# LITTLE PORTAGE CREEK WATERSHED

## Landscape Level Wetland Functional Assessment

*(Enhanced NWI)*

Department of Environmental Quality

8-29-2013

# LITTLE PORTAGE CREEK WATERSHED
## Wetland Resources Status and Trends

Pre-settlement Wetland conditions

- 9,515 Acres of Wetlands
- 384 Polygons
- Average Size – 25 Acres

2005 Wetland Condition

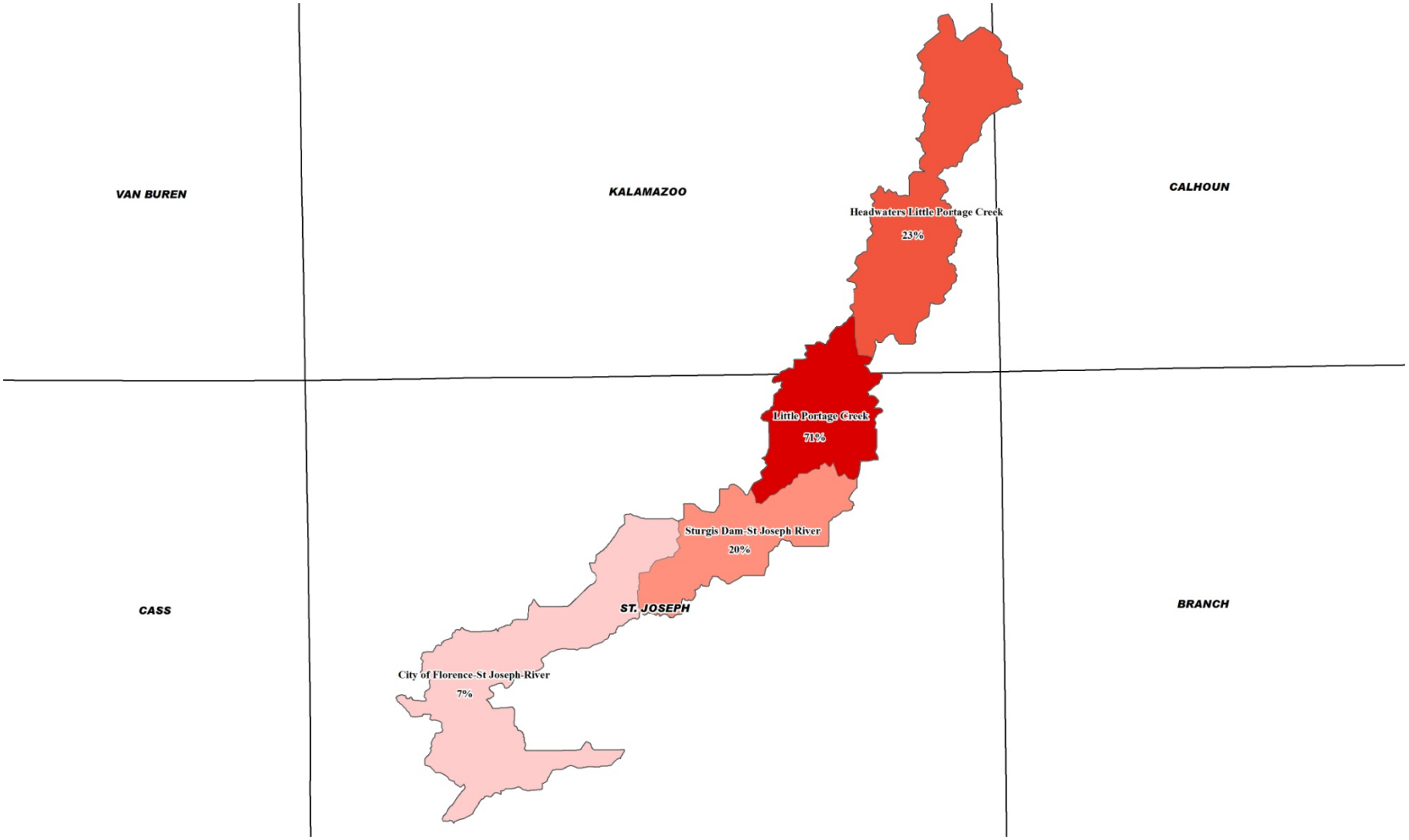
- 4,951 Acres of Wetlands
- 925 Polygons
- Average Size – 5.3 Acres

**52% OF ORIGINAL WETLAND ACREAGE REMAINS**
**48% LOSS OF TOTAL WETLAND RESOURCE**

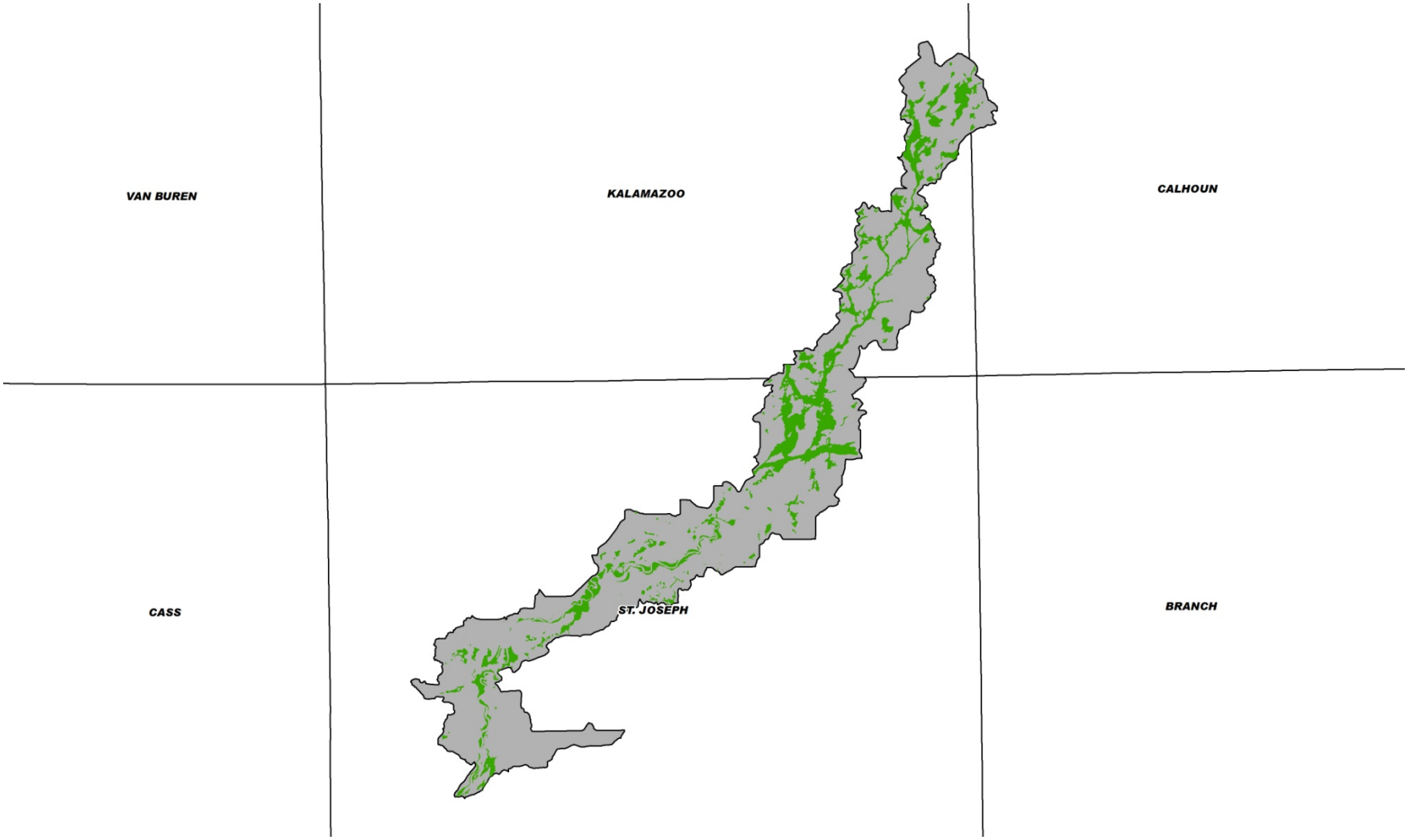
TOTAL ACREAGE LOSS OF:
4,564 ACRES

* These figures exclude open water type wetlands

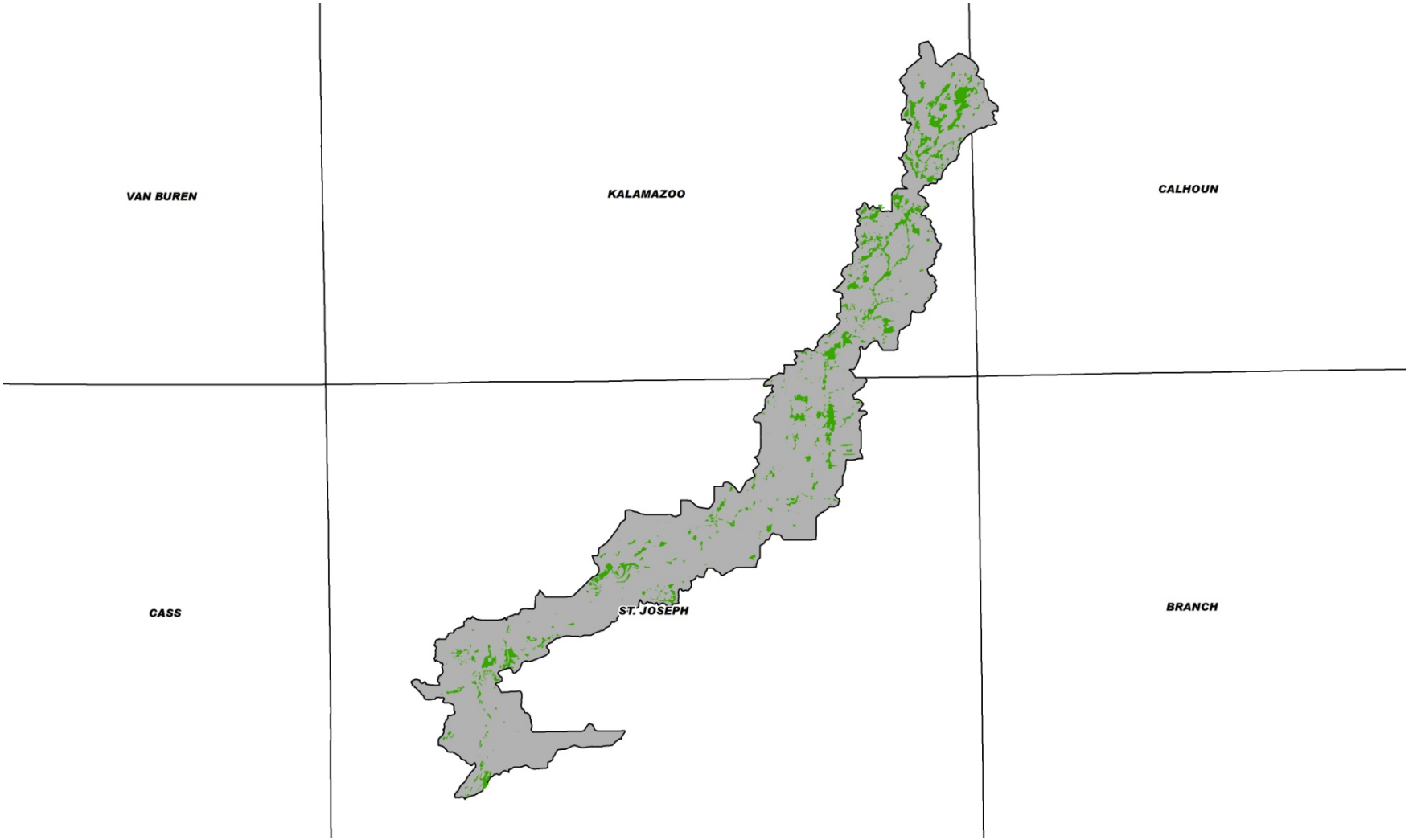
# Percentage of Wetland Loss



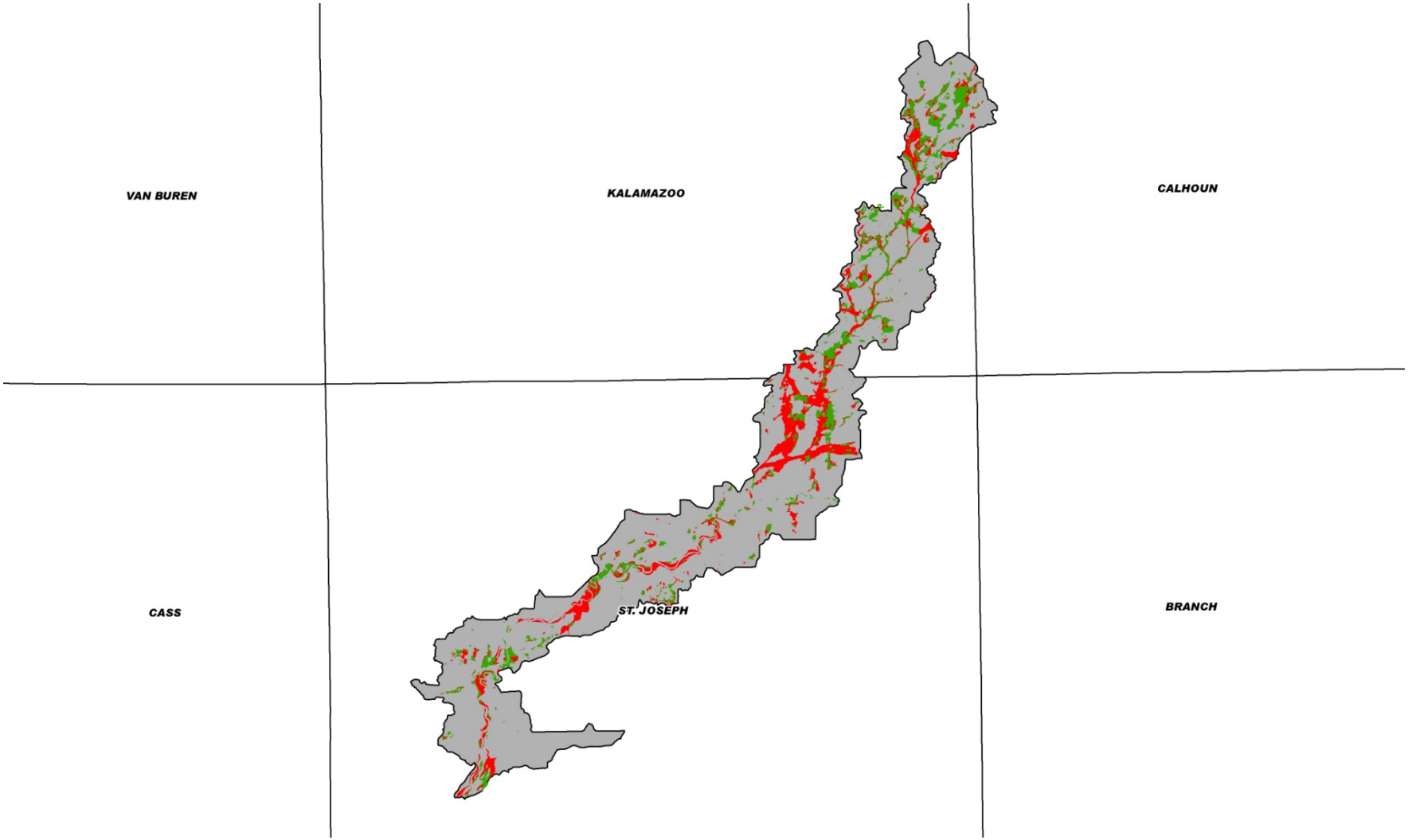
# PRE-EUROPEAN SETTLEMET WETLAND COVERAGE



