



# Monitoring and controlling mosquito larvae to prevent West Nile Virus in Dane County

MAY 2023

# SUMMARY

The West Nile Virus (WNV) surveillance and control program is an effort by Public Health Madison & Dane County to better understand and reduce the risk of West Nile virus in Dane County. This program has two components: monitor human cases of West Nile virus in our community; and monitor and control the larvae of mosquitoes capable of carrying West Nile.

## MOSQUITOES CAN SPREAD SERIOUS DISEASE

- We test ditches, retention ponds, and other water sources for mosquito larvae to prevent mosquito-related illnesses, most notably West Nile virus.
- West Nile virus is carried by mosquitoes and is the [most common mosquito-borne illness in the U.S.](#) 1 out of 5 people who are infected show symptoms, and 1 out of 150 people develop a serious and sometimes fatal illness.
- West Nile virus has been regularly found (endemic) in Dane County since 2003. Before 2020, we tested dead birds for West Nile because birds can also get the virus. You can report sightings of dead birds to the [Wisconsin Department of Natural Resources](#).

## HOW WE TRACK MOSQUITOES

- In 2022, we sampled 737 locations for mosquito larvae in Madison, Middleton, Monona, Sun Prairie, and on the UW-Madison campus. We made 2,300 total inspections to those sites.
- Sites are on public property, such as in parks. 46% are ditches and 41% are detention or retention ponds. Other sites include rain gardens, marshes, creeks, flooded areas, and golf course ponds.
- We sample for mosquito larvae along the water's edge by quickly skimming the surface of the water with a dipper (plastic cup on a pole). Samples at each location are a mix of one to ten dips.
- We then take the sample back to the lab and look for larvae. We look for two species of mosquito larvae that spread the most disease—Culex (most common carrier of West Nile Virus) and Aedes (can carry West Nile virus, but less common. They are also vectors for some other mosquito-borne illness, such as La Crosse encephalitis).
- When three or more Culex larvae are found per dip, the site is treated with larvicide, a chemical that kills mosquito larvae.

## WHAT WE FOUND

- 6.2% of [all sites had Culex mosquito larvae present](#)
- 3.4% of [all sites had Aedes mosquito larvae present](#)
- 0 cases of West Nile virus in humans were found in 2022. Since 2002, there have been 44 total cases and 2 deaths related to West Nile virus in Dane County. These cases are an undercount and represent the most severe cases of West Nile. Most people are not tested for mild cases of West Nile.

## INTRODUCTION



Public Health Madison & Dane County partners with the City of Middleton, City of Monona, City of Sun Prairie, Town of Madison, and University of Wisconsin to monitor and control the breeding activity of mosquitoes capable of carrying West Nile Virus on public property. The main mosquito species of concern is the *Culex* mosquito due to its identification as the principle vector for human transmission of WNV. If present, other mosquito species that are potential vectors for WNV are also monitored; in Dane County, this is the *Aedes* mosquito species.

Mosquito larvae sampling was performed by public health staff from late May through September to identify water sources producing large numbers of mosquito larvae. In 2022, the end of the mosquito season did not come until October when the area received its first frost/freeze. Where high levels of *Culex* or *Aedes* mosquito larvae were found, staff treated the source with larvicide to kill the larvae.

When a person tests positive for WNV, the test is reported to the health department. This way, public health can follow-up with the person to assure they are connected to medical care and ask where they may have been exposed. Additionally, monitoring reports of WNV allows the health department to track trends of the virus in our community.

This report summarizes the results and [maps](#) of both the mosquito monitoring and treatment efforts in the metropolitan area, as well as trends in people in Dane County who tested positive for West Nile Virus.

## MONITORING FOR WEST NILE VIRUS

### MONITORING BIRDS FOR WEST NILE VIRUS

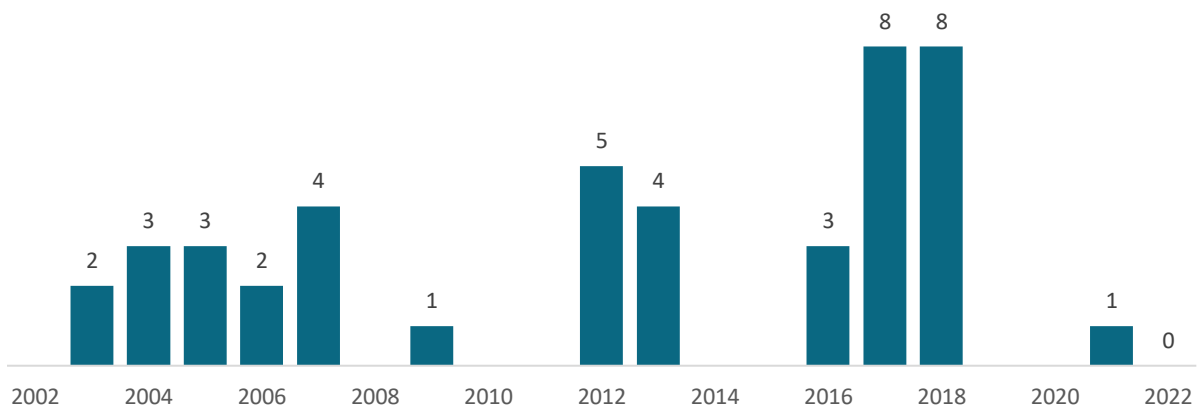
Prior to 2020, Public Health Madison & Dane County participated in statewide efforts to collect and test dead crows and blue jays for West Nile Virus. These types of birds are most likely to get WNV.

## MONITORING PEOPLE FOR WEST NILE VIRUS

Most people (8 out of 10) infected with WNV will have no [symptoms](#), but approximately 20% will experience a fever plus other symptoms like headache, body ache, joint pain, vomiting, diarrhea, or rash. About 1 in 150 people with WNV will develop serious illness affecting the central nervous system such as brain or spinal swelling (encephalitis). Cases are most common in the late summer and early fall months of August and September.

Since CDC started keeping track of WNV infections in 1999, there have been [over 55,000 reported cases](#) in the U.S. with over 2,600 deaths through 2021. Wisconsin started reporting WNV in 2002, with [355 people reported statewide through 2021](#), including [23 deaths](#). Over this same time period, Dane County reported 44 cases, including two deaths. No cases were reported in 2022.

**Figure 1. People with West Nile Virus in Dane County**



Since there is no vaccine currently available to prevent WNV, public health focuses on monitoring and controlling the mosquito populations that can carry the virus in order to reduce the risk to the community.

## MONITORING MOSQUITO POPULATIONS

During the summer of 2022, department staff made 2,300 inspections of 737 sites in order to evaluate and treat, as necessary, *Culex* and *Aedes* populations in the metro area.

At each surface water source, public health staff sampled for mosquito larvae along the water’s edge by quickly skimming the surface of the water with a dipper (plastic cup on a pole). Samples at each location consisted of a composite of one to ten dips. The number of dips depended on the size of the water source and the number of larvae present. Larvae activity for each sample was measured as the number of larvae per dip. When three or more *Culex* larvae are found per dip, the site is treated with larvicide or other action is taken to reduce the number of mosquito larvae. Most mosquito monitoring is performed at surface water sources. On occasion, catch basins are sampled when there is additional concern in a given area. The table below lists the number of sites by community with high concentrations of *Culex* or *Aedes* larvae; all other sites tested reported either low concentrations of larvae or no larvae noted.

### Findings

As [displayed in this map](#) and Appendix 2, 47 sites (6.4%) of inspected sites produced high numbers of *Culex* larvae and 26 (3.5%) of sites produced high numbers of *Aedes* larvae, at least once during 2022 (Table 1).

