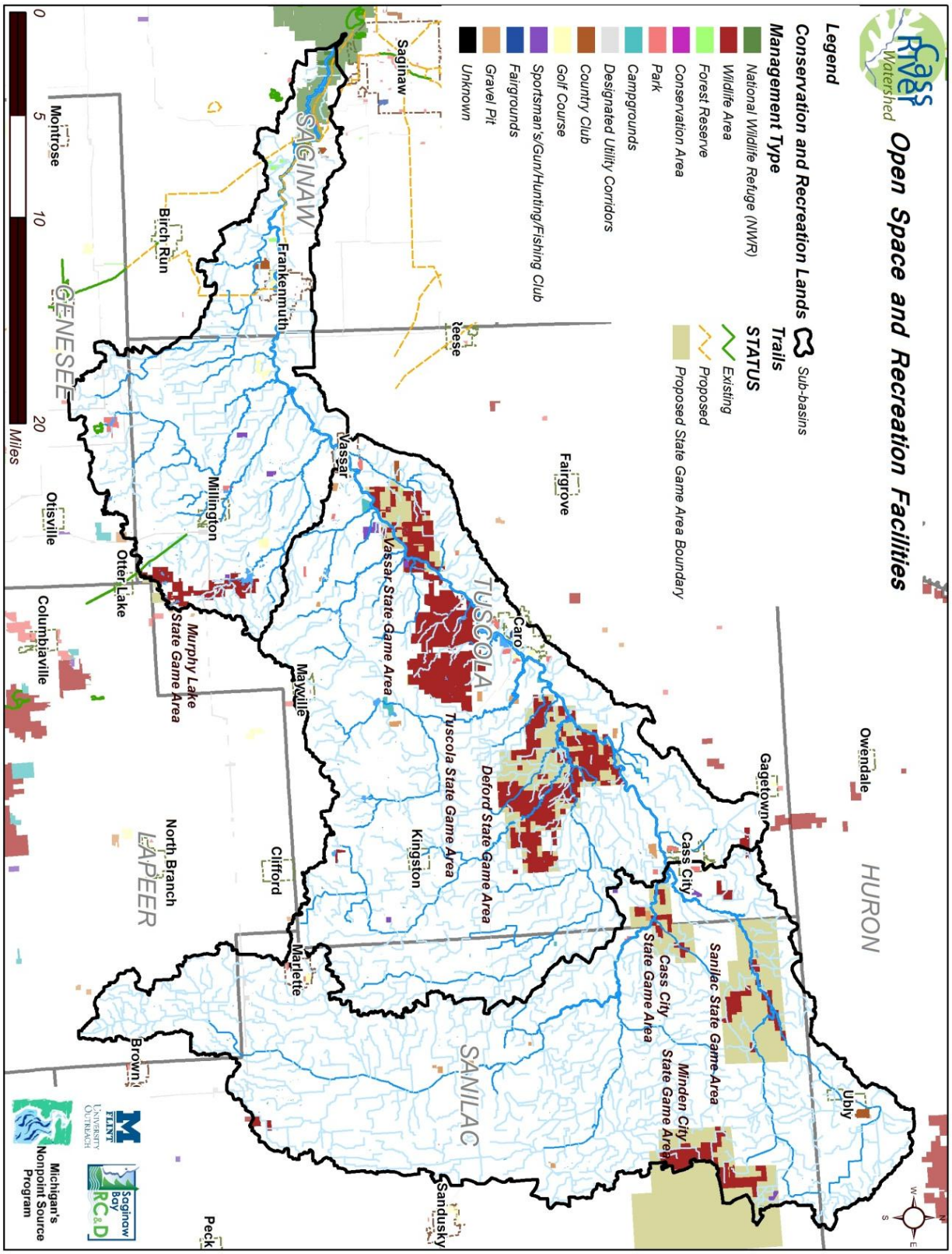
Chapter 5: Natural Resources

The Cass River Watershed is home to several different species of plants, animals, birds, reptiles and amphibians (threatened and endangered species are listed in the Appendix) along with vast natural resources. This watershed encompasses a total of 53,761 acres of recreational land. This recreational land includes wildlife areas and sportsman clubs as well as part of the Shiawassee National Wildlife Refuge and nine state game areas (RC&D pg. 7). The Shiawassee National Wildlife Refuge is historically one of the largest and most productive wetland ecosystems in Michigan (Shiawassee). This National Wildlife Refuge accounts for 4,094 acres of the recreational land in the Cass River Watershed. Another 31,569 acres of the recreational land in the Cass River Watershed can be attributed to the nine state game areas that are home to this watershed. In total, the recreational land in the Cass River Watershed is an important natural resource (RC&D pg. 7).

5.1 Open Space & Recreational Areas

Map 5.1 shows the recreational lands in the Cass River Watershed. The large red sections show wildlife areas, while the large green section on the west side of the map shows the Shiawassee National Wildlife Refuge. The Conservation and Recreation Lands (CARL) dataset was created by Ducks Unlimited and is updated on an annual basis. Data was also collected from the State of Michigan on planned expansion areas for State Game Areas, these are shown in brown on the map, the most notable expansion plans are for Sanilac, Cass City, and Minden State Game Areas in the north-east region of the watershed. The majority of protected natural lands are in the Middle Sub-basin implying that water quality may be of higher quality in these subwatersheds. This map served as a basis for planning the strategy for long-term protection of natural lands and the integrity of water quality.

Map 5.1: Open Space and Recreation Facilities



5.2 Temperature & Flow Characteristics

The Cass River Watershed is divided into five different flow/temperature characteristic types based on valley segment data created by the Michigan Department of Natural Resources (MDNR) Fisheries Division (Seelbach, Wiley, Kotanchik, and Baker 1997).

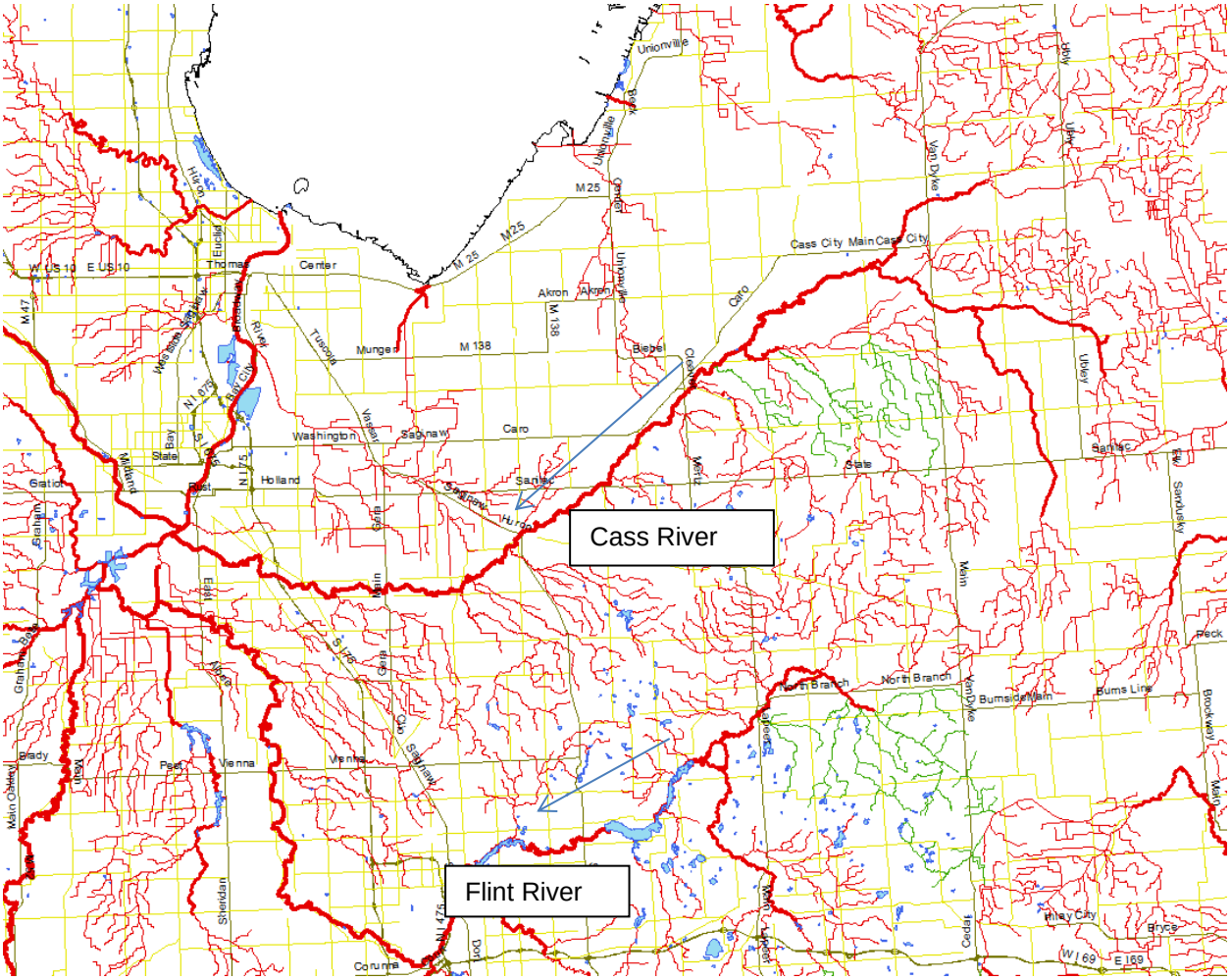
1. **Small Warm** (SW) – low volume warmwater headwater streams with insignificant groundwater influence draining a basin less than 40 mi^2 (40% of Cass River system)
2. **Small Cool** (SC) – small headwater streams with moderate groundwater influence draining a basin less than 40 mi^2 (18% of Cass River system)
3. **Medium Warm** (MW) – medium sized warmwater streams. Summer flows may be reduced significantly as source flows are of relatively low yield. Drainage area is 41 mi^2 – 179 mi^2. (24% of Cass River system)
4. **Large Warm** (LW) – includes larger tributaries and/or portions of the mainstem of a river system. Drainage areas are 180 mi^2 – 620 mi^2 and contain large fish species. (5% of Cass River System)
5. **Very Large Warm** (VLW) – Drainage areas are greater than 602 mi^2 and are likely to be unwadeable. (3% of Cass River System) (Cooper, 2006)

Per discussion with J. Leonardi on Sep 7, 2011 the majority (95%) of the watershed is considered warm water. The groundwater fed portions of the watershed, typically in the cooler headwater reaches, are significant for the fishery in that they provide temperature stabilization. Three sites were sampled in 2011 by the DNR who are interested in looking at wetland restoration sites for temperature control. Map 5.2 shows the temperature classification of streams in the Cass River Watershed.