# 2005 WETLAND COVERAGE



# APPROXIMATE WETLAND LOSS PRE-EUROPEAN SETTLEMENT TO 2005



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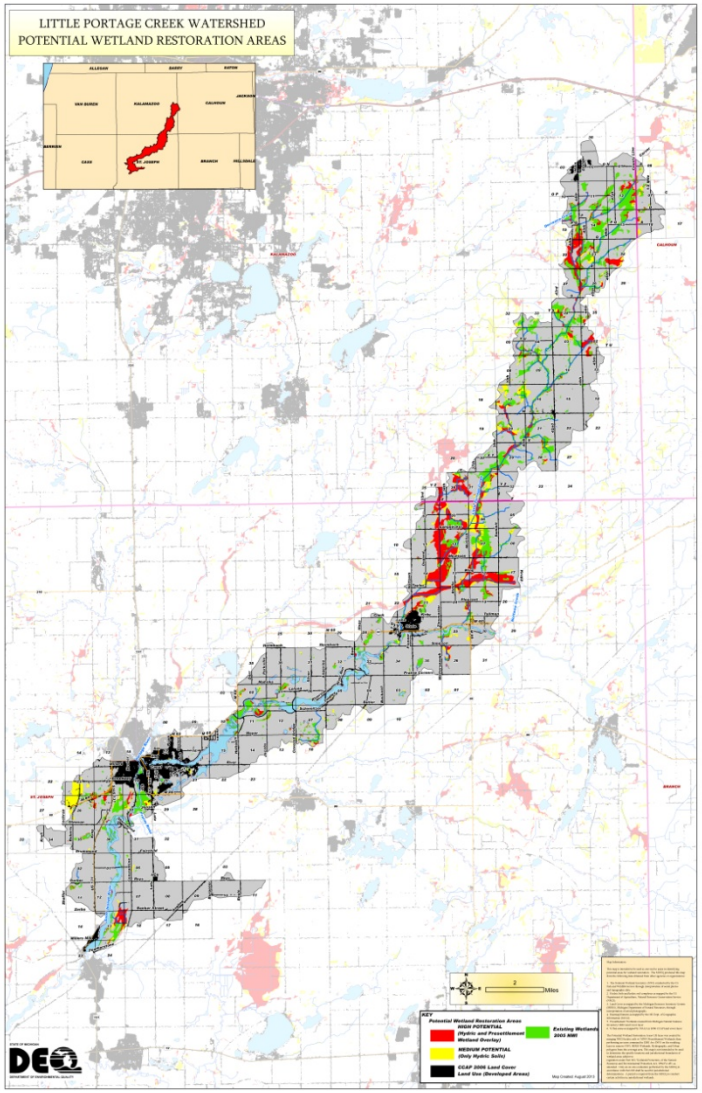


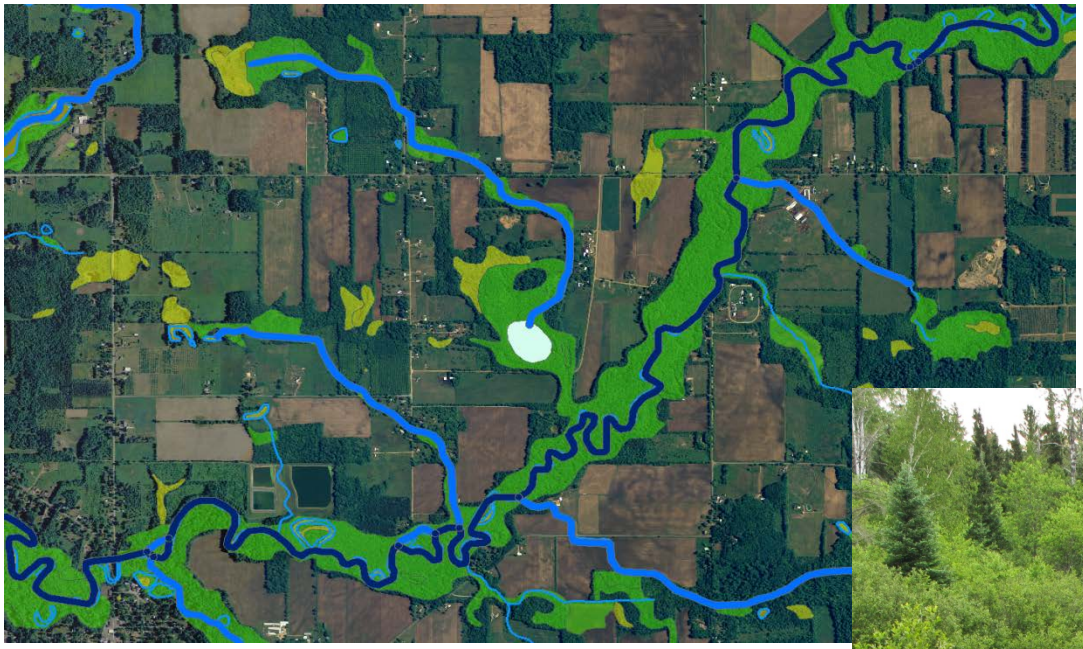
# NWI TYPE COMPARISON

**Table 1: Generalized NWI type comparison**

| Wetland Type | Pre-European Settlement Acres | 2005 Acres of Wetlands | Net Acres Loss/Gained |
|---|---|---|---|
| Palustrine Emergent | 159 | 1,243* | 7% |
| Palustrine Forested | 6,971 | 3,085** | 56% |
| Palustrine Shrub-Scrub | 2,385*** | 555**** | 77% |
| Other Palustrine | | | |
| Ponds | 0***** | 151 | 100% |
| *Total* | 9,515 | 5,034 | 48% |

*Includes mixed emergent wetland classes and mixed communities where subclasses include Forested and Shrub-Scrub Areas
**Includes mixed forested wetland classes and mixed communities where subclasses include Emergent and Shrub-Scrub Areas
*** Includes mixed Shrub-Scrub/Emergent communities
****Includes mixed shrub-scrub wetland classes and mixed communities where subclasses include Emergent, Forested and Shrub-Scrub
***** No acreage in ponds due to mapping differences between Pre-Settlement and Current wetland coverage's.

# ENHANCING NWI FOR LANDSCAPE-LEVEL WETLAND FUNCTIONAL ASSESSMENT IN THE LITTLE PORTAGE CREEK WATERSHED



# Using NWI for Functional Assessment

- Lack of hydro-geomorphic (HGM) information
  - No landscape position
  - No landform
  - No water flow direction
  - General pond classification
  - Features important for assessing many functions are lacking
- *Most of these features can be interpreted from the maps*

# What information can we extract from NWI?

How many wetlands are there?

What is the size range of wetlands?

What is the average size of a given wetland type?

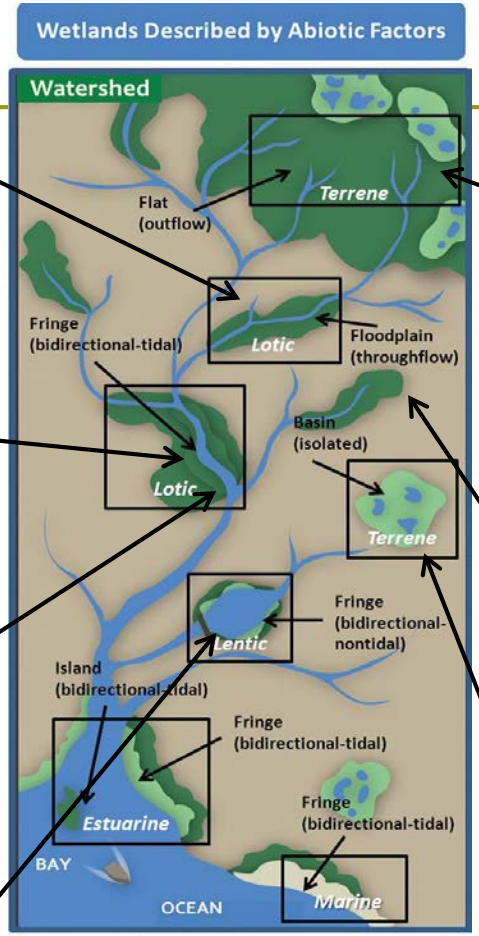
How many wetlands are in various size classes?

# …With HGM information added?

How much and how many

- occur along rivers?
- along streams?
- in lake basins?
- are isolated?
- are sources of streams?
- have inflow but no outflow?
- are connected to other wetlands?
- What types of ponds are there and what is their extent?

# WETLAND LANDSCAPE POSITIONS




**Key:** Landscape position – white italicized, Landform – text from arrow, Water flow path – in parenthesis

**Terrene** - isolated wetlands, headwater outflow wetlands, and wetlands along streams but not subject to overflow due to their elevation

**Lotic** - wetlands along rivers and streams and subject to periodic overflows (e.g., floodplains), including freshwater tidal wetlands

**Lentic** - wetlands within the basins of lakes and reservoirs where their hydrology is greatly affected by fluctuating lake or reservoir water levels

