified as high priority, and 3% were labeled as highest priority. Breaking it down by acreage, 13% (35,190 acres) fell into the low quality category, 22% (59,763 acres) fell into the medium quality category, 30% (81,525 acres) fell into the high priority category, and 36% (97,405 acres) fell into the highest priority category.**

Van Buren County contains the highest number of acres (50,175) of high priority sites in the BCV region. These 50,175 acres represent 54% of the total area of high priority sites.

Despite the more methodical approach to classification, it still could be argued that sites scoring one point below should be included in the higher category or that sites scoring right at the low end of a category should be placed in the next lowest category. To help alleviate anxieties about which category a particular site is placed, actual numeric total scores can be displayed in the middle of each polygon. This would allow the viewer to see how a site compares directly to another site without artificially categorizing it within a group.

Table 2. Results of PCA Analysis for Tri-County Area.

PCA Class	PCA Count	Percentage	Acres	% of PCA acreage	% of Tri-County area
Low 1-7	566	33%	35,190	13%	3%
Med 8-11	738	43%	59,763	22%	5%
High 12-19	365	21%	81,525	30%	7%
Highest 20-34	45	3%	97,405	36%	9%
Total	1,714	100%	273,883	100%	25%

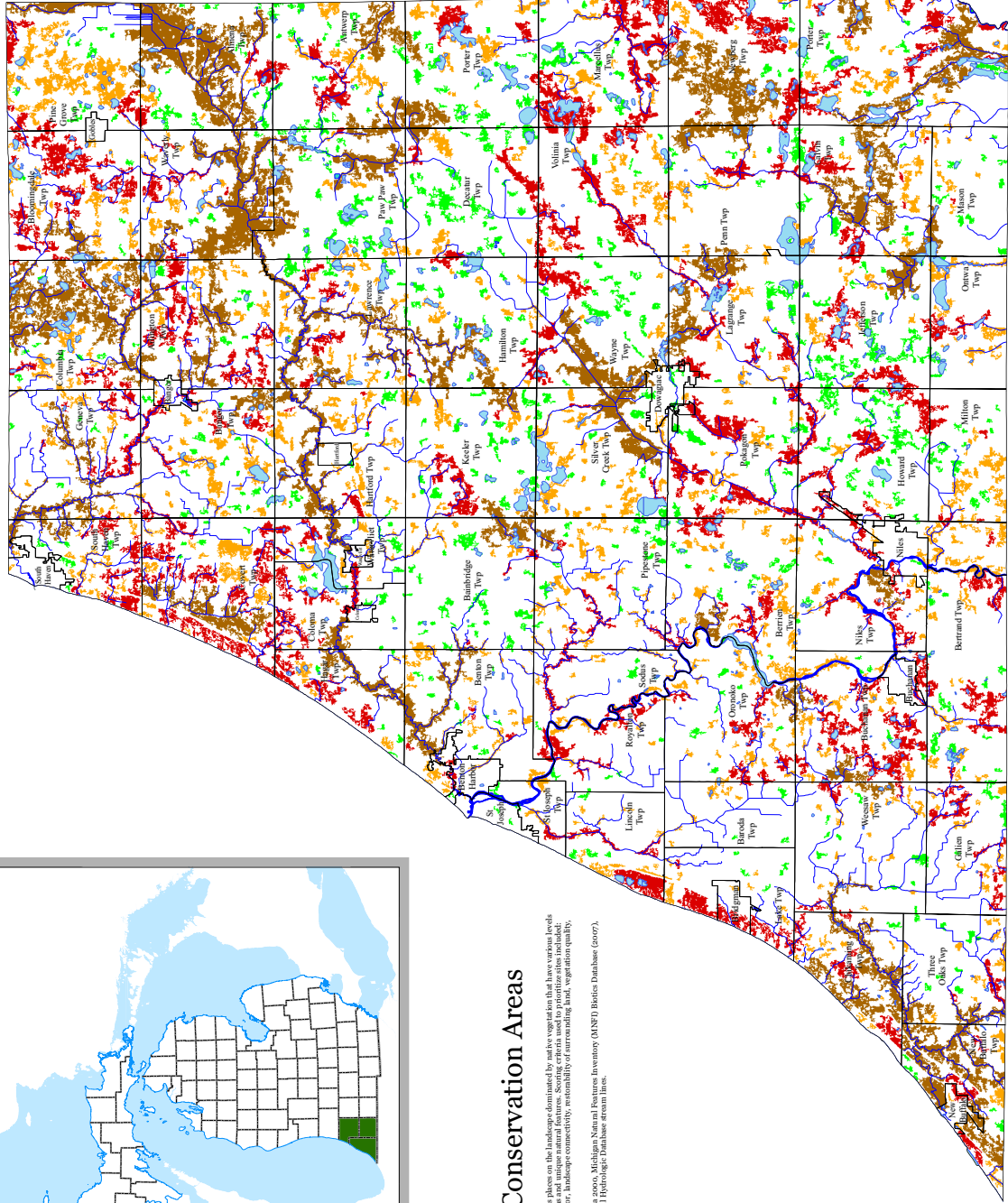* Note: Acres includes 1 mile buffer around three county area.

Southwest Michigan

Potential Conservation Areas

Potential Conservation Areas (PCAs) are defined as places on the landscape dominated by native vegetation that have various levels of potential for harboring high quality natural areas and unique natural features. Scoring criteria used to prioritize sites included: total size, size of core area, length of stream corridor, landscape connectivity, restorability of surrounding land, vegetation quality, and biological rarity score.

Data Sources: Michigan DNR IFMAP land use circa 2000, Michigan Natural Features Inventory (MNFI Biotics Database (2007), Michigan's Vegetation circa 1800, and the National Hydrologic Database stream lines.
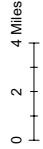
Legend

⬭ Township boundary
⬭ County boundary

Hydrology Features
⬭ Lake/Pond
⬭ Reservoir
⬭ Stream/River

PCA score
■ 1 - 7
■ 8 - 11
■ 12 - 19
■ 20 - 34

0 2 4 Miles

Michigan Natural Features Inventory
07/23/2007

In Berrien County, there were **629 sites**, **totaling 69,887 acres** that were identified as potential conservation areas. **This represents 19% of the total area in the county**. Each of the 754 delineated sites was given a total score based upon the criteria described in table 1. Total scores ranged from a high of 32 points (out of a possible 41 points) to a low of 1 point. The mean score was 10. **The site that received the highest score of 32 is located in the southern portion of the county in Chikaming, New Buffalo, and Three Oaks Townships along the Galien River**. **It includes 2,683 acres in total size and a core area of 701 acres**. Warren Woods State Park and Galien River County Park are both located in this site. The site with the second highest score of 30 is located in Watervilet Township along the Paw Paw River. Only 506 acres actually occurs in Berrien County; the majority of the site is actually located in neighboring Van Buren County. It encompasses 4,643 acres in total size and a core area of 1,473 acres. Three sites tied for third with a score of 26. The first site is located along the main stem of the Paw Paw River, the second site is located along the Galien River, and the third site is located along the South Branch of the Galien River as well as Squaw Creek and Blood Run.

