

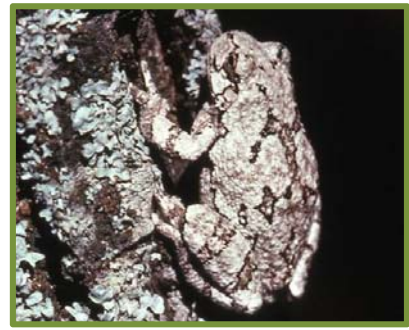
Rouge River Watershed Amphibian Assessment



American toad



Bullfrog



Gray treefrog



Green frog



Northern leopard frog



Wood frog



Western chorus frog



Northern spring peeper

Prepared for:
Rouge River Advisory Council

Prepared by:
Sally Petrella
Friends of the Rouge
4901 Evergreen Rd. KM Bldg.
Dearborn, MI 48128
www.therouge.org

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Abstract

Friends of the Rouge was tasked with examining the data from the Rouge River Watershed Frog and Toad Survey over the past 17 years (1998-2014). The survey was designed to speak specifically to habitat-related goals stated in the 1994 Rouge River Remedial Action Plan Update. An average of 442 volunteers participated each year from 1998-2014, collecting data for an average of 195 survey blocks. Eight species were positively identified as present in the watershed. The Middle 1 and Lower 1 subwatersheds had the highest average number of species heard per block followed by Main 1/2. In 2004, Friends of the Rouge created a wetlands and woodlands map for the watershed through a project funded by the EPA Great Lakes National Program Office. The wetland mapping showed the Rouge River watershed to have 6578 wetlands covering 15,937 acres or 5% of the watershed. The diverse blocks (all eight species heard) had a greater variety of wetland types than the Vacant Blocks and included more large shallow lakes with open water (L2UB), Aquatic Bed (PAB), Emergent (PEM) and Unconsolidated Bottom (PUB) and fewer Forested wetlands (PFO). Most of the blocks had no significant trend (162), 18 had a significant positive trend and 17 had a significant negative slope indicating increased and decreased frog and toad diversity, respectively. Each of the subwatersheds was analyzed separately. The Middle 1 and Lower 1 had the highest diversity (5 species) followed by the Main 1-2 (4 species). The lowest diversity was in the Main 3-4, the most urbanized subwatershed at 84% impervious. Preserving existing wetlands and increasing the number, quality and diversity of wetlands are the major projects needed to improve habitat for frogs and toads in the Rouge River Watershed.

Introduction

Friends of the Rouge was tasked with examining the data that has been collected through the Rouge River Watershed Frog and Toad Survey over the past seventeen years (1998-2014). The goal of the analysis was to assess how amphibian diversity correlates with the priority habitat areas and restoration projects that are being identified by the Rouge River Advisory Council (RRAC). Most of the habitat data being examined by the RRAC related directly to streams. The inclusion of the frog and toad data was expected to give a broader picture of habitat health. Baseline conditions and trends were to be mapped and critical areas and gaps identified.

The RRAC has currently identified 25 restoration projects that will restore habitat in the watershed and remove the Beneficial Use Impairments associated with the Loss of Fish and Wildlife Habitat and the Degradation of Fish and Wildlife Populations (See Table 1). It is anticipated that these projects will cost \$28 million to implement (not including the Concrete Channel Modifications) and provide the following outcomes:

- Restore 25 acres of wetlands,
- Restore 21 acres of open water habitat,
- Restore 4,300 feet of instream habitat,
- Restore 4,800 feet of shoreline habitat,
- Restore 49 acres of upland habitat,
- Restore 14 acres of forest,
- Naturalize 400 feet of banks,
- Construct two fish passages that will reconnect 158 miles of river and tributaries to the Great Lakes,
- Managed 36 acres of invasive species, and
- Manage woody material within 10 miles of stream.

Table 1: The Rouge River Area of Concern Habitat Project Restoration Projects

Stormwater Management Area	Project Name
Main 3-4	Fordson Island and Upland Habitat Restoration (Phase 1 & 2)
	Patton Park Wetland Restoration
	Concrete Channel Modifications
	Rouge Oxbow Phase 3
Main 1-2	Henry Ford Estate Dam Fish Passageway
	Tamarack Creek Stream and Wetland Restoration
	LTU Wetland Restoration
	Fire Fighters Park Sprague Stream Improvements
Upper	Lola Valley Park Wetlands
	Bell Creek Park Wetlands
	Seeley Creek Restoration
Middle 3	Wallaceville Park Wetland
	Perrin Park Wetlands & Reforestation
	Valley View Park Wetland

Stormwater Management Area	Project Name
	Nankin Lake Restoration
	Riverview Park Wetlands
	Sherwood Park Wetland
Middle 1	Wilcox Lake Habitat Improvements
	Phoenix Lake Habitat Improvements
	Johnson Creek Fish Hatchery Park Habitat
Lower 2	Inkster Park Wetlands & Fish Habitat Structures
	Venoy Wetlands & Fish Habitat Structures
	Colonial Park Wetland & Reforestation
	Lower Rouge River Habitat Restoration
Various	Grow Zones Retrofits

Survey Background and Participation

Friends of the Rouge began training volunteers to survey Rouge River wetlands for calling frogs and toads in 1998. The survey was designed to speak specifically to habitat-related goals stated in the 1994 Rouge River Remedial Action Plan Update. These goals included inventorying all plant and animal species, developing a protection plan for endangered and threatened species; inventorying and assessing wetlands, providing recommendations to local decision makers, and creating a habitat map.

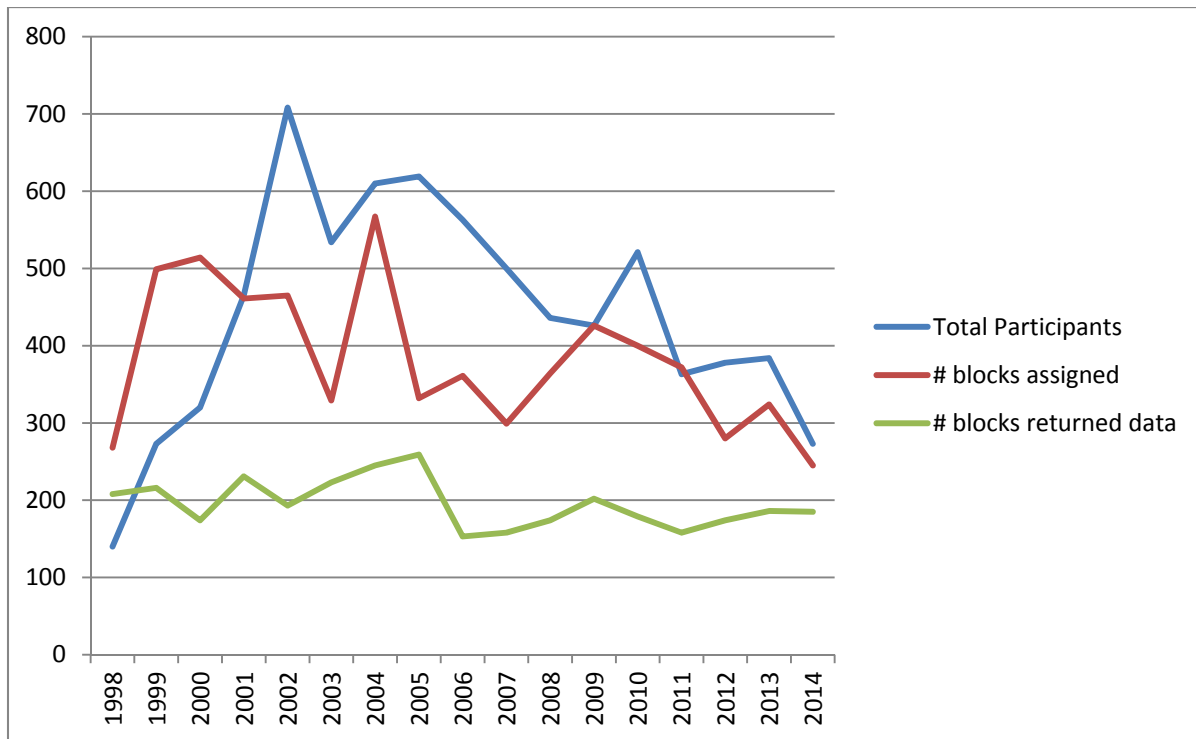
Table 2. Survey Participation

year	workshop attendance	Total Participants	# blocks surveyed
1998	140	140	208
1999	366	273	216
2000	200	320	174
2001	347	465	231
2002	448	708	193
2003	215	534	223
2004	357	610	245
2005	339	619	259
2006	289	563	153
2007	240	500	158
2008	225	436	174
2009	334	426	202
2010	348	521	179
2011	200	363	158
2012	253	378	174
2013	213	384	186
2014	149	273	185

The survey began as a pilot project focused on one subwatershed (Middle 1) and on the four early calling species (wood frogs, western chorus frogs, spring peepers and American toads). Volunteers were assigned quarter square mile section blocks to survey. Surveys were conducted from late February through the end of July. In 1998, volunteers and survey organizers collected data for 208 blocks. Some of the surveying was done by the consulting firm that was tasked with organizing the survey and they surveyed for all species. The second year, the survey was expanded to include an additional subwatershed (Lower 1) and all species. In 2000, the survey was opened up to volunteers throughout the watershed to survey for all species.

An average of 442 volunteers participated each year from 1998-2014, collecting data for an average of 195 survey blocks (Table 2). The amount of data received did not necessarily increase as more volunteers were trained (Chart 1). Coverage varied depending on volunteer interest. Out of 1,479 possible blocks within the watershed, data was collected for 993 blocks over the 17 year period.

Chart 1: Survey Participation vs. Data Received



Sixty of the blocks had only casual observations and 30 blocks had no species calling. Species were heard in 903 blocks. Eight species were positively identified as present in the watershed. These were:

- Wood frogs (*Rana sylvatica*),
- Western chorus frogs (*Pseudacris triseriata*),
- Northern spring peepers (*Pseudacris crucifer*),
- American toads (*Bufo americanus*),
- Northern leopard frogs (*Rana pipiens*),
- Eastern gray treefrogs (*Hyla versicolor*),
- Green frogs (*Rana clamitans*), and
- Bullfrogs (*Rana catesbeiana*).

Volunteers were not asked to distinguish between the closely related eastern gray treefrog and Cope's gray treefrog as the calls can sound identical in certain weather conditions. Fowler's toads and

Blanchard’s cricket frogs were never positively identified and are assumed to not be present in the watershed. The Blanchard’s cricket frog is the only listed species of frog or toad in Michigan (special concern); however, they were never heard over the 17 years. Therefore no listed species are assumed to be present in the watershed. Pickerel frogs were reported but never confirmed.

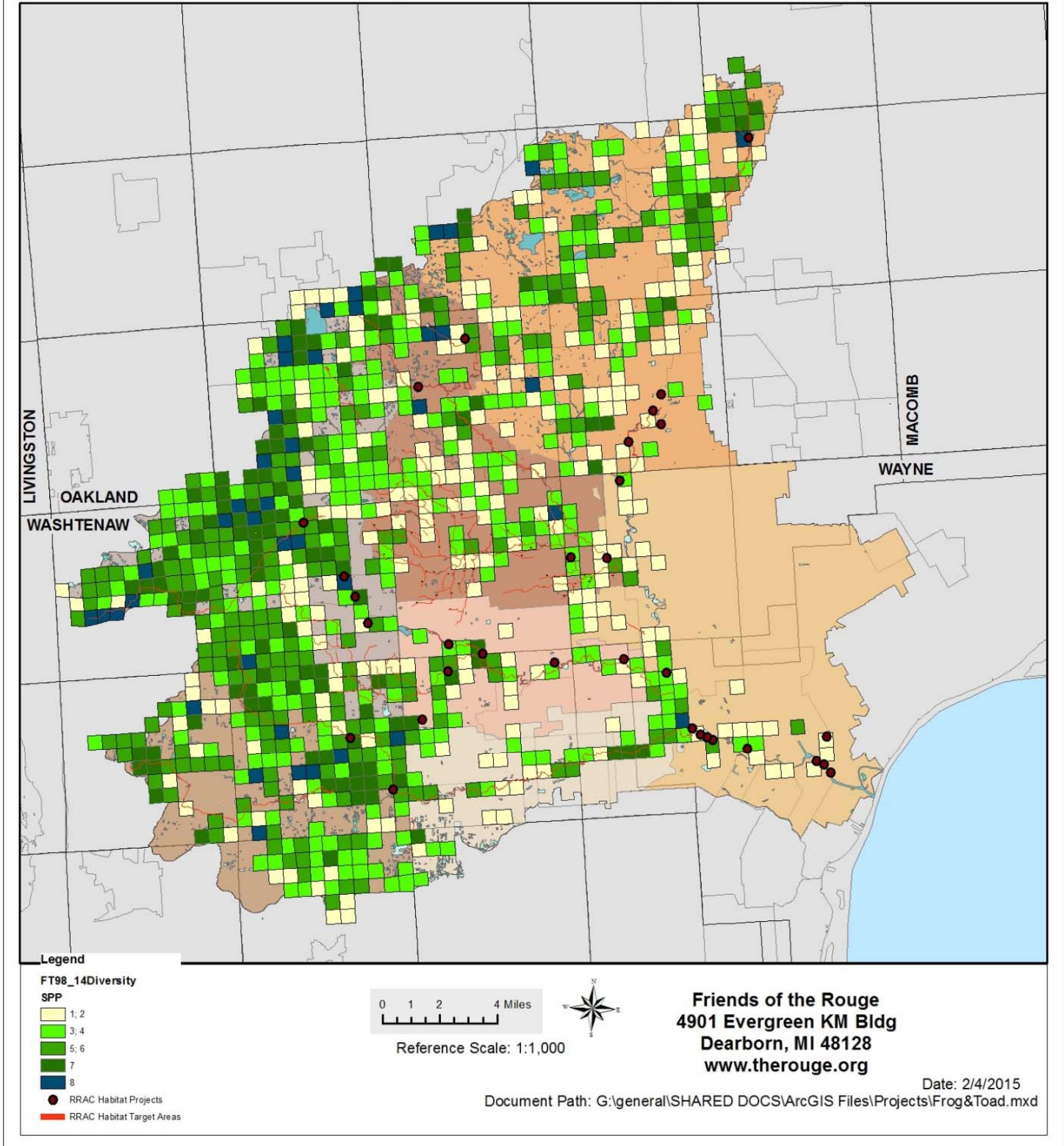
The Middle 1 and Lower 1 subwatersheds had the highest average number of species heard per block followed by Main 1-2. Main 3-4 had the lowest average number of species heard per block (See Table 3 and Map 1). American toads were the most common species heard across the watershed and bullfrogs and leopard frogs were the least commonly heard.

Table 3: Frog and Toad Survey Data by Subwatershed

Sub watershed	Blocks surveyed	possible blocks	average species per block	Percent of Time Identified over Project Period							
				western chorus frogs	wood frogs	spring peepers	American toads	northern leopard frogs	gray treefrogs	green frogs	bullfrogs
Middle1	265	326	5	87%	59%	89%	84%	29%	62%	57%	14%
Lower1	158	245	5	92%	43%	76%	83%	32%	75%	54%	16%
Main 1-2	186	411	4	45%	30%	63%	85%	18%	44%	68%	24%
Upper	126	254	3	45%	29%	60%	87%	13%	34%	42%	14%
Lower 2	43	131	3	74%	26%	49%	93%	19%	37%	37%	21%
Middle 3	43	131	3	56%	37%	53%	70%	7%	47%	42%	16%
Main 3-4	42	369	2	43%	14%	36%	76%	12%	12%	29%	21%
ALL	903	1867		70%	41%	71%	84%	23%	52%	53%	17%

Map 1. Rouge Frog and Toad Diversity 1998-2014 (Average Species Identified per Year)