**Estuarine** - salt and brackish tidal wetlands associated with estuaries

**Marine** - saltwater tidal wetlands along the shores of the ocean and its open embayments

# TERRENE

# LENTIC

# LOTIC

RIVER

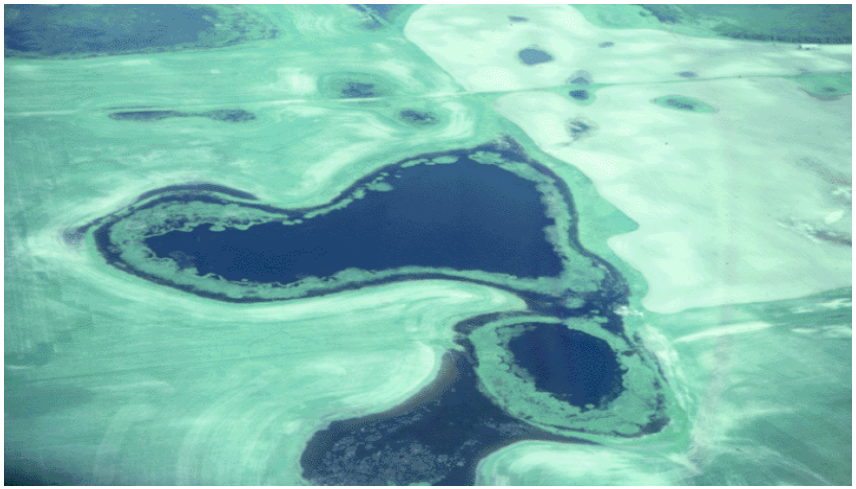
STREAM

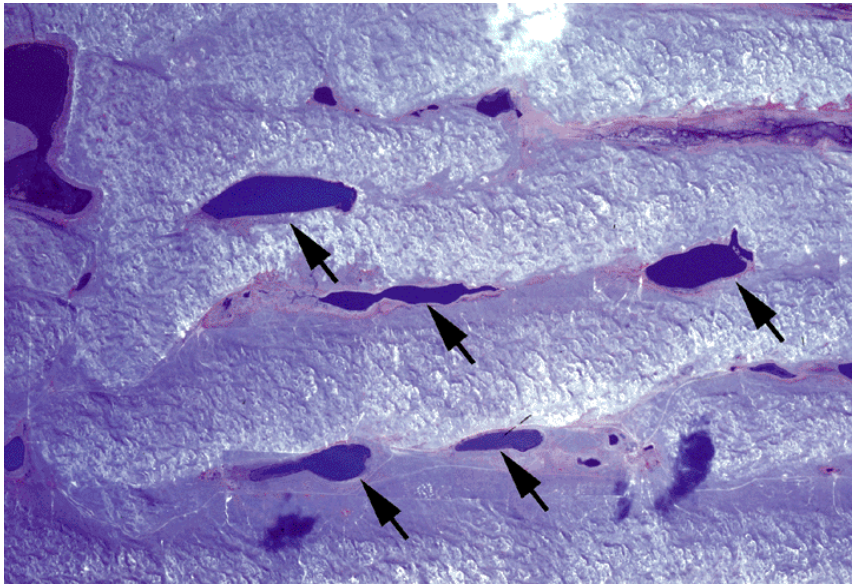
# Wetland Landform Types

- Fringe
- Basin
- Flat
- Floodplain
- Slope

# FRINGE

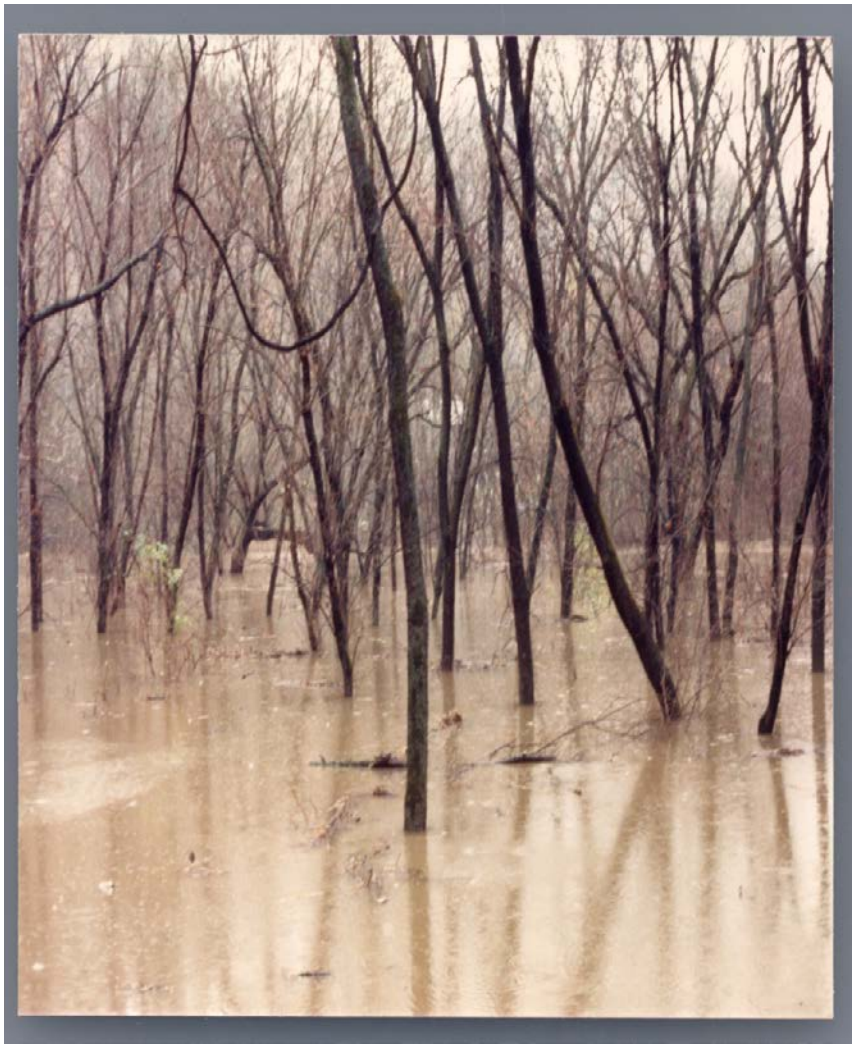
# BASIN





# FLAT

# FLOODPLAIN

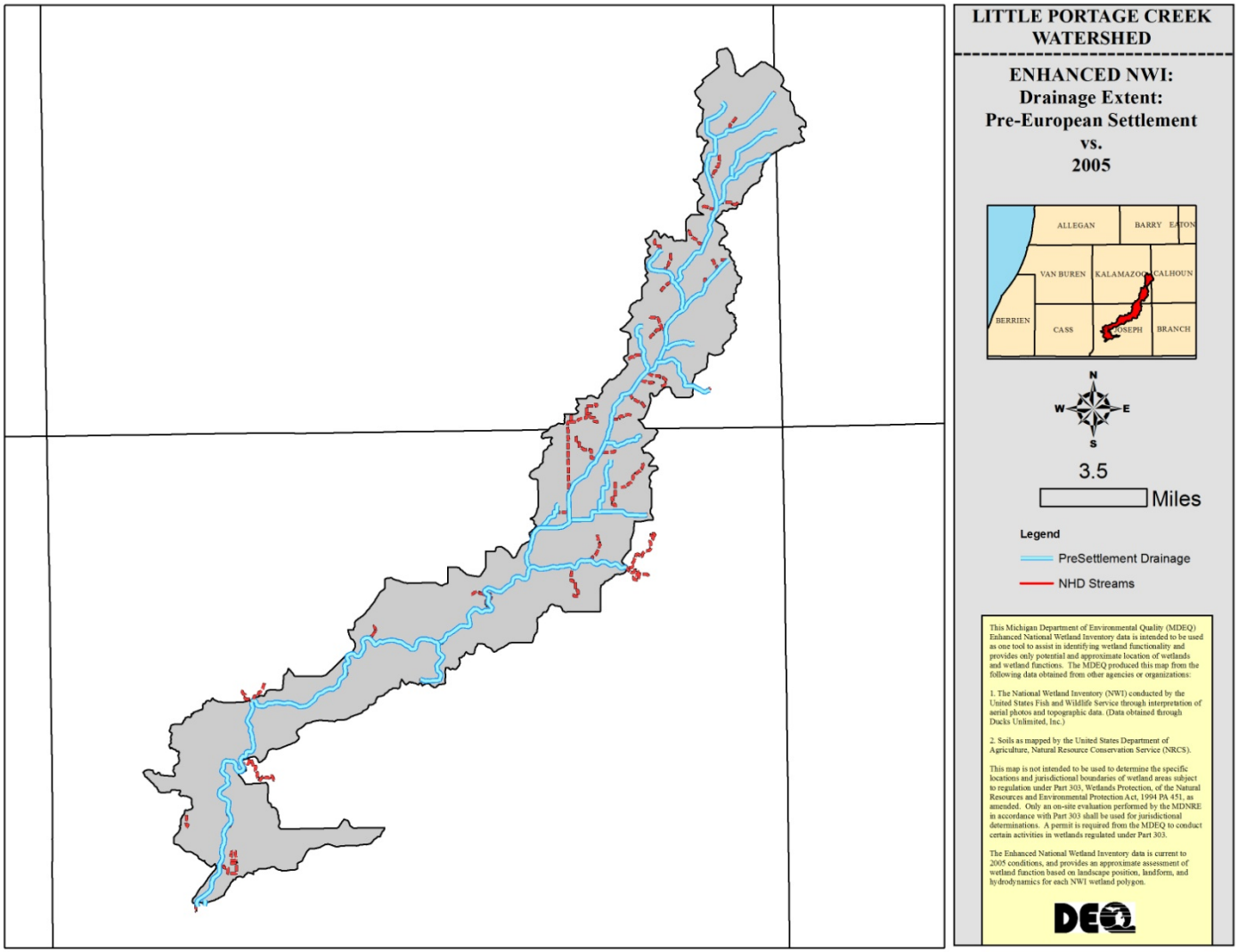


# SLOPE

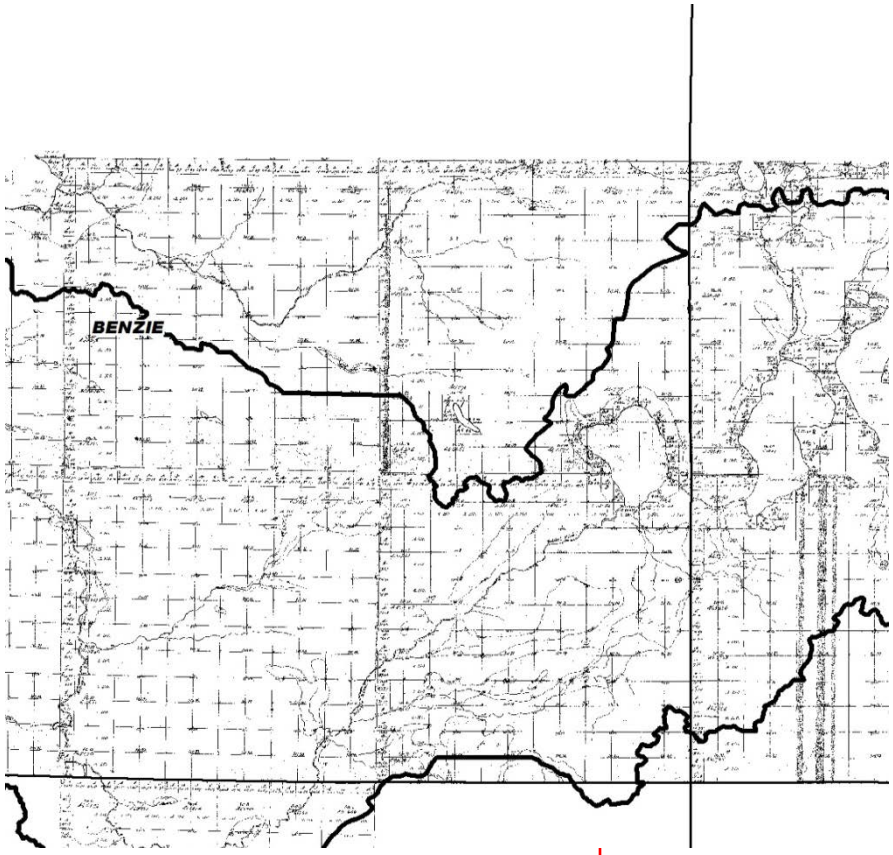
# Evaluated Wetland Functions

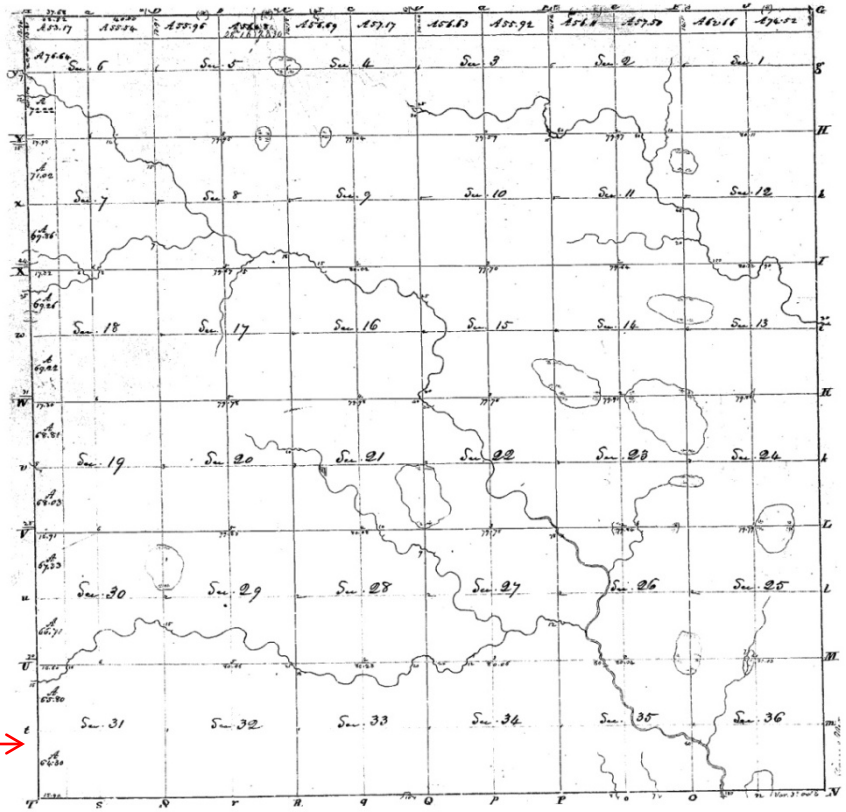
- Flood Water Storage
- Streamflow Maintenance
- Nutrient Transformation
- Sediment and Other Particulate Retention
- Shoreline Stabilization
- Stream Shading
- Conservation of Rare and Imperiled Wetlands
- Ground Water Influence
- Fish Habitat
- Waterfowl/Waterbird Habitat
- Shorebird Habitat
- Interior Forest Bird Habitat
- Amphibian Habitat
- Carbon Sequestration
- Pathogen Retention

# DRAINAGE EXTENT



# HISTORIC RIVERS/STREAMS



# DETAILED FUNCTIONAL COMPARISONS

**Table 2: Detailed Functional Comparisons**

| Function | Potential Significance | Pre-European Settlement Acreage | 2005 Acreage | % Change in Acreage |
|---|---|---|---|---|
| Flood Water Storage | High | 5449.88 | 2424.18 | -56 |
| | Moderate | 3736.67 | 249.13 | -93 |
| | *Total* | 9,186.54 | 2,673.31 | -71 |
| Streamflow Maintenance | High | 4,861.87 | 2,563.51 | -47 |
| | Moderate | 3,528.88 | 3,521.10 | 0 |
| | *Total* | 8,390.75 | 6,084.62 | -27 |
| Nutrient Transformation | High | 5,133.47 | 4,600.55 | -10 |
| | Moderate | 4,381.95 | 350.52 | -92 |
| | *Total* | 9,515.41 | 4,951.07 | -48 |
| Sediment and Retention of Other Particulates | High | 5,449.88 | 1,392.94 | -74 |
| | Moderate | 1,405.92 | 2,536.41 | 80 * |
| | *Total* | 6,855.79 | 3,929.36 | -43 |
| Shoreline Stabilization | High | 4,832.42 | 1,767.79 | -63 |
| | Moderate | 2,804.83 | 1,988.89 | -29 |
| | *Total* | 7,637.25 | 3,756.68 | -51 |
| Fish Habitat | High | 7,641.01 | 2,920.89 | -62 |
| | Moderate | 728.92 | 2,443.52 | 235 * |
| | *Total* | 8,369.93 | 5,364.41 | -36 |
| Stream Shading | High | 1,965.57 | 409.44 | -79 |
| | Moderate | 1,245.70 | 518.58 | -58 |
| | Total | 3,211.27 | 928.02 | -71 |

* Increases in the moderate & high category in the functions above can be attributed to the mapping differences in the two wetland layers and may not represent the current conditions on the ground.