Michigan DNR Fisheries Division staff Joe Leonardi is the fish biologist for the Cass River Watershed, his comments are below regarding Map 5.2.

> *"Cass River is almost entirely classified for warm water thermal habitat. The light green shows portions of the Flint River watershed which has some ground water inflow cooling the streams making them "cool or warm transitional" thermal habitat. Protecting the river corridor with shade producing vegetation is of benefit as it keeps summer temperatures lower and non-lethal for fish. However, the fish community will still be typified by warm water thermal conditions. Protecting the headwaters is of benefit as they typically reflect our more pristine waters which benefits everything downstream."*
>
> - *Joe Leonardi*

Map 5.2: Temperature Regime of Cass River and its tributaries



Map 5.2 Legend

<u>Mid summer temperatures (July)</u>

Blue = cold water < 60F

Dark Green = cold transitional 63-67F

Light Green = cool or warm transitional 67-70F

Red = warm > 70F

5.3 Existing Regional Plans

Three recent reports that involved the natural resources in the Cass River Watershed are the 2000 "Saginaw Bay Watershed Wildlife Habitat Conservation Framework." This report about the Saginaw Bay Watershed classifies the Cass River as an important corridor for wildlife travel. It recommends that it be considered for designation under the Michigan Natural Rivers program –from Vassar upstream for protection of the watershed – and expanding the seven state game areas that exist in the watershed to safeguard the corridor (RC&D pg. 18-19).

The second report, "A Vision of Green Report", 2005, determines the Cass River and its' watershed as a key part of the Saginaw Bay watershed. The Rapid Watershed Assessment done in 2006 explains exactly what the "A Vision of Green Report," entails:

"The Saginaw Bay Greenways Collaborative (the Collaborative) formed in 1999 to develop the Saginaw Bay Greenways plan "to connect communities to the area's natural and cultural amenities for the benefits of recreation, transportation, education, health and well-being of its citizens." The Collaborative' s report, "A Vision of Green", summarized the green infrastructure plan for the tri-county (Midland/Bay/Saginaw) area and outlined suggested implementation steps. The plan put forth capitalizes on the large tracts of land already protected in the area. The Shiawassee National Wildlife Refuge and the adjoining Shiawassee River State Game Area form a major hub for the region. Most of the green infrastructure corridors identified by the Saginaw Bay Greenways Plan follow the network of rivers that flows into the bay. The Cass River system is one of the key rivers identified in the plan," (RC&D pg. 18-19).

The Lower Cass River Natural Lands Inventory was completed for the Cass River Greenway committee in 2011 and identifies and prioritizes natural lands for protection in 6 townships along the lower Cass River from Bridgeport to Indian Fields. The study categorizes over 60,000 acres of land as high, medium, or low priority for protection. The full report can be viewed online at www.cassriver.org/publications.

5.4 Priority Lands Inventory

Watershed-wide Natural Lands Inventory

As part of the watershed planning process, natural areas were delineated for the entire Cass River Watershed from an existing land use/land cover dataset developed in 2006 by the National Oceanic Atmospheric Administration's (NOAA) Coastal Change Analysis Program (C-CAP).

Natural land classes were selected out of the dataset using GIS technology within the Cass River Watershed and within 1-mile of the watershed boundary to allow for inclusion of natural areas that crossed the watershed divide. Road corridors were then extracted from the natural area blocks resulting in a number of discrete natural land classes within the Cass River Watershed. Only natural areas 10 acres or larger were considered for this study. A total of 3,269 unique

natural areas were defined totaling 143,372 acres. Natural areas account for nearly 25% of the Cass River Watershed according to this analysis.

The size of natural areas or Potential Conservation Areas (PCAs) in acres ranged from 10 acres to 3,032 acres. The largest PCAs coincide with State Game Areas located within the watershed including Minden City, Deford, Tuscola, Vassar, Cass City, Sanilac, and Murphy Lake State Game Areas. The Shiawassee National Wildlife Refuge is also partly located within the watershed. Existing protected areas account for 27% of PCA's identified in the watershed.

PCAs were ranked based on scoring criteria developed by MNFI, a final rank was calculated by summarizing the scores for the ten criteria for each natural area and using natural jenks breaks in the distribution of total scores, grouped into five clusters that served as an ecological ranking. The ranking scheme produced a total of 48 possible points. Actual scores varied from 8 – 33 points.

Table 5.1: Scoring Breaks for Prioritization Criteria in the Cass River Watershed

Criteria	Detail	Score
Total Size	20 - 40 ac	1
(Acres)	>40 - 80 ac	2
	>80 - 240 ac	3
	>240 ac	4
Core Area	0 - 60 ac	0
Total area minus 300 ft. buffer from edge of polygon	>60 - 120 ac	2
	>120 - 230 ac	4
	>230 ac	8
Stream Corridor	0	0
Length of stream or river within the polygon	>0 - 400 m	1
	>400 - 800 m	2
	>800 - 1600 m	3
	>1600 - 3200 m	4
	> 3200 m	6
Landscape Connectivity:	0 - 11%	0
Percentage	>11 - 22%	2
% of habitat areas within a 1/4 mile bufffer	>22 - 33%	3
	>33%	4
Landscape Connectivity: Proximity	0	0
	1	1
Number of habitat areas within 100 ft.	2	2
	3	3
	4+	4

Table 5.1 cont'd		
Criteria	**Detail**	**Score**
Biorarity Score (5 Jenks)	0 - 0.1296	0
Average value of quarter quarter section MNFI ecological value score that intersect with habitat	0.1297 - 0.5147	1
	0.5148 - 0.8750	2
	0.8751 - 1.750	3
	1.7501 - 3.25	4
Vegetation Quality: Total Acres of Unchanged Vegetation	0 - 10 ac	0
	10.1 - 40 ac	1
Percentage of potentially unchanged vegetation, circa 1800 veg / 2000 IFMAP	40.1 - 80 ac	2
	80.1 - 160 ac	3
	> 160 ac	4
Vegetation Quality: Percentage Unchanged Vegetation	1 - 10%	0
Acreage: potentially unchanged vegetation within polygon circa 1800 veg/2000 IFMAP	10.1 - 30%	1
	30.1 - 65%	2
	65.1 - 100%	4
Restorability of Surrounding Lands	0 - 35%	1
	>35 - 65%	2
% agriculture/old fields	> 65 %	3
Conservation and Recreation Lands	0.0 - 0.8%	0
	0.8 - 15.3	1
Percentage of protected lands within a habitat patch	15.4 - 22.9	5
	30.0 - 49.4	7
	49.5 - 100.0	1

Table 5.2: Quick comparison of the two priority lands inventories

Criteria	Corridor Study in 2010-2011	Watershed Study in 2011
Scale	6 townships along mainstem of Cass River corridor	Entire watershed
Minimum mapping unit	10 acres	10 acres
Total number of PCAs	511	3,269
Total number of acres	60,089	143,372
Base Dataset	Created from 2009 aerial photography	2006 NOAA C-CAP Land Use / Land Cover
Number of Criteria	Ten	Ten
Range of Total Scores	1 -33	4 -33

Natural and undeveloped lands within the watershed were identified from an existing land use / land cover dataset developed in 2006 by the National Oceanic Atmospheric Administration's (NOAA) Coastal Change Analysis Program (C-CAP). These natural lands were then prioritized for permanent private land-protection based on the ecosystem services they provide such as clean air, clean water, and habitat. A computer model developed by the Nature Conservancy, Habitat Priority Planner, was used to develop a scoring criteria to prioritize these area. Figure 3.x shows where these existing natural areas are still in tact in the watershed. This analysis was one of many tools that stakeholders used during the Natural Resources Forum to identify a long term conservation strategy for the watershed. A full description of the individual criteria used in ranking the natural areas is presented in the Appendix while specific recommendations for protection of these areas are presented in *Chapter 5, Section 5.2 Cass River Corridor and Preservation Areas*.