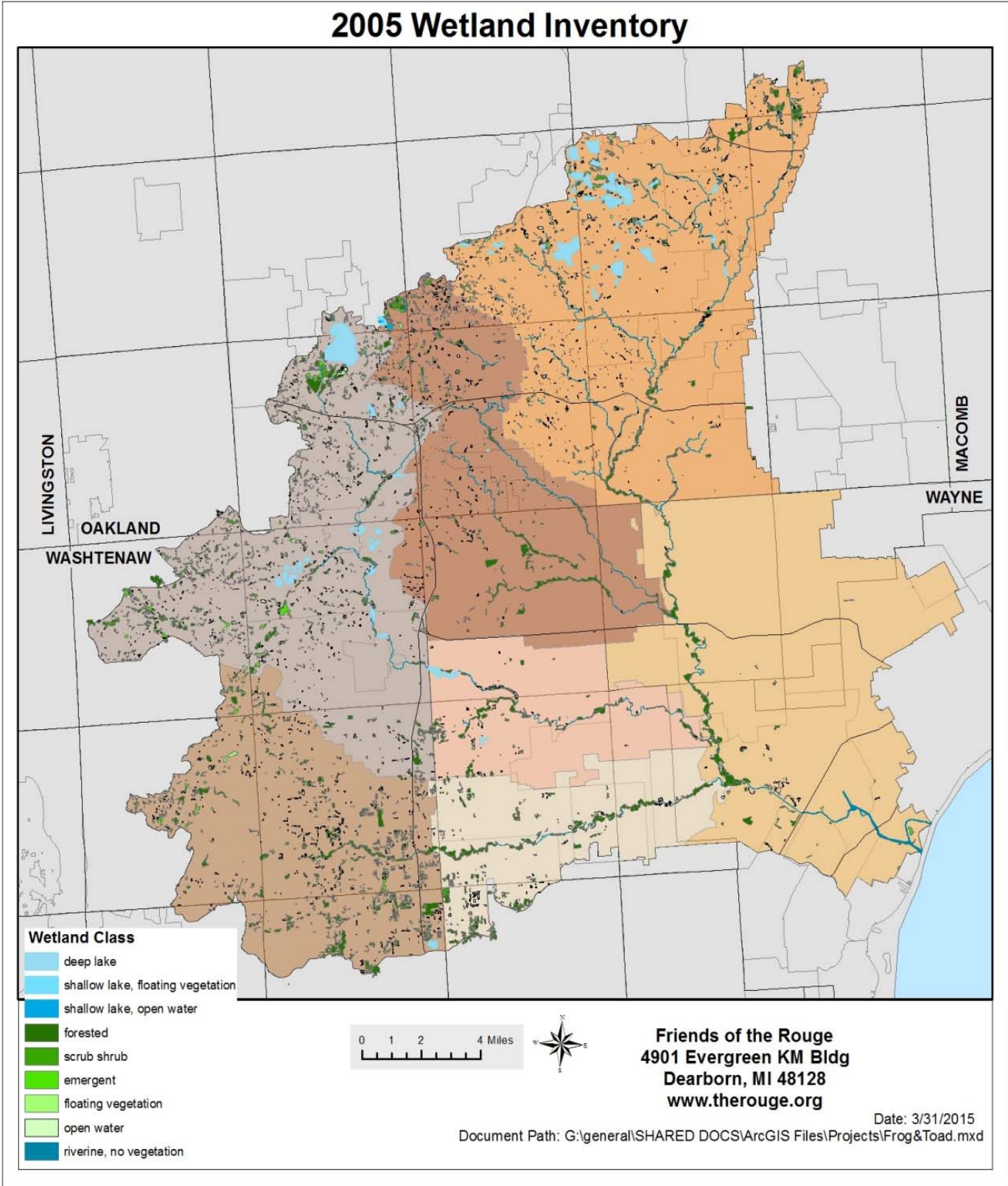
Rouge Frog & Toad Diversity 1998-2014



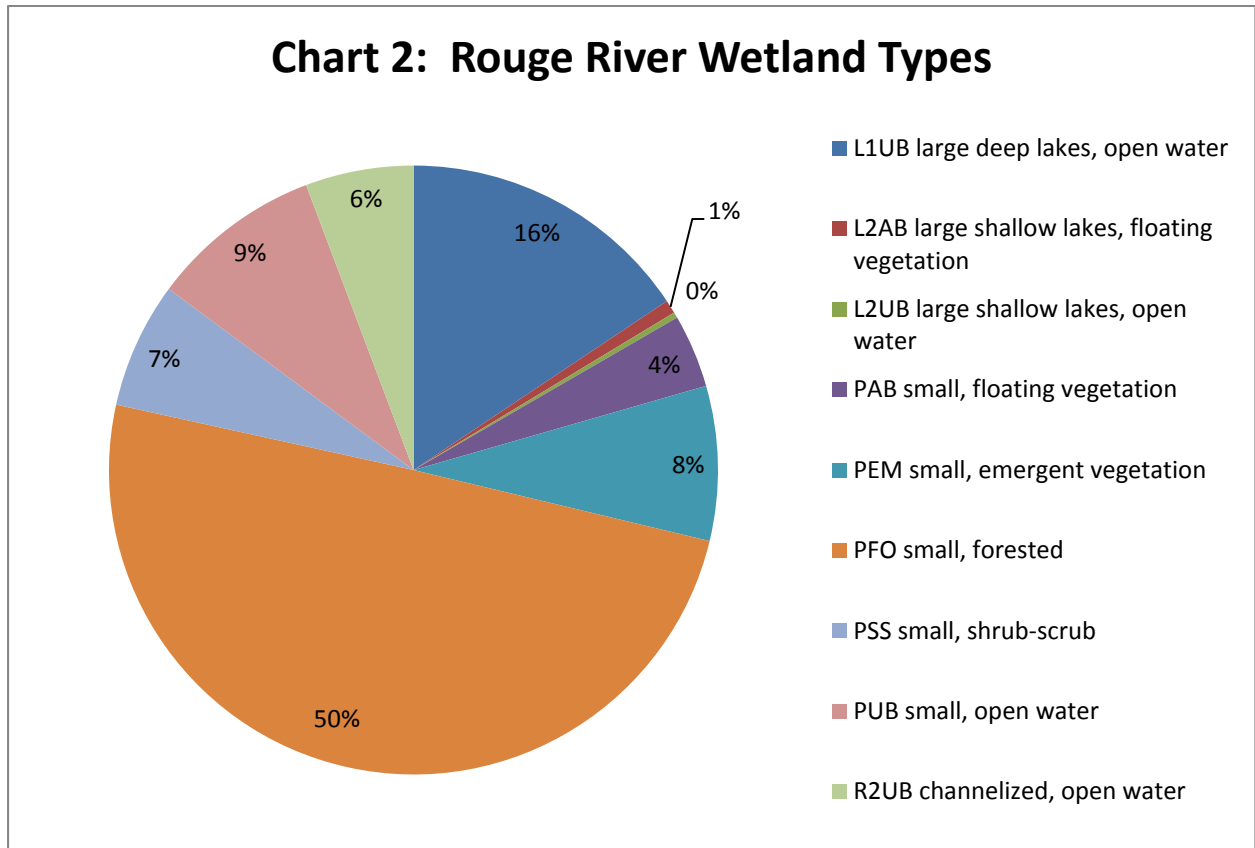
Location of Frogs and Toads in Relationship to Wetlands

In 2004, Friends of the Rouge created a wetlands and woodlands map for the watershed through a project funded by the EPA Great Lakes National Program Office. Using 2005 aerial photos, wetlands and woodlands were digitally outlined and saved in GIS shape files (See Map 2). Wetland types were classified using the National Wetland Classification Codes as described in Appendix A.

Map 2. 2005 Wetland Inventory



The wetland mapping showed the Rouge River watershed to have 6,578 wetlands covering 15,937 acres or 5% of the watershed. Half of the acreage (50%) of wetlands were small forested wetlands (PFO), followed by 16% large deep open lakes (L1UB), 9% small open (PUB), 8% small emergent (PEM), 6% channelized open water (R2UB), 7% small scrub-shrub (PSS), 4% small floating vegetation (PAB), 1% large shallow lake, floating vegetation (L2AB), and <1% large shallow lake with open water (L2UB) (See Chart 2). Most of the lakes are located in Oakland County. South of Eight Mile on the Main Branch there are very few marshes (PEM), scrub shrub (PSS) or small ponds with floating vegetation (PAB).

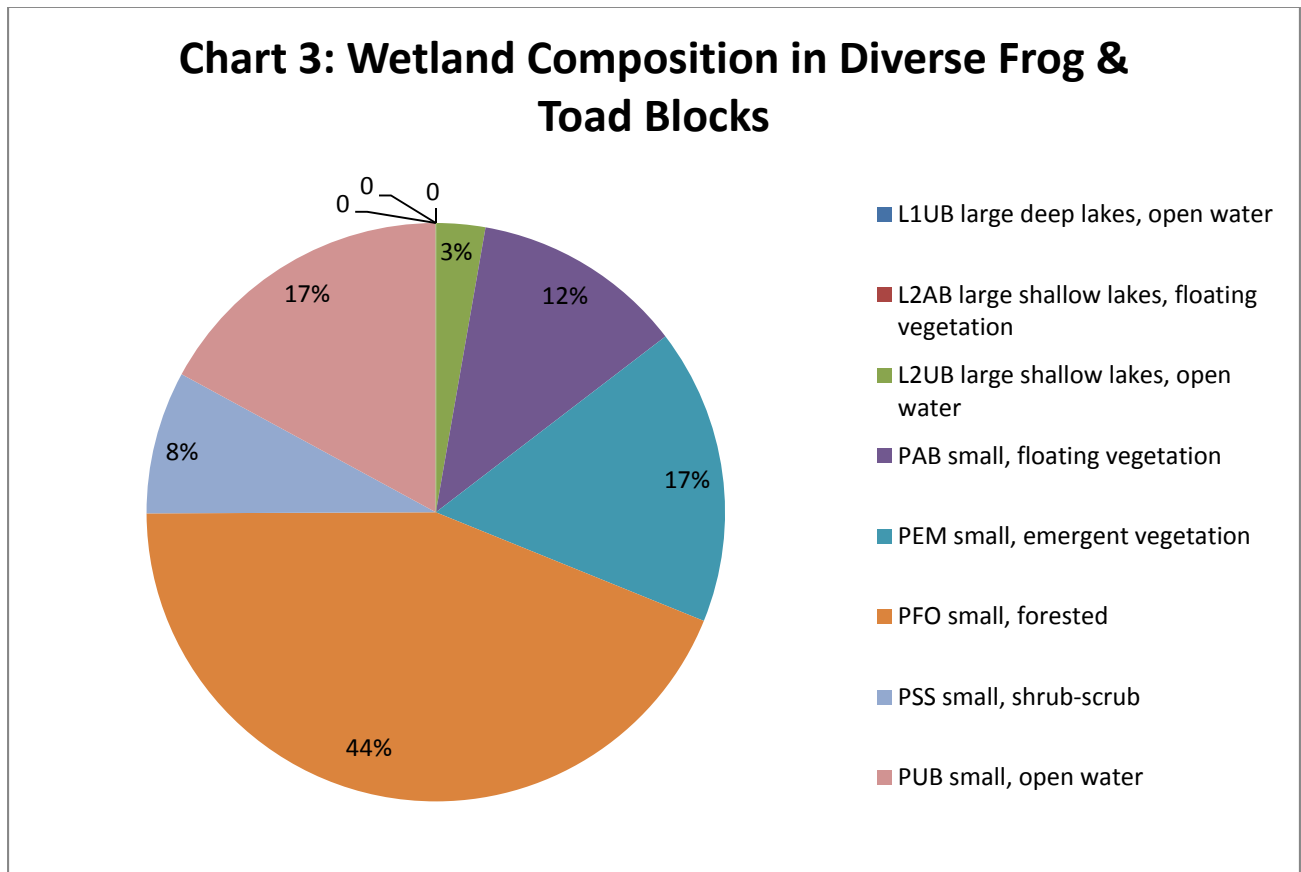


Diverse Blocks

Forty-one of blocks had all eight species present at some time within the 17 year period. Eight species is the maximum diversity for the watershed and areas that can support all eight species are expected to be the healthiest parts of the watershed so these blocks were deemed “diverse.” These 41 diverse blocks were examined for wetland type, adjacent areas with 7-8 species, parkland and whether they were designated for a Habitat Project or were within a Habitat Priority area by the RRAC Habitat Subcommittee. Communities with diverse blocks included: Canton, Commerce, Dearborn, Farmington Hills, Livonia, Northville, Novi, Plymouth, Salem, Superior, Troy, Walled Lake and West Bloomfield. Eight of these areas were within parkland and three had conservation easements. Some of the diverse blocks were adjacent to others and were therefore grouped together as a complex for a total of 28 areas. The largest two complexes were Maybury State Park and Salem Township near Brookville Road and Curtis Road , both having four adjacent diverse blocks. Lakeshore Park at the south end of Walled Lake in Novi

had three diverse blocks. Areas with two adjacent diverse blocks included West Bloomfield Woods Nature Preserve and Woodpecker Lake, Northville High School, Long Park in Commerce Township, Drake and 13 Mile Roads in Farmington Hills and Heritage Park in Canton.

Within the diverse blocks, there were 287 wetlands covering 353 acres. Wetland types contained within these diverse blocks did not include any channelized (R2UB) or large deep lakes (L1UB). There were some large shallow lakes but all had open water (L2UB) and no floating vegetation (L2AB). By acreage, the wetlands associated with the diverse blocks were 44% small forested (PFO), 17% small emergent (PEM), 17% small open (PUB), 12% small floating vegetation (PAB), 8% small scrub-shrub (PSS) and 3% small floating vegetation (PAB) (See Chart 3).



Vacant Blocks

Thirty blocks had no species calling despite being thoroughly surveyed. These “vacant” blocks were also examined for wetland type, adjacent areas with seven species, parkland and whether they were designated for a Habitat Project or were within a Habitat Priority area by the RRAC Habitat Subcommittee. Communities with vacant blocks were Allen Park, Bloomfield Township, Canton Township, Dearborn, Detroit, Farmington, Farmington Hills, Livonia, Plymouth, Rochester Hills, Southfield, Troy and Westland. Four had adjacent vacant blocks and only three had blocks with 7-8 species adjacent. Nine of the vacant blocks were public parks and two were golf courses. They are listed below:

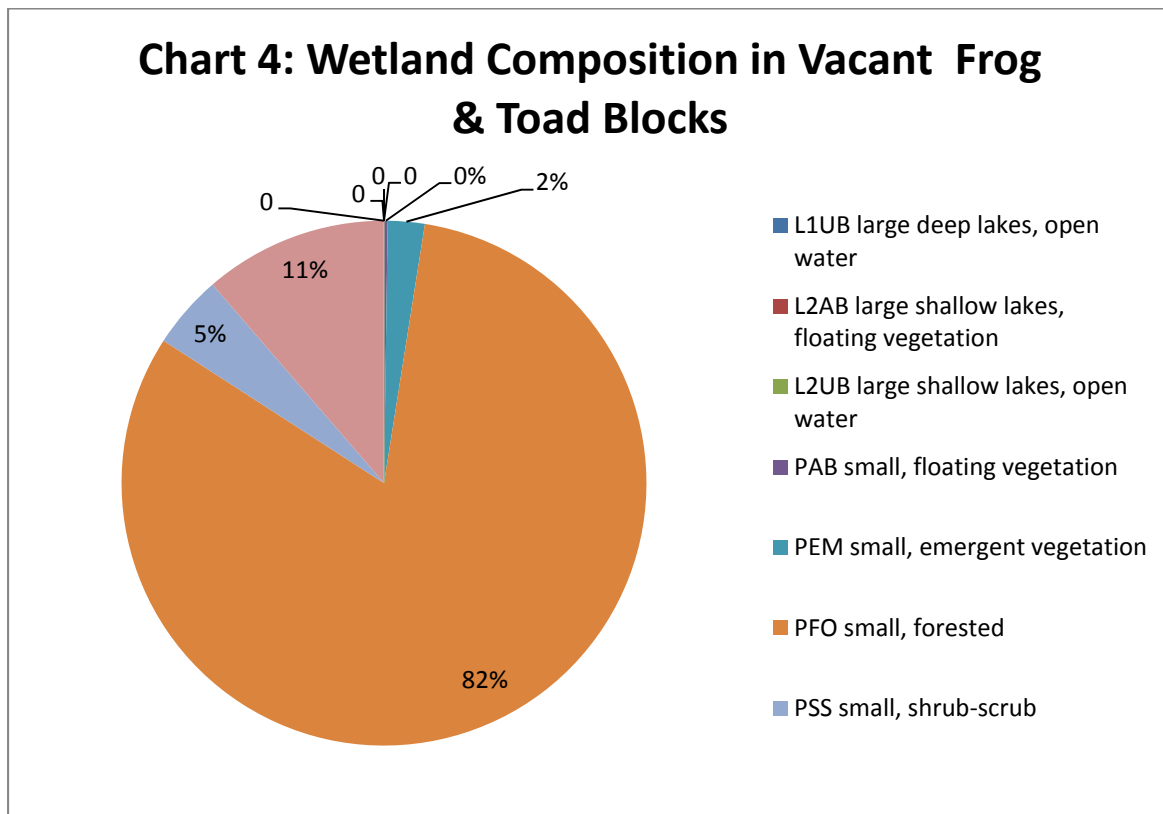
Public Parks

- Code House Park, Southfield
- Seminole Park, Southfield
- Shiawassee Park, Farmington
- Botsford Park, Livonia
- Country Homes Park & Hines Park, Livonia
- Stoepel Park #2, Detroit
- Constance-St Marys Park, Detroit
- Oak Park, Dearborn
- Jaycee Park, Westland

Golf Courses

- Fairways of Copper Creek, Farmington Hills
- Fellows Creek Golf Club, Canton

Within the vacant blocks, there were 74 wetlands covering 88 acres. Wetland types contained within these quiet blocks did not include any lakes (L1UB, L2AB, L2UB) or channelized river (R2UB). By acreage, small forested (PFO) dominated at 82%, followed by 11% small open (PUB), 5% small scrub-shrub (PSS), 2% small emergent (PEM), and <1% small floating vegetation (PAB) (See Chart 4).



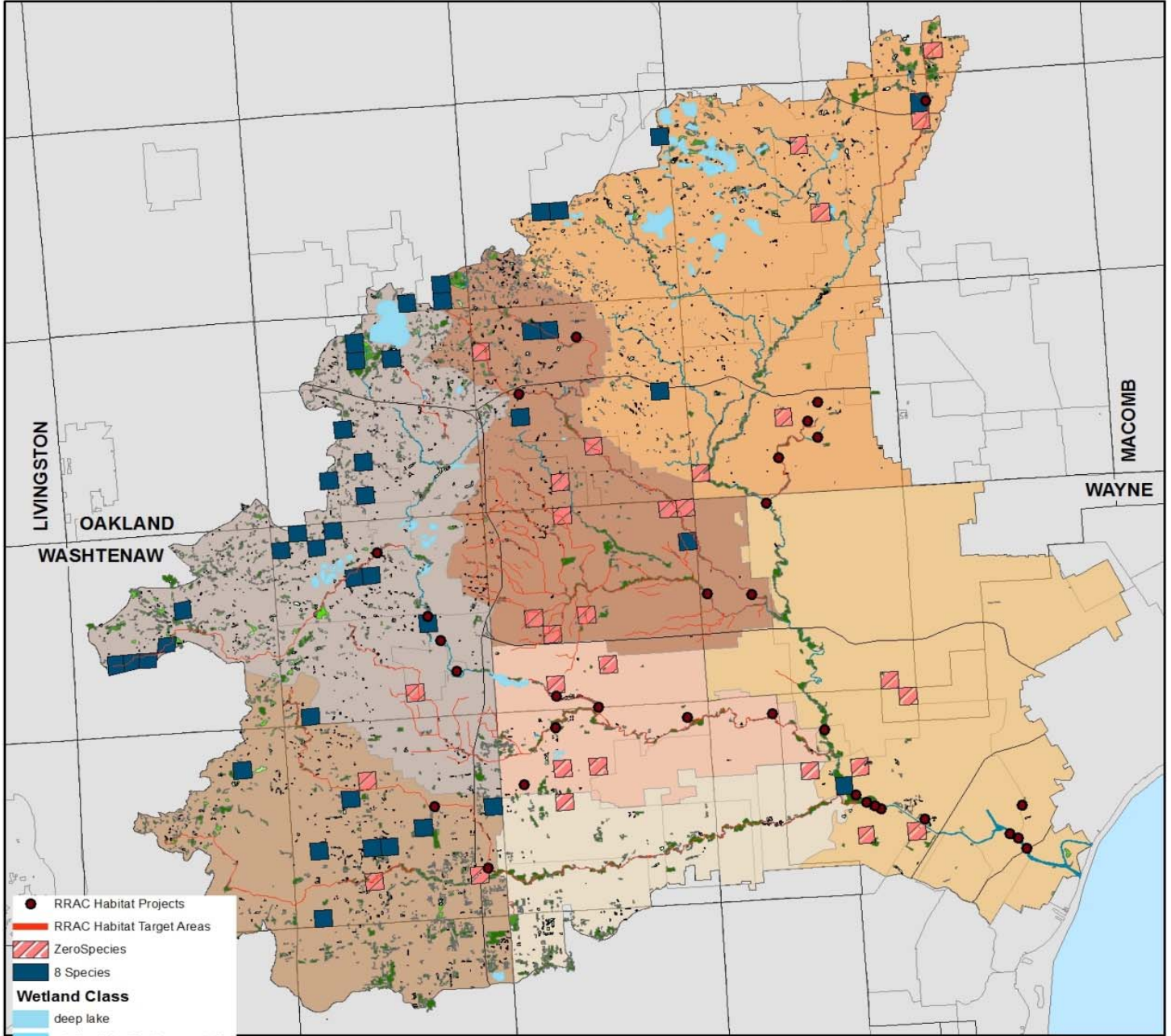
The Diverse Blocks had a greater variety of wetland types than the Vacant Blocks and included more large shallow lakes with open water (L2UB), Aquatic Bed (PAB), Emergent (PEM) and Unconsolidated Bottom (PUB) and fewer Forested wetlands (PFO).