# DETAILED FUNCTIONAL COMPARISONS CONT…

| Function | Potential Significance | Pre-European Settlement Acreage | 2005 Acreage | % Change in Acreage |
|---|---|---|---|---|
| Waterfowl/Waterbird Habitat | High | 1,503.48 | 1,642.05 | 9 * |
| | Moderate | 3,352.19 | 2,937.33 | -12 |
| | *Total* | 4,855.67 | 4,579.38 | -6 |
| Shorebird Habitat | High | 0.00 | 106.69 | Null |
| | Moderate | 8,162.42 | 4,788.51 | -41 |
| | Total | 8,162.42 | 4,895.20 | -40 |
| Interior Forest Bird Habitat | High | 3,756.33 | 1,088.52 | -71 |
| | Moderate | 5,600.12 | 2,553.09 | -54 |
| | *Total* | 9,356.45 | 3,641.61 | -61 |
| Amphibian Habitat | High | 3,783.18 | 1,068.02 | -72 |
| | Moderate | 1,229.49 | 669.24 | -46 |
| | Total | 5,012.66 | 1,737.26 | -65 |
| Carbon Sequestration | High | 178.65 | 536.51 | 200 * |
| | Moderate | 3,601.83 | 938.47 | -74 |
| | Total | 3,780.48 | 1,474.98 | -61 |
| Ground Water Influence | High | 104.52 | 1,754.52 | 1579 * |
| | Moderate | 9,026.55 | 3,608.14 | -60 |
| | Total | 9,131.07 | 5,362.66 | -41 |
| | | | | |
| Conservation of Rare & Imperiled Wetlands & Species | High | Null | 230.59 | Null |
| | Moderate | Null | 6,216.08 | Null |
| | Total | Null | 6,446.66 | Null |

* Increases in the moderate & high categories in the functions above can be attributed to the mapping differences in the two wetland layers and may not represent the current conditions on the ground.

# FUNCTIONAL ACRES COMPARISON

**Table 3: Functional Acres comparison**

| Function | Pre-European Settlement Functional Acres | 2005 Functional Acres | Predicted % of Original Capacity Left | Predicted % Change in Functional Capacity |
|---|---|---|---|---|
| Flood Water Storage | 14,636.42 | 5,097.49 | 35 | -65 |
| Streamflow Maintenance | 13,252.61 | 8,648.13 | 65 | -35 |
| Nutrient Transformation | 14,648.88 | 9,551.62 | 65 | -35 |
| Sediment and Other Particulate Retention | 12,305.67 | 5,322.30 | 43 | -57 |
| Shoreline Stabilization | 12,469.67 | 5,524.47 | 44 | -56 |
| Fish Habitat | 16,010.94 | 8,285.30 | 52 | -48 |
| Stream Shading | 5,176.84 | 1,337.46 | 26 | -74 |
| Waterfowl and Waterbird Habitat | 6,359.15 | 6,221.43 | 98 | -2 |
| Shorebird Habitat | 8,162.42 | 5,001.89 | 61 | -39 |
| Interior Forest Bird Habitat | 13,112.78 | 4,730.13 | 36 | -64 |
| Amphibian Habitat | 8,795.84 | 2,805.28 | 32 | -68 |
| Carbon Sequestration | 3,959.13 | 2,011.49 | 51 | -49 |
| Ground Water Influence | 9,235.59 | 7,117.18 | 77 | -23 |
| Conservation of Rare & Imperiled Wetlands & Species | 0 | 6,677.25 | 100 | 100 |

- Increases in the predicted percent change functional capacity in the functions above can be attributed to the mapping differences in the two wetland layers and may not represent the current conditions on the ground.

# Frequency of Functions

Pre-Settlement

| # of Wetlands | # of Functions | ACRES |
|---|---|---|
| 4 | 2 | 999 |
| 14 | 3 | 167 |
| 19 | 4 | 162 |
| 14 | 5 | 76 |
| 35 | 6 | 430 |
| 45 | 7 | 723 |
| 60 | 8 | 1,002 |
| 68 | 9 | 1,689 |
| 47 | 10 | 1,984 |
| 8 | 11 | 145 |
| 74 | 12 | 3,137 |

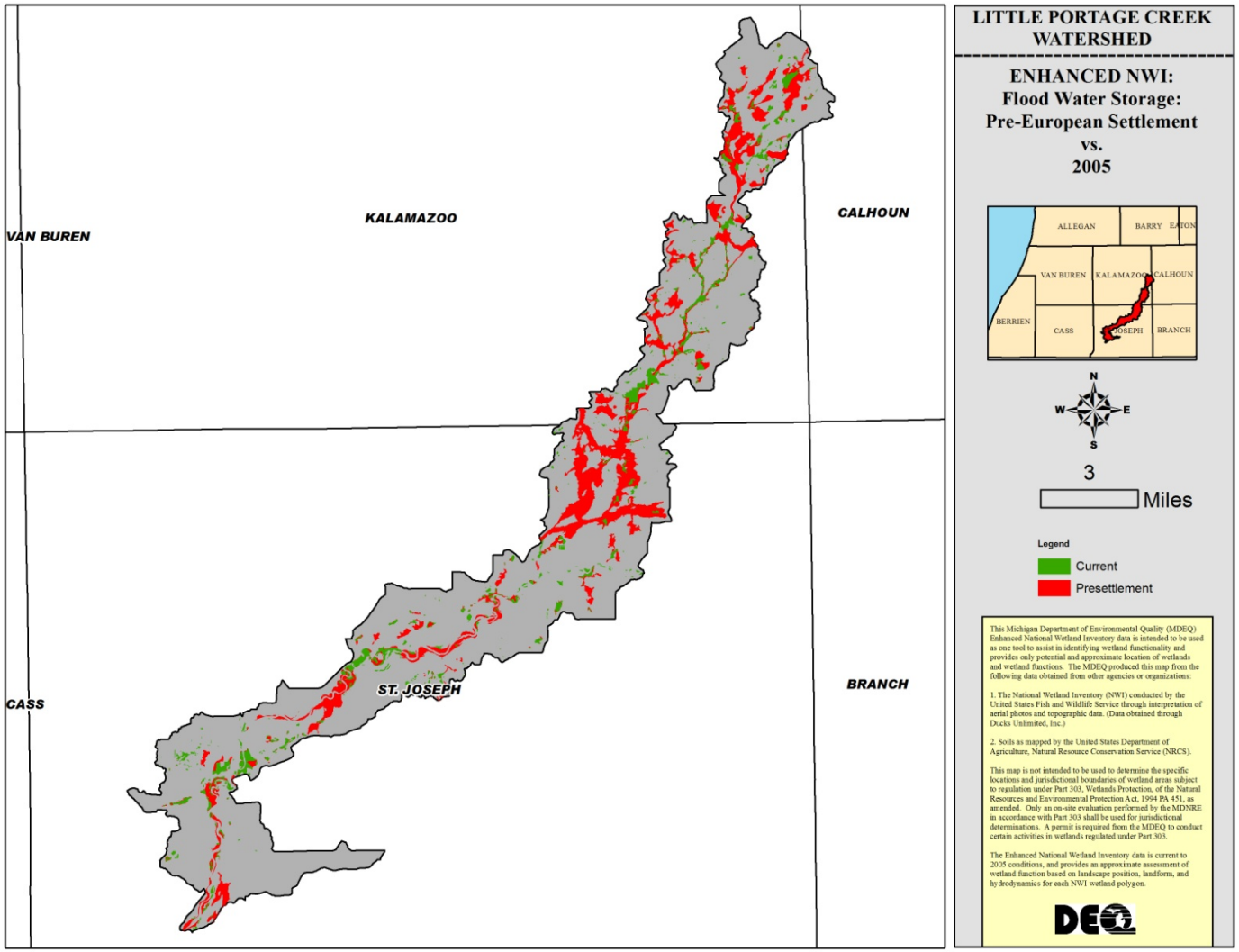
Current

| # of Wetlands | # of Functions | ACRES |
|---|---|---|
| 15 | 1 | 4 |
| 59 | 2 | 28 |
| 100 | 3 | 206 |
| 51 | 4 | 1,805 |
| 42 | 5 | 78 |
| 55 | 6 | 105 |
| 51 | 7 | 148 |
| 147 | 8 | 662 |
| 274 | 9 | 1,550 |
| 159 | 10 | 1,463 |
| 52 | 11 | 151 |
| 62 | 12 | 252 |
| 69 | 13 | 557 |
| 2 | 14 | 6 |

# FLOOD WATER STORAGE

- This function is important for reducing the downstream flooding and lowering flood heights, both of which aid in minimizing property damage and personal injury from such events.
- The following map illustrates wetlands that perform the above ecological service at a level of significance above that of wetlands not designated. Wetlands deemed to be performing this function are mapped in two distinct time periods; Pre-European settlement (red), and wetlands circa 2005 (green).

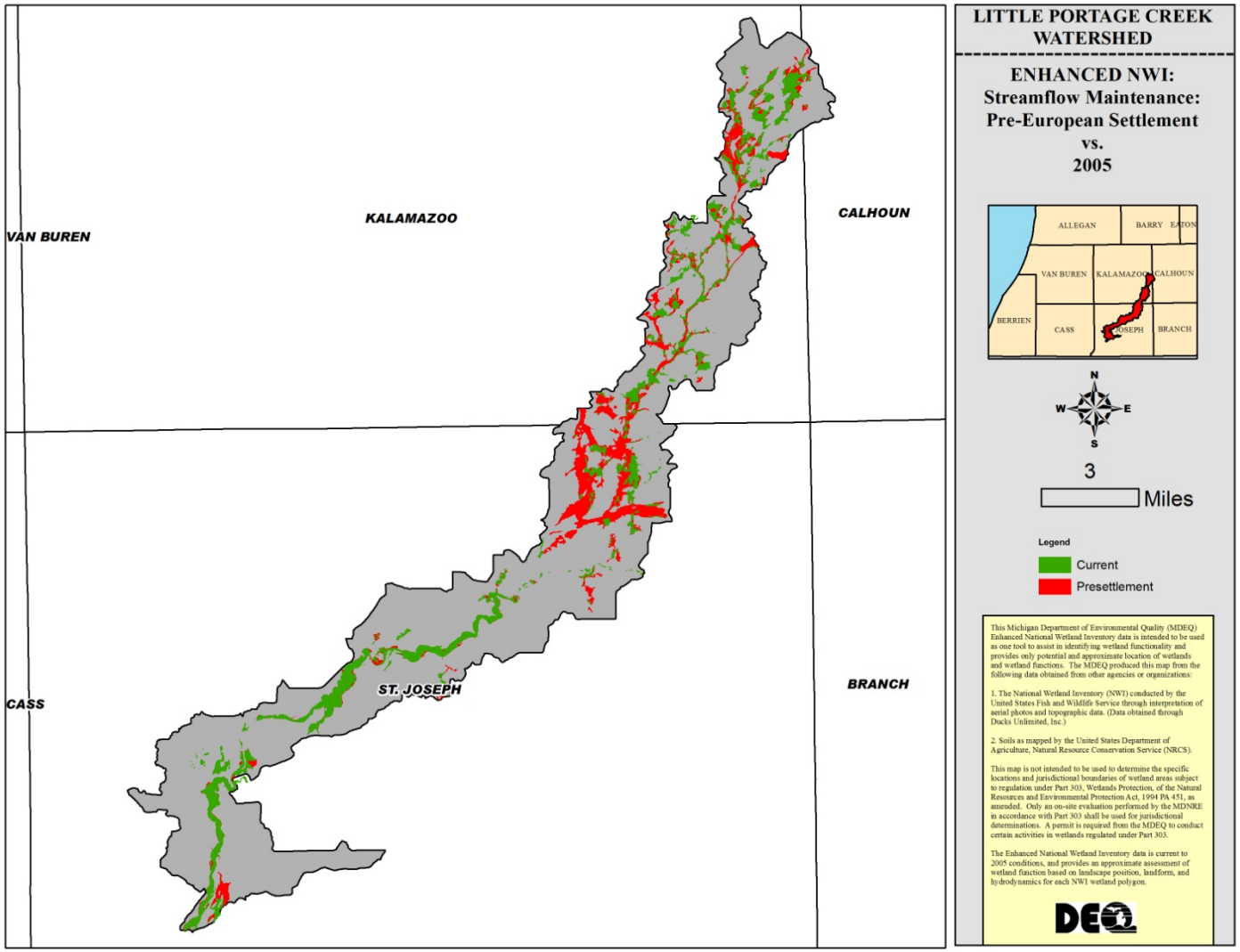
# FLOOD WATER STORAGE



# STREAMFLOW MAINTENANCE

- Wetlands that are sources of groundwater discharge that sustain streamflow in the watershed. Such wetlands are critically important for supporting aquatic life in streams. All wetlands classified as headwater wetlands are important for streamflow.
- The following map illustrates wetlands that perform the above ecological service at a level of significance above that of wetlands not designated. Wetlands deemed to be performing this function are mapped in two distinct time periods; Pre-European settlement (red), and wetlands circa 2005 (green).