**Table 1: Areas with high levels of *Culex* and *Aedes* mosquitoes, 2022**

	High <i>Culex</i> (% of inspected sites)	High <i>Aedes</i> (% of inspected sites)	Total number of sites inspected
City of Madison	36 (8.3%)	16 (3.7%)	433



City of Sun Prairie	3 (2.5%)	0 (0%)	119
City of Middleton	6 (5.9%)	8 (7.9%)	101
UW Madison (includes campus and arboretum)	1 (3.3%)	1 (3.3%)	30
City of Monona	0 (0%)	0 (0%)	23
Town of Madison	1 (*)	1 (*)	15
Town of Burke	0 (*)	0 (*)	9
Village of Maple Bluff	0 (*)	0 (*)	4
City of Fitchburg	0 (*)	0 (*)	2
Village of Shorewood Hills	0 (*)	0 (*)	1
Total	47 (6.4%)	26 (3.5%)	737

*\*Percentages not calculated for sites with fewer than five samples*

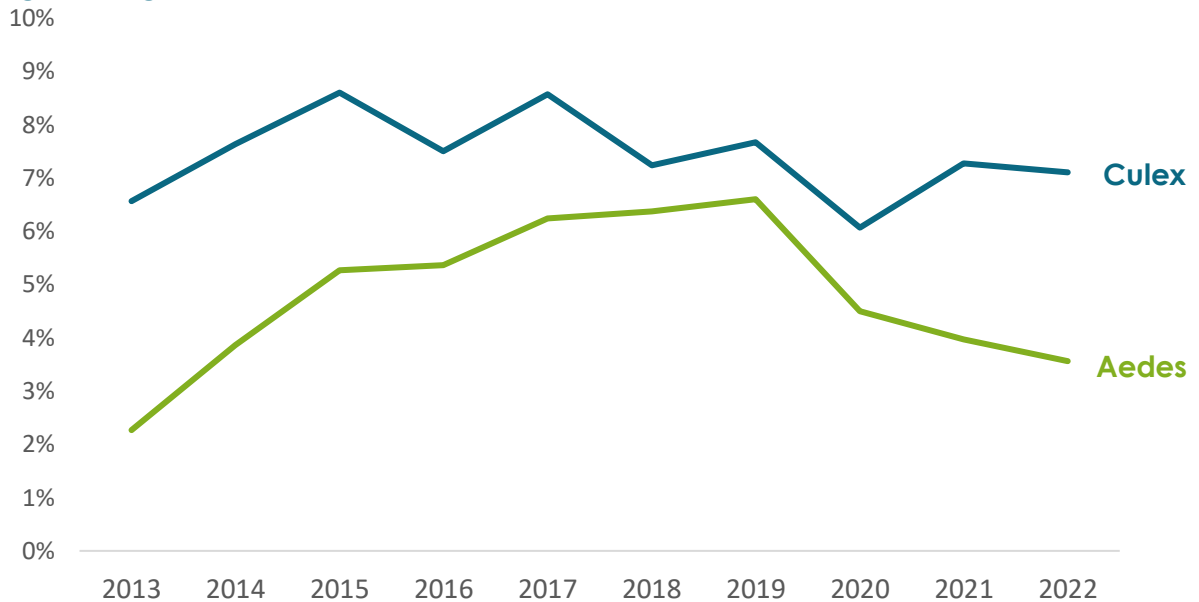
Over the past decade, the percentage of sampled sites with high levels of problem mosquitoes has ranged from 2.7% to 10.9% (Table 2). Seasonal variation in temperature and rainfall can impact findings.

**Table 2: Percentage of sites with high levels of *Culex* and *Aedes* mosquitoes, 2013-2022**

Year	<i>Culex</i>	<i>Aedes</i>
2013	8.7%	3.6%
2014	7.7%	6.4%
2015	9.4%	5.8%
2016	5.4%	3.9%
2017	10.9%	9.0%
2018	5.4%	6.2%
2019	6.7%	4.6%
2020	6.1%	2.7%
2021	9.0%	4.6%
2022	6.4%	3.5%

Over the past decade, a total of 193 sites have been found to produce high numbers of *Culex* larvae in at least one season during this time period. Thirty-six (18.6%) of these sites have been found to produce *Culex* larvae repeatedly (four or more years) over the past ten years. We find *Culex* more often than we find *Aedes* (Figure 2).

**Figure 2: Percentage of sites with high levels of *Culex* and *Aedes* mosquitoes, 3-year rolling averages, 2013-2022**

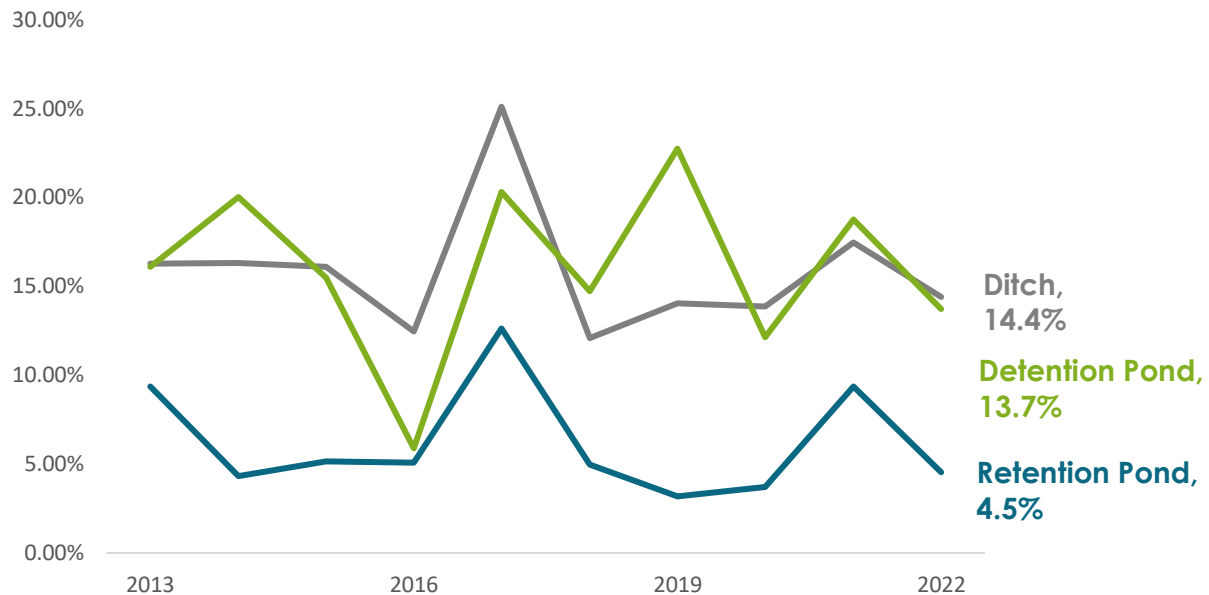


The types of water sources that produced high numbers of larvae are generally consistent from year to year (Figure 3). Similar to previous monitoring seasons, ditches continue to be the most important source of mosquitoes in 2022. Detention and retention ponds were also sources of high *Culex* and *Aedes* larvae during the current monitoring season. Detention ponds temporarily store stormwater runoff and then release it gradually until it is drained. Retention ponds, on the other hand, are designed to permanently hold water. Retention ponds are less likely than ditches and detention ponds to host problem mosquitoes because these water bodies have much more stable edges and shallow pools are not prone to develop at these sites, which would provide a suitable habitat for mosquito larvae.

Several large, natural water sources, like Mud Lake, Nine Springs Marsh, the Yahara River, Lakes Mendota and Monona, and others, are not assessed because they are unlikely to produce *Culex* mosquitoes. Assessment of these areas would likely change the results for the floodwater mosquito (*Aedes vexans*) and increase the number of mosquito species identified.

**Figure 3: Sampled sites with high levels of *Culex* and/or *Aedes* mosquito larvae, by site type, 2013-2022**

Ditches and **detention ponds** are also more likely to have total mosquito activity than **retention ponds**\*



\* Total combined activity of reported *Culex* and/or *Aedes* larvae at selected site types

### Larvicide applications

During the 2022 mosquito season, a total of 82 treatments were performed at 47 sites that reported high levels of *Culex* mosquito larvae; nine of these treatment sites were considered problematic and required treatment on 3 or more separate occasions. The remaining sites that reported elevated levels of *Culex* activity larvicidal treatment was deemed unnecessary due to weather and site conditions or the predominant species identified was not associated with WNV. All treatments were effective in reducing larvae numbers below the treatment threshold of three larvae per dip.