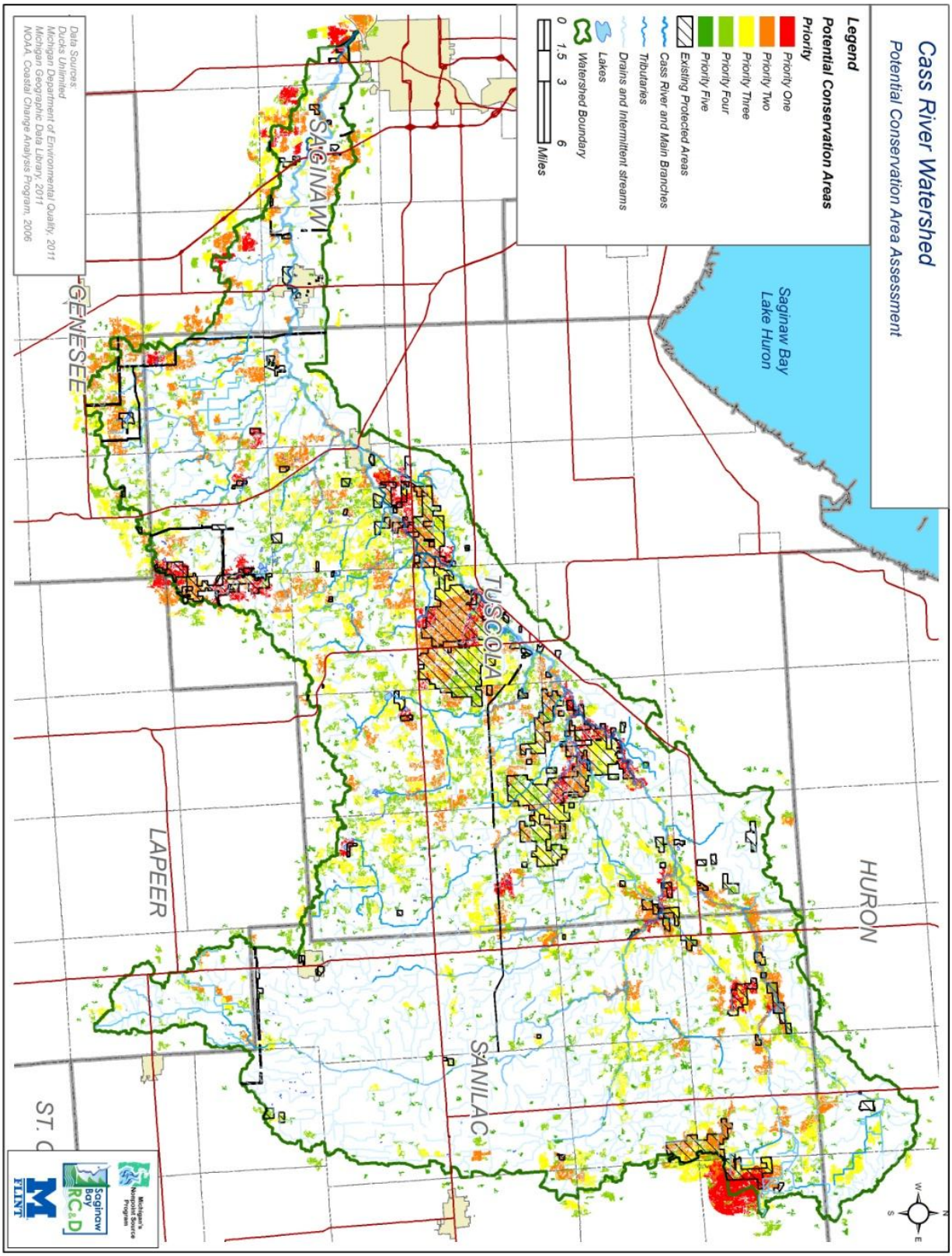
The map below shows priority areas for protection in the Cass River watershed. Priority One (red) areas are those that are the largest in total area and have the highest probability of supporting biodiversity, habitat, and functions that create clean air and water. It is important to note that many of these areas are already protected, primarily via Michigan State Game Areas. Priority Two (orange) areas are those with medium potential to support services mentioned above. Priority Three (yellow) areas are those with low potential to support biodiversity and habitat functions but contribute to ecosystem services.

Table 5.3: Score Distributions for Rankings of Potential Conservation Areas in the Cass River Watershed

Priority	Points	Number of PCAs	Number of Acres
One - High	33 - 23	38	14,810
Two - Medium	22 - 17	255	36,569
Three - Low	16 - 13	691	43,751
Four	12 - 9	1799	39,787
Five	8.0 - 4.0	486	8,453
48 Total Possible Points			

3,269 Total Habitat Patches

Figure 5.3: Potential Conservation Areas for the Cass River Watershed



5.5 Landscape Level Wetland Functional Assessment (Enhanced NWI), Michigan Department of Environmental Quality

The U.S. Fish and Wildlife Service (USFWS) has been conducting the National Wetlands Inventory (NWI) for over 25 years. In the 1990s, the NWI Program for the Northeast Region recognized the potential application of NWI data for watershed assessments, but realized that other attributes would have to be added to the data to facilitate functional analysis. A hydrogeomorphic (HGM) approach to wetland functional assessment provided a method for developing other attributes to expand the NWI database and make it more useful for functional assessment.

A set of HGM-type descriptors have been developed for the NWI to describe a wetland's landscape position, landform, water flow path, and water body type. Working with local and regional wetland experts, the USFWS developed correlations between these wetland descriptors and wetland functions. These correlations reflect the best approximation of what types of wetlands are likely to perform certain functions at significant levels based on the descriptors in the NWI database.

The Cass River watershed is approximately 900 square miles in size and is part of the larger Saginaw Bay watershed. The watershed is located in Huron, Lapeer, Genesee, Saginaw, Tuscola, and Sanilac counties in, Michigan. These counties like many areas of Southern Michigan have experienced significant losses of historical wetlands due to extensive drainage and conversion to agriculture.

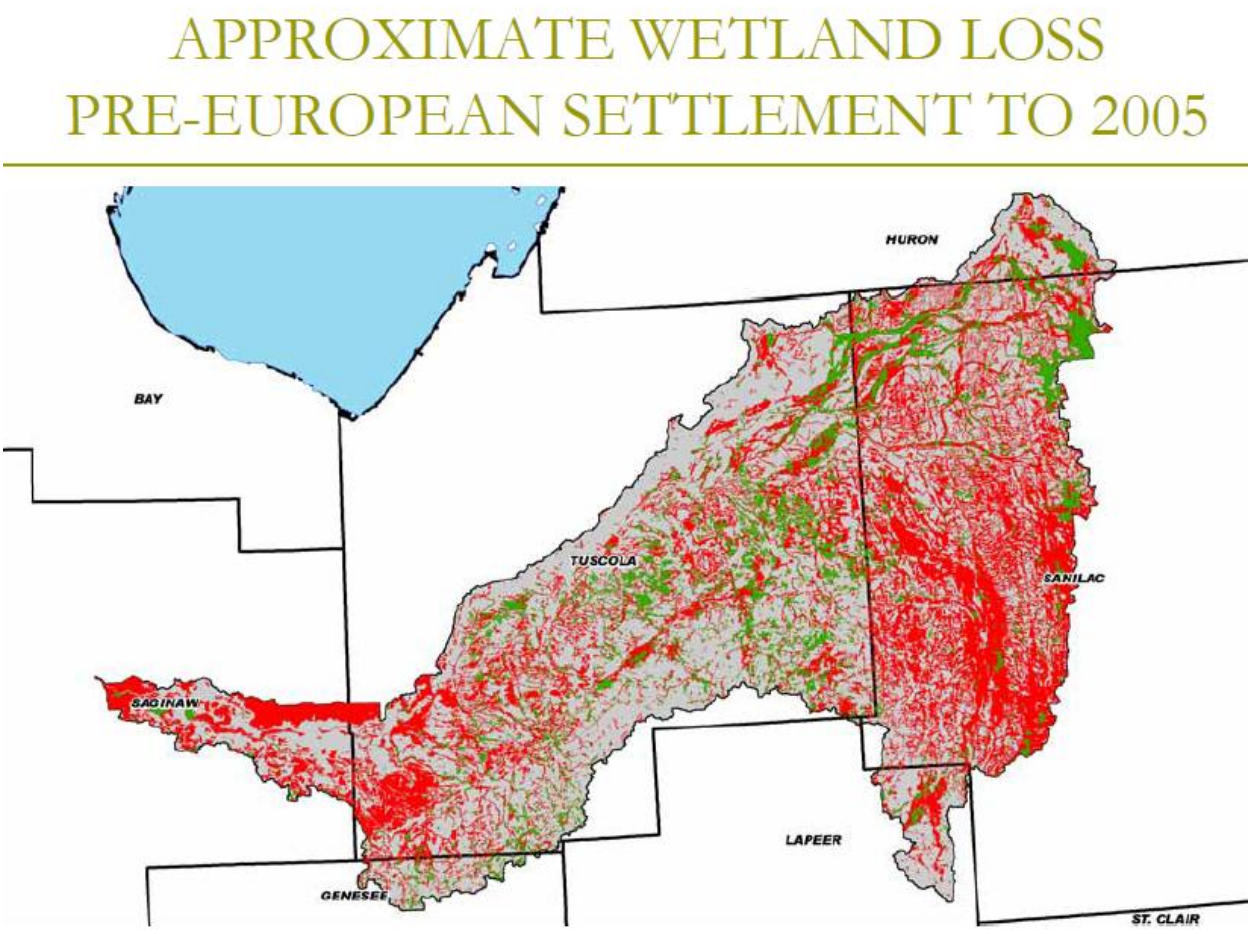
The Michigan Department of Environmental Quality completed a Landscape Level Wetland Functional Assessment (LLWFA) for the Cass River watershed. The LLWFA is a GIS based tool that can be used to identify and prioritize existing wetlands for protection or enhancement based on the ecological or water quality functions they provide. Similarly, the tool can be used to prioritize historic wetland areas for restoration based on the functions they would then provide.