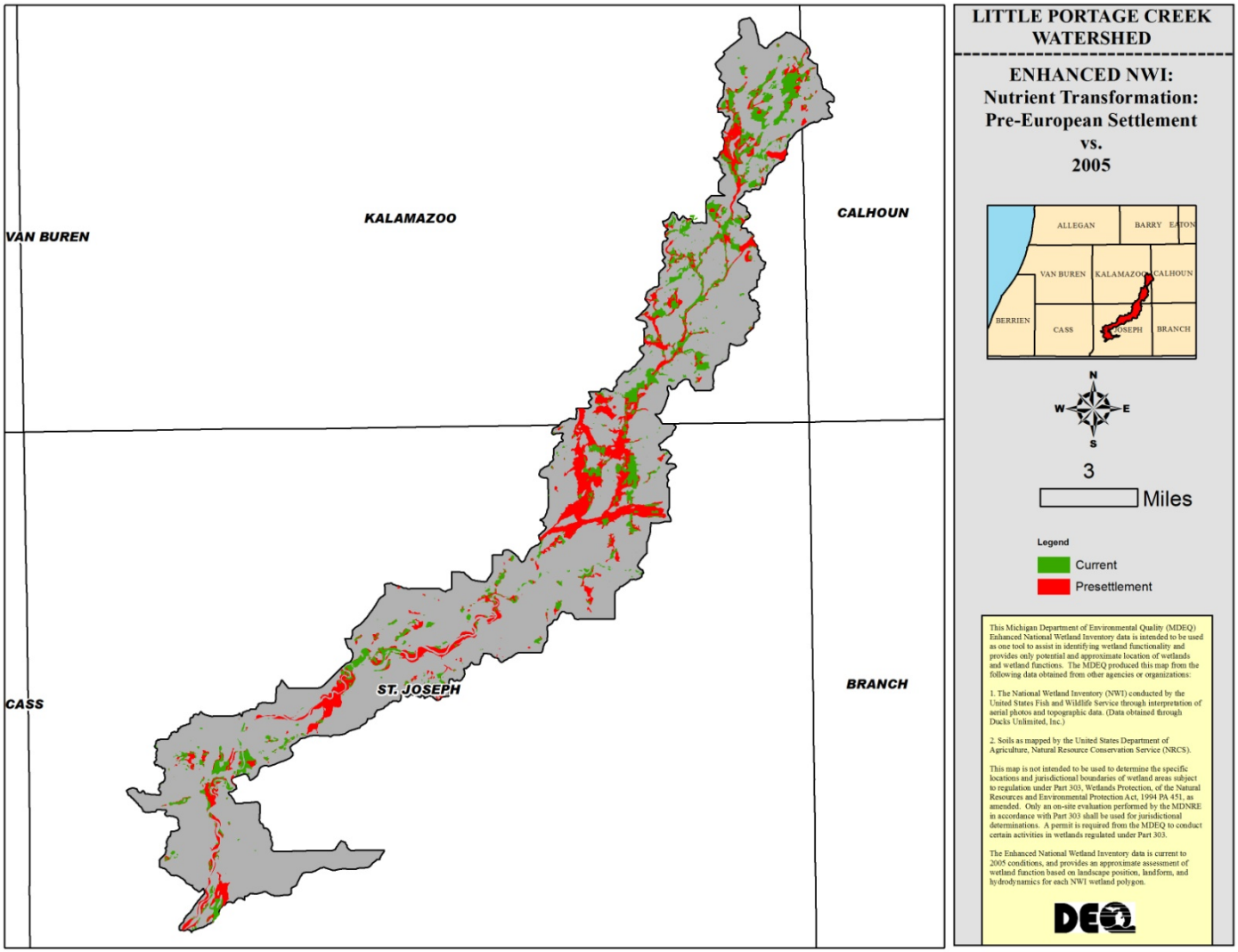
# STREAMFLOW MAINTENANCE



# NUTRIENT TRANSFORMATION

- Wetlands that have a fluctuating water table are best able to recycle nutrients. Natural wetlands performing this function help improve local water quality of streams and other watercourses.
- The following map illustrates wetlands that perform the above ecological service at a level of significance above that of wetlands not designated. Wetlands deemed to be performing this function are mapped in two distinct time periods; Pre-European settlement (red), and wetlands circa 2005 (green).

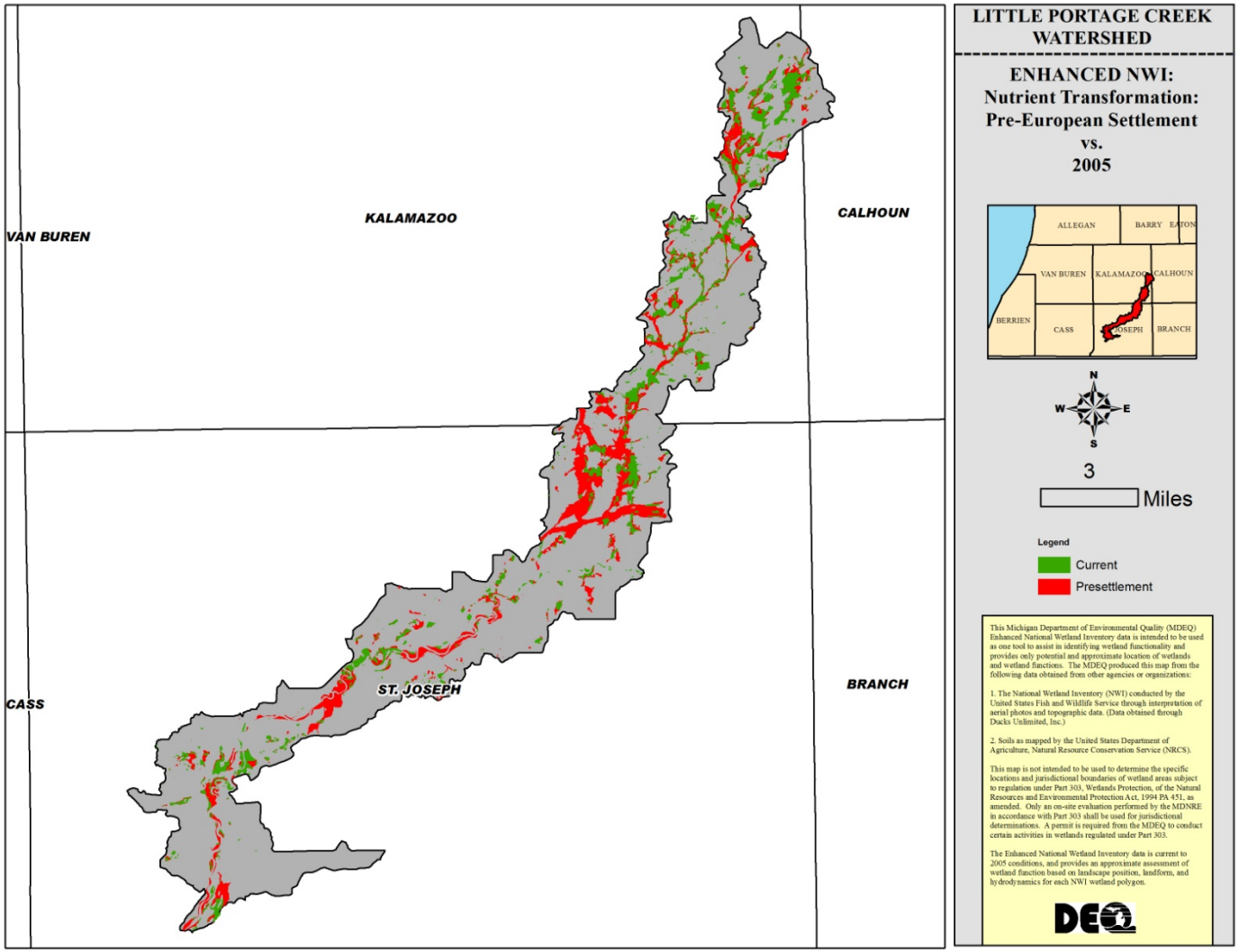
# NUTRIENT TRANSFORMATION



# SEDIMENT AND OTHER PARTICULATE RETENTION

- This function supports water quality maintenance by capturing sediments with bonded nutrients or heavy metals. Vegetated wetlands will perform this function at higher levels than those of non-vegetated wetlands.
- The following map illustrates wetlands that perform the above ecological service at a level of significance above that of wetlands not designated. Wetlands deemed to be performing this function are mapped in two distinct time periods; Pre-European settlement (red), and wetlands circa 2005 (green).

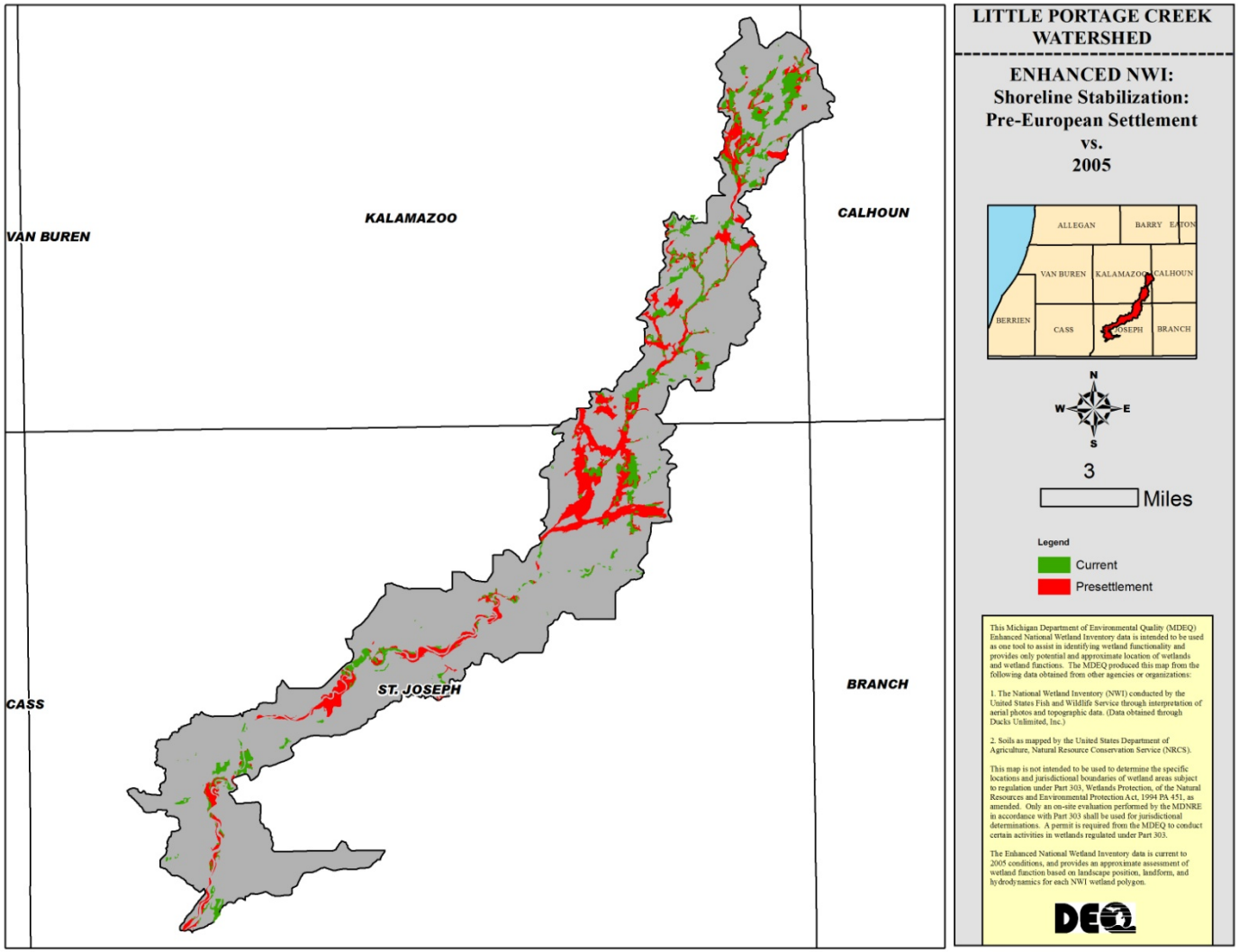
# SEDIMENT AND OTHER PARTICULATE RETENTION



# SHORELINE STABILIZATION

- Vegetated wetland along all waterbodies (e.g. estuaries, lakes, rivers, and streams) provide this function. Vegetation stabilizes the soil or substrate and diminished wave action, thereby reducing shoreline erosion potential.
- The following map illustrates wetlands that perform the above ecological service at a level of significance above that of wetlands not designated. Wetlands deemed to be performing this function are mapped in two distinct time periods; Pre-European settlement (red), and wetlands circa 2005 (green).

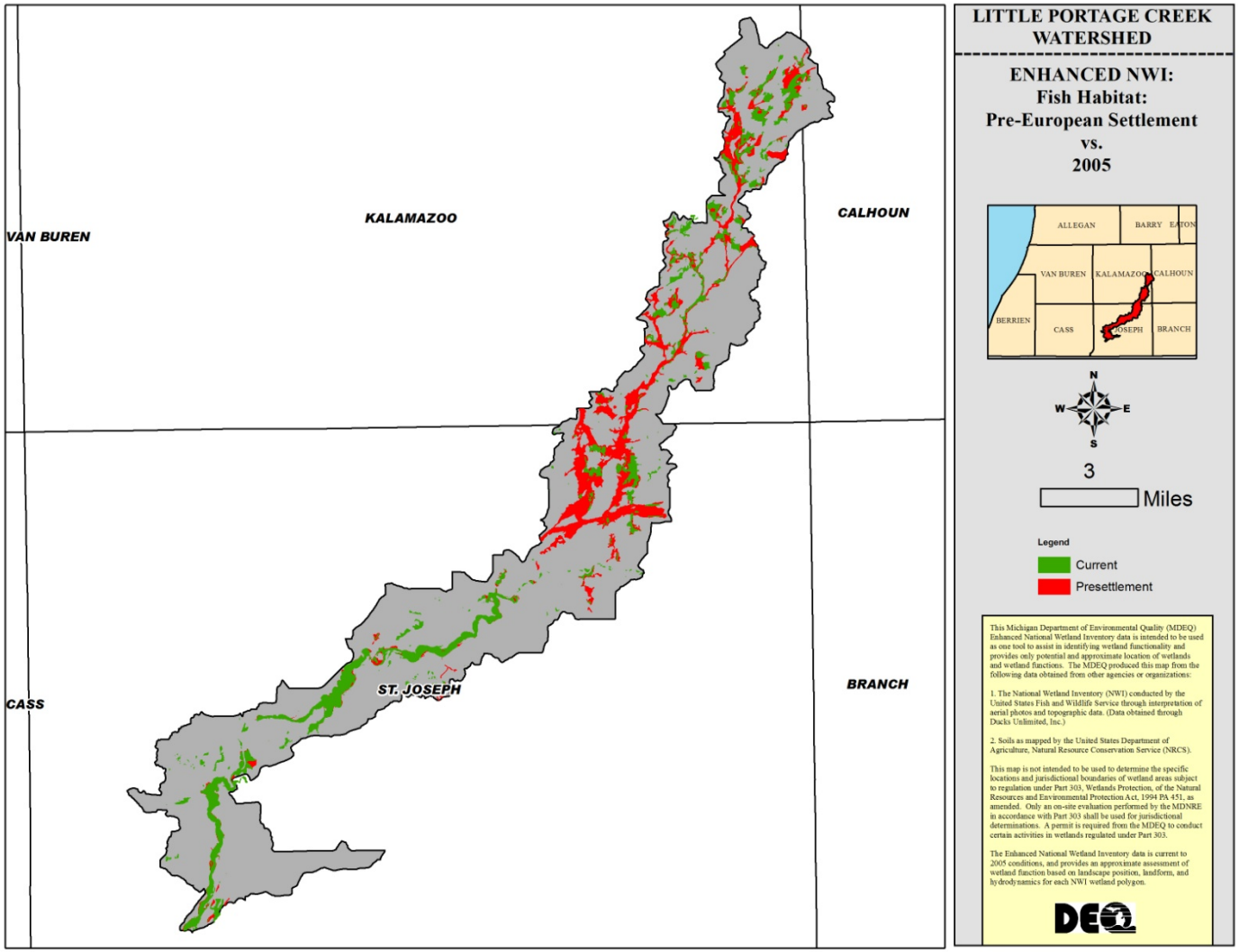
# SHORELINE STABILIZATION



# FISH HABITAT

- Wetlands that are considered essential to one or more parts of fish life cycles. Wetlands designated as important for fish are generally those used for reproduction, or feeding.
- The following map illustrates wetlands that perform the above ecological service at a level of significance above that of wetlands not designated. Wetlands deemed to be performing this function are mapped in two distinct time periods; Pre-European settlement (red), and wetlands circa 2005 (green).