As a result of applying the natural break method, 161 sites were placed in the low priority category, 303 sites were placed in the medium category, 149 sites were placed in the high priority category, and 16 sites were placed in the highest category. Breaking it down into percentages of total sites identified, 26% were labeled low priority, 48% were labeled medium priority, 24% were identified as high priority, and 3% were labeled highest priority. Breaking it down by acreage, 11 % (8,020 acres) fell into the low quality category, 27 % (18,763 acres) fell into the medium quality category, 35 % (24,764 acres) fell into the high priority category, and 26% fell into the highest priority category.

Table 3. Results of PCA Analysis for Berrien County

| PCA Class	PCA Count	Percentage	Acres	% of PCA acreage	% County acreage
Low 1-7	161	26%	8,020	11%	2%
Med 8-11	303	48%	18,763	27%	5%
High 12-19	149	24%	24,764	35%	7%
Highest 20-34	16	3%	18,340	26%	5%
Total	629	100%	69,887	100%	19%

Berrien County

Potential Conservation Areas

Legend

Major roads
— Interstate
— US
— MI Highway
— Other
◯ Township boundary
◯ Berrien County

Hydrology Features
Lake/Pond
Reservoir
Stream/River

PCA score
1 - 7
8 - 11
12 - 19
20 - 34

0   2   4 Miles

Michigan Natural Features Inventory
07/24/2007

N

Michigan
Natural
Features
Inventory

MICHIGAN STATE
U N I V E R S I T Y
EXTENSION
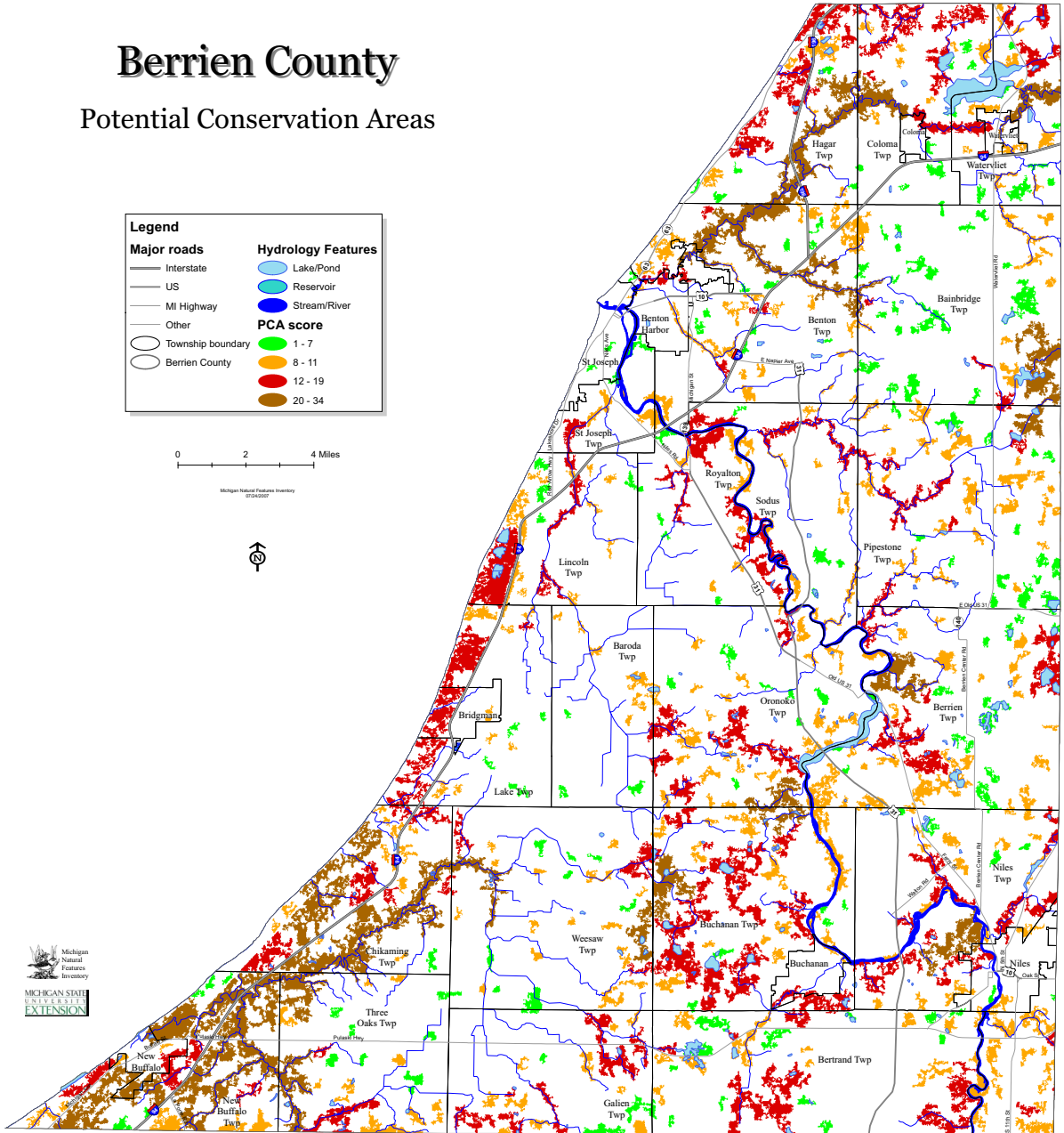
In Cass County, there were **479 sites, totaling 81,092 acres** that were identified as potential conservation areas. **This represents 25 % of the total area in the County**. Each of the 479 delineated sites was given a total score based upon the criteria described in table 1. Total scores ranged from a high of 32 points (out of a possible 41 points) to a low of 1 point. The mean score was nine. **The site that received the highest score of 32 is located primarily in Newberg Township, as well as portions of Penn and Marcellus Townships. The majority of the site falls within the boundary of the Crane Pond State Game Area.** It is 5,879 acres in total size, with a core area of 1,515 acres. Two sites tied for the second highest ranking sites in the County with a score of 28. The first site is located in the center of Calvin Township in the southeast part of the County. A portion of Christiana creek flows through the site. The second site with a score of 28 is completely contained within Wayne Township. It is located along the Dowagiac River just north and east of the town of Dowagiac. It encompasses 2,804 acres in total size with a core area of 1,167 acres.