Table 4: Wetland Types vs Blocks

ID	Wetland Types	Surveyed Blocks	Diverse Blocks	Vacant Blocks
L1UB	large deep lakes, open water	16%		
L2AB	large shallow lakes, floating vegetation	1%		
L2UB	large shallow lakes, open water	0%	3%	
PAB	small, floating vegetation	4%	12%	0%
PEM	small, emergent vegetation	8%	17%	2%
PFO	small, forested	50%	44%	82%
PSS	small, shrub-scrub	7%	8%	5%
PUB	small, open water	9%	17%	11%
R2UB	channelized, open water	6%		

Map 3. Diverse and Vacant Blocks and Habitat Project Sites

Diverse and Vacant Blocks and Habitat Projects and Areas



- RRAC Habitat Projects
 - RRAC Habitat Target Areas
 - ▨ ZeroSpecies
 - 8 Species
- Wetland Class**
- deep lake
 - shallow lake, floating vegetation
 - shallow lake, open water
 - forested
 - scrub shrub
 - emergent
 - floating vegetation
 - open water
 - riverine, no vegetation



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 4901 Evergreen KM Bldg
 Dearborn, MI 48128
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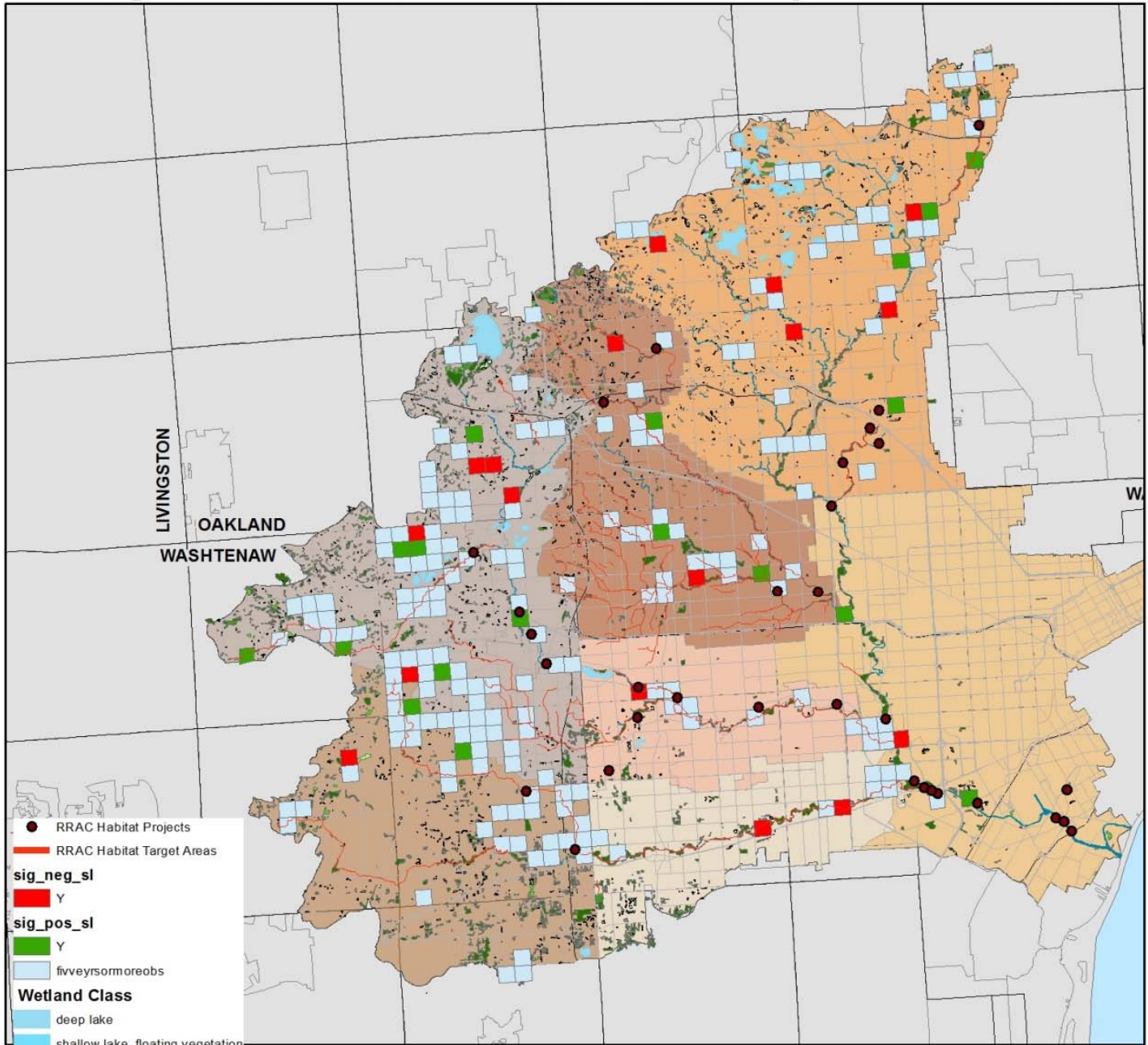
Trends

Survey blocks vary in the years in which data was collected. For this analysis, only blocks with five or more years of data were considered. Two hundred and 23 blocks had five years or more of data but this was reduced to 179 blocks after the data was examined to ensure that each of those blocks were thoroughly surveyed. Thoroughly surveyed was defined as having four or more observations distributed through the survey period including one in March/early April, late April and May/June. These periods were determined by examining first calling dates for all species over the 17 years. As a result of this determination, future surveyors will be asked to make sure to observe within these periods rather than twice a month.

For the 179 blocks, the number of species heard each year was plotted over time and the trends examined for significance. An R squared value of 0.49 or greater was considered significant. Most of the blocks had no significant trend (162), 18 had a significant positive trend and 17 had a significant negative slope indicating increased and decreased frog and toad diversity, respectively (See Map 4). Blocks with significant trends were further analyzed.

Map 4. Blocks with Improving and Declining Frog and Toad Populations

Significant Data Trends and Habitat Projects and Areas



- RRAC Habitat Projects
- RRAC Habitat Target Areas
- sig_neg_sl**
- Y
- sig_pos_sl**
- Y
- fiveyrsormoreobs
- Wetland Class**
- deep lake
- shallow lake, floating vegetation
- shallow lake, open water
- forested
- scrub shrub
- emergent
- floating vegetation
- open water
- riverine, no vegetation



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Subwatershed Analysis

The Rouge River Watershed has four major branches. For management reasons, these were further broken down mainly by political boundaries into seven subwatersheds: Middle 1, Lower 1, Upper, Main 1-2, Middle 3, Lower 2, and Main 3-4. Each of these subwatersheds was analyzed separately.

Middle 1

Middle 1 covers 80 square miles (51,589 acres) at the upstream portion of the Middle Branch and comprises 17% of the watershed (Rouge River Watershed Management Plan, 2012). It includes the 670 acre Walled Lake and its drainage; Johnson Creek, the only cold water tributary to the Rouge; and several impoundments along the Middle Branch (See Map 5). It has the only state park (Maybury), the developed and growing communities of Novi, Northville and Plymouth and a large landfill in the less developed Salem Township. Between 1991 and 2002, 16% of the green space was lost to impervious surface. In 2002, green space comprised 47% of the watershed, urban 51% and water 2%. Wetlands cover 4429 acres or 9% of the area, the highest percentage of wetlands for any subwatershed (See Map 6).

Middle 1 has some of the best water quality in the watershed. It supports numerous sensitive benthic macroinvertebrates with Stream Quality Index (SQI) Scores averaging in the Good range (33) (Friends of the Rouge data). The highest SQI in the watershed (63) was found in the Middle 1 as well as the highest number of taxa (31) found at a site. Stoneflies, a very sensitive order of insects, are regularly found in the Johnson Creek and downstream in the Middle Branch. Occasionally stoneflies have been found in the headwaters of the Tonquish Creek. In 2012, a fish seine survey of the Johnson Creek was done by University of Michigan-Dearborn student Robert Muller and FOTR volunteers and staff. They identified 23 species of fish in the Johnson Creek including the endangered redbelly dace (*Clinostomus elongatus*), mottled sculpins (*Cottus bairdi*), rainbow darters (*Etheostoma caeruleum*), and northern redbelly dace (*Phoxinus eos*). The sensitive least darter (*Etheostoma microperca*) was recently found at only one site in the watershed on the Tonquish Creek (Friends of the Rouge data).

Middle 1 was the only subwatershed surveyed the first year of the Frog & Toad Survey in 1998 and therefore has the most historical data and the best coverage. Data was collected for 265 of 326 possible blocks or 81%. An average of five species was heard per block. All eight species were heard in 28 blocks or 11% of surveyed blocks (See Map 7). All species but bullfrogs were heard in a higher percentage of blocks as compared to the whole watershed. For blocks with five or more years of data, seven showed an increasing trend and four showed a decline. One block had zero species in downtown Plymouth. Northern leopard frogs were more common in the Middle 1 where they were heard in 29% of blocks. Northern leopard frogs are one of the least common species in the watershed.

Areas of frog and toad diversity in the Middle 1 include: Walled Lake and associated wetlands, Johnson Creek in Salem Township and near 6 Mile and Beck Rd, Maybury State Park, Novi between Beck and Taft

and 11 and 9 Mile Roads, and Phoenix Lake. The developed areas of the subwatershed had the lowest diversity including one block with no frogs or toads calling in Plymouth Township.

Overlaying the frog and toad data with the benthic macroinvertebrate SQI showed similar very diverse areas and low diversity areas. The only poor macroinvertebrate SQI was found just downstream of the only frog and toad block with no species calling. The only excellent SQI was in Maybury State Park. This park had four blocks where all eight frog and toad species were heard.

Middle 1 Habitat Projects and Target Areas

Johnson Creek Fish Hatchery Park Habitat – The block that contains Fish Hatchery Park (T1S R8E 9 1) was surveyed from 2001-2014. In 2001-2004-six species were heard, in 2005-four, 2007-six, 2008-five, 2009-2014-six. Bullfrogs and leopard frogs were the two species not heard. Wood frogs were only occasionally heard and were last heard in 2007.

Phoenix Lake Habitat Improvements – The block that contains Phoenix Lake (T1S R8E 232) was surveyed in 2003, 2006, 2008, and 2011-2014. In 2003, two species were heard, 2006-one, 2008-one, 2011-one, 2012-five, 2013-three, 2014-four. All eight species have been heard at one time at this site but never all in one year.

Wilcox Lake Habitat Improvements – The block that contains Wilcox Lake (T1S R8E 234) was surveyed in 2004 and 2011-2013. In 2004-two species were heard, in 2011-two, 2012-five, 2013-four, 2014-one. Seven species have been heard at one time at this site but never all in one year.

Additional Suggested Target Areas

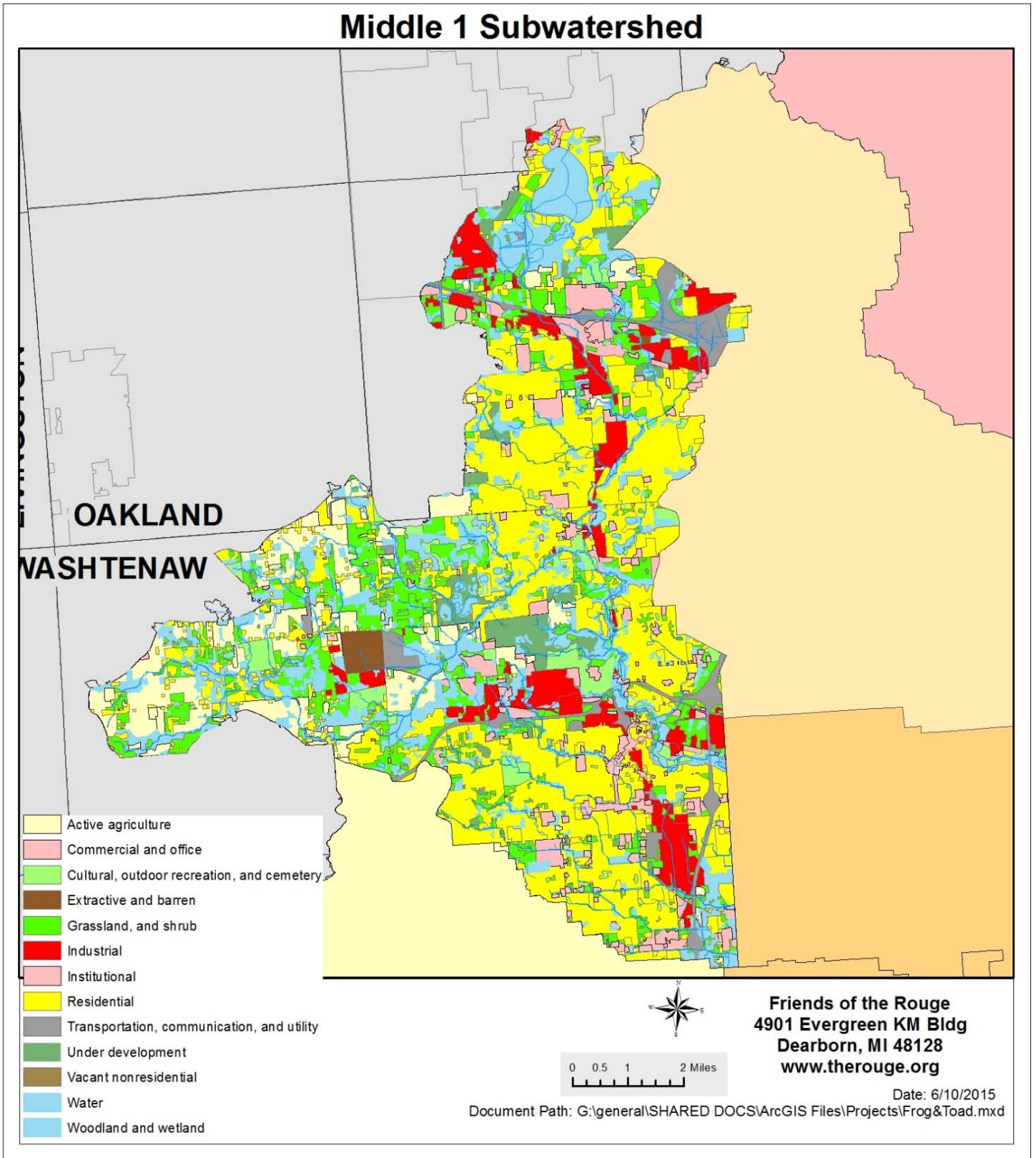
Upper portion of the Johnson Creek - This area has some of the largest diversity of frogs and toads in the watershed, in blocks along the creek as well as in adjacent surrounding land, especially near tributaries. Targeting this area for preservation of wetlands and open space would help to retain frog and toad diversity and prevent increased flashiness of an already flashy creek.

Bishop Creek - Frog and toad diversity is medium along this creek. All of the Walled Lake tributaries have medium diversity. No project was chosen for this area but it would benefit from improved and increased wetlands. Much of the land is already developed.

Tonquish Creek –The north branch of Tonquish Creek has a low diversity of frogs and toads. The only block in the Middle1 where no species were heard was along the Tonquish Creek. No project was chosen for this area but it would benefit from improved and increased wetlands. Much of the land is already developed.

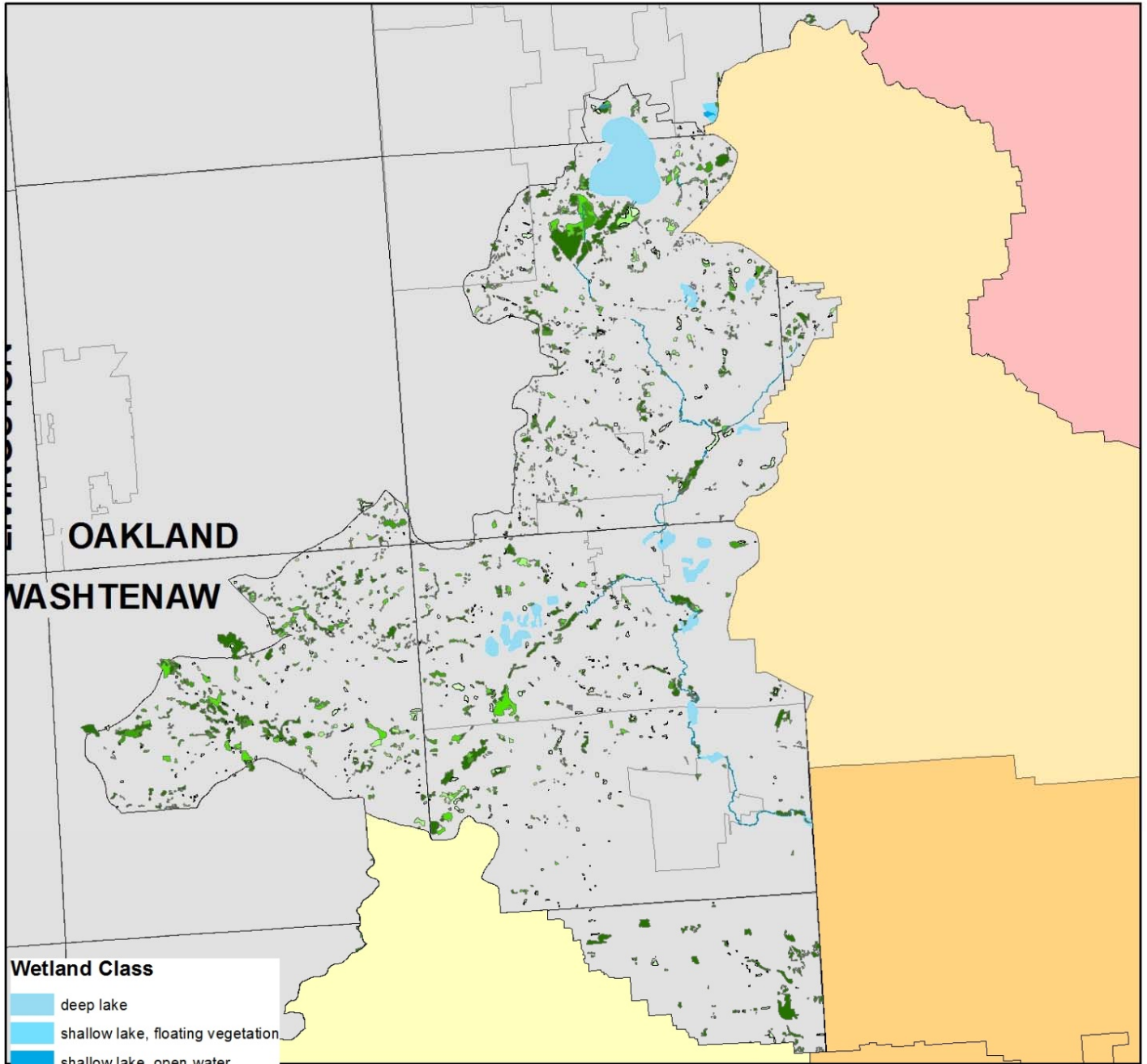
Two additional areas that show a diversity of frogs and toads are the wetlands around Walled Lake and the wetlands near Novi High School. Other areas with low diversity are the city centers. With the rapidly changing land use in the Middle 1 (16%), retaining the existing habitat is critical. Wetlands are particularly critical because they help improve water quality downstream.

Map 5. Middle 1 Land Use

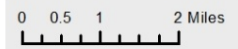


Map 6. Middle 1 Wetlands

Middle 1 Subwatershed



- Wetland Class**
- deep lake
 - shallow lake, floating vegetation
 - shallow lake, open water
 - forested
 - scrub shrub
 - emergent
 - floating vegetation
 - open water
 - riverine, no vegetation



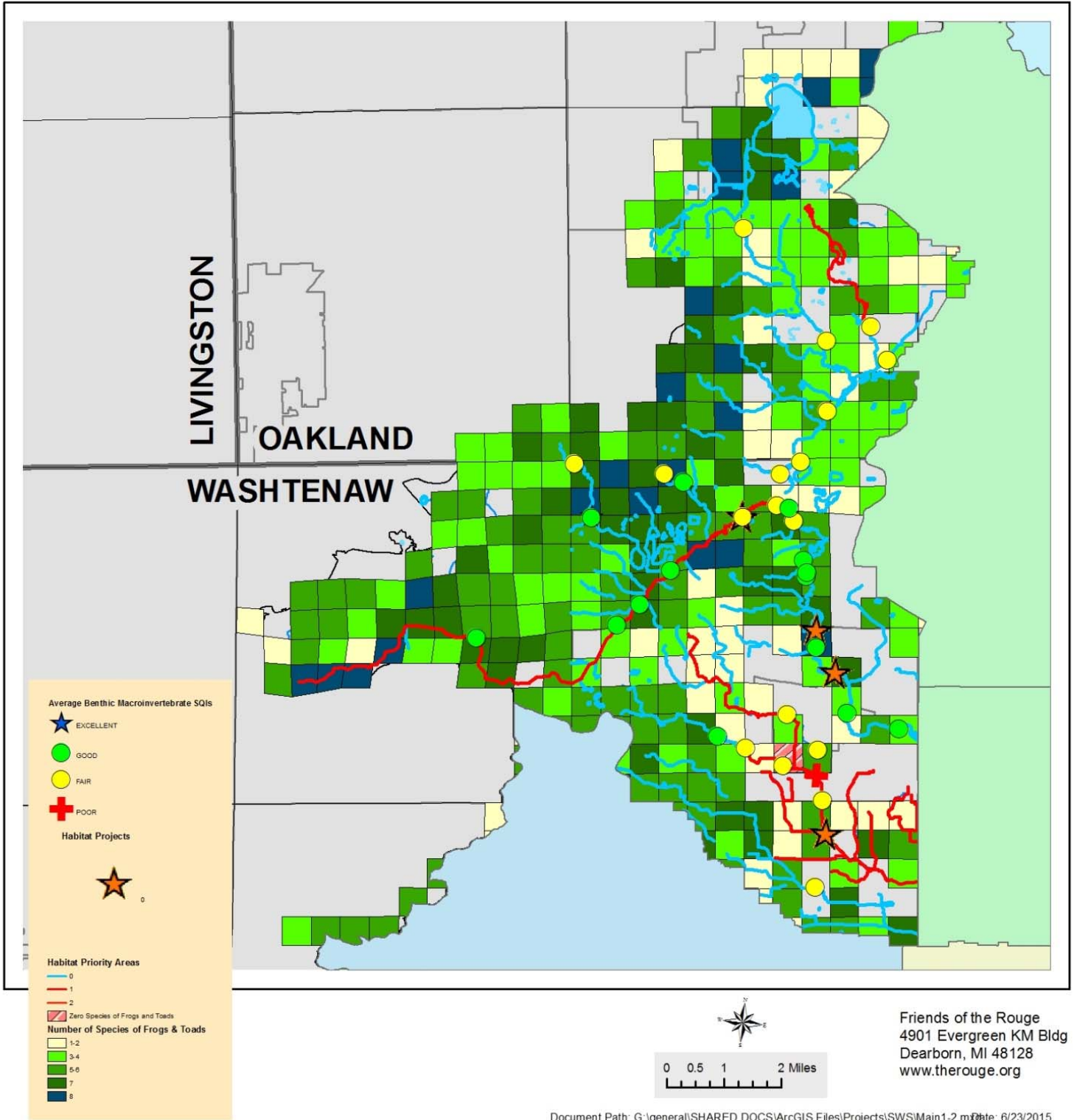
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Map 7. Middle 1 Frog and Toad Results

Middle 1 Subwatershed



Lower 1

The Lower 1 subwatershed covers 62 square miles (39,785 acres) or 13% of the watershed (See Map 8). Fellows and Fowler Creek are its two major tributaries. It includes an airport (Willow Run) and several landfills. Similar to the Middle 1, green space declined by 16% between 1991 and 2002, while impervious surface increased by 17%. Open space made up 10% of the loss of green space and trees 6%. In 2002, green space comprised 58% and urban 36%. Wetlands cover 2406 acres or 6% of the area (See Map 9).