In the metro area, 47 sites (6.4%) of inspected sites produced high numbers of *Culex* larvae and 26 (3.5%) of sites produced high numbers of *Aedes* larvae, at least once during 2022 (Table 1).

### HOW TO PREVENT MOSQUITO-RELATED ILLNESSES

Mosquito-related illnesses, like West Nile, are preventable:

- Mosquitoes like to lay eggs in standing water. They don't need a lot, so be sure to keep things dry. Drain any standing water in your outdoor living areas. You might see water accumulating in clogged gutters, air conditioners, tarps, wheelbarrows, plant debris, flower pots, pet dishes, or birdbaths.
- Use insect repellents on skin and clothing before heading outdoors during mosquito season (May-September).
- Wear long-sleeved shirts, pants, socks, and shoes outside during peak mosquito activity hours.
- Learn more on the [Department of Health Services website](#)

## Appendix 1: Sites within Dane County that produced high numbers of Culex and/or Aedes larvae in 2022

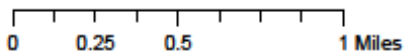
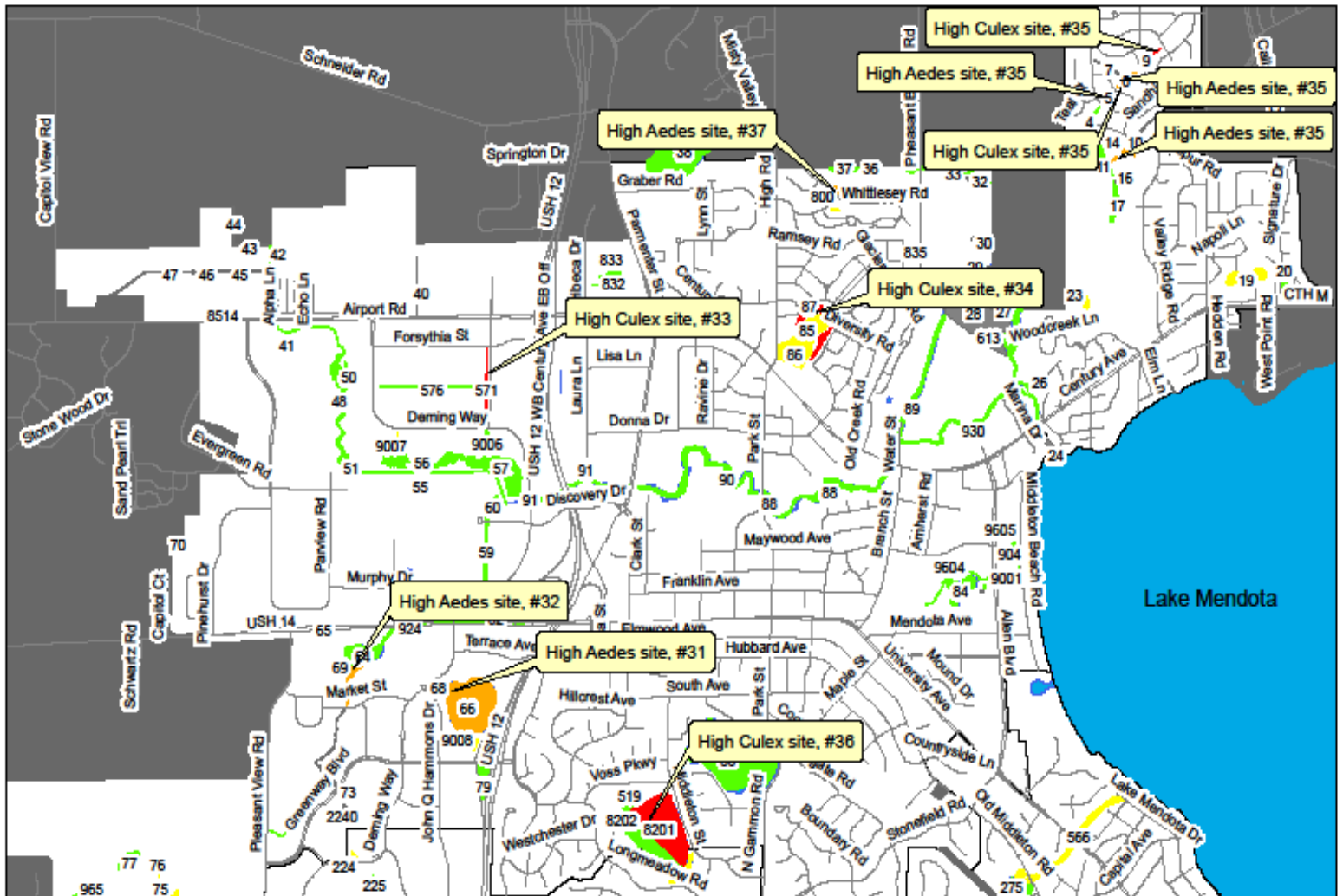
Site group name	Total for site			High <i>Culex</i> in site		High <i>Aedes</i> in site		
	# sites	#	#	#	#	#	#	
	# inspections	acres	acres	sites	acres	sites	acres	
<b>City of Madison</b>								
1	Airport	19	48	3.8	0	0	5	0.49
2	Badger Mill Creek - Greenway	7	21	20.6	0	0	1	1.27
3	Bay Creek	1	3	2.1	0	0	1	2.1
4	Cherokee Marsh	4	3	10.5	1	7.7	0	0
5	Culvert drainage ditch – Ocean Rd.	1	12	<0.1	1	<0.1	0	0
6	East Badger Mill Creek Greenway	15	73	7.8	2	0.9	2	1.7
7	Elver Park Greenway	14	44	15.2	1	0.5	0	0
8	Franklin Field	5	15	0.7	0	0	1	0.1
9	Glacier Greenway	5	15	1.8	0	0	1	0.4
10	High Point ditches	1	3	1.1	1	1.1	0	0
11	International Lane sites	1	3	0.1	1	0.1	0	0
12	Junction Ridge	1	3	0.3	1	0.3	0	0
13	Knob Hill Ponds	1	4	<0.1	1	<0.1	0	0
14	Kottke Drive detention area	1	9	0.2	1	0.2	0	0
15	Marquette St. Rain Garden	1	3	<0.1	1	<0.1	0	0
16	MATC TRAUx parking lot	9	28	4.4	2	1.1	0	0
17	McClellan Drive pond	1	12	0.7	1	0.7	0	0
18	Mendota – Pheasant Branch Greenway	26	93	30.1	7	5.3	0	0
19	Milwaukee Street Greenway	9	42	6.0	3	0.5	0	0
20	Nob Hill Ponds	7	22	16.8	1	<0.1	2	<0.1
21	North Penito Creek Greenway	7	29	9.7	2	2.2	0	0
22	Reindahl Park ditch	1	3	0.8	1	0.8	0	0
23	Ridgewood Ponds	2	15	0.8	1	0.5	0	0
24	Starkweather – Olbrich Greenway	10	37	11.8	2	1.1	0	0
25	UW Research Park ponds	7	21	13.4	0	0	1	2.1
26	Warner Park Lagoon	10	43	33.6	2	0.1	0	0
27	West Badger Mill Creek Greenway	12	36	8.3	0	0	2	1.3
28	Westchester Garden Park	3	18	6.5	1	<0.1	0	0
29	Westin Road ditch – south end	1	11	0.3	1	0.3	0	0
30	Whitetail Ridge detention pond	1	13	2.0	1	2.0	0	0