As a result of applying the natural break method, 184 sites were placed in the low priority category, 194 sites were placed in the medium category, 89 sites were placed in the high priority category, 12 sites were placed in the highest priority category. Breaking it down into percentages of total sites identified, 38 % were labeled low priority, 41 % were labeled medium priority, 19 % of the sites were identified as high priority, and 3 % were identified as highest priority. Breaking it down by acreage, 16 % (12,836 acres) fell into the low quality category, 19 % (15,153 acres) fell into the medium quality category, 36 % (29,051 acres) fell into the high priority category, and 30 % (24,052 acres) fell into the highest priority category.

Table 4. Results of PCA Analysis for Cass County.

PCA Class	PCA Count	Percentage	Acres	% of PCA acreage	% County acreage
Low 1-7	184	38%	12,836	16%	4%
Med 8-11	194	41%	15,153	19%	5%
High 12-19	89	19%	29,051	36%	9%
Highest 20-34	12	3%	24,052	30%	7%
Total	479	100%	81,092	100%	25%
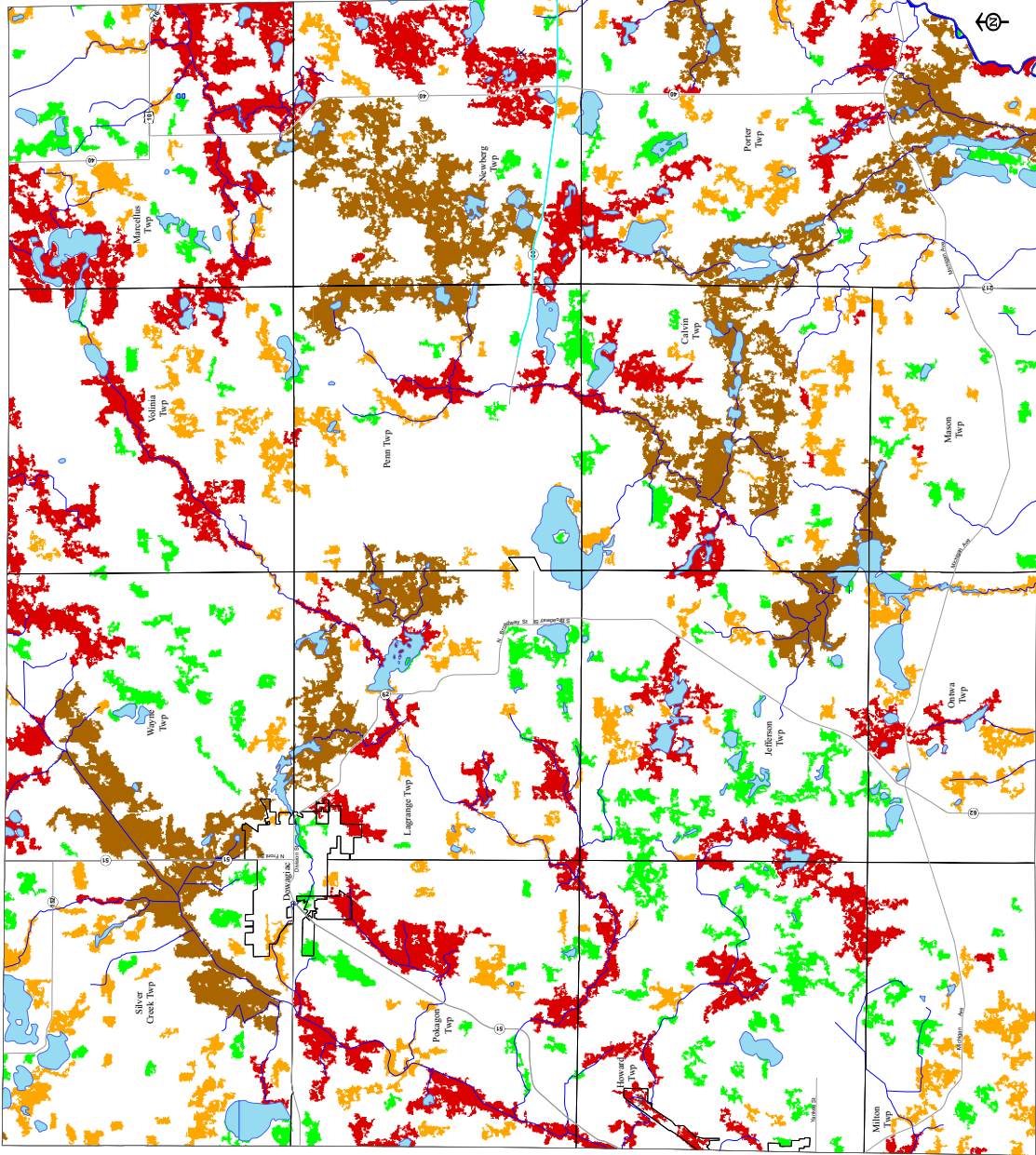
Cass County

Potential Conservation Areas

Legend

Major roads
- Interstate
- US
- MI Highway
- Other
- Cass County
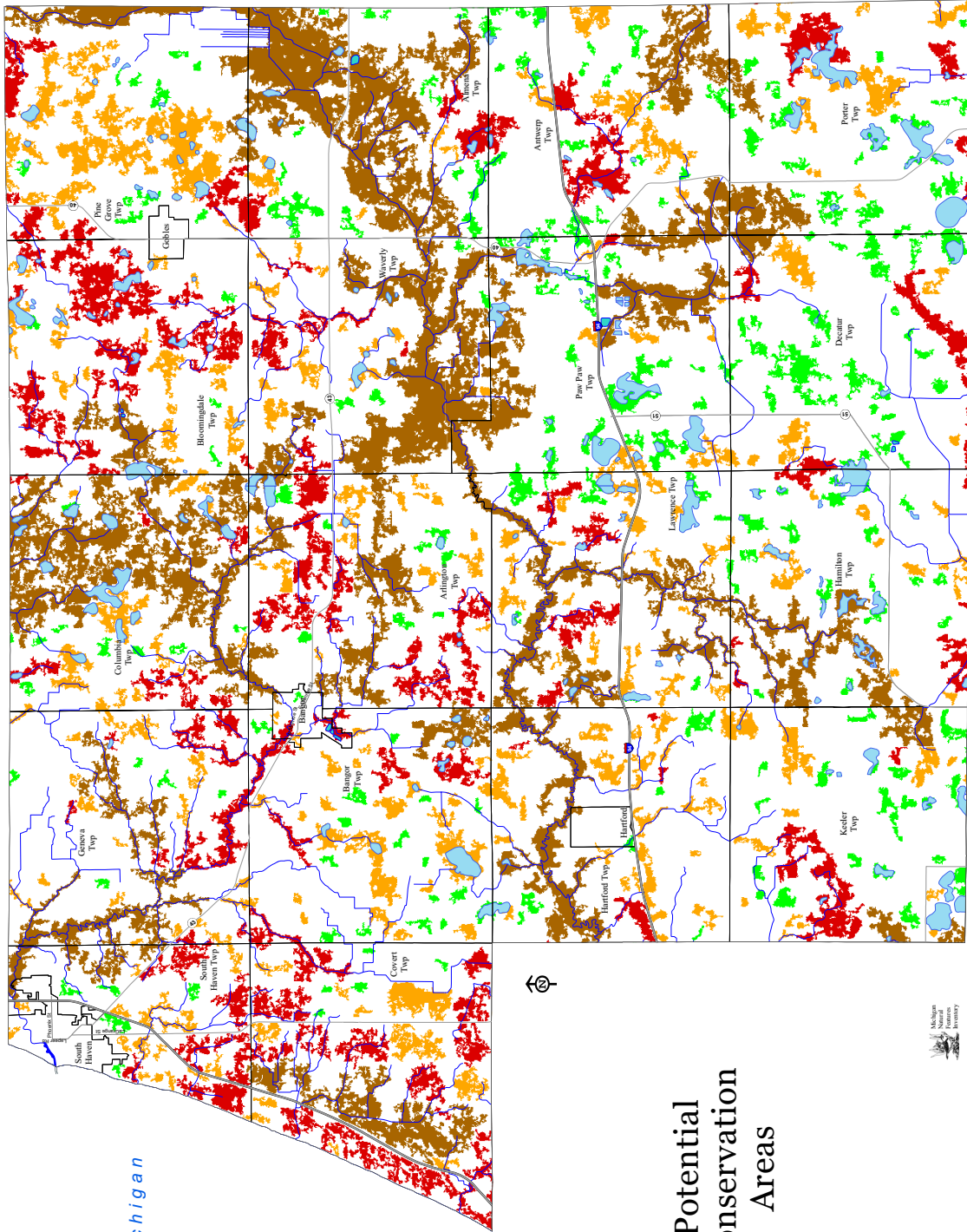- Township boundary