The LLWFA uses pre-European settlement data, a 2005 update of the original National Wetlands Inventory data, soils data and 2005 high resolution aerial photography to identify existing wetlands and areas with potential for wetland restoration (areas identified as pre-settlement wetland and/or hydric soils). The database associated with the mapping provides hydro-geomorphic information for each wetland area such as: landscape position, landform, water flow direction, and pond classification. This information is then interpreted to derive the specific wetland functions (i.e. flood water storage, fish habitat, nutrient transformation, ground water influence, etc.) of each wetland area. The status and trends of wetlands in the area are summarized in Table 5.4 and the current status of wetland areas is shown in Map 5.4.

Assessment completed by MDEQ for the Cass River watershed shows wetlands have decreased in the watershed by 75% or 170,000 acres from "pre-settlement" to 2005. When broken down by 10-digit HUC (hydrologic unit code) or sub-basin the lower watershed experienced 85%

wetlands loss, and the average size of a wetland decreased from 42 acres to 5.2 acres. The middle watershed experienced 62% wetlands loss with the average wetland size decreasing from 35 acres to 8 acres. The upper watershed experienced a 78% wetlands loss with the average wetland size decreasing from 36 acres to 13 acres.

Figure 5.4: Cass River Approximate Wetland Loss (DEQ)



Red areas show in the above map are pre-settlement wetlands that have been lost to farming and/or development and total 74% of the total wetland resource. Wetlands that are present as of 2005 are shown in green and comprise 25% of the original wetland acreage.

Table 5.4 Cass River Watershed: Wetland Resources Status and Trends

Pre-settlement Wetland conditions	2005 Wetland conditions
231,920 Acres of Wetlands	61,323 Acres of Wetlands
Average Size – 33 acres	Average Size 8.8 acres

Landscape Level Wetland Functional Assessment (LLWFA) Methodology Report

The goal of a Landscape Level Wetland Functional Assessment (LLWFA) is to add valuable information to the existing National Wetland Inventory (NWI) database. The LLWFA is used to differentiate 13 wetland functions. By doing so, it is possible to calculate the qualitative loss of wetland function. This approach was used to gather information in 2005 and to approximate wetland conditions in Michigan pre-European settlement. There are five tasks that must be completed when using the LLWFA: spatial data collection and integration, classification and enhancement of NWI data with LLWW descriptors, functional correlations and assessment, GIS tool development and status and trends report, and training and outreach. The first step involved collecting GIS spatial data for the watershed. This was done to complete some of the hydrogeomorphic (HGM) classification. The second step classified NWI polygons using the Landform, Landscape Position, Water Flow Path, and Waterbody Type (LLWW) descriptors. The third step was to relate the polygons, which are now hydrogeomorphic (LLWW) coded, to their respective functions as determined by the MDEQ. The fourth step involved taking the product of this assessment and presenting it. The final step is to have training and outreach about wetland functions and its value to the community.

The pre-European settlement wetland inventory was completed using “soil survey data from the U.S.D.A. Natural Resource Conservation Science (NRCS) and the Michigan Natural Features Inventory Pre-European Settlement vegetation maps derived from the General Land Office Survey (GLO) created between 1816 and 1856”. The 2005 enhanced National Wetland Inventory was completed using NWI mapping. After both inventories had been completed, wetland functions were assessed. These functions included: flood water storage, streamflow maintenance, nutrient transformation, sediment and other particulate retention, shoreline stabilization, fish habitat, stream shading, waterfowl and waterbird habitat, shore bird habitat, interior forest bird habitat, amphibian habitat, conservation of rare and imperiled wetlands and species, and ground water influence. The purpose of LLWFA is to approximate the size of wetland areas and its functions from pre-European settlement to present in order to restore and enhance those functional areas.

Results of Cass River Watershed: Landscape Level Wetland Functional Assessment

The Cass River Watershed LLWFA was conducted to compare wetland resources, status, and trends of pre-European settlement conditions to 2005 wetland conditions. Pre-European wetland conditions were approximated using soil survey data from the U.S.D.A. Natural Resource Conservation Service and Michigan Natural Features Inventory Pre-European Settlement vegetation maps. The latter maps were created using General Land Office Survey maps that were produced using maps dating from 1816 to 1856. The pre-European settlement wetland conditions were as follows: a total of 231,920 acres of wetlands, 7,041 polygons, and an average size of 33 acres. The wetland conditions of 2005 were as follows: a total of 61,323 acres of wetlands, 6,956 polygons, and an average size of 8.8 acres. Only 26 percent of the original wetland acreage remains, and there is a 74 percent loss of total wetland resource. There is a loss of 170,597 acres from pre-European settlement total acreage to 2005 total acreage. There were many types of wetland functions that were evaluated. The types of wetland functions that experienced the most loss were amphibian habitat (-91%), fish habitat (-84), stream shading (-76%), shoreline stabilization (-75%), and streamflow maintenance (-74%). Statistics of wetland loss were calculated by subwatershed, the following tables compare pre-settlement wetland conditions with those of 2005.

Table 5.5 Upper Cass River Watershed, Wetland Resources Status and Trends

	Pre-Settlement Wetland Condition	2005 Wetland Condition	(Loss)
Total Acres of Wetland	111,376	24,742 (22%)	86,634 (78%)
Average Wetland Size	33 Acres	13 Acres	

Table 5.6 Middle Cass River Watershed, Wetland Resources Status and Trends

	Pre-Settlement Wetland Condition	2005 Wetland Condition	(Loss)
Total Acres of Wetland	74,421	29,031 (39%)	45,390 (61%)
Average Wetland Size	28 Acres	8 Acres	

Table 5.7 Lower Cass River Watershed, Wetland Resources Status and Trends

	Pre-Settlement Wetland Condition	2005 Wetland Condition	(Loss)
Total Acres of Wetland	46,123	7,575 (16%)	38,548 (84%)
Average Wetland Size	40 Acres	5.2 Acres	

Restoration efforts appear to be greatest in the upper Cass river watershed, where there is the highest percentage of potential wetland restoration areas identified as “high potential”, which are displayed in red in the following map series.

Potential wetland restoration areas that have a “high potential” for restoration are locations of pre-settlement wetlands and contain hydric soils. Map locations marked in yellow are those that contain hydric soils but are not known to be locations of pre-settlement wetlands and are thus classified as “medium potential” for wetland restoration. Wetlands that existed in 2005, and presumably still do, are marked as green in the map series.

The Potential Wetland Restoration Areas GIS layer was created by staff at the Michigan Department of Environmental Quality, Water Resources Division. The layer was created by merging NRCS hydric soils with Michigan Natural Features Inventory (MNFI) Presettlement Wetlands, then performing an erase command in ESRI Arc-INFO on the resulting layer to remove NWI, MIRIS Wetlands, Hydrography, and Urban polygons from the coverage area. The maps are not intended to be used to determine the specific locations and jurisdictional boundaries of wetland areas subject to regulation under Part 303, Wetlands Protection, of the Natural Resources and Environmental Protection Act, 1994 PA 451, as amended. Only an on-site evaluation performed by the MDEQ in accordance with Part 303 shall be used for jurisdictional determinations. A permit is required from the MDEQ to conduct certain activities in jurisdictional wetlands. An interactive tool for wetland and conservation professionals has also been developed for use in assessing potential restoration sites before initiating a field-visit.