Lower 1 has fairly good water quality. Benthic macroinvertebrate SQIs average in the high Fair range (31) (Friends of the Rouge data). Stoneflies are found in large number in the headwaters of Fowler Creek and in the upper portion of Fellows Creek. In 2014, 28 native species of fish were found in the Lower 1. Mottled sculpins were only found in Fellows Creek (Friends of the Rouge data). The round goby (*Neogobius melanostomus*), a non-native invasive fish is moving up the Lower Rouge.

Lower 1 was added to the Frog & Toad Survey the second year in 1990 and is therefore the second most surveyed subwatershed. Sixty-five percent of the blocks or 158 of 245 blocks were surveyed. There were several large data gaps in Superior Township that would increase the understanding if covered next year. An average of five species was heard per block (See Map 10). All eight species were heard in eight blocks or 3%. Three blocks had no species calling. Sensitive leopard frogs were calling in 32% of all blocks.

Areas of diversity included Heritage Park and the headwaters of Fellows Creek and the Lower branch. Areas with less diversity include the I-275 corridor and areas near the airport.

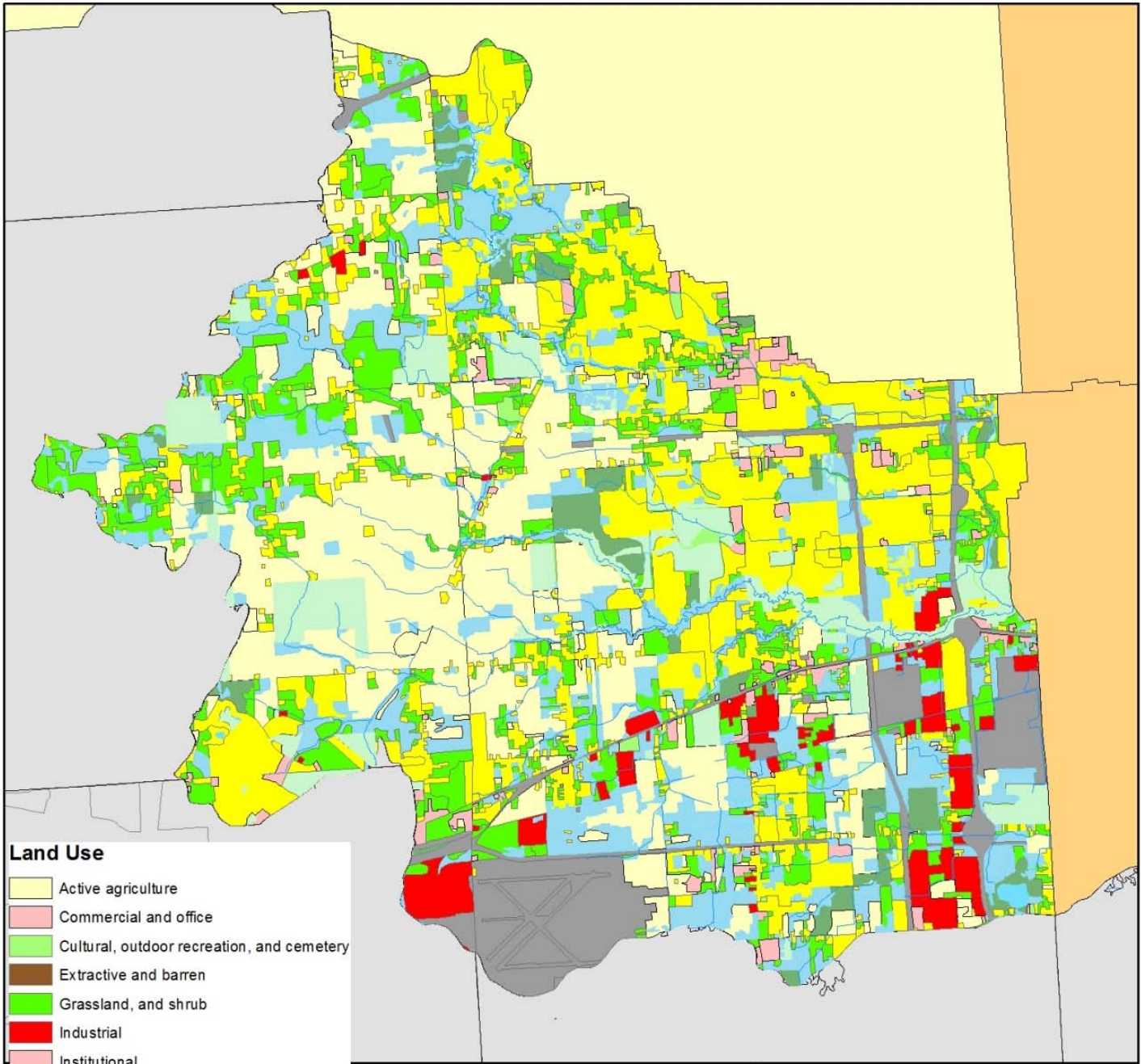
Overlaying the frog and toad data with the benthic macroinvertebrate scores showed some correlation. There were no excellent or poor SQIs. The good SQIs were in areas with diverse frog and toads. Several fair SQIs were located in the same location where no frogs or toads were heard at Beck Road and Geddes. This is where the Ypsilanti Waste Water Treatment Plant discharges into the Lower Rouge.

Lower 1 Habitat Projects and Target Areas

There are no habitat projects selected for the Lower 1 subwatershed. The target areas include Fellows and Fowler Creeks. No specific areas stand out from the frog and toad data. With the rapidly changing land use in the Lower 1 (17%), retaining existing habitat is critical. Wetlands are particularly critical because they help improve water quality downstream.

Map 8. Lower 1 Land Use

Lower 1 Subwatershed



Land Use

- Active agriculture
- Commercial and office
- Cultural, outdoor recreation, and cemetery
- Extractive and barren
- Grassland, and shrub
- Industrial
- Institutional
- Residential
- Transportation, communication, and utility
- Under development
- Vacant nonresidential
- Water
- Woodland and wetland



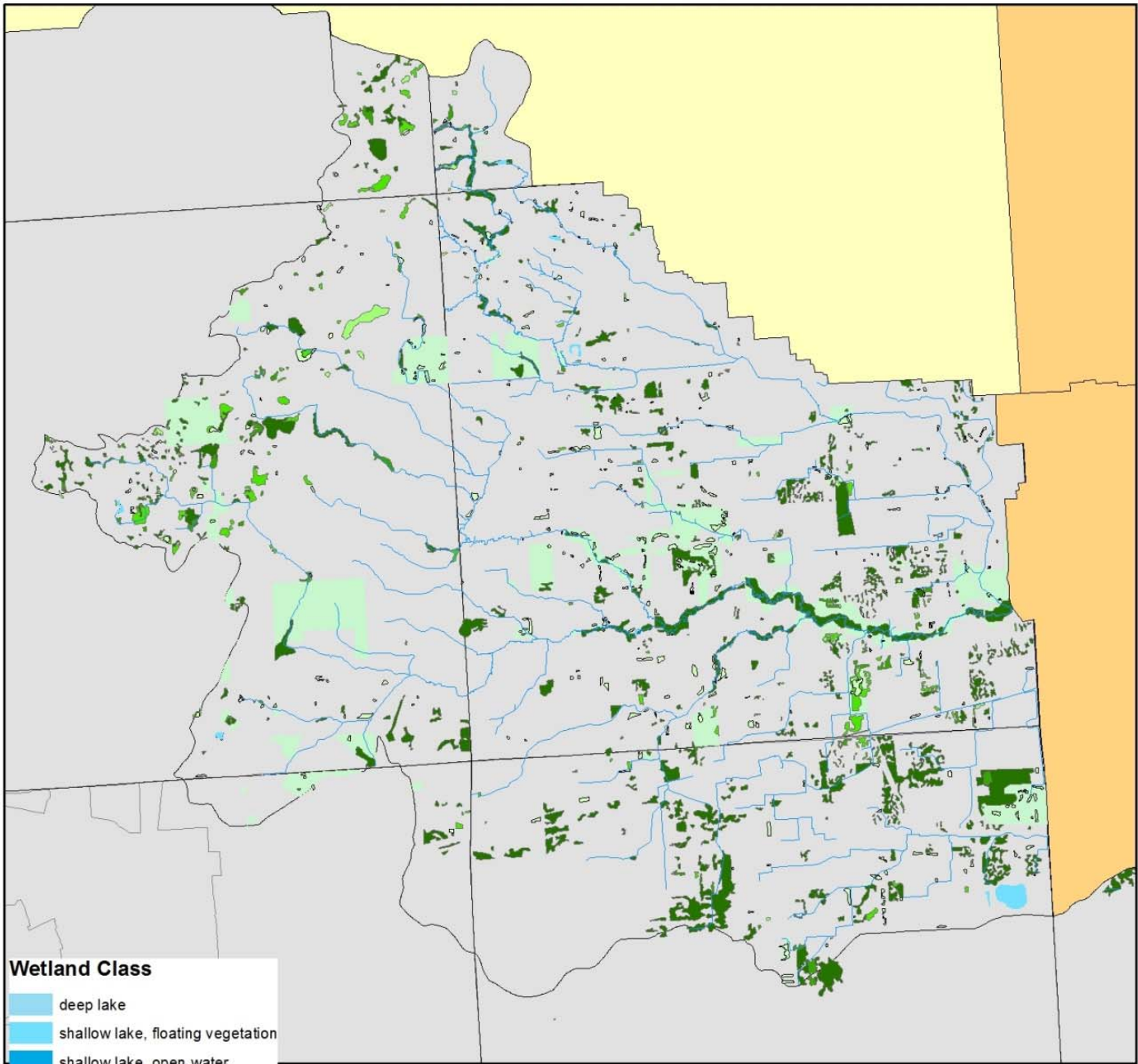
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Map 9. Lower 1 Wetlands

Lower 1 Subwatershed



Wetland Class

- deep lake
- shallow lake, floating vegetation
- shallow lake, open water
- forested
- scrub shrub
- emergent
- floating vegetation
- open water
- riverine, no vegetation



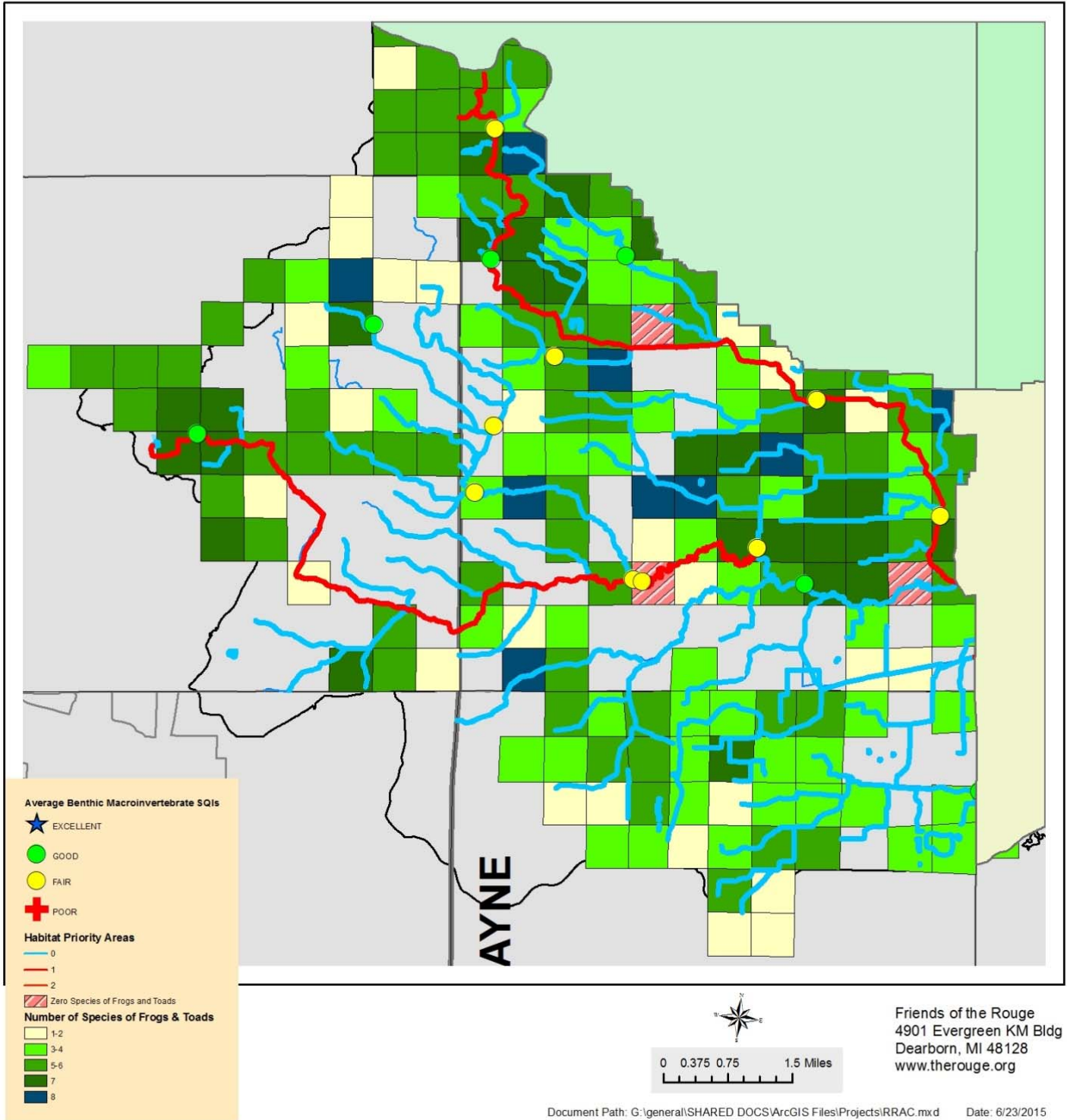
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Map 10. Lower 1 Frog and Toad Results

Lower 1 Subwatershed



Main 1-2

Main 1-2 is the upper portion of the Main Branch in Oakland County, north of Eight Mile or Baseline Road. The Main 1-2 drains 102 square miles of land (65,879 acres) or 22% of the watershed (See Map 11). It includes the tributaries Evans, Pebble and Franklin Creeks. The largest land use in 2002 was medium density residential at 63%. Open space declined from 21% to 12% between 1991-2002 while impervious surfaces increased from 34% to 45%. CSOs are mainly found in the Birmingham-Bloomfield area and have been controlled with basins since the late 1990s. Wetlands cover 3,696 acres or 6% of the subwatershed (See Map 12).

Main 1-2 has a large region of lakes on the northwest side. Benthic macroinvertebrate scores average in the Fair range (29). No stoneflies have been documented in this subwatershed. Sprague Creek at the Lloyd Stage Nature Center in Troy has an excellent diversity of insects including sensitive clubtail dragonfly larvae. Native mussels are the most prevalent in this subwatershed with four species found at Firefighters Park in Troy and no known invasive mussels or clams yet present. The sensitive tiny catfish called the stonecat (*Noturus flavus*) has been found in Firefighters Park. One area of very low diversity is Evans Creek in Southfield. This stream has very few benthic macroinvertebrates and FOTR has recently added sites on this creek.

Data was received for 192 of the 411 blocks or 47%. An average of four species was heard per block (See Map 13). Five blocks (3%) had all eight species calling while six (3%) had no species calling. Green frogs and bullfrogs were more prevalent in this subwatershed due to the large and deep lakes. Five blocks showed decreasing trends while four showed an increase. Leopard frogs were heard in 18% of blocks. There are significant gaps in the data especially in Bloomfield Township. Because there are no public parks in this township, other strategies such as targeting homeowner associations could be tried.

Areas of diversity include West Bloomfield Woods Nature Preserve in West Bloomfield, Upper Long Lake in Bloomfield Township, Firefighters Park in Troy, and Mercy High School area in Farmington Hills. Less diverse areas include the Main Branch in Birmingham and Southfield around the Civic Center.

Overlaying the benthic macroinvertebrate scores on the frog and toad data confirmed the diversity in the area near the Stage Nature Center. The rest of the scores were Fair.

Main 1-2 Habitat Projects and Target Areas

LTU Wetland Restoration – No surveys were done at the block that LTU is within (T1N R10E223). The block directly west was surveyed completely in 2001 but no frogs or toads were heard. Additional baseline surveys are needed.

Tamarack Creek Stream and Wetland Restoration – No surveys were done at the block that this project is within (T1N R10E271). A block directly west (T1N R10E271) was surveyed in 2002 and only chorus frogs were heard. Additional baseline surveys are needed.

Firefighter's Park – The block that contains Firefighter's Park had all eight species calling.