Hydrology Features
- Lake/Pond
- Reservoir
- Stream/River

PCA score
- 1 - 7
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- 20 - 34

Michigan Natural Features Inventory
07/24/2007

0   1   2 Miles

Michigan Natural Features Inventory

MICHIGAN STATE
UNIVERSITY
EXTENSION
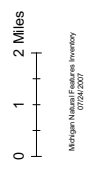
In Van Buren County there were **653 sites totaling 113,504 acres** that were identified as potential conservation areas. **This represents 28 % of the total area of the county**. Each of the 653 delineated sites was given a total score based upon the criteria described in table 1. Total scores ranged from a high of 34 points (out of a possible 41 points) to a low of 1 point. The mean score was nine. **The site that received the highest score of 34 is located in the northeast part of the county in Almena and Pine Grove Townships**. Portions of the site spill over into neighboring Kalamazoo County, and the entire site is located along the headwaters of the Paw Paw River, further raising the ecological significance of this site. It includes a total area of 7,408 acres and a core area of 3,495 acres. The site with the second highest score of 33 is located along the main stem of the Paw Paw River primarily in Waverly Township. Portions of the site are also located in Paw Paw, Lawrence, and Arlington Townships. The total acreage of this area is 8,907 acres (the largest site in Van Buren County) with a core area of 3,419 acres. The third highest scoring site (30) is also located along the main stem of the Paw Paw River in Hartford, Bangor, and Lawrence Townships. The total acreage for this site is 4,643 acres with a core area of 1,474 acres.

As a result of applying the natural break method, 230 sites were placed in the low priority category, 253 sites were placed in the medium category, 150 sites were placed in the high priority category, and 20 sites were placed in the highest priority category. Breaking it down into percentages of total sites identified, 35 % were labeled low priority, 39 % were labeled medium priority, 23% of the sites were identified as high priority, and 3 % were identified as highest priority. Breaking it down by acreage, 12 % (13,520 acres) fell into the low quality category, 21 % (23,987 acres) fell into the medium quality category, 23 % (25,823 acres) fell into the high priority category, and 44 % (50,175 acres) fell into the highest priority category.
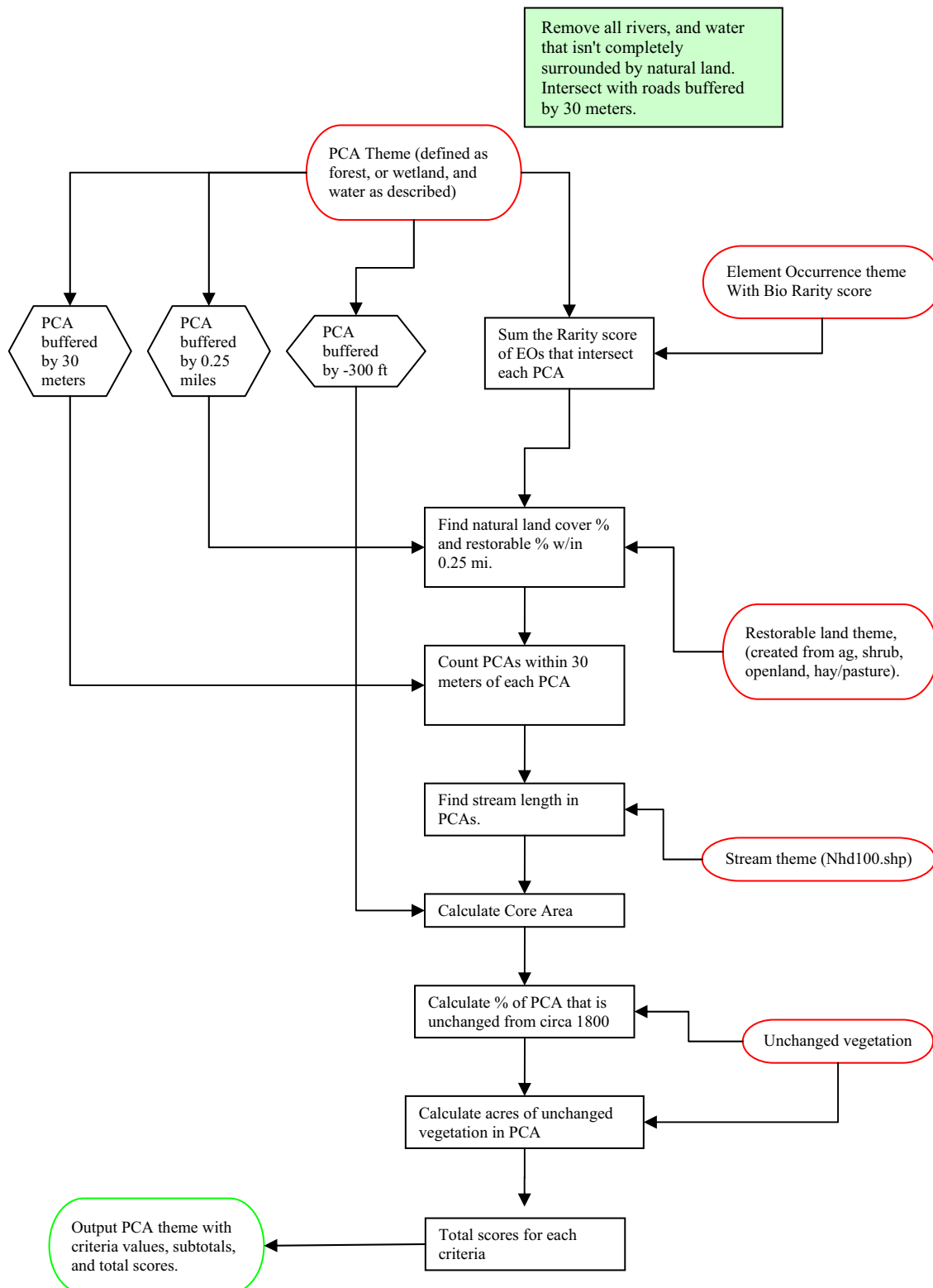
Table 5. Results of the PCA Analysis for Van Buren County