Figure 5.5: Potential Wetland Restoration Areas - Upper Cass River

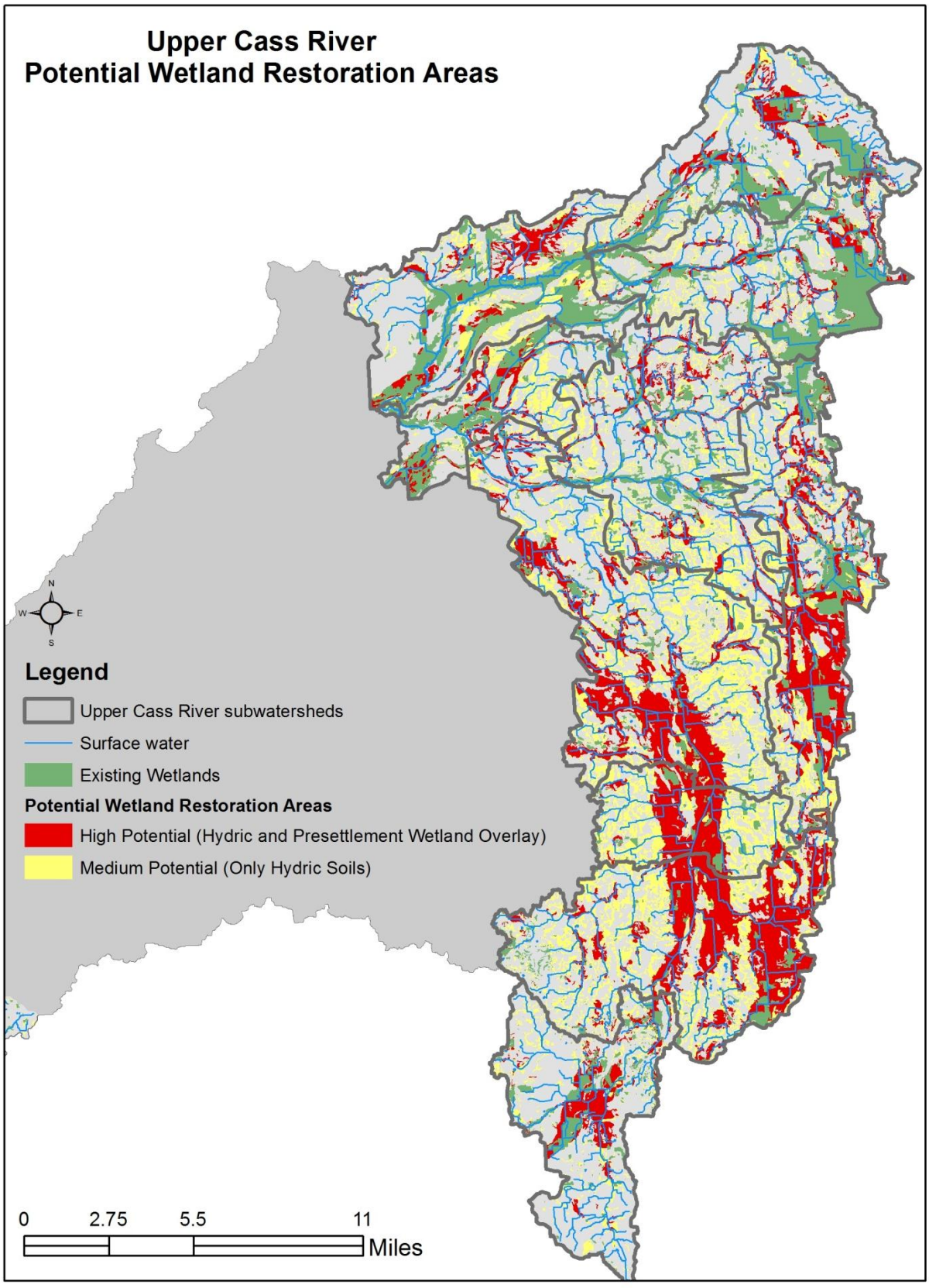


Figure 5.6: Potential Wetland Restoration Areas - Middle Cass River

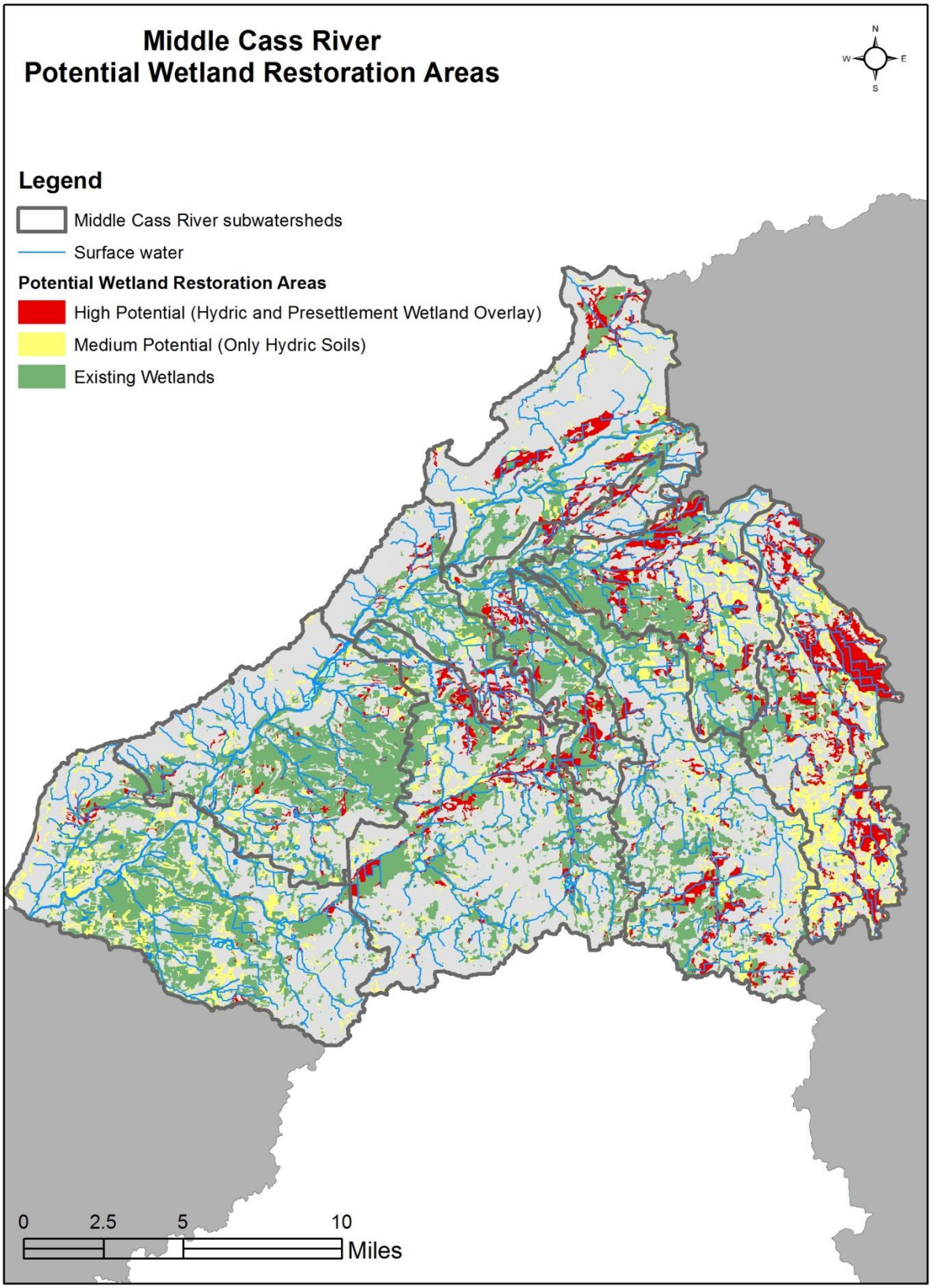
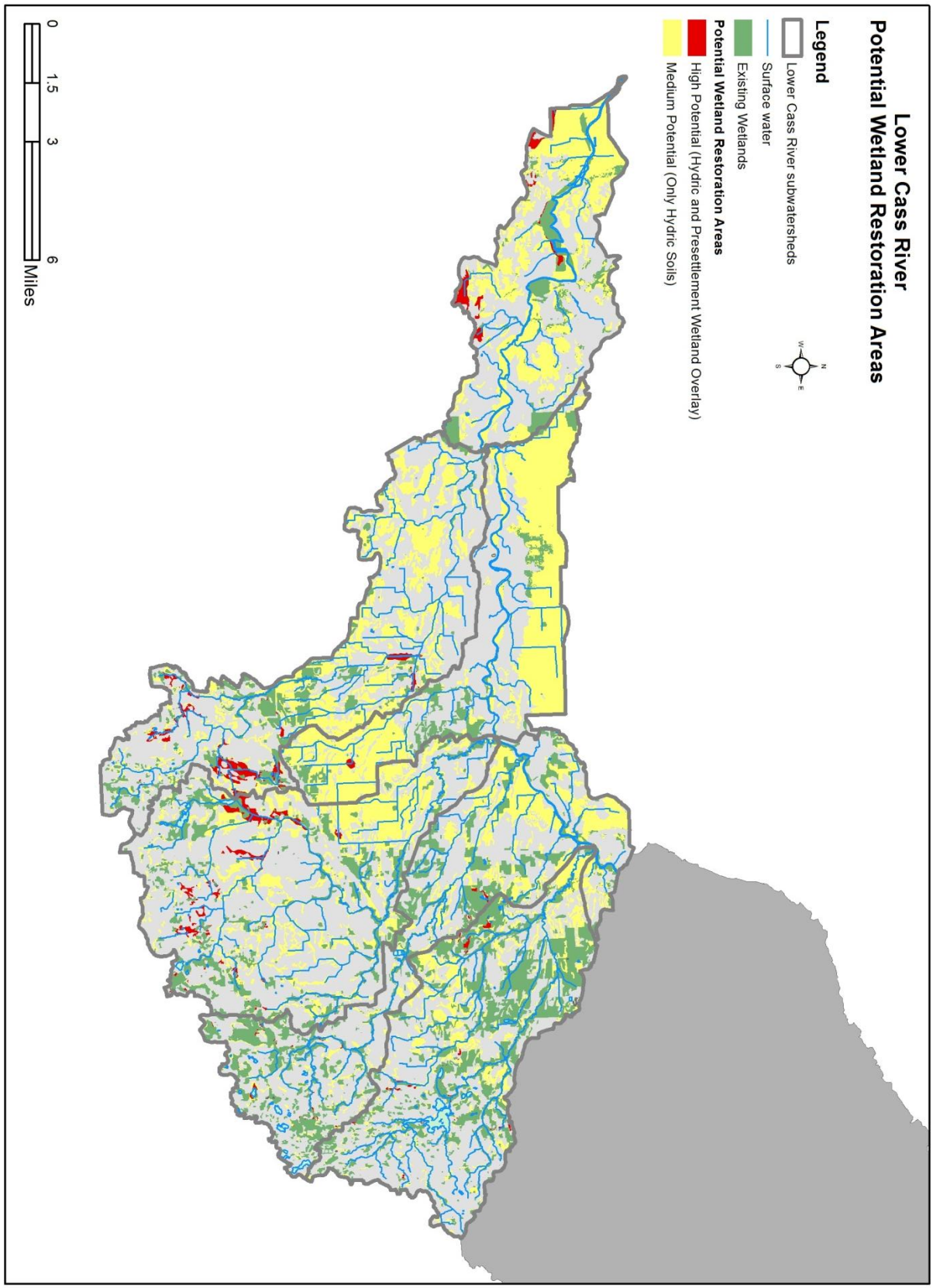


Figure 5.7: Potential Wetland Restoration Areas - Lower Cass River



Application of LLFWA

A total of twelve functions were assessed for each wetland:

Water Quality:

1. *Nutrient Transformation*
   - ability of the wetland to remove nutrients from the water column and convert them into plant material within the wetland.
2. *Sediment Retention*
   - ability of the wetland to retain the sediment that would otherwise move downstream and buildup in rivers, streams and lakes.
3. *Shoreline Stabilization*
   - ability of the wetland to protect the shoreline by minimizing bank erosion caused by wave actions and currents.