Additional Suggested Target Areas

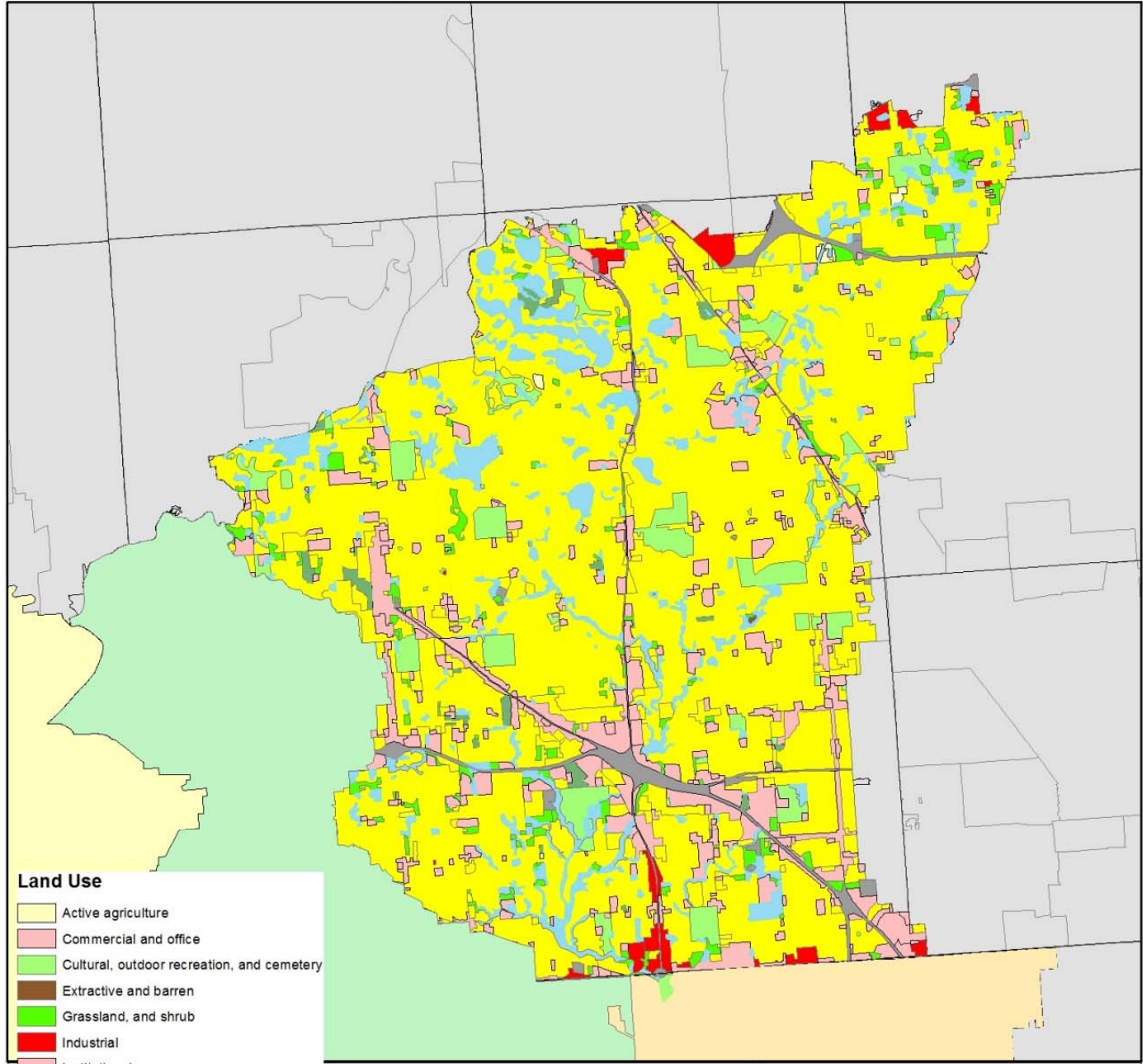
Evans Branch – The few survey blocks along this creek had few species. Additional surveys need to be done.

Main Branch in Troy – The block directly south of Firefighters Park had no species despite the diversity north. This area would benefit from a project to improve wetlands.

Main Branch in Birmingham – The Main Rouge within the City of Birmingham has only 1-2 species calling in three adjacent blocks. Amphibians would benefit from additional wetland habitat in this area.

Map 11. Main 1-2 Land Use

Main 1-2 Subwatershed



Land Use

-  Active agriculture
-  Commercial and office
-  Cultural, outdoor recreation, and cemetery
-  Extractive and barren
-  Grassland, and shrub
-  Industrial
-  Institutional
-  Residential
-  Transportation, communication, and utility
-  Under development
-  Vacant nonresidential
-  Water
-  Woodland and wetland



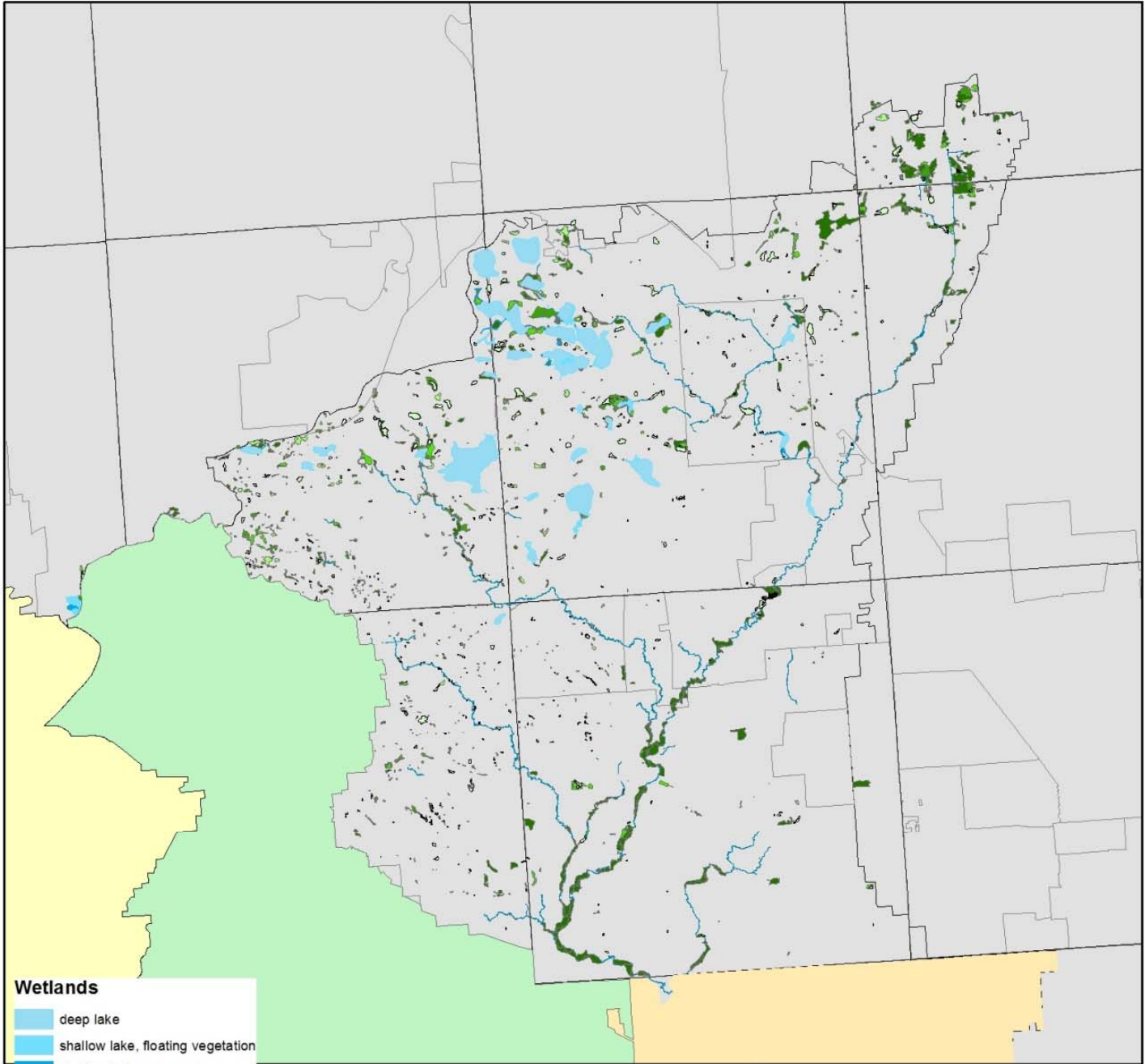
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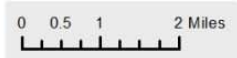
Map 12. Main 1-2 Wetlands

Main 1-2 Subwatershed



Wetlands

-  deep lake
-  shallow lake, floating vegetation
-  shallow lake, open water
-  forested
-  scrub shrub
-  emergent
-  floating vegetation
-  open water
-  riverine, no vegetation



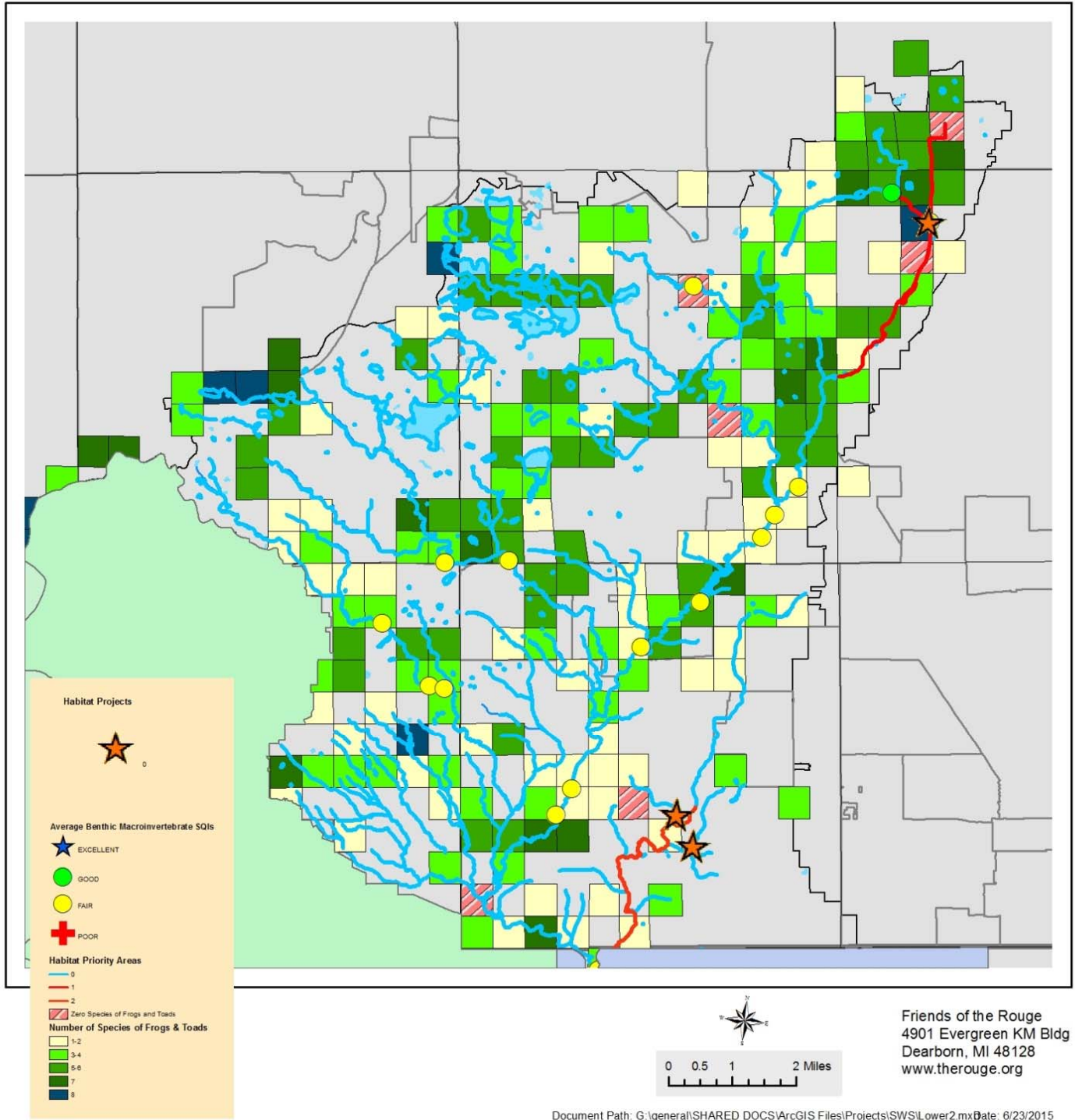
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Map 13. Main 1-2 Frog and Toad Results

Main 1-2 Subwatershed



Upper

The Upper subwatershed covers 63 square miles (40,768 acres) and 14% of the watershed (See Map 14). It is unique in having a stream gradient averaging 21 feet per mile in contrast to most of the rest of the watershed at five feet per mile. Between 1991 and 2002, green space declined by 15% and was replaced by impervious surfaces 15%. In 2002, green space covered 36% of the area and 62% was impervious. Wetlands cover 1,635 acres which is 4% of the area (See Map 15).

Benthic macroinvertebrate SQIs average in the Fair Range (25). Stoneflies are very seldom found in the area with three sites where they were found once despite repeated searches. Two tributaries, Seeley Creek and Minnow Pond Creek, are home to the redbreast dace, an endangered minnow. In 2012, fish surveys documented 20 native species including sensitive mottled sculpins, rainbow darters and a mimic shiner. Nine redbreast dace were found.

Data was received for 126 of 254 potential blocks or 50%. An average of three species was heard per block (See Map 16). All eight species were heard in six blocks (2%). Nine blocks (4%) had no species calling. Sensitive leopard frogs were heard in 13% of blocks. There were fewer blocks covered in this subwatershed and some data gaps between 11 and 13 Mile and Drake Roads and Halsted and the southern portion of Bell Creek in Livonia.

Heritage Park in Farmington Hills, Long Park in Commerce Township and the headwaters of Seeley and Minnow Pond Creeks had the most diverse areas. Less diversity was found downstream on the Upper branch and almost all of the Bell Creek. Shiawassee Park in Farmington, Botsford Park in Livonia, two blocks on Bell Creek and a block on Tarabusi Creek in Livonia had no species.

Overlaying the benthic macroinvertebrate scores on the frog and toad data did not show any differences as all of the scores in the Upper are Fair.

Upper Habitat Projects and Target Areas

Bell Creek Park Wetlands – The block that contains Bell Creek Park (T1S R10E183) was surveyed 2003-2014 although not every year. In 2003-one species was heard, 2004-three, 2005-2006-one, 2007-2009-two, 2010-three, 2014-three. Four species have been heard in this block but never all in one year.

Lola Valley Park Wetlands – The block that contains Lola Valley Park (T1S R10E173) was surveyed in 2003 and 2009 and only American toads were heard. Adding more wetlands here could substantially increase diversity.

Seeley Creek Wetland and Stream Restoration -On Seeley Creek, the block at Haggerty and 13 Mile Roads had no species calling. The areas south and east need more survey work. With the designation of a project, more surveys are needed.

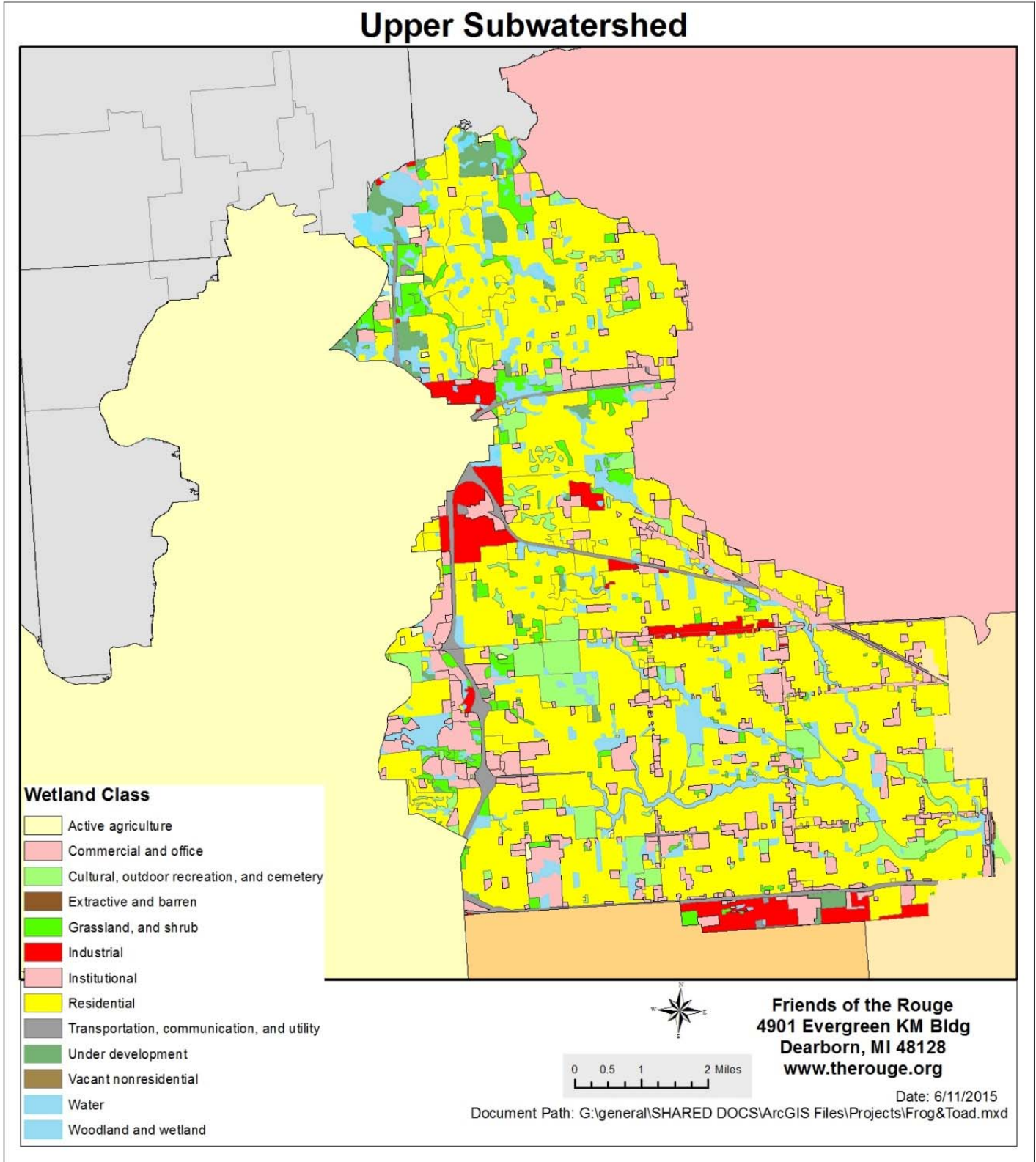
Additional Suggested Target Areas

Minnow Pond Creek –Frog and toad diversity is high along Minnow Pond at Drake and 13 Mile Roads. The blocks south and east have very few species. This area might be a good candidate for a project.

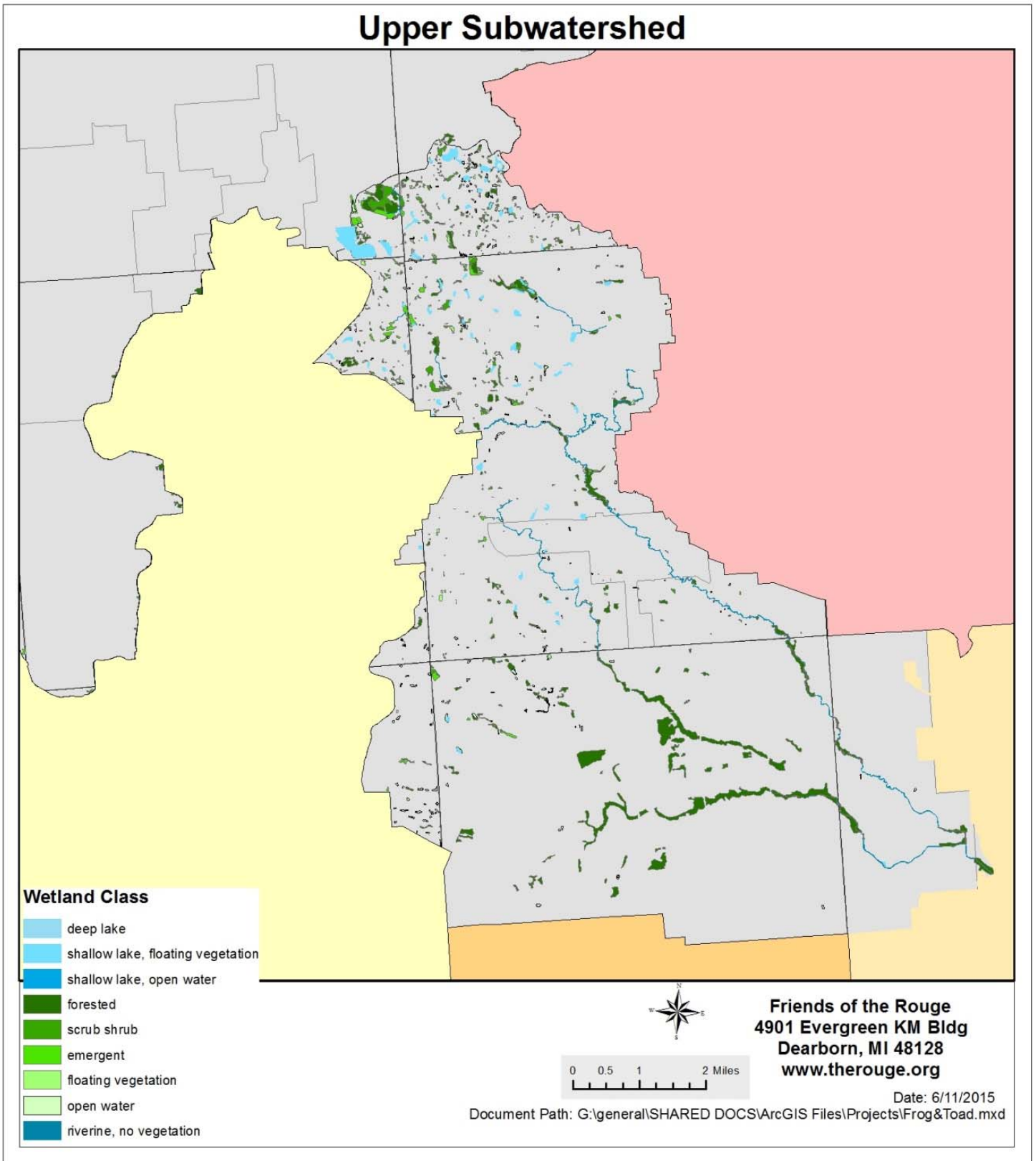
Main Upper Branch – Three blocks along the Upper branch had no species calling. One was Shiawassee Park in Farmington. This public park has been improved with grow zones but could benefit greatly from added wetlands. Two adjacent blocks south of Eight Mile near Grand River also had no species calling. Botsford Park is another potential area for wetland improvements.