City of Middleton								
31	Esser Pond	3	9	16.0	0	0	2	15.8
32	Greenway Center	5	8	6.5	0	0	1	2.2
33	Middleton Business Park Nursery Rd.	1	3	0.7	1	0.7	0	0
34	Middleton Hills	3	9	10.9	1	2.4	0	0
35	Orchid Heights Park	13	36	4.7	2	0.2	3	0.3
36	Stricker's Pond	5	22	22.5	2	17.2	0	0
37	Whittlesey Road	1	3	0.7	0	0	1	0.7
City of Sun Prairie								
38	Sheehan Park	1	11	0.9	1	0.9	0	0
39	Uplands Neighborhood	3	8	6.9	1	<0.1	0	0
40	Weybridge	3	9	2.2	1	0.7	0	0
Town of Madison								
41	Alliant Energy Center	9	28	8.5	0	0	1	0.5
42	Beltline – John Nolen exit	1	1	0.6	1	0.6	0	0
UW Madison								
43	UW Arboretum	21	38	58.8	0	0	1	0.9
44	UW Campus	2	13	<0.1	1	<0.1	0	0

## Appendix 2: Mosquito larvae monitoring results, 2022

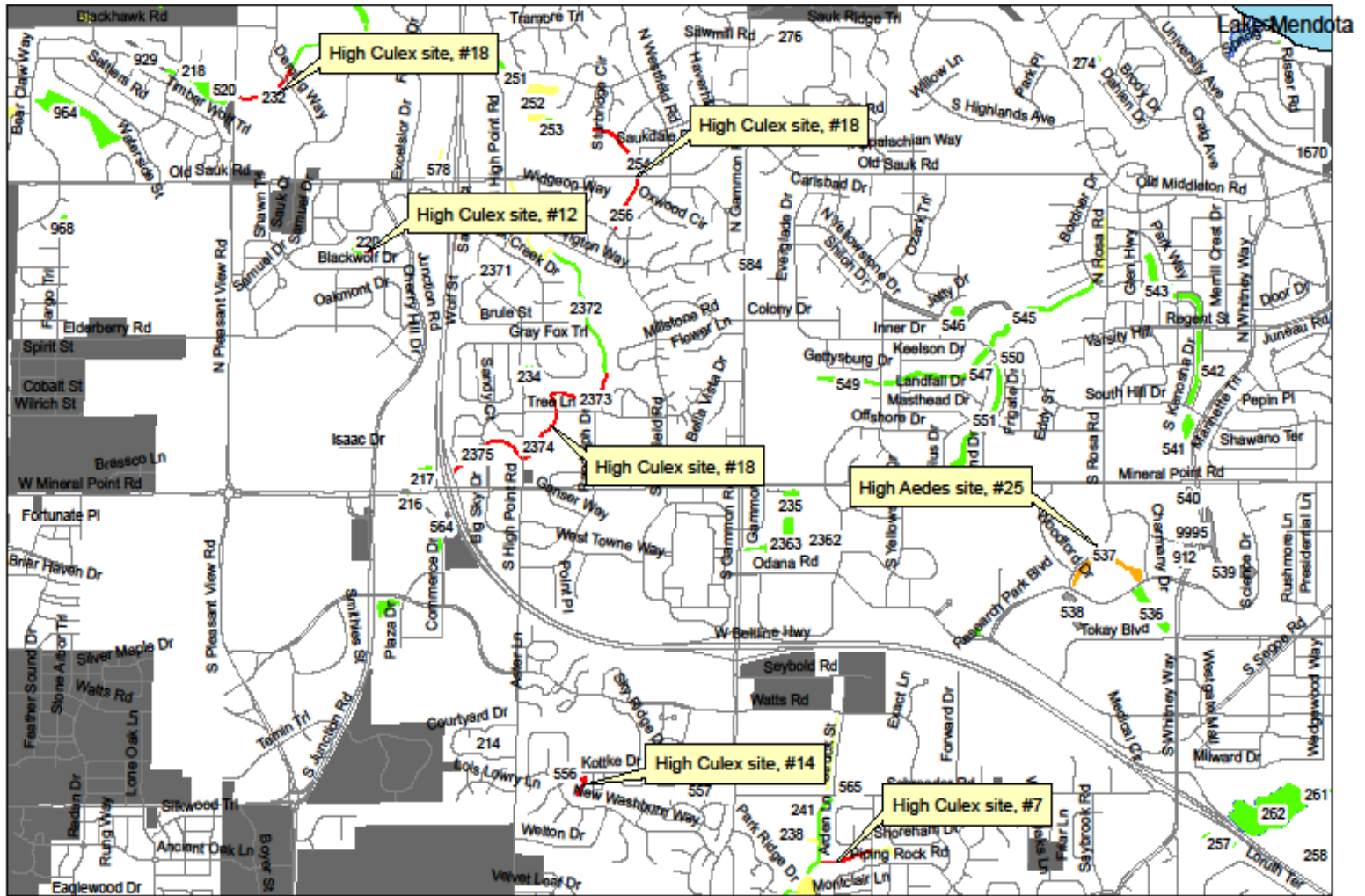
Middleton, WI



### Legend

- |  |   |
|--|---|
| <span style="color: red;">■</span> High Culex    | <span style="color: green;">■</span> No Larvae              |
| <span style="color: orange;">■</span> High Aedes | <span style="color: gray;">■</span> Inaccessible or Private |
| <span style="color: yellow;">■</span> Low Larvae | <span style="color: blue;">■</span> Lakes, Rivers, Streams  |

Madison, WI (northern west side)

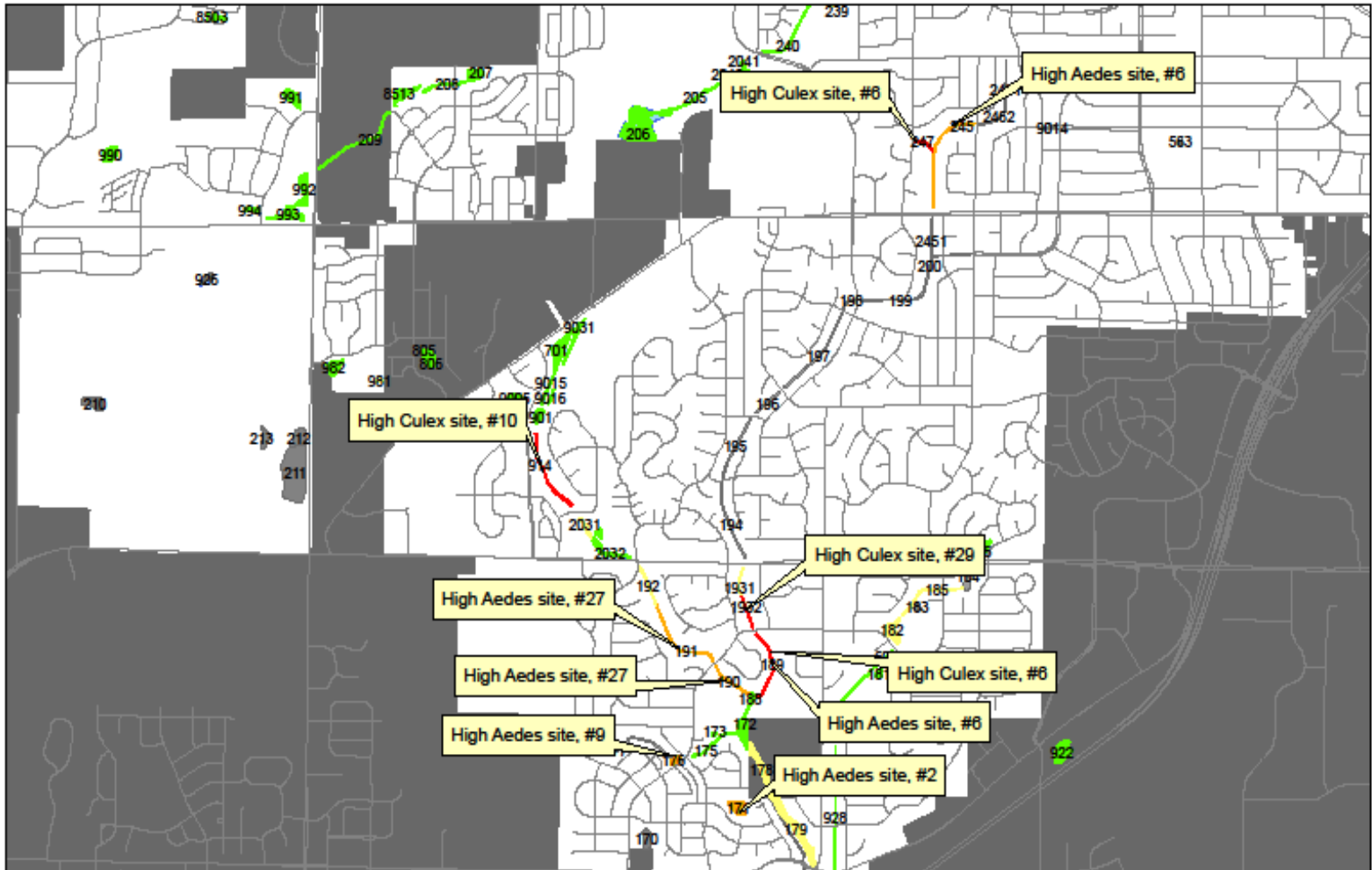


0 0.25 0.5 1 Miles

**Legend**

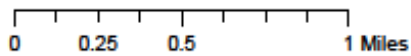
- High Culex
- High Aedes
- Low Larvae
- No Larvae
- Inaccessible or Private
- Lakes, rivers, streams