PCA Class	PCA Count	Percentage	Acres	% of PCA acreage	% County acreage
Low 1-7	230	35%	13,520	12%	3%
Med 8-11	253	39%	23,987	21%	6%
High 12-19	150	23%	25,823	23%	6%
Highest 20-34	20	3%	50,175	44%	13%
Total	653	100%	113,505	100%	28%

Van Buren County

Lake Michigan

Potential
Conservation
Areas

Pine Grove Twp
Geneva Twp
South Haven Twp
South Haven
Columbia Twp
Bloomingdale Twp
Arlington Twp
Bangor Twp
Bangor
Covert Twp
Hartford Twp
Hartford
Keeler Twp
Waverly Twp
Almena Twp
Antwerp Twp
Paw Paw Twp
Lawrence Twp
Hamilton Twp
Porter Twp
Decatur Twp
Gobles

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Flow chart for PCA model

Remove all rivers, and water that isn't completely surrounded by natural land. Intersect with roads buffered by 30 meters.

PCA Theme (defined as forest, or wetland, and water as described)

Element Occurrence theme With Bio Rarity score

PCA buffered by 30 meters

PCA buffered by 0.25 miles

PCA buffered by -300 ft

Sum the Rarity score of EOs that intersect each PCA

Find natural land cover % and restorable % w/in 0.25 mi.

Restorable land theme, (created from ag, shrub, openland, hay/pasture).

Count PCAs within 30 meters of each PCA

Find stream length in PCAs.

Stream theme (Nhd100.shp)

Calculate Core Area

Calculate % of PCA that is unchanged from circa 1800

Unchanged vegetation

Calculate acres of unchanged vegetation in PCA

Output PCA theme with criteria values, subtotals, and total scores.

Total scores for each criteria

Conclusion

This analysis documents that the BCV region has several high quality natural areas that still look and function the way they did 200 years ago. Of the remaining high quality sites, some have the potential of harboring endangered, threatened, or special concern animal and plant species. With the high rate of development and its associated stresses on the natural environment, conservation of these remaining areas and their native plant and animal populations are vital if the Region's diverse, natural heritage is to be conserved.

When using this information it is important to keep in mind that site boundaries and rankings are a starting point and tend to be somewhat general in nature. Consequently, each community, group or individual using this information should determine what additional expertise is needed in order to establish more exact boundaries and the most appropriate conservation efforts.

Comments/Recommendations

1) Local units of government, individuals and interest groups using this information should consult a publication produced by SEMCOG in 2003 entitled, "Land use Tools and Techniques." The publication includes information on tools and techniques that conserve natural resources and create open space linkages while allowing for economically viable development.

2) Municipalities should identify opportunities to link other possible natural resource sites not mapped during this survey. This would include small patches of land, tree and fence row plantings, agriculture land, and open fields (greenways).

3) Field inventories should be conducted on identified potential conservation areas. This fieldwork would provide much needed additional site-specific data that should be considered when developing in and around such areas.

4) All identified sites, regardless of their priority, have significance to their local setting. This is especially true in areas that have experienced a high degree of development and landscape fragmentation.

5) A direct relationship exists between natural area protection and long-term water quality. With the abundance of water resources found in the BCV Region and the potential impact on the economy associated with degradation of these resources, natural area protection should be integrated into local water quality management plans.

6) Municipalities should work together and adopt a comprehensive green infrastructure plan. The conservation of critical natural areas is most effective, and successful, in the context of an overall plan.

7) Funding should be secured to update the mapping and assessment of this project's potential conservation areas approximately every three to five years.

8) Efforts to conserve potential conservation areas should include on-going site assessment and stewardship.

9) Local units of government in Berrien, Cass, and Van Buren Counties should undertake widespread distribution of this information in order to build awareness and encourage long-term resource planning and stewardship. Knowledge of potential conservation areas is meaningless unless action is taken to ensure that they will remain part of this area's natural heritage.

10) When establishing sites for possible field inventory, each community, group or individual should consider all available criteria in conjunction with their unique local conditions. Site selection may well be influenced by local growth pressure and ownership of the land.

References

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Forman, Richard T. T. and Michel Gordon. 1986. Landscape Ecology. Wiley, New York.

MDIT-CGI. 2006. The Michigan Geographic Framework (MGF) Standard Reference Base GIS Data Layers for Michigan Roads, Hydrology, and County Lines, Version 6b. Center for Geographic Information (DIT-CGI), Michigan Department of Information Technology (MDNR), Lansing, Michigan. Base data layers include roads, hydrology, and county lines and other standard reference layers; data layers created as part of maintaining Michigan base data layers for GIS applications. Data and metadata available online at http://www.mcgi.state.mi.us/mgdl/.

MNFI, 2003. Draft Land Use Change of Michigan's Lower Peninsula, Circa 1800-2000. Raster digital data.

MNFI, 2006. Biotics 4 database. The element occurrence database for the state of Michigan, created by the Michigan Natural Features Inventory (MNFI) in Lansing, MI. These data represent a current snapshot of the elements of biodiversity (animal species, plant species, natural communities, geologic features, and champion trees) being maintained by MNFI using established Natural Heritage Methodology developed by the Association for Biodiversity Information (ABI) (now NatureServe) and The Nature Conservancy (TNC).