Bell Creek – The entire subwatershed of Bell Creek has very few frogs or toads and would benefit from multiple wetland projects.

Map 14. Upper Land Use

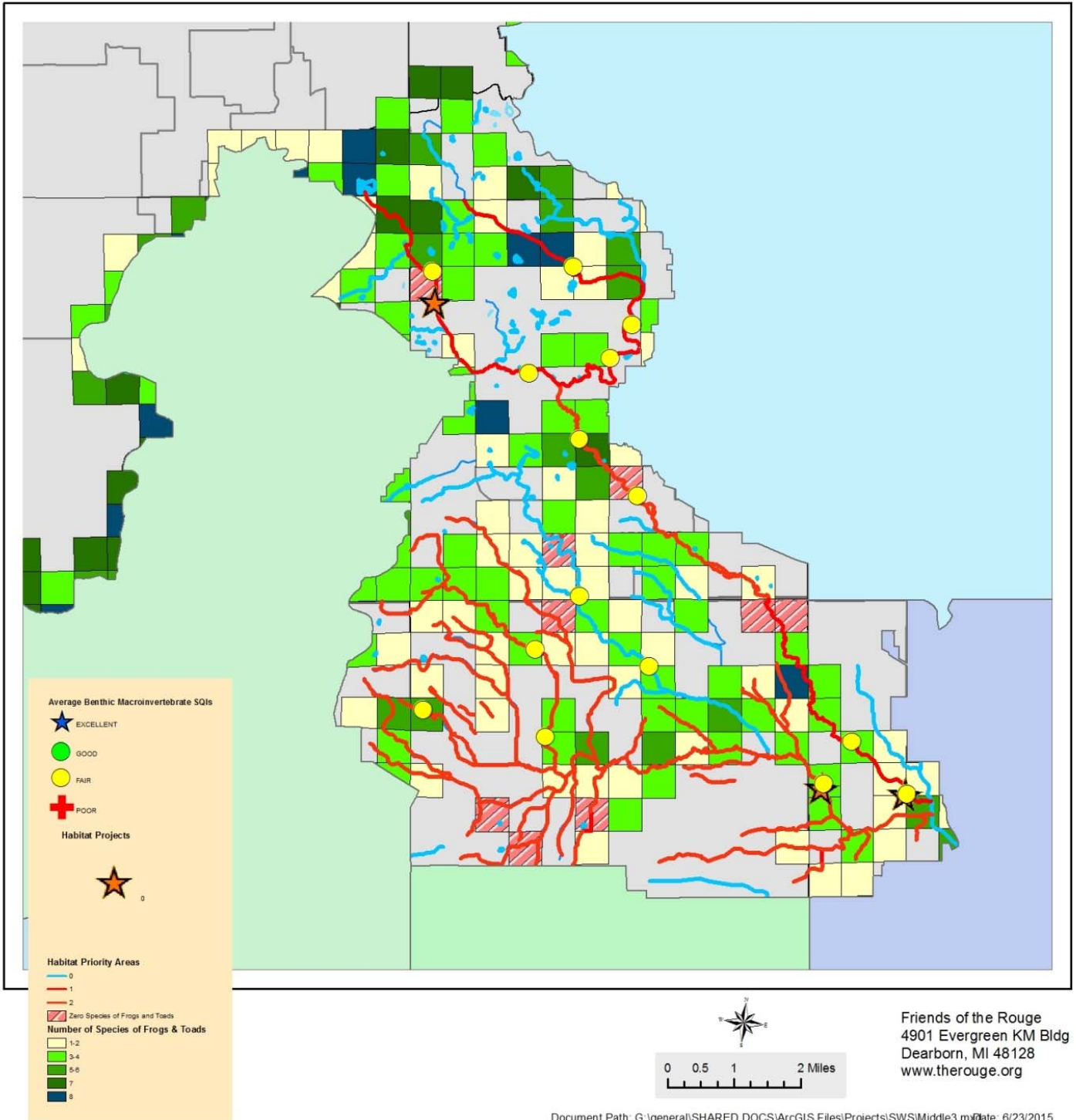


Map 15. Upper Wetlands



Map 16. Upper Frog and Toad Results

Upper Subwatershed



Middle 3

The Middle 3 is one of three non headwaters subwatersheds and the smallest at only 7% of the watershed (See Map 17). It covers 32.4 square miles (20,727 acres) and encompasses Hines Park along the Middle Branch and the downstream portion of Tonquish Creek within Holliday Nature Preserve. It includes Newburgh Lake and Nankin Lake. It is mainly residential and institutional and contains three large industrial areas: along I-96, I-275 and Ford Road. Almost all of the green space is within Wayne County Parks. Between 1991 and 2002, green space declined 7% and impervious surfaces increased 9%. In 2002 there remained 21% green space and 78% impervious surfaces. Wetlands cover only 552 acres or 3% of the area (See Map 18).

Benthic macroinvertebrates scores average at the very low end of Fair (20). Five sites along the Middle Branch averaged poor. Rainbow darters have been found at Warrendale Park near the confluence with the Main Branch but the round goby has also recently been found downstream of Newburgh Lake.

Data was received for 43 of the 131 blocks. An average of three species was heard per block (See Map 19). There were no blocks with more than seven species, four blocks with no species, one block showing a decrease in species and none showing an increase. One pocket of diversity was around Nankin Mills. All four blocks with no species calling were in industrial zones. With the exception of a few blocks along Hines Drive including Newburgh Lake, most of the available habitat has been surveyed.

Overlaying the benthic macroinvertebrate scores with the frog and toad data, SQIs are slightly higher where there are more frog and toad species.

Middle 3 Habitat Projects and Target Areas

Nankin Lake Restoration – The block that includes Nankin Lake (T1S R9E 334) was surveyed 2001-2014, though not every year. In 2001-four species were heard, 2004-two, 2006-two, 2008-three, 2009-two, 2010-2012-three, 2013-five, 2014-one. Seven species have been heard though never all in one year. Gray treefrogs are the only species not heard in this block.

Valley View Park Wetland – The block that includes Valley View (T2S R9E 3 3) was surveyed in 2001-2014 sporadically. In 2001-four species were heard, 2002-one, 2004-two, 2010-two, 2014-one. Five species were heard but never all in one year. American toads were the only species heard every year. Gray treefrogs and wood frogs were only heard in 2001.

Sherwood Park Wetlands – The block that includes Sherwood Park (T2S R9E 2 4) was surveyed in 2002 and 2004. Wood frogs were heard both years and spring peepers only in 2002. More surveys are needed for a baseline.

Perrin Park Wetlands & Reforestation – There is no frog and toad data for the block that contains this project (T2S R9E 1 1). The block immediately east (T2S R10E6 2) was surveyed in 2010 and 2014 and three species were heard both years: chorus frogs, wood frogs and American toads.

Wallaceville Park Wetland – The block that includes Wallaceville (T2S R10E5 4) was surveyed in 2013 and 2014. American toads were heard both years and gray treefrogs in 2013 only.

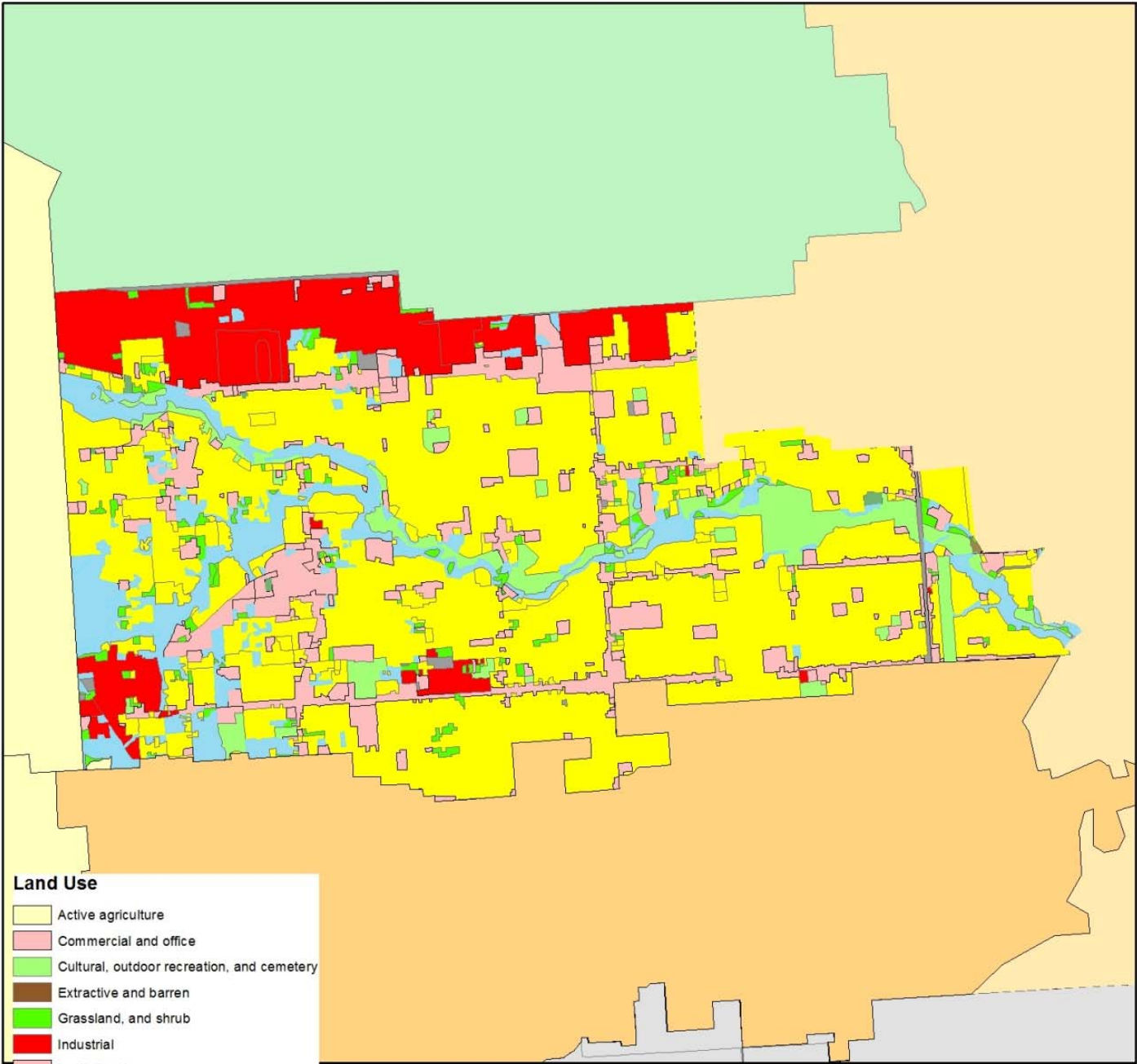
Riverview Park Wetlands – The block that contains Riverview Park (T1S R9E 324) was surveyed only in 2011. Only American toads were heard. This area would benefit from an additional baseline survey.

Additional Suggested Target Areas

Tonguish Creek – no projects have been proposed for the Tonguish Creek. Frogs and toads are fairly diverse within the preserve.

Map 17. Middle 3 Land Use

Middle 3 Subwatershed



Land Use

- Active agriculture
- Commercial and office
- Cultural, outdoor recreation, and cemetery
- Extractive and barren
- Grassland, and shrub
- Industrial
- Institutional
- Residential
- Transportation, communication, and utility
- Under development
- Vacant nonresidential
- Water
- Woodland and wetland

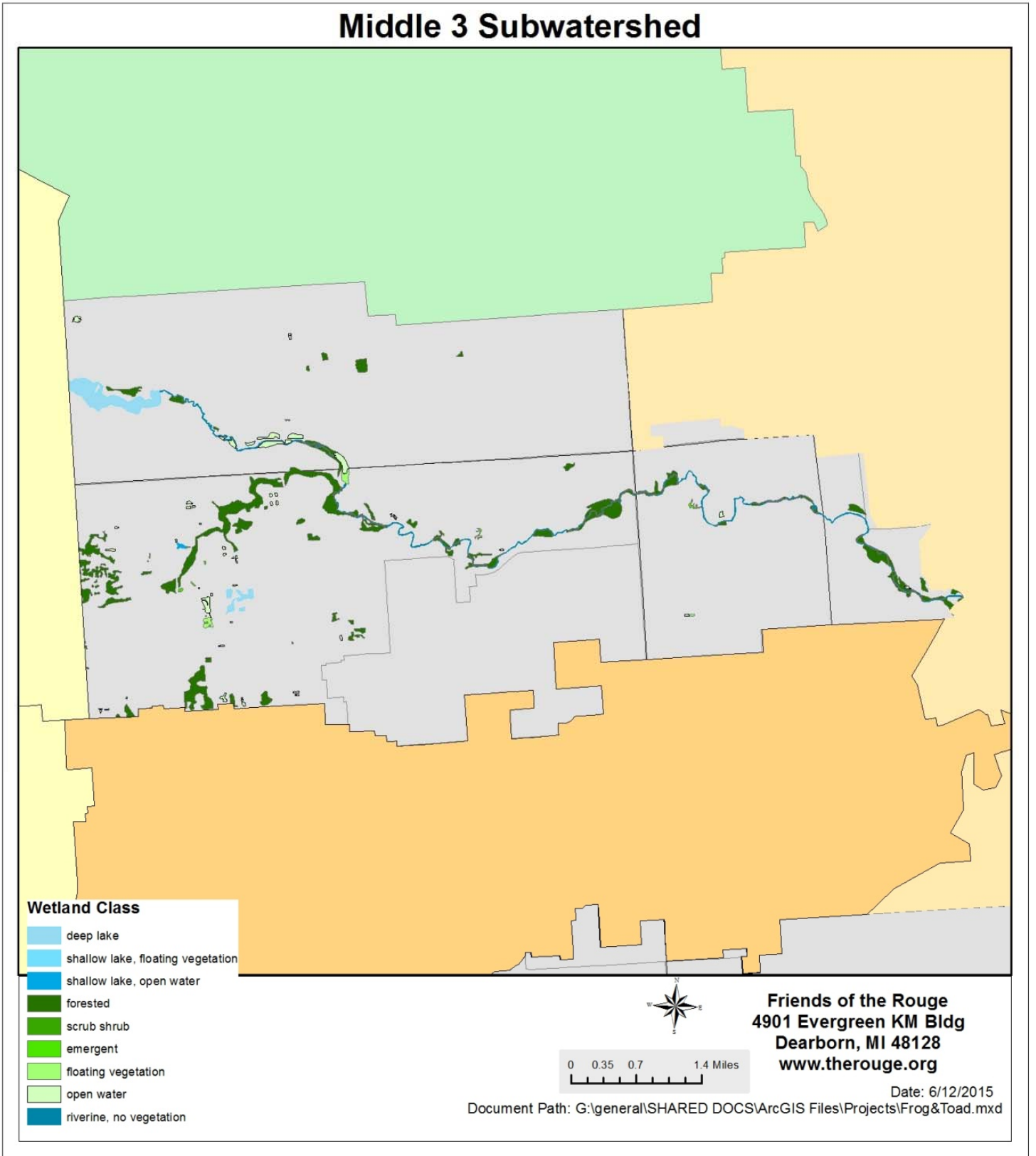


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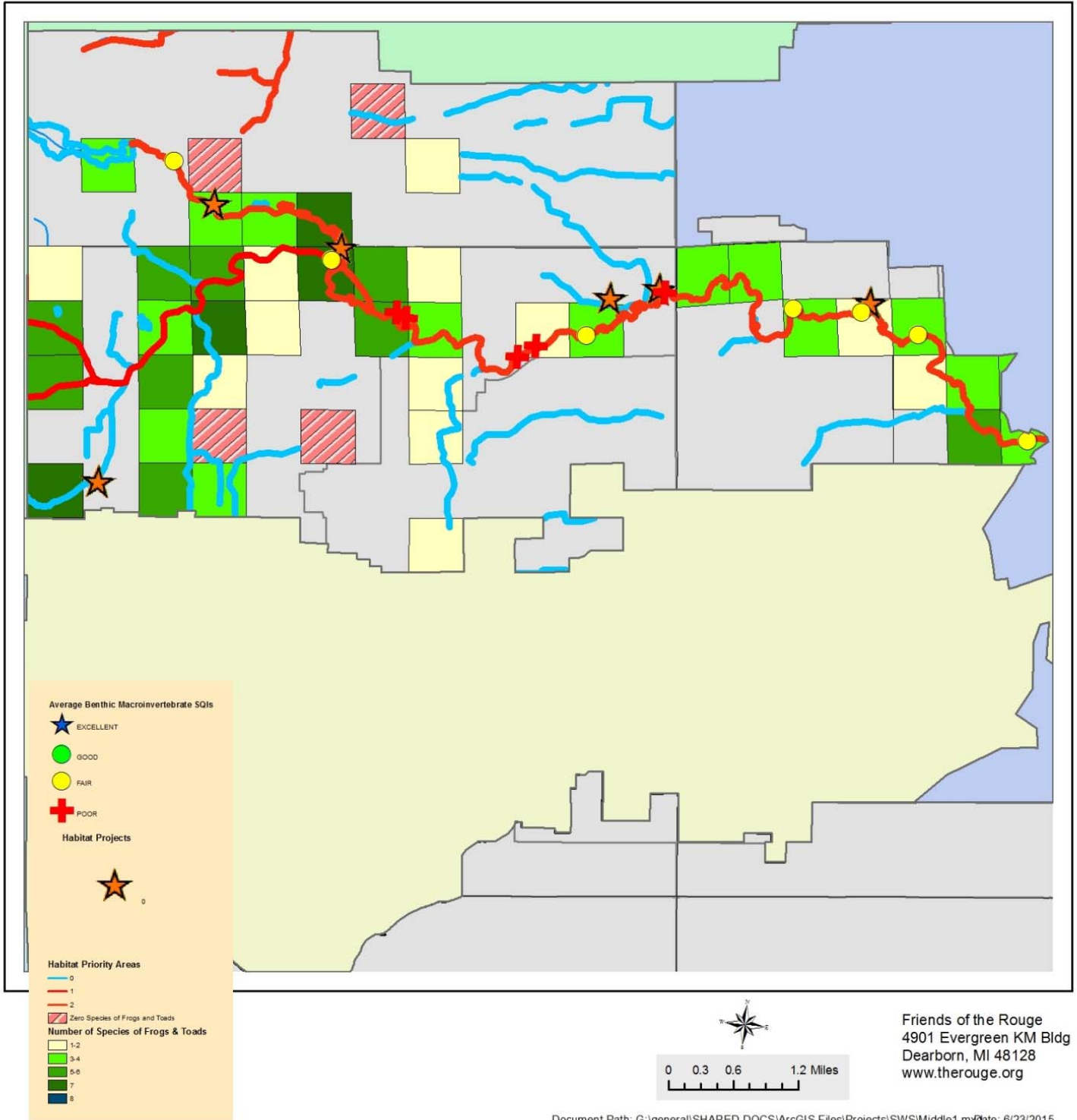
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Map 18. Middle 3 Wetlands



Map 19. Middle 3 Frog and Toad Results

Middle 3 Subwatershed



Lower 2

The Lower 2 subwatershed covers 33 square miles (21,024 acres) or 7% of the watershed (See Map 20). Michigan Avenue runs through the center of it, just south of the Lower Branch. It also includes the Ford Wayne Assembly Plant in Wayne. Between 1992 and 2002, green space declined by 9% and imperviousness increased 11%. In 2002, there was 27% green space and 71% imperviousness. Wetlands cover 1,003 or 5% of the area (See Map 21).