Madison, WI (southern west side)

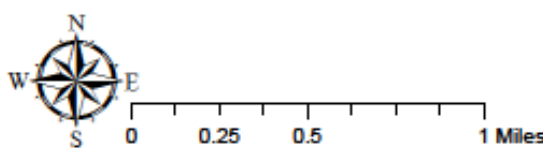
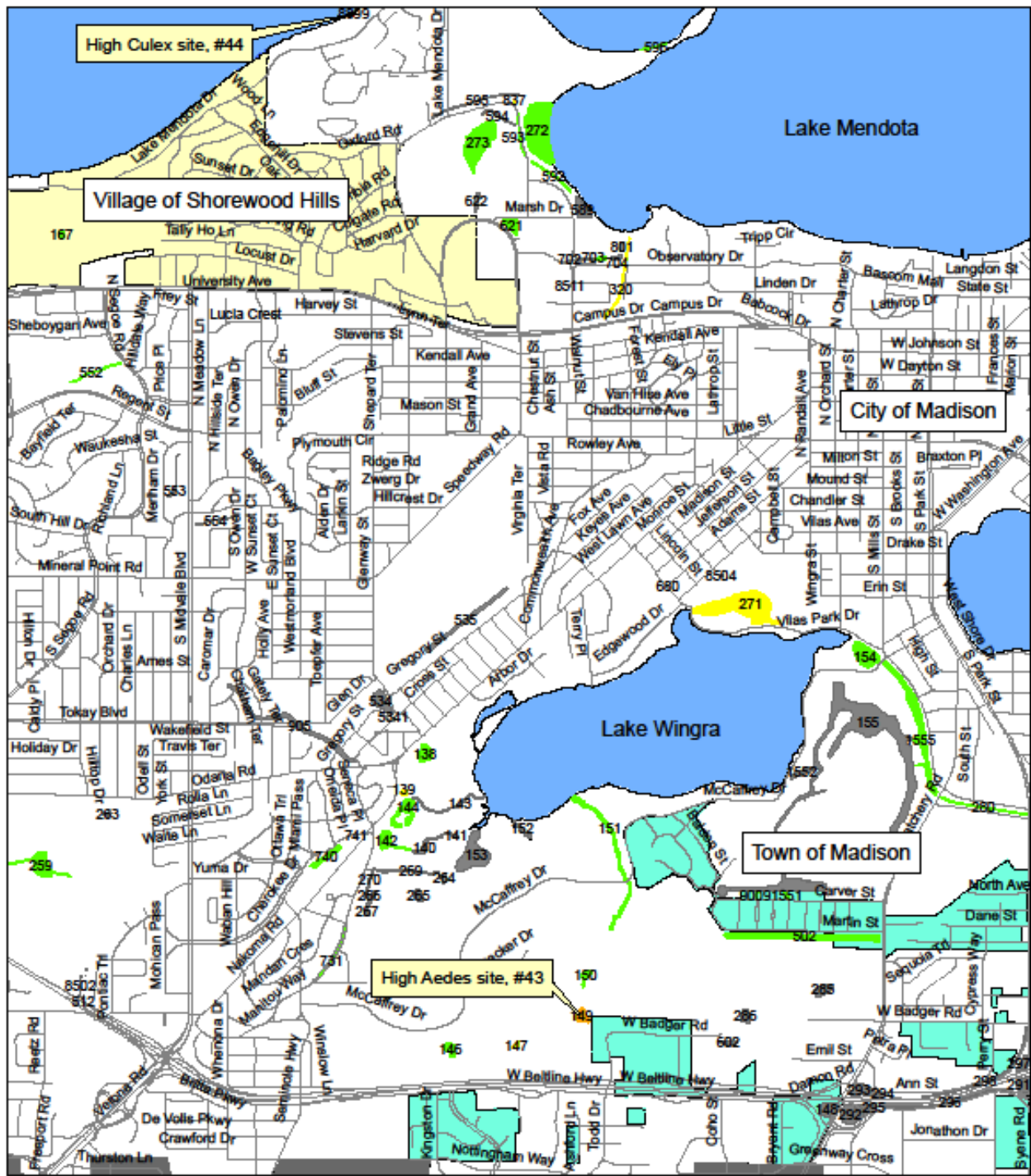


**Legend**

- |   |  |
|---|--|
| <span style="display: inline-block; width: 15px; height: 15px; background-color: red; border: 1px solid black;"></span> High Culex    | <span style="display: inline-block; width: 15px; height: 15px; background-color: lime; border: 1px solid black;"></span> No Larvae                   |
| <span style="display: inline-block; width: 15px; height: 15px; background-color: orange; border: 1px solid black;"></span> High Aedes | <span style="display: inline-block; width: 15px; height: 15px; background-color: grey; border: 1px solid black;"></span> Inaccessible or Private     |
| <span style="display: inline-block; width: 15px; height: 15px; background-color: yellow; border: 1px solid black;"></span> Low Larvae | <span style="display: inline-block; width: 15px; height: 15px; background-color: lightblue; border: 1px solid black;"></span> Lakes, rivers, streams |



Madison (near west side), Village of Shorewood Hills, and Town of Madison, WI.