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Rosenberg, K. V., R. W. Rohrbaugh, Jr., S. E. Barker, J. D. Lowe, R. S. Hames and A. A. Dhondt. 1999. A land manager's guide to improving habitat for scarlet tanagers and other forest–interior birds. The Cornell Lab of Ornithology.
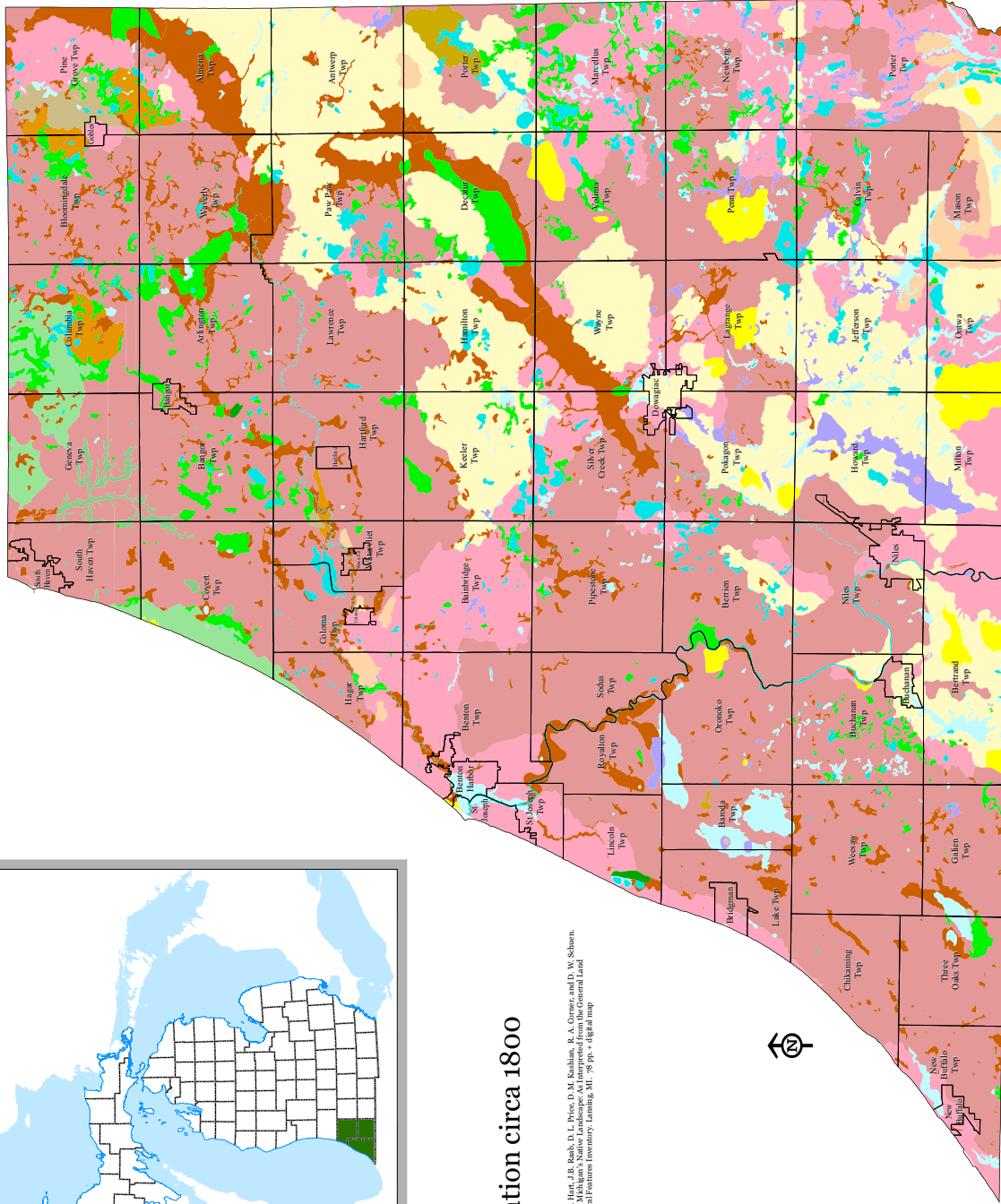
Appendix 1.
Circa 1800 Vegetation
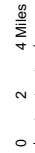## for Berrien, Cass, and Van Buren Counties

Southwest Michigan

Vegetation circa 1800

Legend

- ◯ Township boundary
- ◯ County boundary
- **circa 1800 covertype**
- BEECH-SUGAR MAPLE FOREST
- BEECH-SUGAR MAPLE-HEMLOCK FOREST
- BLACK ASH SWAMP
- BLACK OAK BARREN
- CEDAR SWAMP
- GRASSLAND
- HEMLOCK-WHITE PINE FOREST
- LAKE/RIVER
- MIXED CONIFER SWAMP
- MIXED HARDWOOD SWAMP
- MIXED OAK FOREST
- MIXED OAK SAVANNA
- MUSKEG/BOG
- OAK-HICKORY FOREST
- SAND DUNE
- SHRUB SWAMP/EMERGENT MARSH
- WET PRAIRIE
- WHITE PINE-MIXED HARDWOOD FOREST
- RED PINE-WHITE PINE FOREST
- WHITE PINE-WHITE OAK FOREST

Michigan Natural Features Inventory
07/24/2007

0   2   4 Miles

Appendix 2.
Circa 2000 Land Cover
for Berrien, Cass, and Van Buren Counties

Southwest Michigan

Current Land Cover

Data Source: MDNR. 2003. Integrated Forest Monitoring Assessment and Prescription (IFMAP) / GAP Landuse/Landcover
for Michigan, version 1 (2003). Forest, Minerals and Fire Management Division, Michigan Department of Natural Resources
(MDNR), Lansing, Michigan. Raster data at 30 meter cell size; time-period of content 1997 – 2001 for source remotely-sensed
Landsat TM satellite data. Data and metadata available online at http://www.mcgi.state.mi.us/mgdl/.

Appendix 3.
Element Occurrence Frequency Map
for Berrien, Cass, and Van Buren Counties

Southwest Michigan

Legend

Township boundary
County boundary

Frequency count

- 1 - 3
- 4 - 7
- 8 - 14
- 15 - 21
- 22 - 34

0   2   4 Miles

Frequency Count

The biological entity value is based on based on the Michigan Natural Features Inventory (MNFI) database of known sightings of threatened, endangered, or special concern species and high quality natural communities. It is a simple count of the database records in each section, to highlight areas with higher concentrations of rare species

Data Sources: Michigan Natural Features Inventory (MNFI) Biotics Database (5/2007), and the Public Land System Survey (PLSS) township range sections.