Benthic macroinvertebrate scores average in the Fair range (26). No stoneflies have been found. In 2014, 22 native species of fish were found including northern logperch, (*Percina caprodes semifasciata*), blackside darters, (*Percina maculata*), and largemouth and smallmouth bass. Three non-native fish including common carp (*Cyprinus carpio*), mosquito fish (*Gambusia spp.*) and round goby were found. Asian clams are prevalent in this subwatershed as well as zebra mussels.

Data was received for 43 of 131 blocks or 33%. An average of three species was heard per block (See Map 22). There were two blocks with no species and no blocks with more than seven species. Two blocks showed a decreasing trend. One area of diversity is along the Lower Rouge in Dearborn along the Dearborn Hills Golf Course. Near Merriman Road, blocks along the Lower Rouge had only 1-2 species. Additional surveys are needed in the Romulus area where there are ore wetlands.

Overlaying the benthic macroinvertebrate data did not show any correlation as all scores were in the Fair range with the exception of a site on McClaughery Drain. While no frog and toad surveys were done in this block, nearby one had 3-4 species.

Lower 2 Habitat Projects and Target Areas

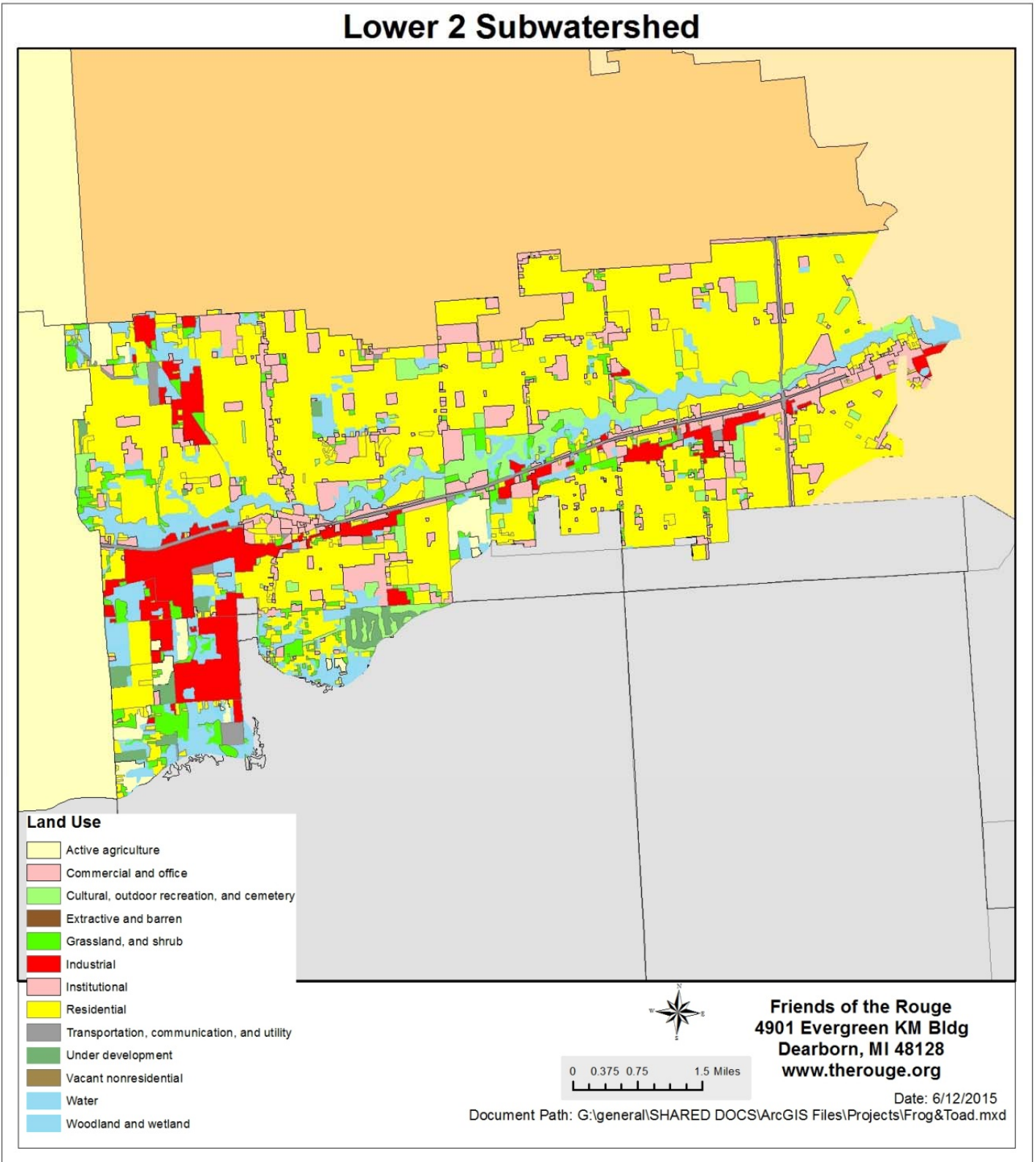
Venoy Wetlands & Fish Habitat Structures – The block that contains Venoy Wetlands (T2S R9E 273) was surveyed in 2002 and 2005. Chorus frog and American toads were heard both years and only chorus frogs in 2005.

Colonial Park Wetland & Reforestation – The block that contains Colonial Park (T2S R9E 244) was surveyed in 2005 and had four species calling: chorus frogs, spring peepers, American toads and gray treefrogs.

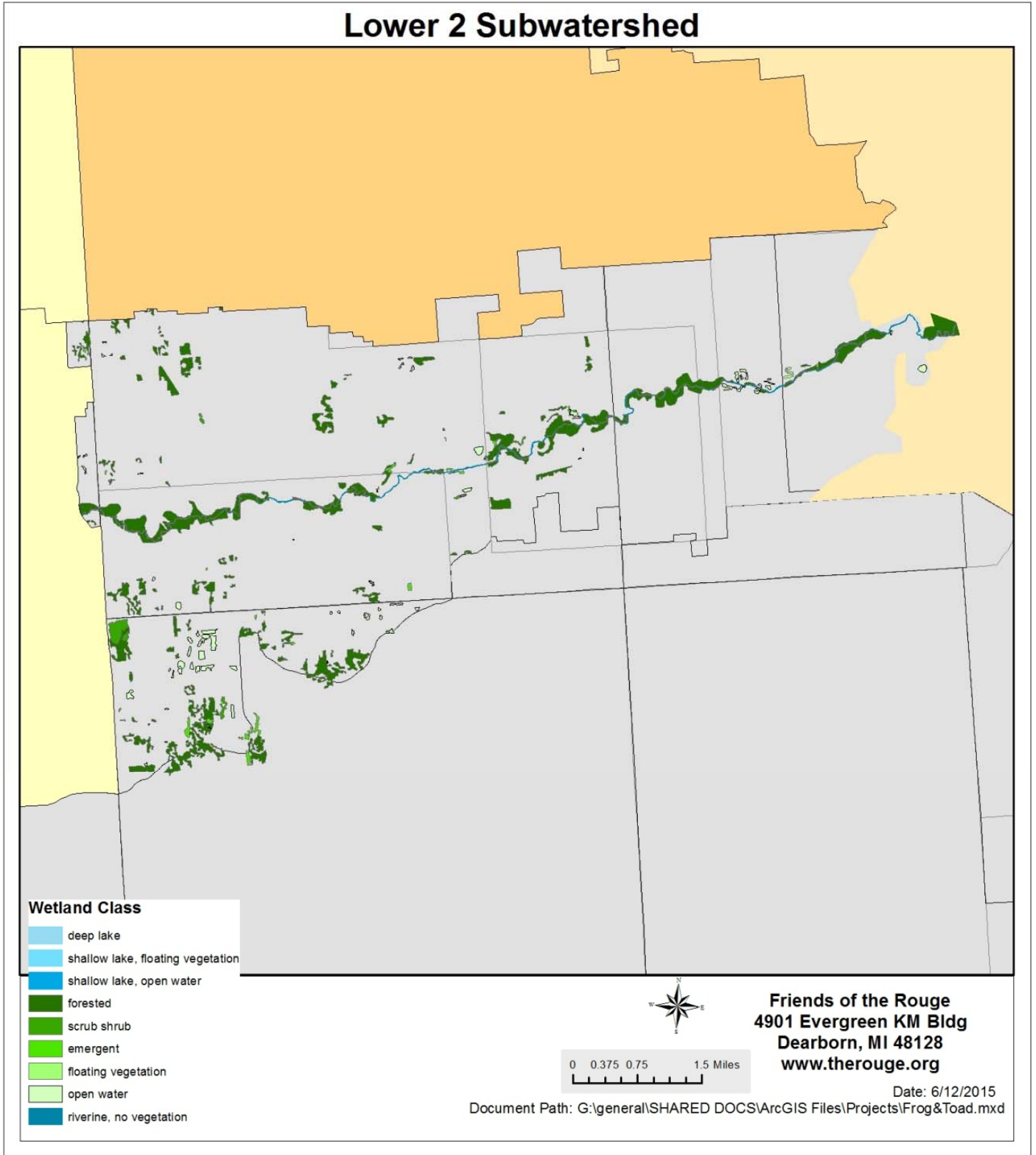
Inkster Park Wetlands & Fish Habitat Structures – The block that contains this project (T2S R10E302) was not surveyed. The block directly north (T2S R10E 193) was surveyed in 2004, 2005 and 2009. In 2004 only gray treefrogs were heard. In 2005, green frogs were heard in addition to gray treefrogs. In 2009, chorus frogs and American toads were heard. This adds up to four species but there were no years when all four were heard. More surveys need to be done in the actual block.

Lower Rouge River Habitat Restoration – More wetland creation along the Lower Rouge would benefit frog and toad populations.

Map 20. Lower 2 Land Use

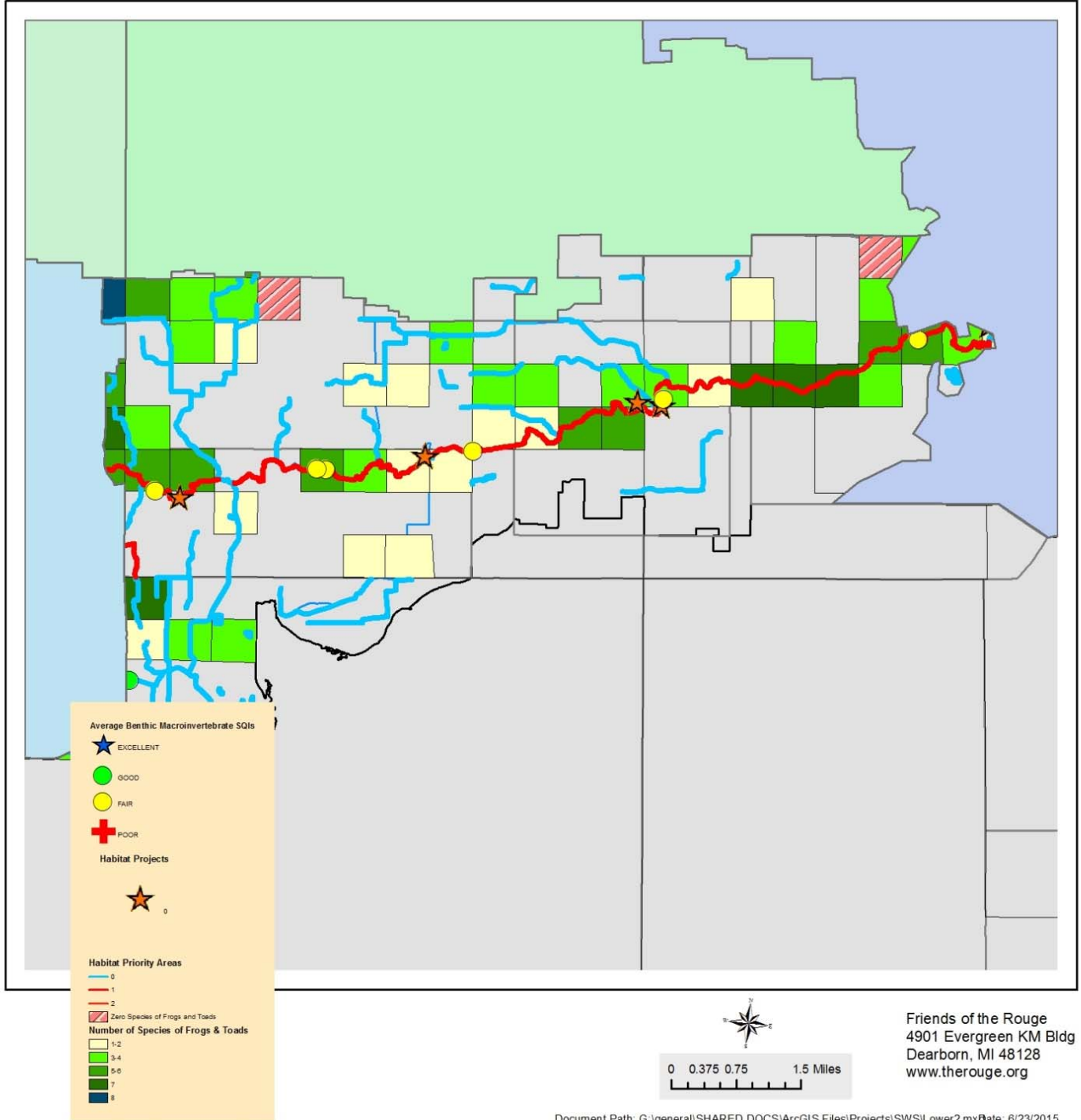


Map 21. Lower 2 Wetlands



Map 22. Lower 2 Frog and Toad Results

Lower 2 Subwatershed



Main 3-4

The Main 3-4 is the most urbanized subwatershed. It drains 91 square miles (58,475 acres) or 20% of the watershed (See Map 23). It includes the Ford Rouge complex and an industrial zone including Zug Island and the west side of Detroit where many of the streams were moved underground and used as sewers. There is a string of green space along the Main Branch that is partially protected within Detroit's Eliza Howell and Rouge Parks, Parkland Park in Dearborn Heights, the University of Michigan-Dearborn Natural Areas, Greenfield Village, Oakwood Cemetery and Patton Park. Between 1992 and 2002, green space decreased from 16% to 14% and imperviousness increased from 80% to 84%. Although this is the smallest change of any subwatershed, the Main3-4 has the least amount of green space (14%) and the highest percent imperviousness (84%). Wetlands covered only 716 acres or 2% of the area (See Map 24).

Benthic macroinvertebrates were only collected at four sites in the Main 3-4 due to the deep sites and lack of habitat. SQIs were in the Fair range (26). Despite the lack of habitat, stoneflies were found at Eight Mile Road and along the concrete channel in Dearborn. These were a type not seen before in the watershed but all stoneflies are very sensitive. A variety of fish inhabit the Main Branch. A fish survey conducted by the Michigan Department of Environmental Quality in 2012 found 16 native species in the oxbow around Fordson Island.

Data was received for 42 of 369 blocks or 11%. An average of only two species was heard per block (See Map 25). There were five blocks with no species heard and one block with all eight. This block was in the University of Michigan-Dearborn natural areas. Blocks north from there through Rouge Park formed the largest block of diversity in this subwatershed. One block showed a decrease in species and two showed an increase. One of the areas with an increase was Eliza Howell Park in Detroit. One area with surprising diversity was the Ford Rouge plant with five species in its recently created wetlands.

There were too few benthic macroinvertebrate sampling sites to compare and all were in the Fair range.

Main 3-4 Habitat Projects and Target Areas

Patton Park Wetland Restoration – The block that contains Patton Park (T2S R11E214) was surveyed in 2002 and only American toads were heard. Local residents reported leopard frogs inhabiting the wetland in Patton Park years ago.

Fordson Island and Marathon Gardens – The block that contains this project (T2S R11E283) was surveyed in 2004. Only gray treefrogs were heard. The area was very difficult to survey as volunteers feared for their safety in the area at night. With the change in the neighborhood and the increased Marathon patrols, this area could be more thoroughly surveyed for a good baseline.

Henry Ford Estate Dam and Michigan Avenue & Evergreen Road Stormwater Treatment and Habitat Restoration – The block that contains both of these projects (T2S R10E232) was surveyed in 2013 and only western chorus frogs were heard. Additional surveys are needed.

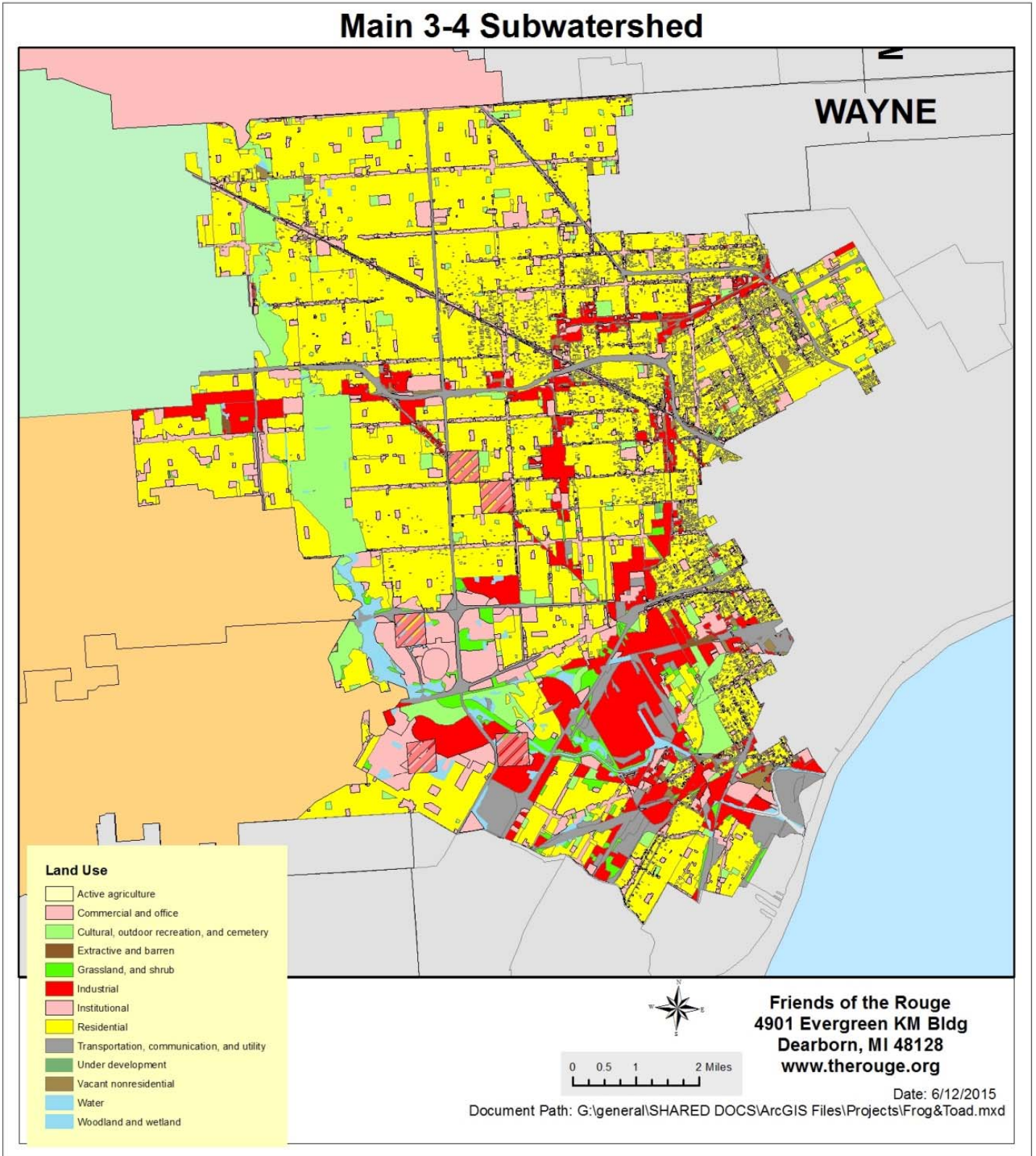
Rouge Oxbow Phase 3 Reconnect the Oxbow to the River at the Henry Ford – Surveys were not done at the Oxbow but in the pond nearby (T2S R10E 234). In 2001 American toads were heard. In 2005 chorus frogs and wood frogs were heard. In 2006 American toads, green frogs and bullfrogs were heard. In 2007 green frogs and bullfrogs were heard. In 2008 American toads, green frogs and bullfrogs were heard. In 2009 and 2011 green frogs and bullfrogs were heard. A total of five species have been heard at one time though never all in our year. The presence of that many species would assist in colonizing the oxbow as it is restored. Surveys of the oxbow are needed.