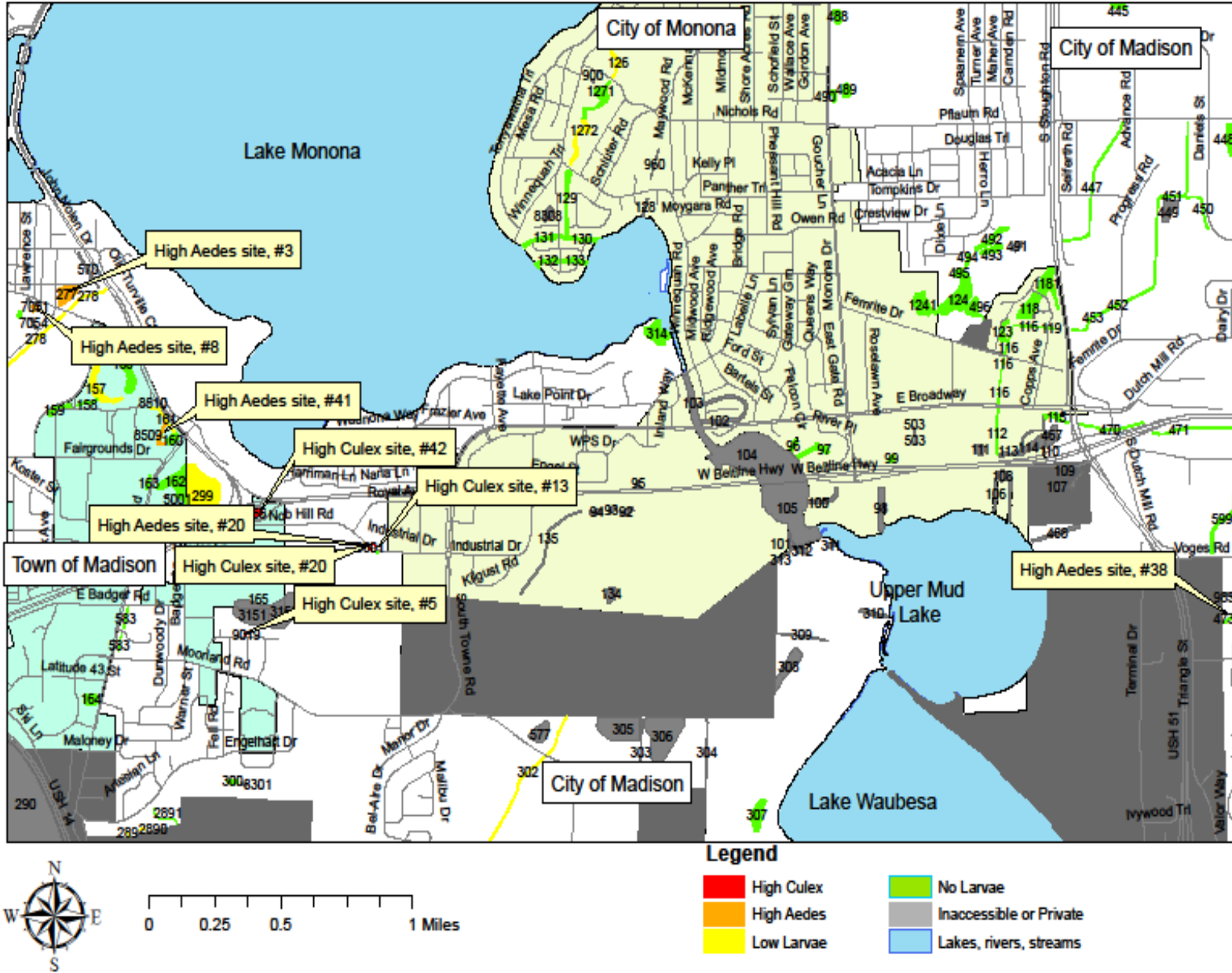


**Legend**

<span style="color: red;">■</span> High Culex	<span style="color: green;">■</span> No Larvae
<span style="color: orange;">■</span> High Aedes	<span style="color: grey;">■</span> Inaccessible or Private
<span style="color: yellow;">■</span> Low Larvae	<span style="color: blue;">■</span> Lakes, rivers, streams

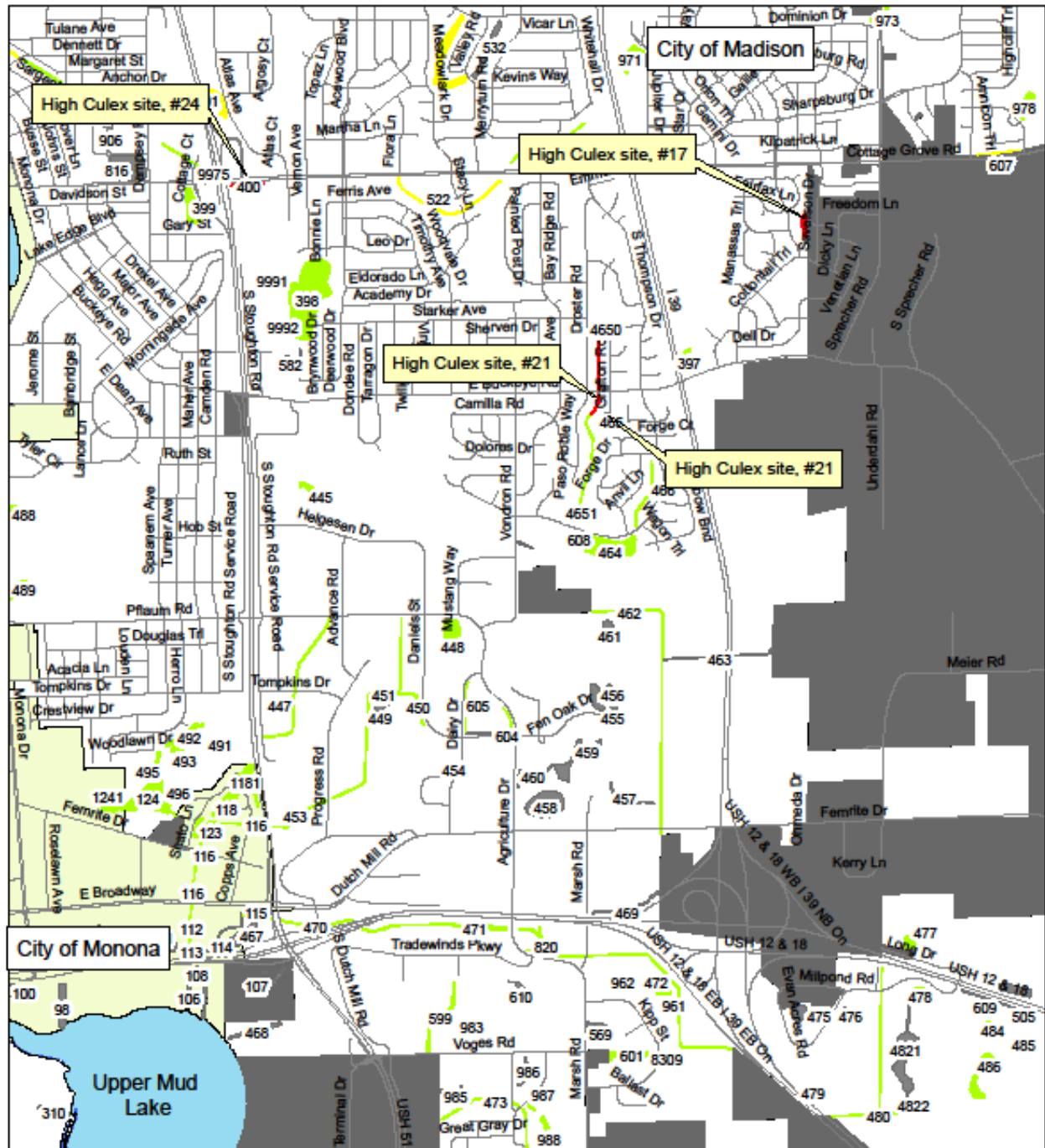


Madison (south side), City of Monona, and Town of Madison, WI.