Hydrologic:

4. *Streamflow Maintenance*
   - ability of the wetland to provide a base flow of water for streams, especially critical during dry periods.
5. *Surface Water Detention*
   - ability of the wetland to store excess water during flood events.
6. *Stream Shading*
   - ability of the wetland to buffer water temperature fluctuations.

Habitat:

7. *Fish/Shellfish*
   - ability of the wetland to provide habitat for fish and shellfish.
8. *Waterfowl/Bird*
   - ability of the wetland to provide habitat for waterfowl, shorebirds and forest birds.
9. *Amphibians*
   - ability of the wetland to provide habitat for amphibians and other invertebrates.

The following steps should be followed when identifying sites to be included in funding proposals:

Define the local need and/or waterbody impairment

1. Locate all existing and potential wetlands with the Potential Wetland Restoration Areas Dataset
2. Using the LLWFA tool select only those wetland functions that address the local need and/or impairment (turn other functions off)
3. Run program and identify “High” functioning existing and potential sites first.

4. Overlay the “high” functioning sites with parcel data and determine ownership. Only move to “Medium”functioning sites if there are not any good candidate produced by the process so far.
5. Use the Prioritization tool to help select from the remaining candidate sites, ones that are of sufficient size and are connected water bodies.
6. Select the best candidate(s) for preservation and restoration to include in your proposal.

Due to the high ecological importance of wetland areas as well as the exceptionally high rate of wetland loss in the watershed all opportunities for restoration and protection of wetlands should pursued as they arise regardless of their location in the watershed. However, the Cass River Watershed Group will selectively pursue the restoration and protection of wetlands using the following process:

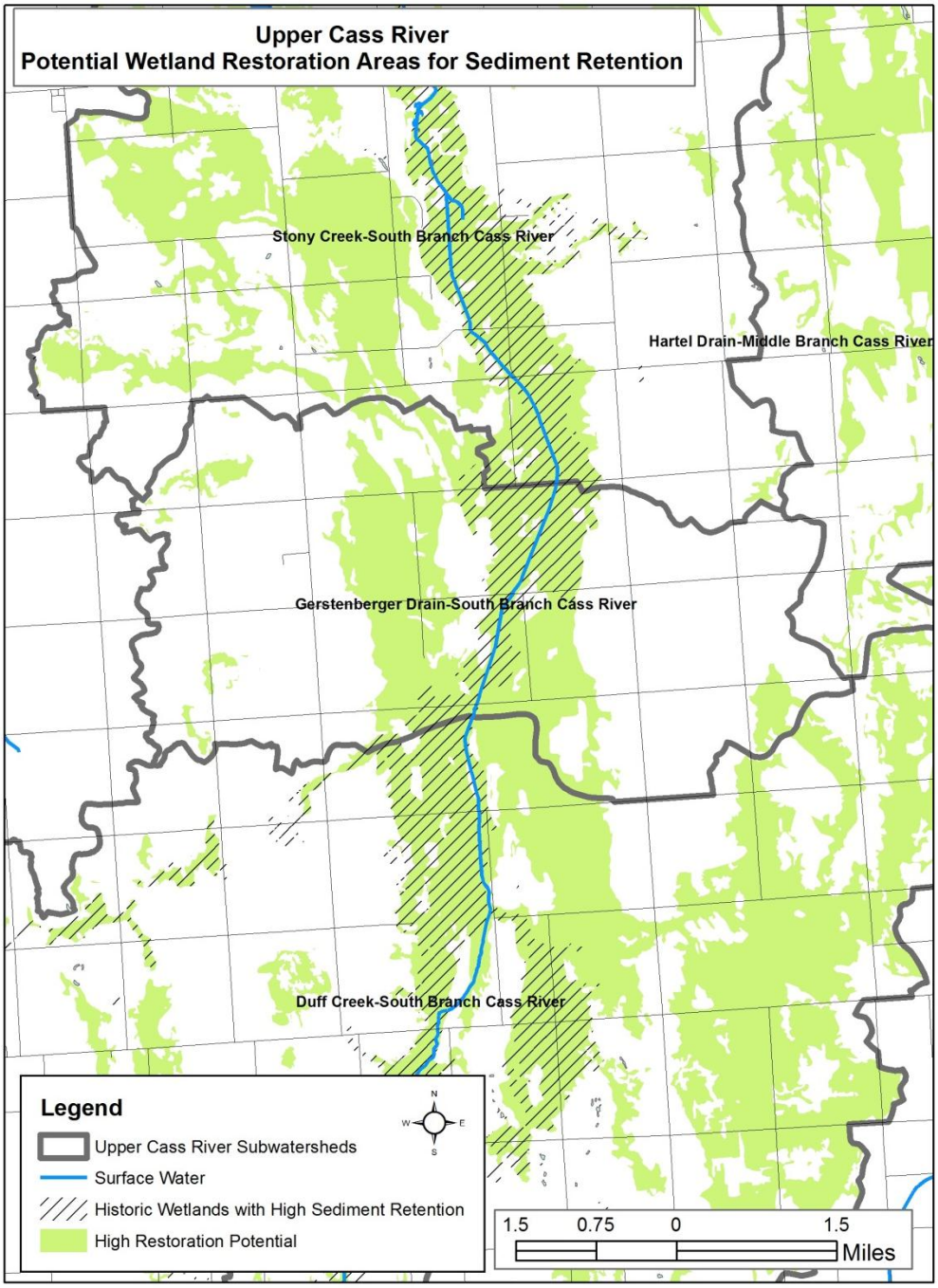
Critical areas and sites will be identified using the LLWFA and other criteria for each appropriate goal. An example might be:

For the Sediment Reduction Goals:

- In a subwatershed identified as having siltation and sedimentation impairments
- High performing for “Sediment Retention”
- Wetland area 20 acres or more in size

An example of this process is demonstrated for the Upper Cass River in northern Lapeer county and southern Sanilac county in Map 5.8 showing locations where the greatest potential lies for the restoration of wetlands for the function of sediment retention.

Map 5.8 Potential Restoration of Wetlands for Sediment Retention, Upper Cass River



5.6 Priority Preservation and Protection Areas

Representatives from local conservation organizations, state and federal resource managers and other local stakeholders gathered together on June 13, 2012 to prioritize areas for preservation and protection. The prioritization process was based on the priority lands inventory and the practical knowledge of the stakeholders in the room. During the meeting four

different concepts were discussed pertaining to the Cass River Watershed: Recreation and Health, Ecology, Economy, and Culture and Society. Within each of these concepts different aspects of the Cass River Watershed were discussed including what already exists, opportunities, challenges, and priorities.

There are numerous existing features in the watershed that support recreation and health. It was determined that within the Cass River Watershed. There are State Games Areas (nine) and the Shiawassee National Wildlife Refuge along with city parks including Caro and Vassar. Recreation includes fishing, hunting, and trapping. Future opportunities abound for expanding and improving public access to the Cass River. This included improved access for fishing, boating, and biking along the river. In order for new opportunities for recreation and health to manifest, work needs to be done to restore wetlands and acquire more land with the intention of linking existing areas within the Cass River Watershed.

The existing ecology along the main Cass River corridor includes five of the State Game Areas, the Shiawassee National Wildlife Refuge, forested riparian corridors, and wetlands. Opportunities include restoring wetlands near the riparian corridors and the expansion of State Game Areas and the Shiawassee National Wildlife Refuge. Another was the need to address water quality to meet total maximum daily loads (TMDLs) and make sure they are within an acceptable range. Other opportunities include the use of filter strips to help maintain water quality, work to improve the overall quality of the river, and invasive species control. It was thought that some of these goals could be met by using and promoting a public stewardship opportunity which would involve local communities in restoring the river.

The existing economy of the Cass River Watershed includes farming and recreation. Recreation includes hunting, fishing, and boat tours and rentals. Agriculture is a major contributor to the economy and over 1,500 farms exist within the Cass River corridor. Lastly, it was mentioned

that there is a sugar beet plant that also is a part of the existing economy. The expansion of State Game Areas and the Shiawassee National Wildlife Refuge would help to improve the resource-based economy by protecting wildlife and fishery habitat that sustains game species. The restoration of wetlands would cut back on pollution and likely increase the use of the river. Another opportunity exists in promoting river based recreation and tourism and expanding outdoor recreation on the river. Finally, if communities along the river were to share and coordinate different events along the river it would improve local economies.

For culture and society there are museums, Petroglyph Park, and the Octagon Barn. The value of cities such as Frankenmuth, farmers' markets and various festivals were mentioned. Several opportunities mentioned for improvement of culture and society along the Cass River could be more nature festivals to involve the community and watershed and water quality educational opportunities by way of involving more schools.