Additional Suggested Target Areas

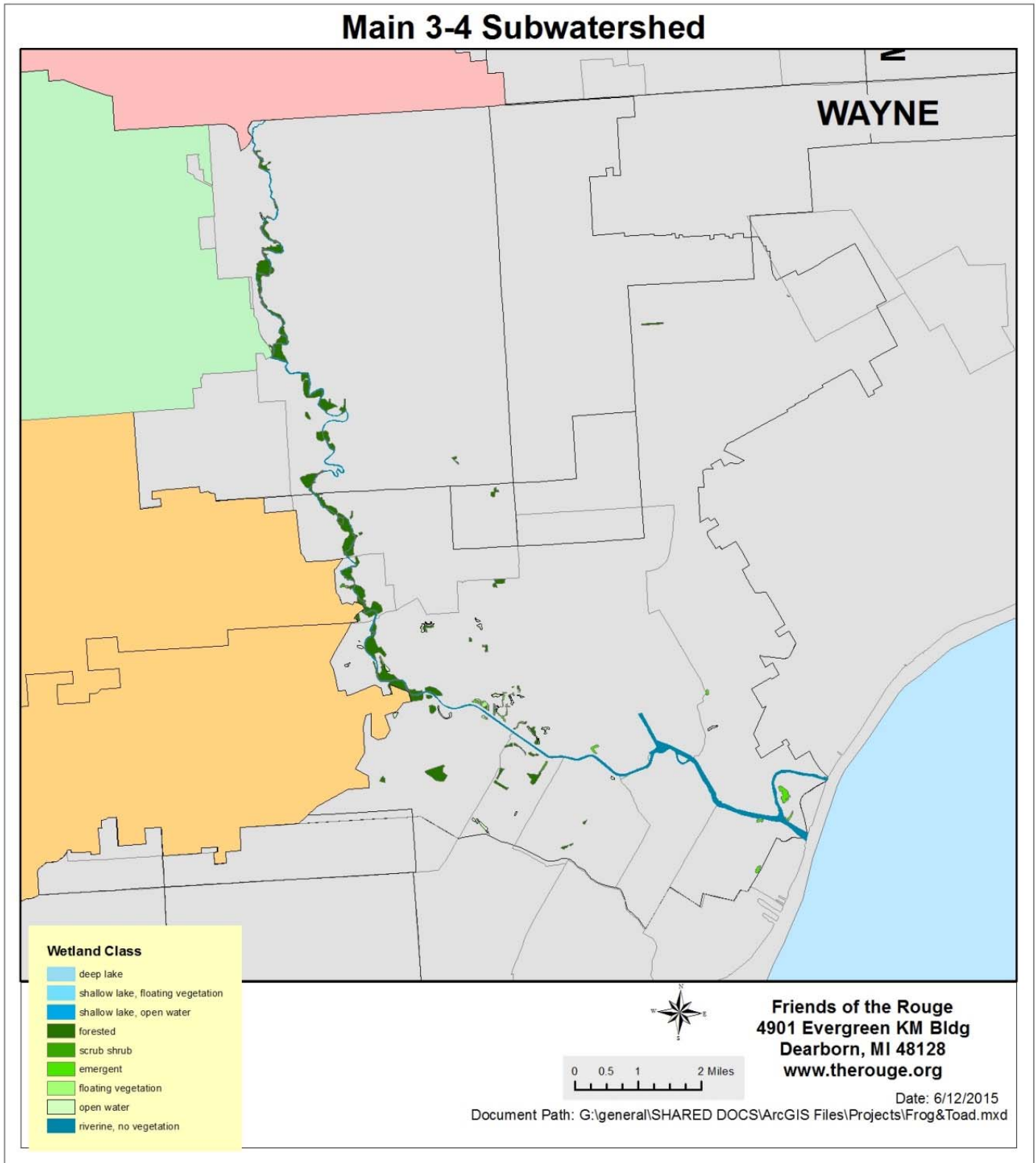
Ashcroft Sherwood Drain - This creek has very poor water quality partially due to uncontrolled CSO discharges (See Map 26). Despite this, a recent road project resulted in an additional wetland being accidentally created. In 2015, leopard frogs and tadpoles were found all around the pond.

There are few opportunities in the Main 3-4 due to the developed nature of the subwatershed. Rouge Park and Eliza Howell Park and the UM-D Natural Areas retain the best habitat and expanding and improving the green space along the Main Branch would improve habitat. Fordson Island, Patton Park, Oakwood Cemetery and the Ford Rouge plant all offer opportunities for habitat restoration.

Map 23. Main 3-4 Land Use

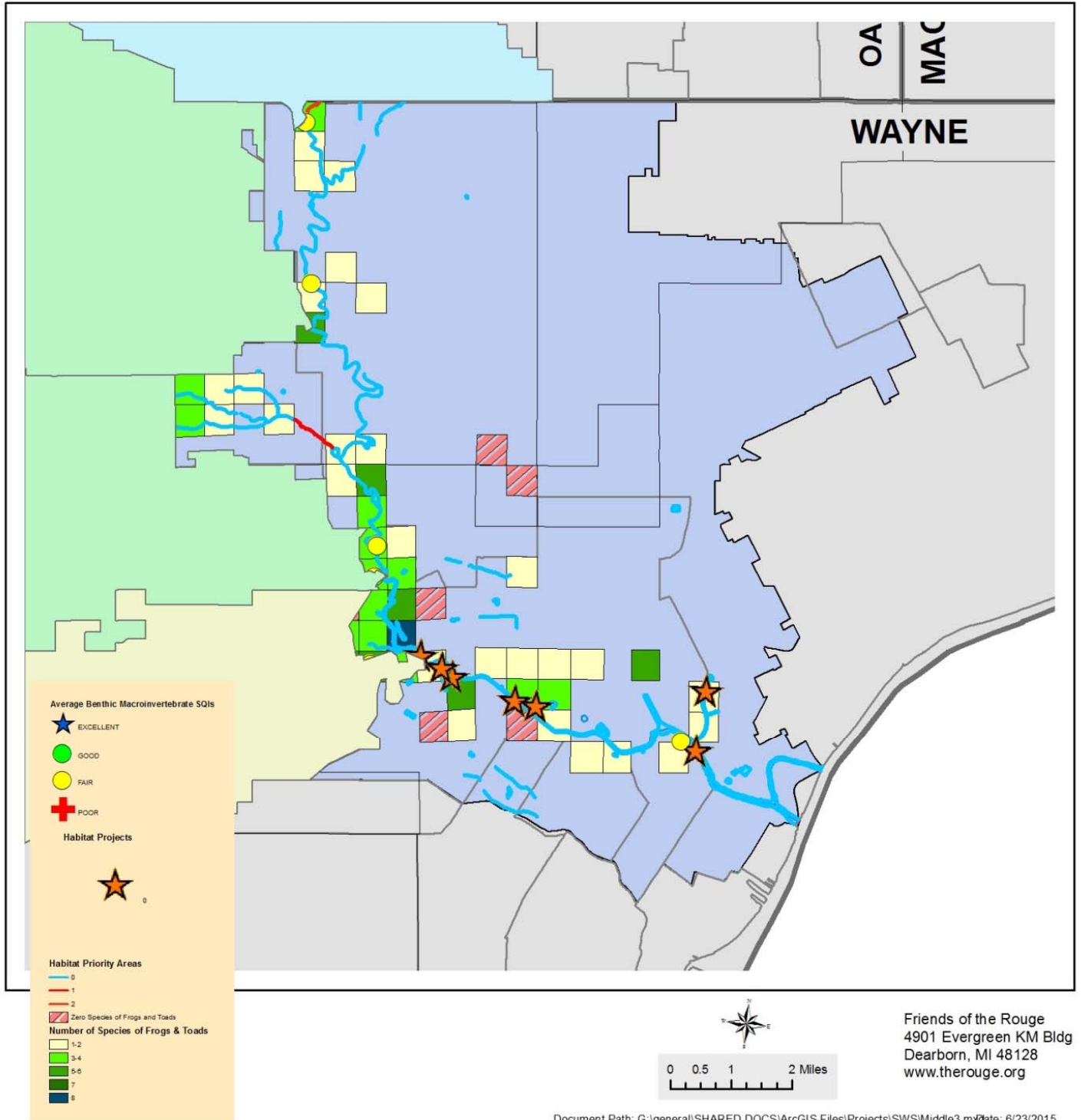


Map 24. Main 3-4 Wetlands



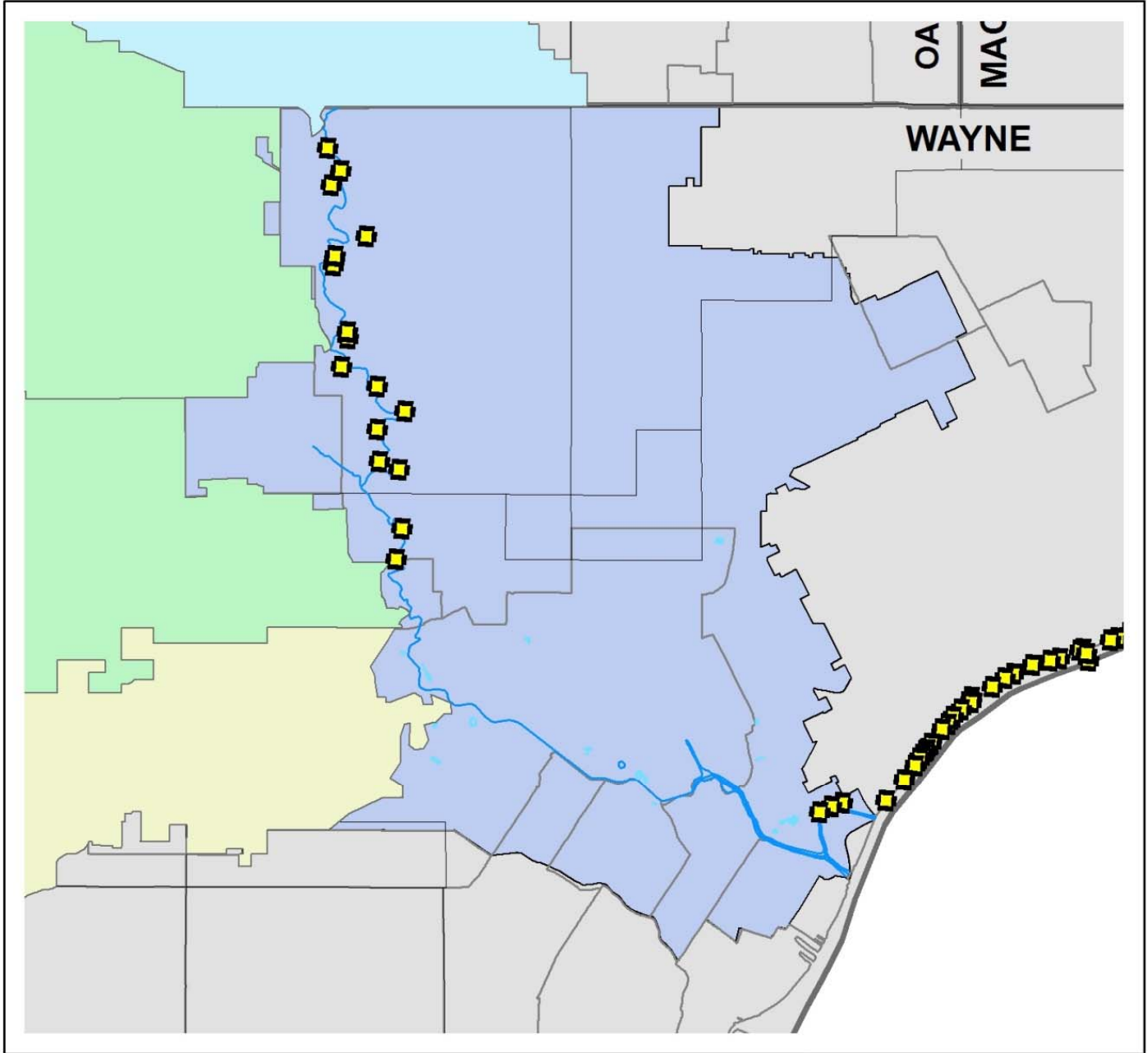
Map 25. Main 3-4 Frog and Toad Results

Main 3-4 Subwatershed

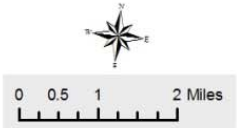


Map 26. Uncontrolled CSO Outfalls in the Main 3-4 Operated by DWSD

Main 3-4 Subwatershed



Uncontrolled CSOs



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Conclusions

The Rouge River Watershed is home to eight species of frogs and toads with no listed species. The highest diversity is in the Middle 1 and Lower 1 subwatersheds and the lowest diversity is in the Main 3-4 subwatershed. The majority of wetlands are small forested. The most diverse blocks had a larger diversity of wetland types, more large shallow lakes, and small wetlands that were not forested. Northern leopard frogs, once common in the area, were found in only 23% of blocks and are a good indicator species.

The Middle 1 has the most wetlands in the watershed (9%) but is rapidly losing green space (16% over 11 years) and therefore would benefit most from projects to protect existing wetlands. Three of the chosen habitat restoration projects for the area already have a good diversity of frogs and toads, so these projects would help expand the footprint of this diversity. The developed areas in the cities of Plymouth and Novi have low diversity but little opportunity for projects. There are few data gaps because this subwatershed was the first to be surveyed. Riverview Park would benefit from an additional thorough baseline survey as well as continued surveys in the chosen project areas.

The Lower 1 has similar diversity to the Middle 1 though fewer wetlands. It also is experiencing a loss of green space at 16%. No habitat restoration projects were identified for this area. The data showed good diversity at Canton's Heritage Park and the headwaters of Fellows Creek and the Lower branch. Preserving the existing diverse wetlands would protect habitat.

The Main 1-2 has a large lake region and therefore more green frogs and bullfrogs than other subwatersheds as they prefer this type of habitat. Additional surveys are needed in Bloomfield Township but this will have to be approached differently due to the lack of public property. Baseline surveys are needed for the two chosen habitat project sites on the Evans Branch. The other habitat site in Troy has a good diversity of frogs and toads, so this project would help expand the footprint this diversity. Additional projects to create wetlands on the Main Branch in Troy and within the City of Birmingham along the Main Branch are recommended.

The Upper is also losing green space at a rapid rate (15% over 11 years). Additional surveys are needed on the west side of Farmington Hills and in the Bell Creek area in Livonia. The three chosen projects areas have a low diversity and would benefit from increased wetland habitat. Additional projects to create wetland along the river in Shiawassee Park and Bell Creek are recommended.

The Middle 3 has the smallest acreage of wetlands (552) and most are located within Hines Park and Holliday Nature Preserve. Additional surveys are needed around Newburgh Lake. The six projects chosen for this area all address the need for wetlands along the Middle Branch. Baseline surveys are needed in Sherwood Park and Riverview Park.

The Lower 2 has few wetlands and most are located within Wayne County Parks along the Lower Branch as well a few in Romulus. Three of the chosen habitat restoration projects are within blocks with low to moderate frog and toad diversity. Given that these projects will increase wetlands, frog and toad

diversity should improve. Additional surveys are needed in the Romulus area and a baseline survey is needed in Inkster Park, the site of a fourth habitat restoration project.

The Main 3-4 is the most urbanized subwatershed and was 84% impervious in 2002. The largest block of diversity is the area from the University of Michigan–Dearborn campus north through Rouge and Eliza Howell Parks. The four chosen habitat restoration projects address the need for additional and higher quality habitat within the industrial area south of Michigan Ave. All sites need baseline surveys. Additional projects that expand and improve the quality of green space along the river are recommended.

Preserving existing wetlands and increasing the number, quality and diversity of wetlands are the major projects needed to improve habitat for frogs and toads in the Rouge River Watershed.

Appendix A. Wetland Classification Codes and Prevalence in the Watershed

R2UB – Riverine Lower Perennial Unconsolidated Bottom: within a channel with open water. This includes the river from the confluence to all four major branches and the deeper portions of some of the tributaries (6% of wetlands in the watershed).

L1UB – Lacustrine Limnetic Unconsolidated Bottom: large (>20 acres) deep (>2 m deep) lakes with open water. Most of these are located in Oakland County around Walled Lake or northeast of it around Walnut Lake, Wing Lake and the Forest Lakes. In Wayne County, most are impoundments within Hines Park, a few lakes near Johnson Creek and some lakes in Westland around the Landings apartment complex and a Grace Lake in Van Buren Township (16% of wetlands in the watershed).

L2AB – Lacustrine Littoral Aquatic Bed: large (>20 acres) shallow (<2m deep) lakes with floating vegetation. All but one are in Oakland County north of 14 Mile. One small one is located in Plymouth and is an impoundment on the north branch of Fellows Creek (1% of wetlands in the watershed).

L2UB – Lacustrine Littoral Unconsolidated Bottom: large shallow lakes with open water. Most are in Oakland County around the Forest Lakes, Cranbrook lakes, Woodpecker Lake, and the wetlands around Walled Lake. In Wayne County, there are a few near Johnson Creek, Hines Drive and one in Westland (0.3% of wetlands in the watershed).

PFO – Palustrine Forested: wetlands not connected to the river or lake and forested. PFO is the most common type of wetland in the watershed, both in number and acreage (50% of wetlands in the watershed).

PUB – Palustrine Unconsolidated Bottom: wetlands not connected to the river or lake with open water. These are quite common throughout (9% of wetlands in the watershed)

PEM – Palustrine Emergent: wetlands not connected to the river or lake with emergent vegetation (marsh). Marshes are found in the upper reaches of all of the branches and in the lower main stem but absent from the Main branch south of Eight Mile and the Upper branch in Livonia (8% of the watershed).

PSS – Palustrine Scrub Shrub: wetlands not connected to the river or lake with shrubby vegetation. These have a similar distribution to PEM and are also absent from Middle branch east of I-275 (7% of the watershed).

PAB – Palustrine Aquatic Bed: wetlands not connected to the river or lake with floating vegetation. These have a similar distribution to PEM and PSS (9% of the watershed).