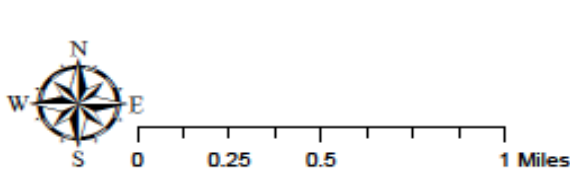
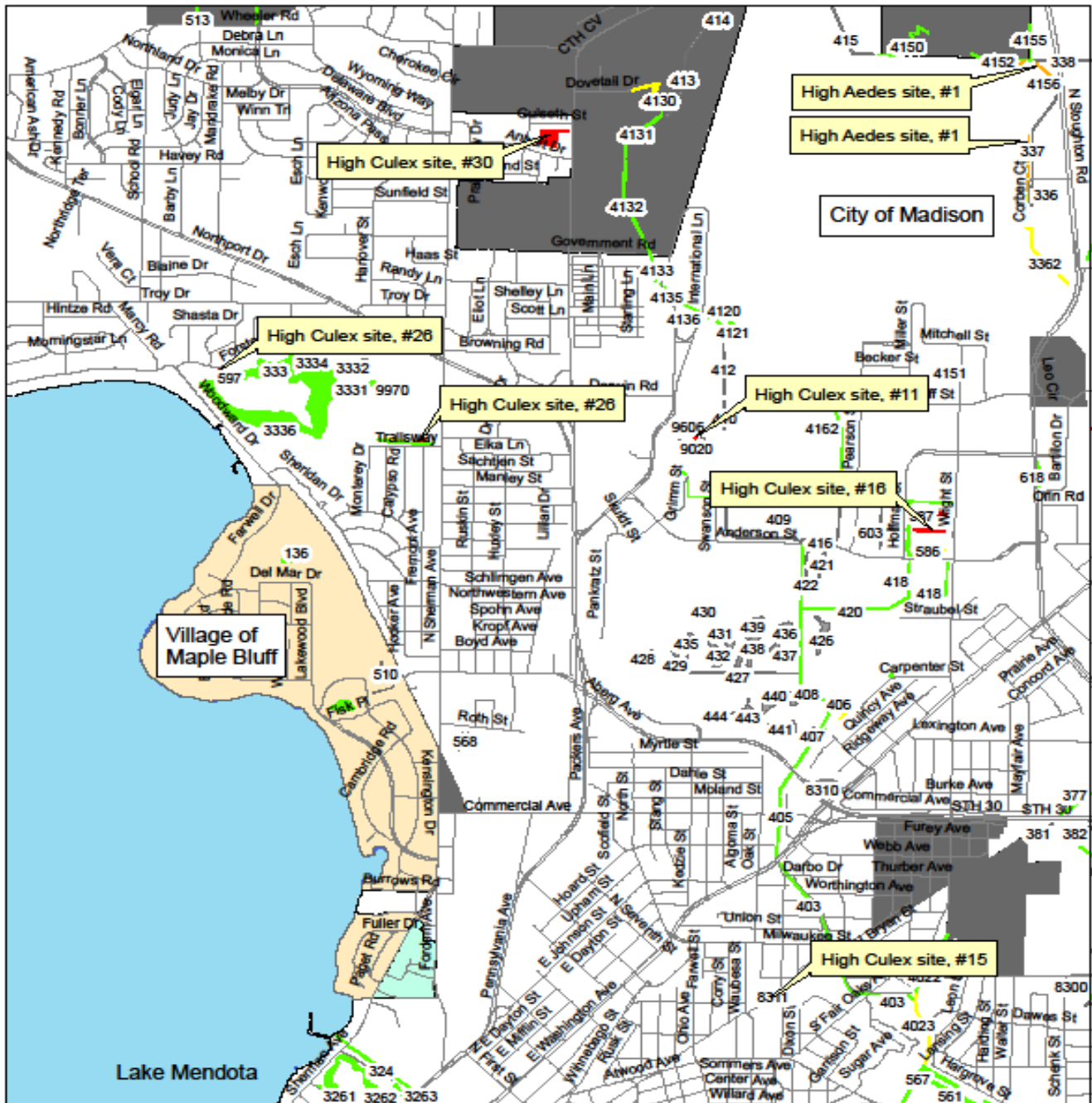




Madison (southeast) and City of Monona, WI.



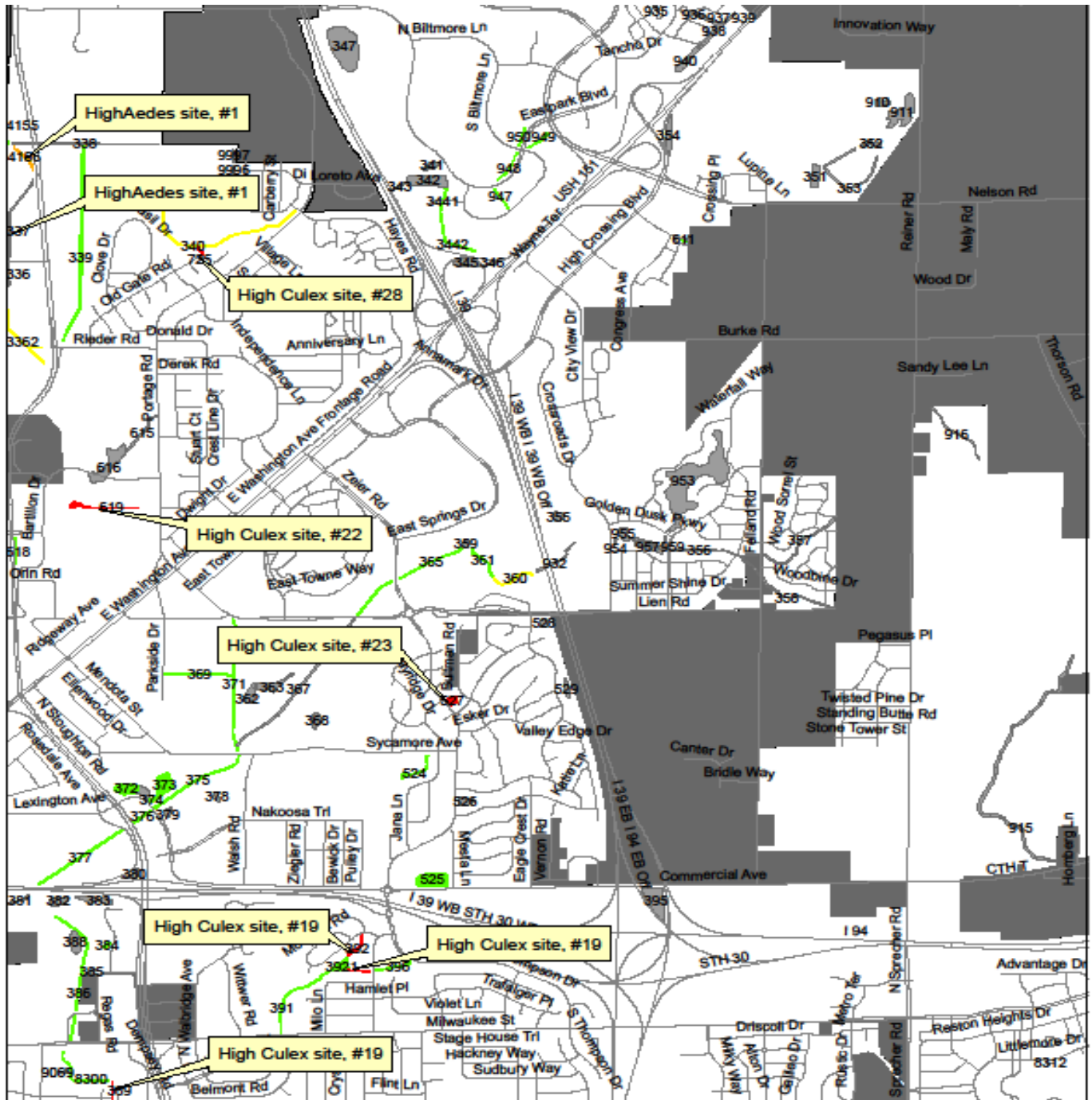
Madison (north), and Village of Maple Bluff, WI.



**Legend**

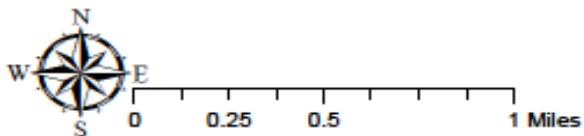
- High Culex
- High Aedes
- Low Larvae
- No Larvae
- Inaccessible or Private
- Lakes, rivers, streams

Madison (northeast), WI.