Challenges to the strategy to improve natural resources along the Cass River are:

- Need for funding to seize opportunities / poor existing economy in several small communities
- Large holdings of private-land along the river make improving recreational opportunities difficult
- General lack of awareness and concern from landowners along the River
- Dams along the River block year-round access to boating and fishing

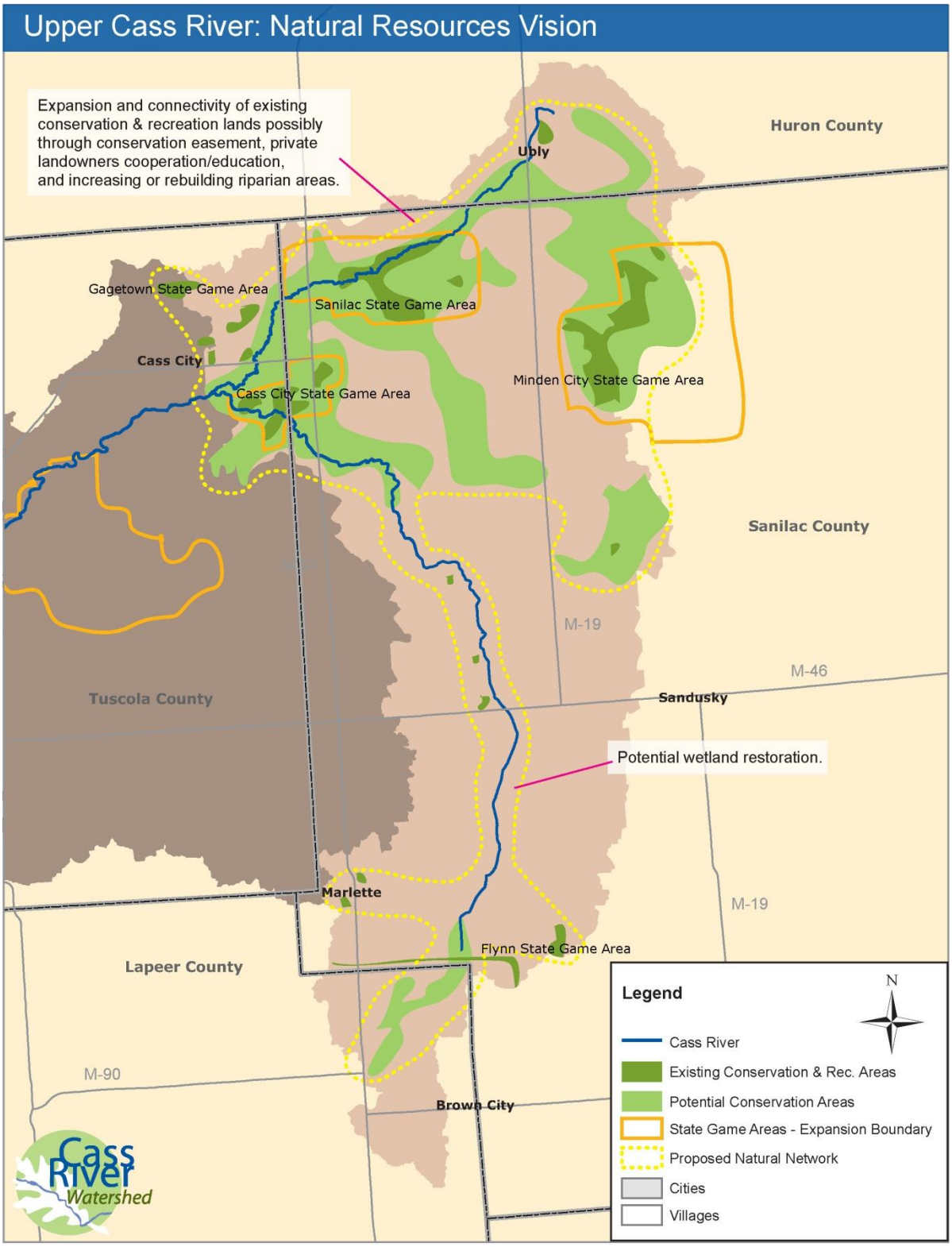
Major priorities for the Cass River corridor include:

- Increase number of recreational users and access to the river
- Raise awareness among river users and landowners about the valuable resources along the Cass (recreation, health, culture, economic, ecologic)
- Maintain rural and small town culture
- Connect State Game Areas through different private/public ownership conservation tools
- Remove failing dams
- Restore high quality wetland functions
- Expand water trail above Vassar

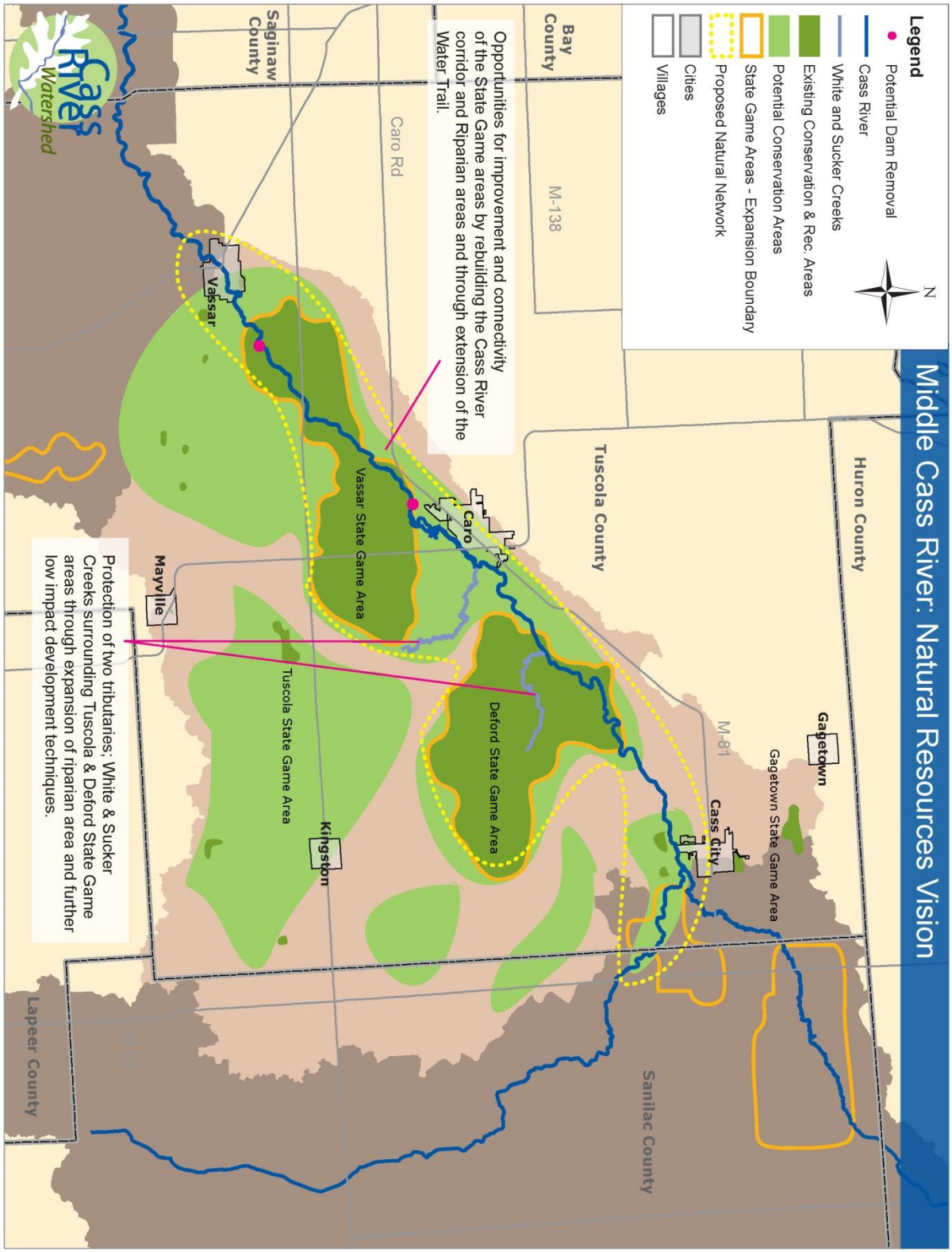
Next steps that were decided on at the meeting include identifying key stakeholders, pursuing fish passage over the dam in Frankenmuth, dam removal in Vassar and a portage around the Caro dam, and identifying key corridor opportunities to connect State Game Areas.

The natural resources convening of the Cass River watershed project culminated into a series of maps and strategies for each of the major sub-basins. These are shown in Maps 5.8-5.10.