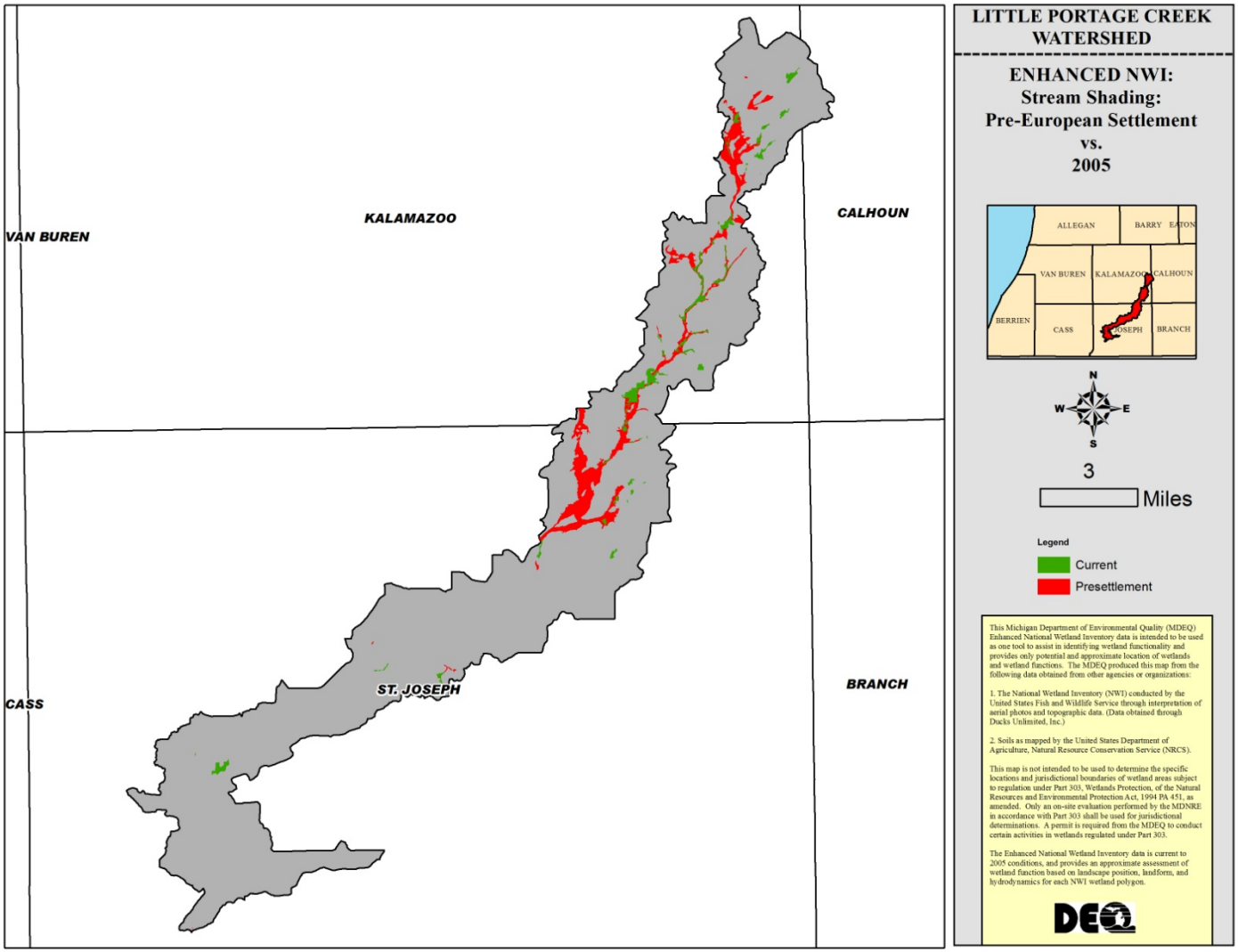
# FISH HABITAT



# STREAM SHADING

- Wetlands that perform water temperature control due to the proximity to streams and waterways. These wetlands generally are Palustrine Forested or Scrub-Shrub.
- The following map illustrates wetlands that perform the above ecological service at a level of significance above that of wetlands not designated. Wetlands deemed to be performing this function are mapped in two distinct time periods; Pre-European settlement (red), and wetlands circa 2005 (green).

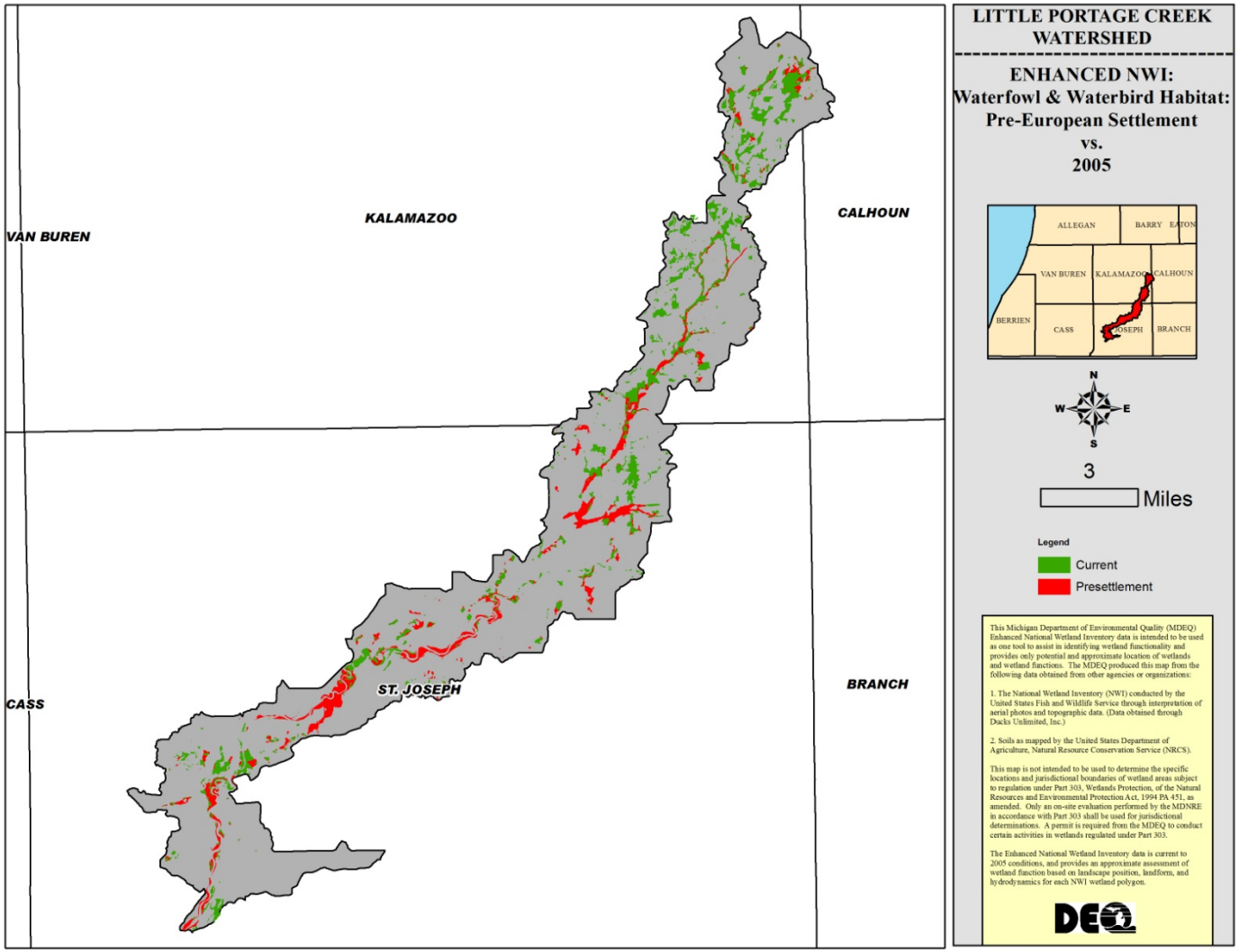
# STREAM SHADING



# WATERFOWL AND WATERBIRD HABITAT

- Wetlands designated as important for waterfowl and waterbirds are generally those used for nesting, reproduction, or feeding. The emphasis is on the wetter wetlands and ones that are frequently flooded for long periods.
- The following map illustrates wetlands that perform the above ecological service at a level of significance above that of wetlands not designated. Wetlands deemed to be performing this function are mapped in two distinct time periods; Pre-European settlement (red), and wetlands circa 2005 (green).

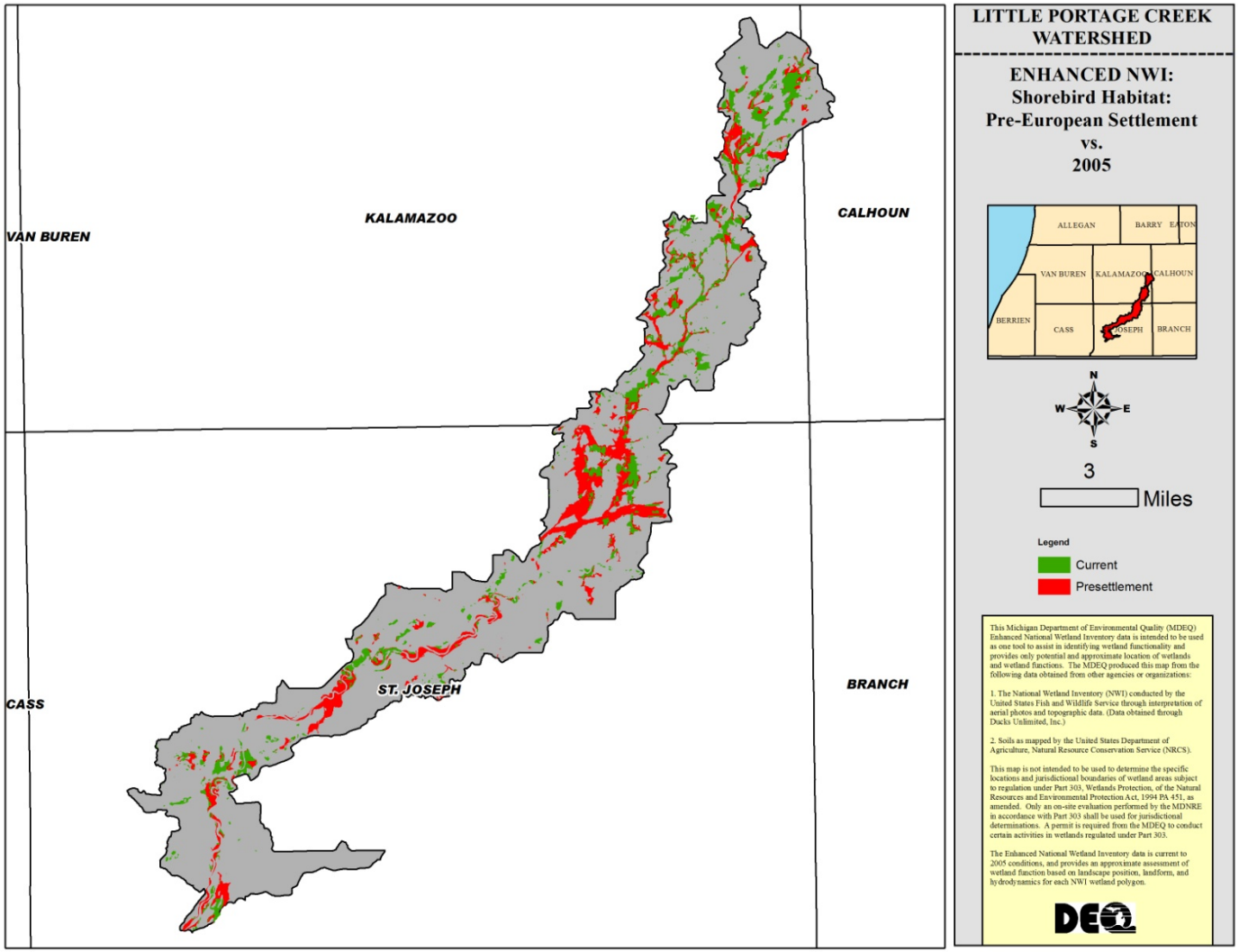
# WATERFOWL & WATERBIRD HABITAT



# SHOREBIRD HABITAT

- Shorebirds generally inhabit open areas of beaches, grasslands, wetlands, and tundra and undertake some of the longest migrations known. Along their migration pathway, many shorebirds feed in coastal and inland wetlands where they accumulate fat reserves needed to continue their flight. Common species include; plovers, oystercatchers, avocets, stilts, and sandpipers. This function attempts to capture wetland types most likely to provide habitat for these species.
- The following map illustrates wetlands that perform the above ecological service at a level of significance above that of wetlands not designated. Wetlands deemed to be performing this function are mapped in two distinct time periods; Pre-European settlement (red), and wetlands circa 2005 (green).