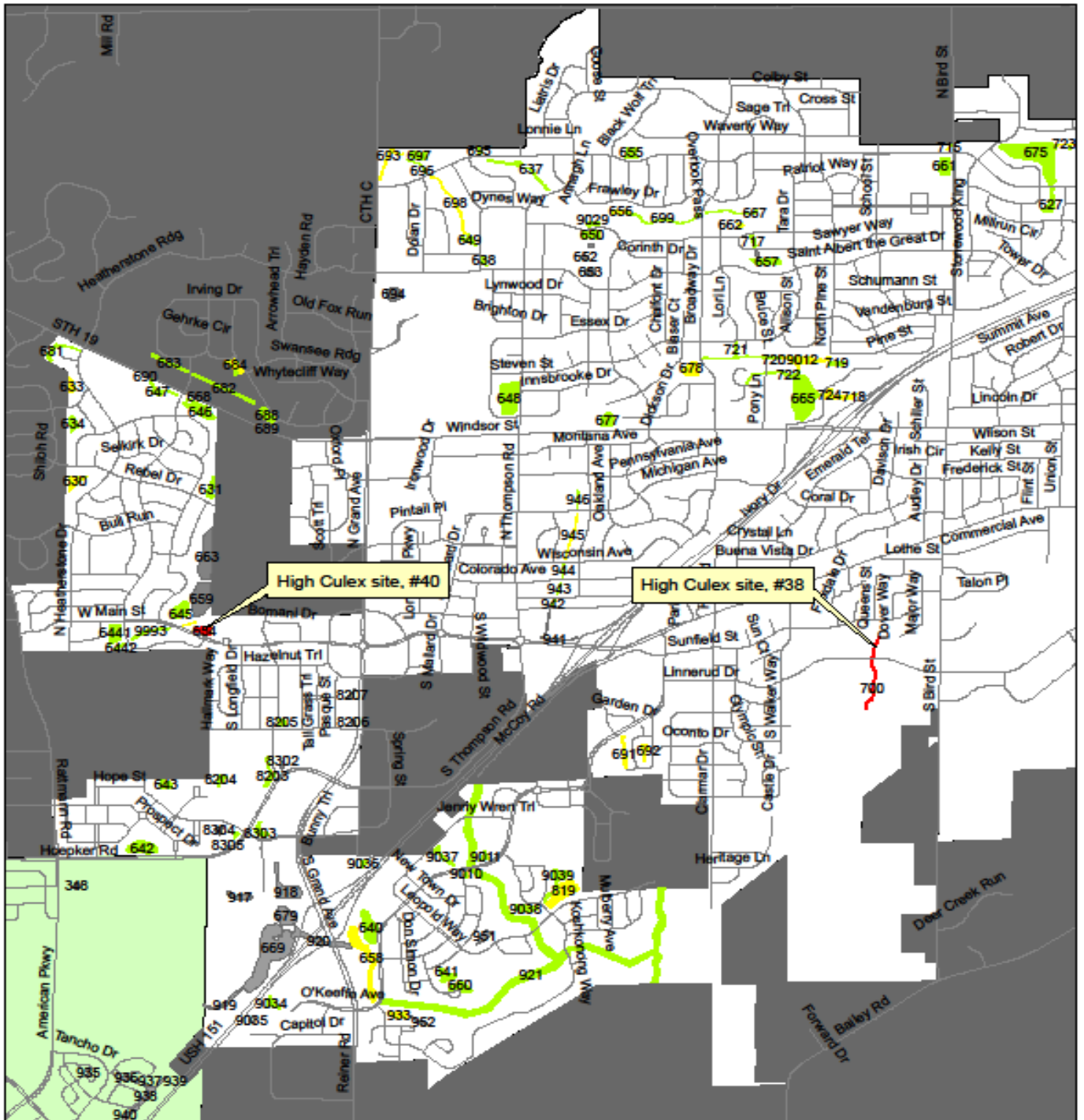
**Legend**

- High Culex
- High Aedes
- Low Larvae
- No Larvae
- Inaccessible or Private
- Lakes, rivers, streams



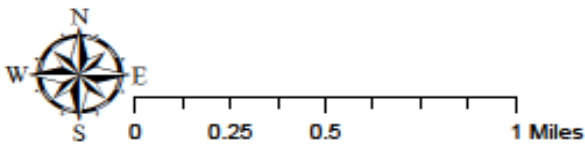


Sun Prairie (West), WI.

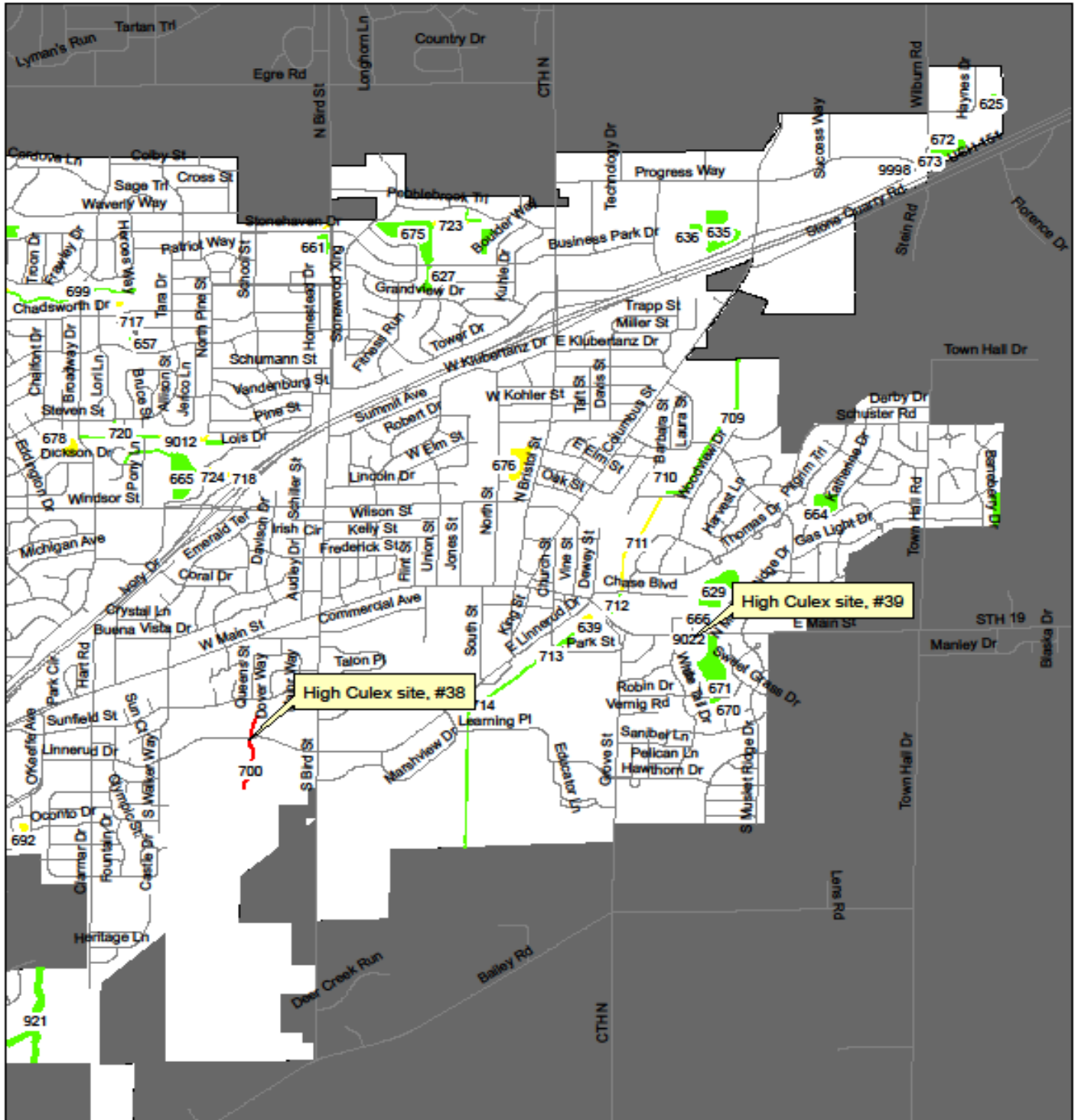


**Legend**

- |  |   |
|--|---|
| <span style="color: red;">█</span> High Culex              | <span style="color: lime;">█</span> No Larvae               |
| <span style="color: yellow;">█</span> Low Larvae           | <span style="color: gray;">█</span> Inaccessible or Private |
| <span style="color: blue;">█</span> Lakes, rivers, streams |   |

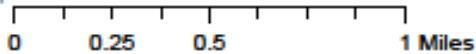


Sun Prairie (East), WI.



**Legend**

- |   |            |   |                         |
|---|------------|---|-------------------------|
|  | High Culex |  | No Larvae               |
|  | High Aedes |  | Inaccessible or Private |
|  | Low Larvae |  | Lakes, rivers, streams  |



For more information, contact:

Jeffery S. Lafferty, Environmental Epidemiologist [JLafferty@publichealthmdc.com](mailto:JLafferty@publichealthmdc.com)



[publichealthmdc.com](http://publichealthmdc.com)

May 2023