Michigan Natural Features Inventory

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Appendix 4.
Element Occurrence Likelihood Map
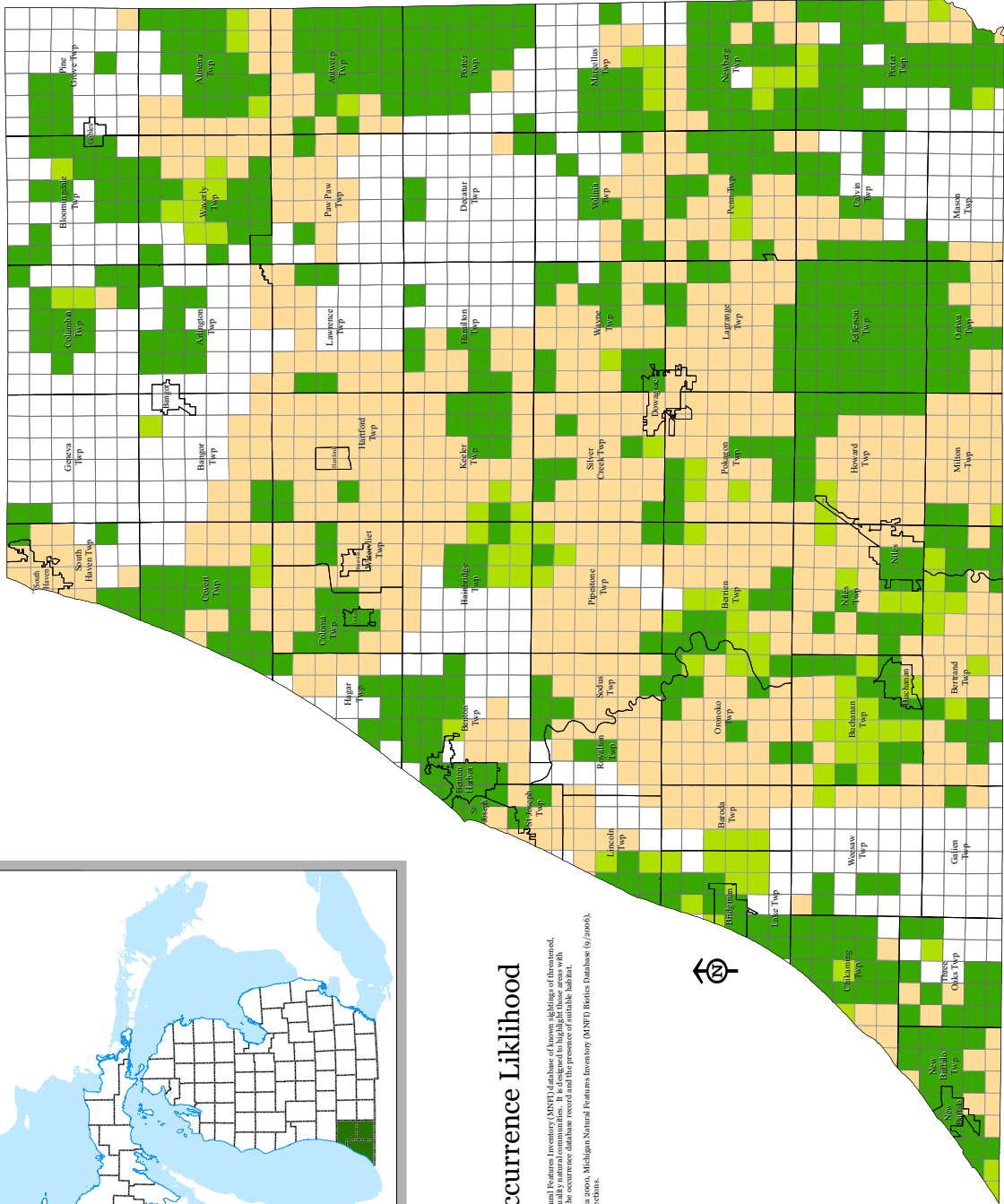for Berrien, Cass, and Van Buren Counties

Southwest Michigan

Element Occurrence Liklihood

The liklihood model is based on the Michigan Natural Features Inventory (MNFI) database of known sightings of threatened, endangered, or special concern species and high quality natural communities. It is designed to highlight those areas with known occurrences and is classified on the age of the occurrence database record and the presence of suitable habitat.

Data Sources: Michigan DNR IFMAP land use circa 2000, Michigan Natural Features Inventory (MNFI) Biotics Database (9/2006), Public Land Survey System (PLSS) Town Range Sections.
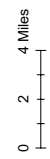
Michigan
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Appendix 5.
Bio-Rarity Score
for Berrien, Cass, and Van Buren Counties
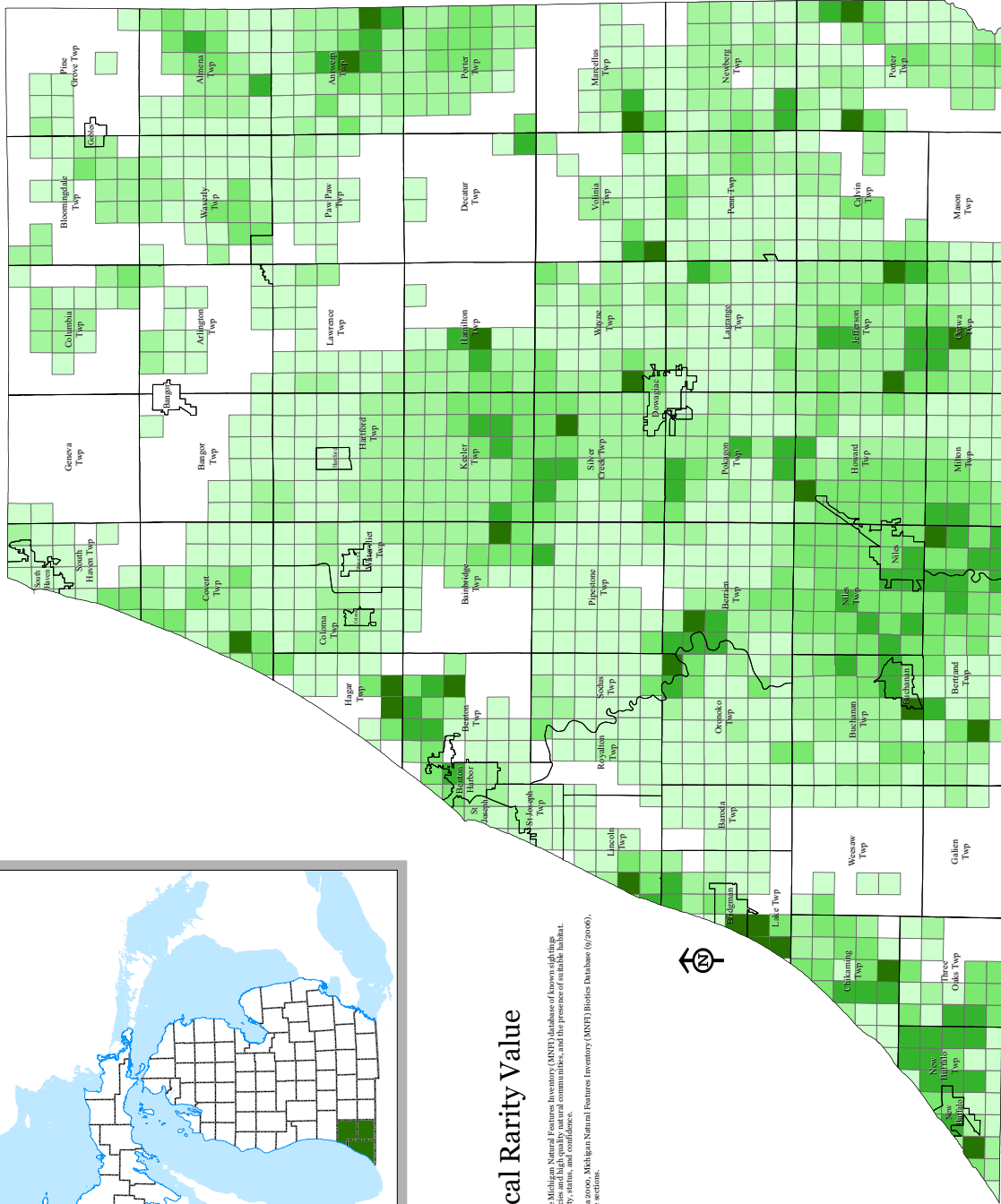
Southwest Michigan