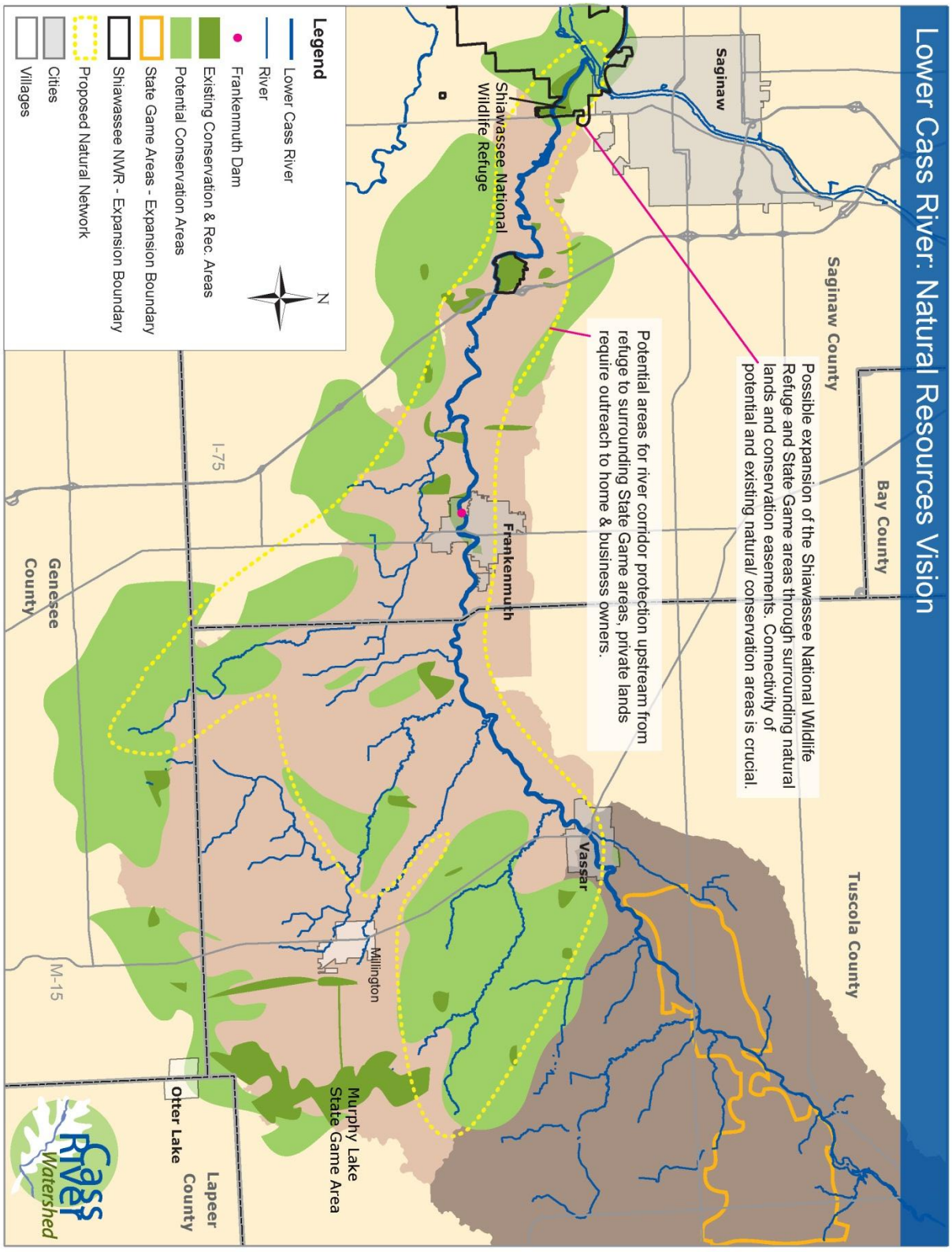
Map 5.8: Upper Cass River Priority Natural Areas



Map 5.9: Middle Cass River Priority Natural Areas



Map 5.10: Lower Cass River Priority Natural Areas



5.7 Recommended Managerial Strategies

Area planning commissions and/or management plans should have set guidelines to provide to areas residents and businesses that gives to them detailed information on where and how to find information for land preservation and conservation, in particular land protection by way of a Land Conservancy and Low Impact Development (LID) techniques; including stormwater management. Much of this information could be held at local libraries, post offices, and easily accessed through a variety of websites and documents that are available to residents and businesses. Local land conservancies are a great resource for land protection and preservation. Since much of the watershed river corridor is occupied by private property owners both methods would be in the best interest for the Cass River. According to the Saginaw Basin Land Conservancy (SBLC), "a conservation easement (or preservation agreement) is a legal agreement between a landowner and a land conservancy or other public body that permanently limits uses of the land in order to protect its conservation values." With this option landowners still own and have full use of their land according to the agreement. Another option through SBLC is land donation and in some cases they may be able to purchase the property directly from the homeowner. All options offered by SBLC are tax deductible and can be discussed directly with the SBLC representative or furthermore with a legal advisor. LID techniques will be discussed further under Land Use Planning.

5.8 Education Outreach Strategies

Chapter 6 provides pointed recommendations for the entire watershed. There are a variety of ways that government, educational institutions, community organizations, and municipalities can reach out to area residents. It is through this outreach that individuals can be made aware of the human and ecological benefits, recreational opportunities and aesthetics the Cass River has to offer; if such a connection is made than they are more likely to participate in activities that will protect the viability of the Cass River. One method of increasing awareness for landowners in a watershed community is being implemented in the Cedar River by the Little Forks Conservancy. The Sustainable Lands partner program is voluntary and does not require a contract; it is a partnership between the Little Forks Conservancy and landowners who are dedicated to conserve the natural resources on their property (The Little Forks Conservancy Inc., 2011).

Community/volunteer based organizations would be another avenue of outreach that would be able to incorporate residents and area businesses in land and river projects surrounding the Cass. The Cass River Greenway (CRG) strives to build opportunities, growth and future sustainability for areas within the Cass River Watershed. By working directly with property owners, government agencies, area conservation districts and nonprofit agencies the CRG committee hosts annual river cleanup projects, and has worked in planning new and proposed river launch site accesses. Another large potential resource for education and outreach in the CRW would be through the SBLC. The SBLC holds approximately 20% of their conservation easements throughout the CRW (SBLC, 2012) and could further connect with easement landowners, promote membership and build volunteer groups along with other local

organizations. Local watershed organization could provide to residents support (possibly some financial/educational) and land management methods that would benefit the Cass River. Also, the conservation easements and state games areas can serve to provide educational opportunities for schools, residents, and businesses by hosting nature walks, invasive plant removal days, river paddles, and possibly a sub basin watershed tour.

5.9 Land Use Planning

LID techniques are used to aid in the storage and transport of stormwater by using native vegetation and a variety of LID practices to promote infiltration, filter sediments, and to form detention and/or holding areas that slow or stop the movement of stormwater rather than it being quickly transported by drains or runoff directly into local waterbodies. The Southeast MI Council of Governments with funding from MDEQ and U.S. Environmental Protection Agency produced an LID manual; within the manual are suggestions for homeowners and local governments on ways to incorporate LID methods at the parcel and community levels. Some suggestions for residents are to incorporate rain gardens, disconnect downspouts, and to restore areas around lakes and rivers with native plants. Some localities and state agencies suggest that a fifty to one hundred (MDEQ, 2012) foot vegetative buffer for properties surrounding rivers be implemented by homeowners and businesses, these vegetated buffer areas (riparian area) aides in river bank stabilization, filtration of sediments, and overall health of the river. Local Governments should incorporate the use of the LID manual into planning and zoning decisions/reviews and its recommendations into local parks and recreation plans. Also, many townships and counties have zoning standards that require maintenance of natural vegetation along shoreline areas (Tip of the Mitt Watershed Council, 2012). In order for the watershed to benefit from any type of land or water conservation method, plans must be set up as such to consider fundamental ecological, land cover and water management issues (Natural Lands Inventory: Lower Cass River 2010-2011). Those seeking permits to develop or re-develop a parcel of land can be provided with recommendations or restrictions well before the actual plan is submitted for review.

5.10 Sustainability Strategies

Chapter 10 provides next steps for the overall watershed management plan. One main component of sustainability for the organizations involved in the CRW is to secure future funding for future projects. Grants such as Michigan's Section 319 Nonpoint Source Pollution (NPS) grants and Clean Michigan Initiative (CMI) NPS pollution control grants have already been working to benefit the CRW and Saginaw Bay Watershed as a whole. Taking advantage of the partnerships that exist between above named organizations (and other organizations not previously named), government and educational institutions such as; the Department of Natural Resources (DNR), Department of Environmental Quality (DEQ), area Conservation Districts, Ducks Unlimited, and many more would provide for sustainability, future project funding, and most likely, continued and additional support from the community and volunteers. Another measure of sustainment would be through building connectivity of the Cass River Corridor (CRC) and available natural lands. This is currently being done by a partnership

between the CRG, MDEQ, MDNR, and local municipalities with the proposed expansion of the Cass River Water trail near the Vassar State Game area and M-46 and a portage around the damn upriver of Indianfields Township Park, both additions would be upstream of the most recent launch site addition in the City of Vassar. Also, improved access and maintenance of sites for fishing, boating, and biking along the river would ensure that residents and visitors would have those amenities in the future. Opportunities for sustainability and success occur from promoting river based recreation, tourism, and through the coordination of community sponsored watershed wide events.

5.11 Measures of Success

There are many different ways the success of the river corridor, riparian areas and state game areas enhancement and preservation could be assessed. It may be by the number of private property owners that take part in stewardship opportunities and programs. The need for funding is at all times an issue when planning environmentally so being able to secure such funding for watershed wide projects such as wetland restoration and land acquisition in order to build connectivity amongst natural lands would suffice as a measure. Increasing awareness by providing education and building membership and volunteerism within local watershed groups would aid in overcoming some of the main challenges the CRW faces. What has already been done throughout the watershed, such as the water trail expansion, and building upon those improvements by incorporating new ideas, education, and public use and awareness could be measured by the amount of users identified in and around river accesses. Improving culture and society by linking communities to local museums, parks, and historical sites in the area could be done by partnering with educational institutions and local land conservancies.

Scheduled water quality sampling has already taken place and will continue throughout 2013. “The Cass River will be sampled above and below the communities of Bridgeport, Frankenmuth, Vassar, Caro and Cass City for phosphorous, suspended solids, dissolved oxygen, biological oxygen demand, nitrates, turbidity, and fecal coliform bacteria (Cass River Greenway).” Doing so would allow total maximum daily load (TMDLs) levels to be recorded and to make certain that they are within acceptable ranges.