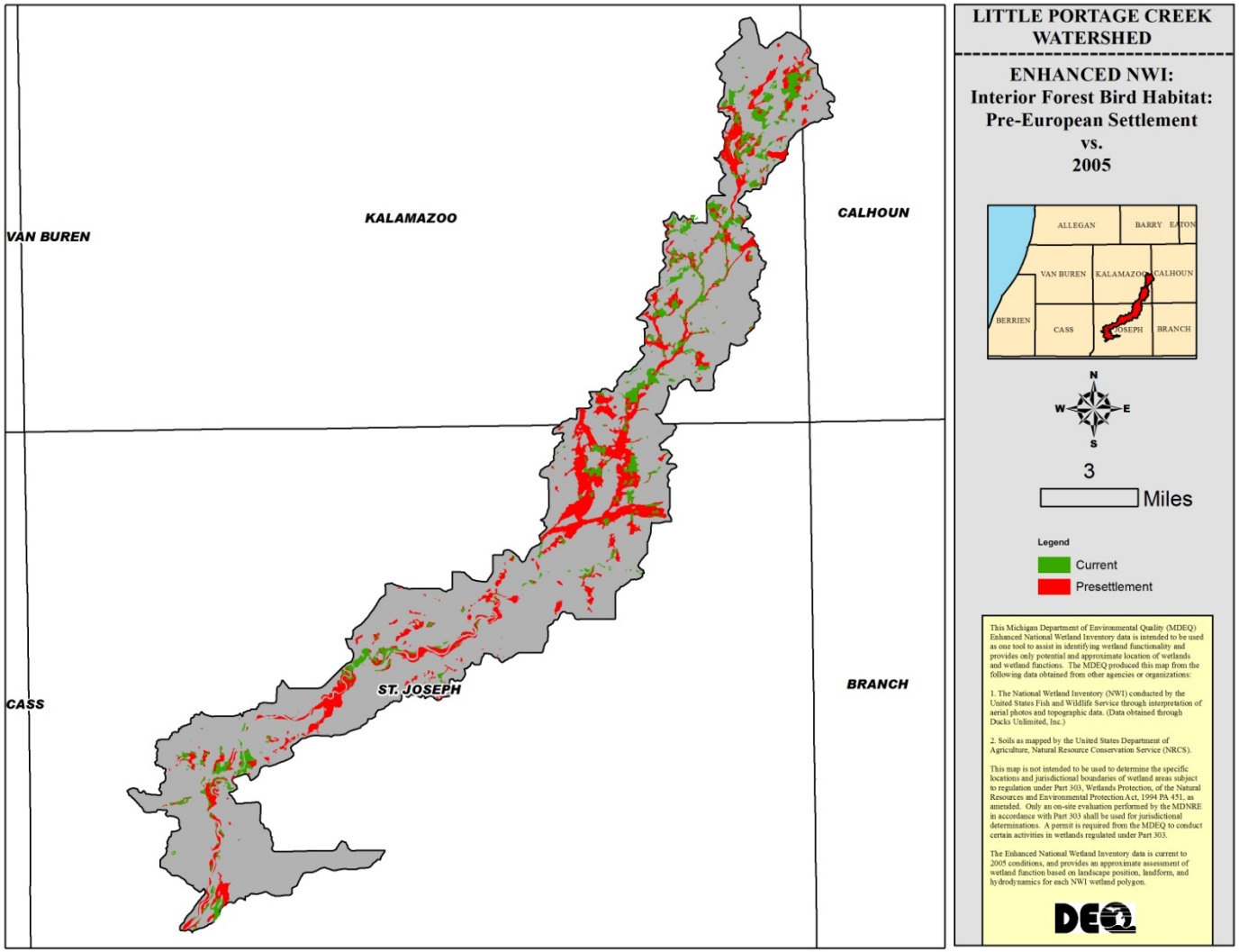
# SHORE BIRD HABAITAT



# INTERIOR FOREST BIRDS

- Interior Forest Birds require large forested areas to breed successfully and maintain viable populations. This diverse group includes colorful songbirds such as; tanagers, warblers, vireos that breed in North America and winter in the Caribbean, Central and South America, as well as residents and short-distance migrants such as; woodpeckers, hawks, and owls. They depend on large forested tracts, including streamside and floodplain forests. It is important to note that adjacent upland forest to these riparian areas are critical habitat for these species as well. This function attempts to capture wetland types most likely to provide habitat for these species.
- The following map illustrates wetlands that perform the above ecological service at a level of significance above that of wetlands not designated. Wetlands deemed to be performing this function are mapped in two distinct time periods; Pre-European settlement (red), and wetlands circa 2005 (green).

# INTERIOR FOREST BIRD HABITAT



# AMPHIBIAN HABITAT

- Amphibians share several characteristics in common including wet skin that functions in respiration and gelatinous eggs that require water or moist soil for development. Most amphibians have an aquatic stage and a terrestrial stage and thus live in both aquatic and terrestrial habitats. Aquatic stages of these organisms are often eaten by fish and so for certain species, successful reproduction may occur only in fish-free ponds. Common sub-groups of amphibians are salamanders, frogs, and toads. This function attempts to capture wetland types most likely to provide habitat for these species.
- The following map illustrates wetlands that perform the above ecological service at a level of significance above that of wetlands not designated. Wetlands deemed to be performing this function are mapped in two distinct time periods; Pre-European settlement (red), and wetlands circa 2005 (green).

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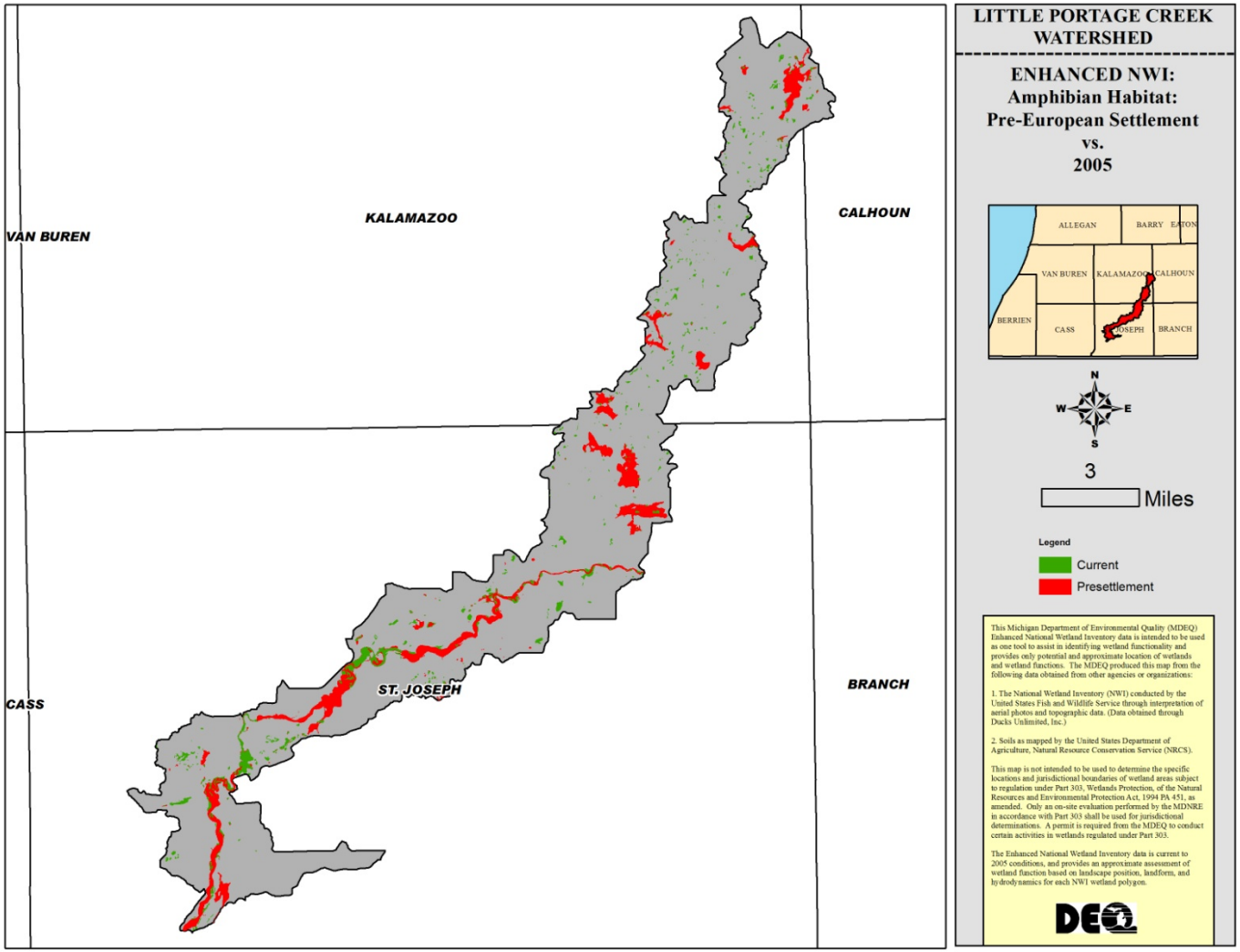
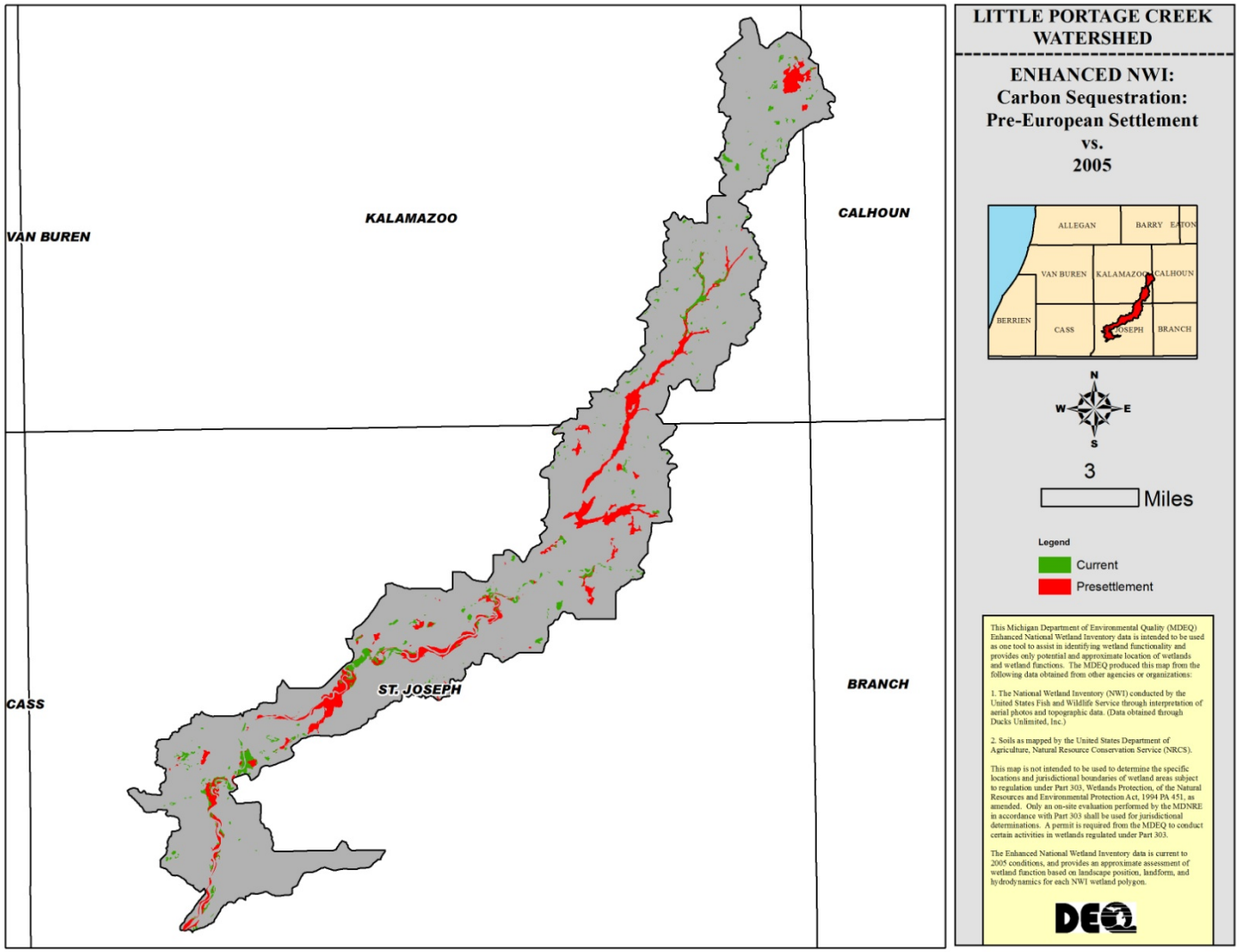


# CARBON SEQUESTRATION

- Wetlands are different from other biomes in their ability to sequester large amounts of carbon, as a consequence of high primary production and then deposition of decaying matter in the anaerobic areas of their inundated soils.
- The following map illustrates wetlands that perform the above ecological service at a level of significance above that of wetlands not designated. Wetlands deemed to be performing this function are mapped in two distinct time periods; Pre-European settlement (red), and wetlands circa 2005 (green).