Biological Rarity Value

The biological rarity value is based on based on the Michigan Natural Features Inventory (MNFI) database of known sightings of threatened, endangered, or special concern species and high quality natural communities, and the presence of suitable habitat. It prioritizes areas for conservation by quality, rarity, status, and confidence.

Data Sources: Michigan DNR-IFMAP land use circa 2000, Michigan Natural Features Inventory (MNFI) Biotics Database (9/2006), Public Land System Survey (PLSS) township range sections.

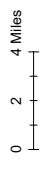Michigan Natural Features Inventory

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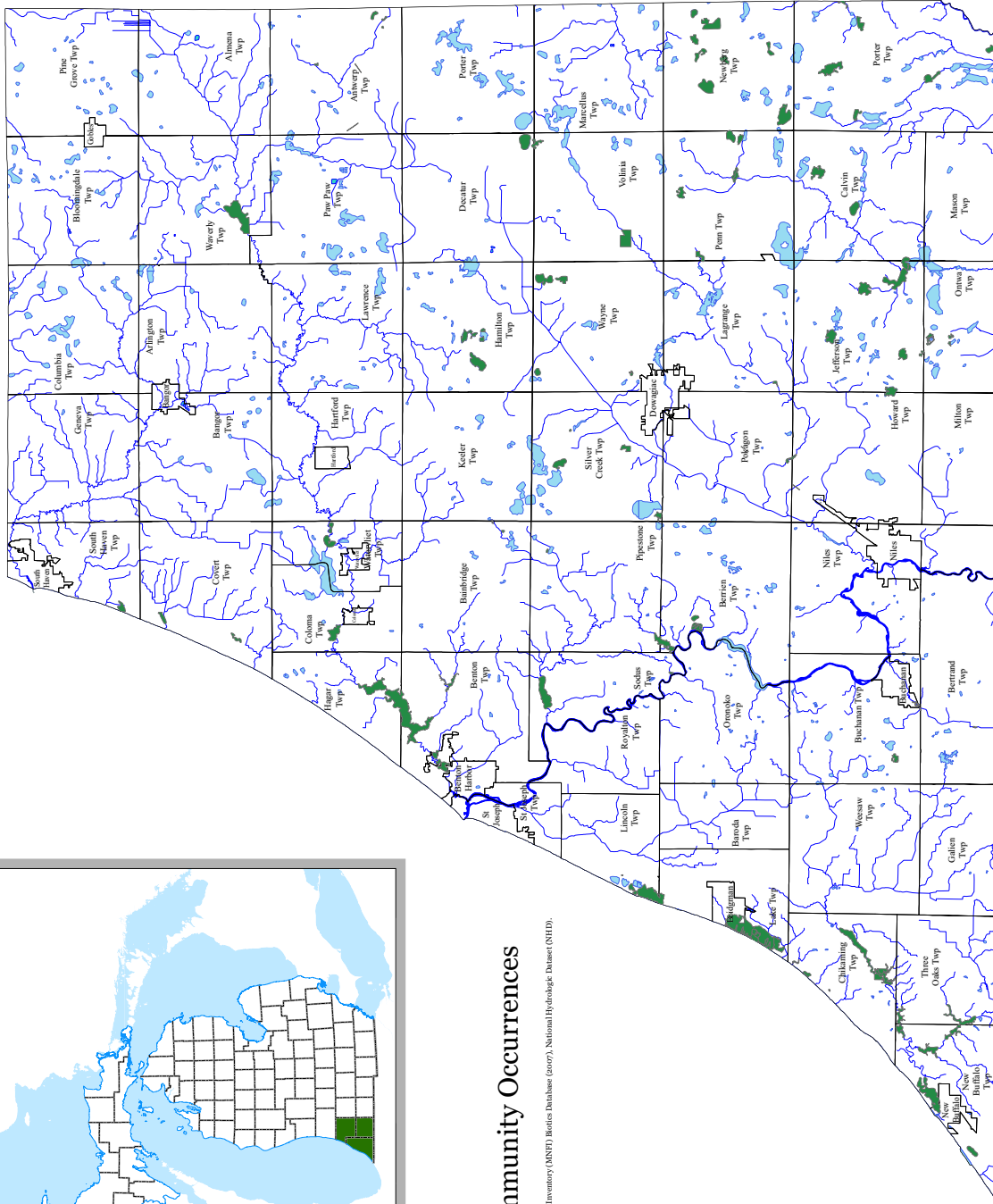*Berrien, Cass, and Van Buren Counties Potential Conservation Areas* - 32

Appendix 6.
High Quality Natural Communities
for Berrien, Cass, and Van Buren Counties

Southwest Michigan

Natural Community Occurrences

Data Sources: Michigan Natural Features Inventory (MNFI) Biotics Database (2007), National Hydrologic Dataset (NHD).
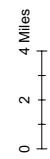

Pine Grove Twp, Almena Twp, Antwerp Twp, Porter Twp, Marcellus Twp, Newberg Twp, Porter Twp, Bloomingdale Twp, Gobles, Waverly Twp, Paw Paw Twp, Decatur Twp, Volinia Twp, Calvin Twp, Mason Twp, Penn Twp, Columbia Twp, Arlington Twp, Lawrence Twp, Hamilton Twp, Wayne Twp, Lagrange Twp, Jefferson Twp, Ontwa Twp, Geneva Twp, Bangor Twp, Hartford Twp, Keeler Twp, Silver Creek Twp, Dowagiac, Pokagon Twp, Howard Twp, Milton Twp, South Haven Twp, Covert Twp, District Twp, Bainbridge Twp, Pipestone Twp, Berrien Twp, Niles Twp, Niles, South Haven, Coloma Twp, Benton Twp, Sodus Twp, Oronoko Twp, Buchanan Twp, Bertrand Twp, Hagar Twp, Royalton Twp, Buchanan, Benton Harbor, St Joseph, St Joseph Twp, Lincoln Twp, Baroda Twp, Weesaw Twp, Galien Twp, Bridgman, Lake Twp, Chikaming Twp, Three Oaks Twp, New Buffalo, Buffalo Twp