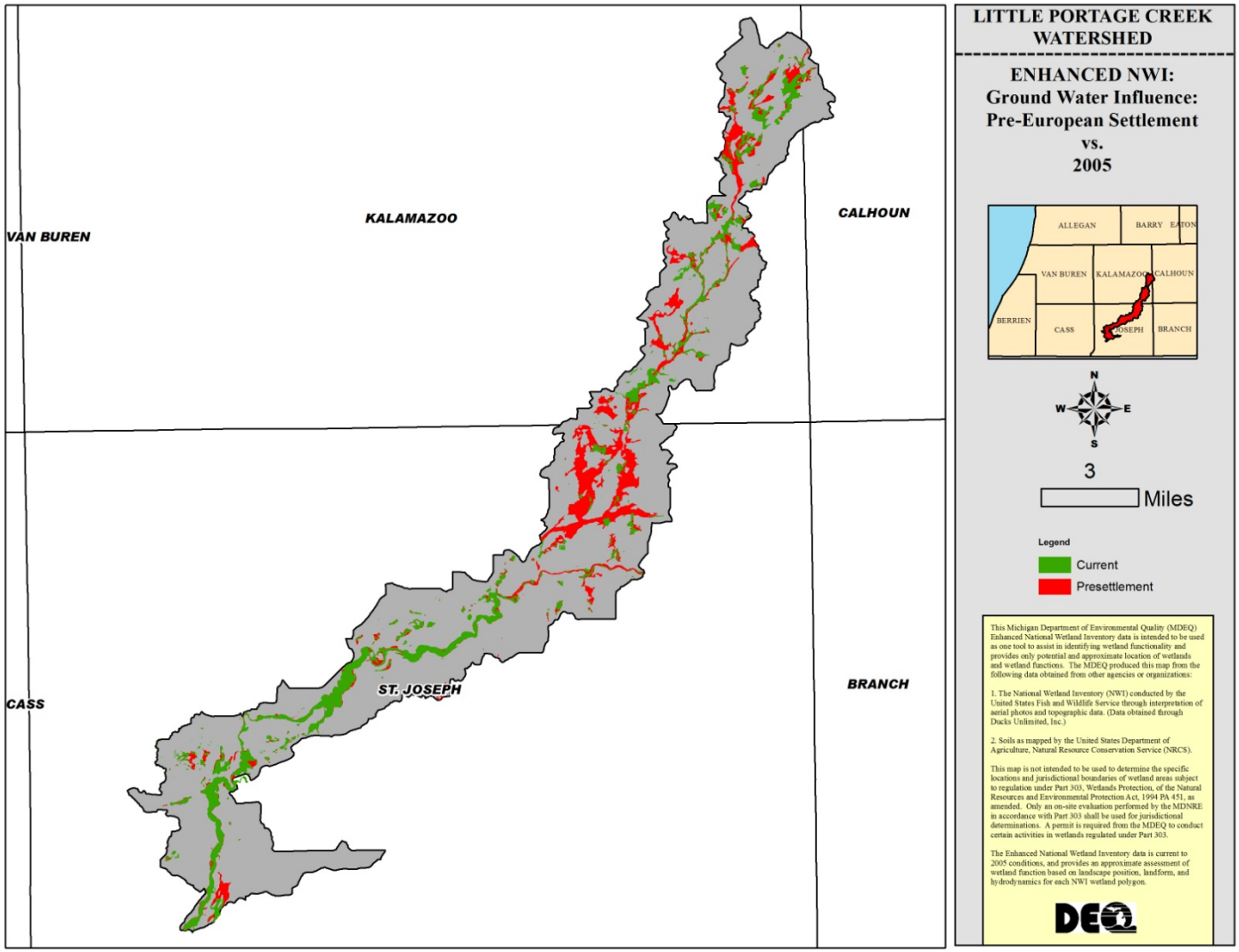
# CARBON SEQUESTRATION



# GROUND WATER INFLUENCE

- Wetlands categorized as High or Moderate for Groundwater Influence are areas that receive some or all of their hydrologic input from groundwater reflected at the surface. The DARCY (definition of acronym) model was the data source utilized to determine this wetland/groundwater connection, which is based upon soil transmissivity and topography. Wetlands rated for this function are important for maintaining streamflows and temperature control in waterbodies.
- The following map illustrates wetlands that perform the above ecological service at a level of significance above that of wetlands not designated. Wetlands deemed to be performing this function are mapped in two distinct time periods; Pre-European settlement (red), and wetlands circa 2005 (green).

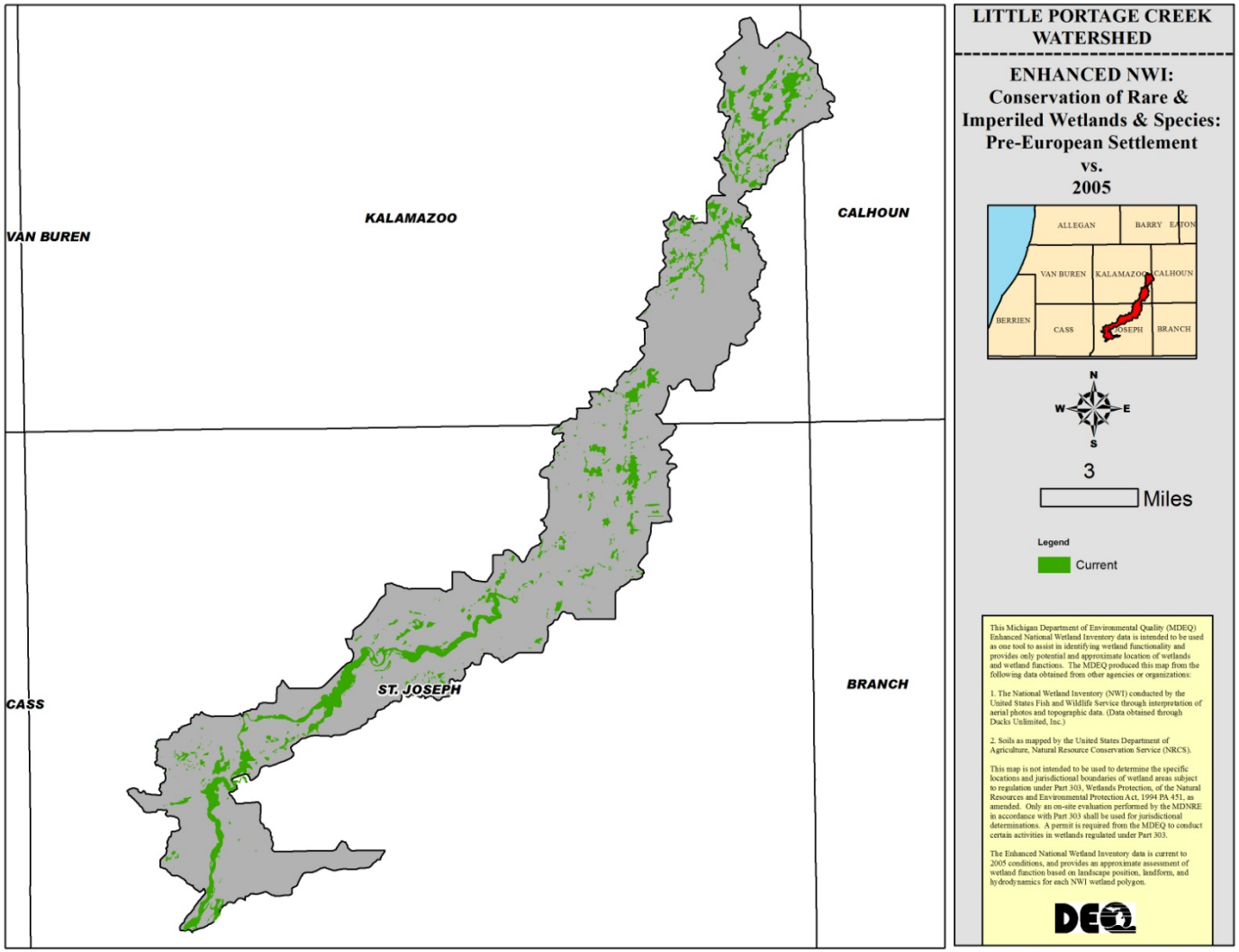
# GROUND WATER INFLUENCE



# CONSERVATION OF RARE AND IMPERILED WETLANDS & SPECIES

- Wetlands that are considered rare either globally or at the state level. They are likely to contain a wide variety of flora and fauna, or contain threatened or endangered species.
- This function is derived from the Michigan Natural Features Dataset (MNFI) of known sightings of threatened, endangered, or special concern species and high quality natural communities. The model values are reported on a 40 acre polygon grid for the state of Michigan, or a subset of MI. Due to this the dataset should not be used as a comprehensive inventory of Rare and Imperiled wetlands.
- The following map illustrates wetlands that perform the above ecological service at a level of significance above that of wetlands not designated. Wetlands deemed to be performing this function are mapped in (green) circa 2005.

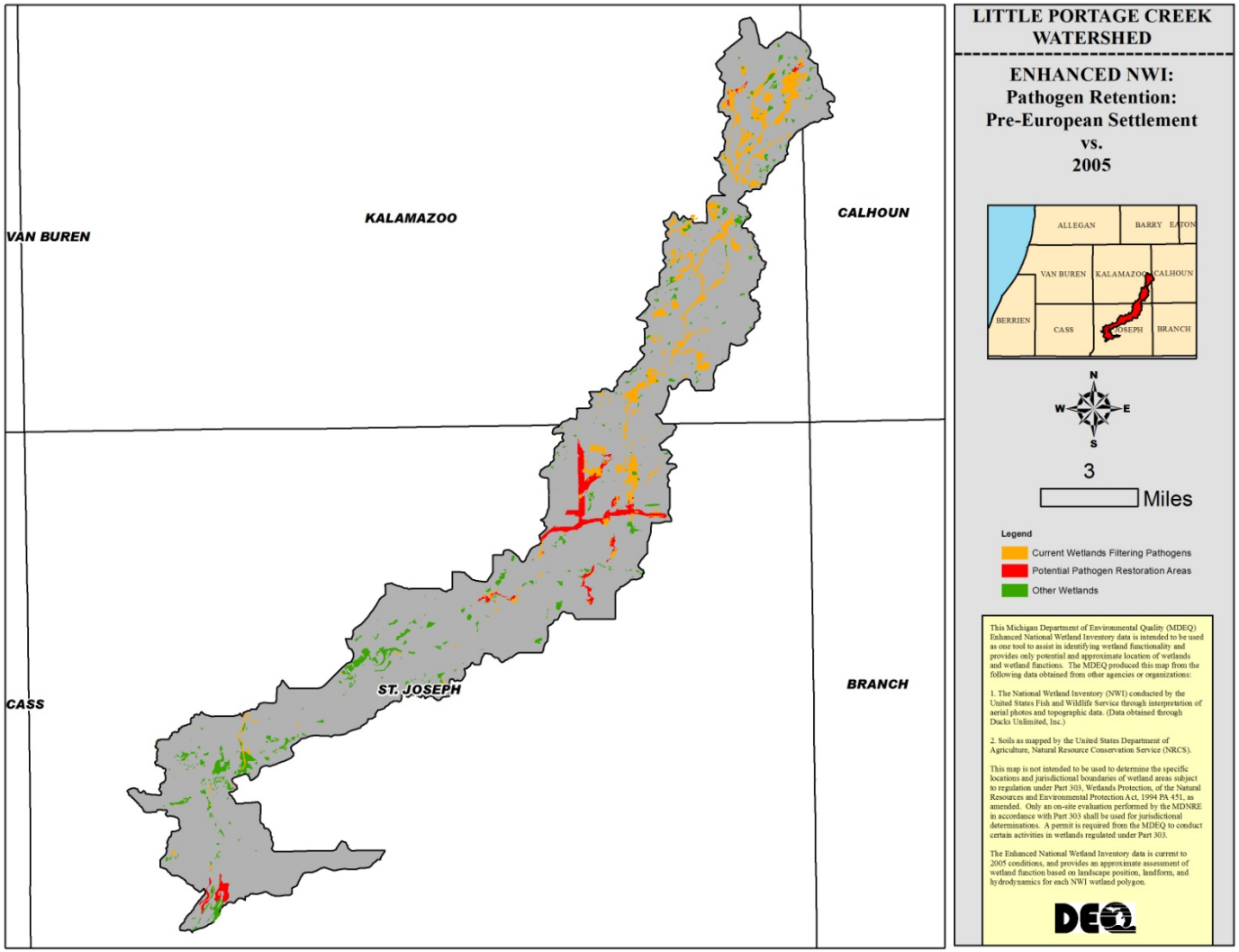
# CONSERVATION OF RARE IMPERILED WETLANDS, & SPECIES



# PATHOGEN RETENTION

- Wetlands can improve water quality through natural processes of filtration for sedimentation, nutrients and Escherichia coli (E. coli). E. coli is a sub-set of fecal coli forms whose presence in water indicates fecal contamination from warm blooded animals. The presence of E. coli indicates that contamination has occurred, and other harmful pathogens may also be present.
- The following map illustrates wetlands that perform the above ecological service at a level of significance above that of wetlands not designated. Wetlands deemed to be performing this function at a high level are mapped in (orange) circa 2005. Wetlands deemed valuable for restoration for this function are mapped in (red). All other wetland areas are mapped in (green).

# PATHOGEN RETENTION



# Data Limitations and Disclaimer

## National Wetlands Inventory Plus (NWI)

- Wetland boundaries determined from Aerial Imagery
- Last updated in 2005
- Obvious limitations to Aerial Photo Interpretation:
  - Errors of Omission (forested and drier-end wetlands)
  - Errors of Comission (misinterpretation of aerials)

The 2005 NWI data was used in this analysis to report status and trends, as this is currently the best data source available. However, this data may not accurately reflect current conditions on the ground.

Federal, state, and local regulatory agencies with jurisdiction over wetlands may define and describe wetlands in a different manner than that used in this inventory. There is no attempt, in either the design or products of this inventory, to define the limits of proprietary jurisdiction of any Federal, state, or local government or to establish the geographical scope of the regulatory programs of government agencies. Persons intending to engage in activities involving modifications within or adjacent to wetland areas should seek the advice of appropriate federal, state, or local agencies concerning specified agency regulatory programs and proprietary jurisdictions that may affect such activities.

## Landscape Level Wetland Functional Assessment (LLWFA)

- Source data are a primary limiting factor.
- Wetland mapping limitations due to scale, photo quality, and date and time of year of the photos.

- Functional assessment is a preliminary one based on:
  - Wetland Characteristics interpreted through remote sensing
  - Professional Judgment of various specialists to develop correlations between those wetlands and their functions.
- Watershed-based Preliminary Assessment of wetland functions:
  - Applies general knowledge about wetlands and their functions
  - Develops a watershed overview that highlights possible wetlands of significance
  - Does not consider the condition of the adjacent upland
  - Does not obviate the need for more detailed assessment of various functions
- This analysis is a “Landscape Level” assessment and used to identify wetlands that are likely to perform a given function at a level above that of other wetlands not designated