VLAWMO Frog and toad surveys
Monitoring results from 2019-2020

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During 2019-2020, VLAWMO made it a priority to better understand our wetlands in a variety of ways. One way we did that was by conducting a frog and toad call survey. The survey is modeled after a long-running MN DNR sampling program, and follows the same protocol used for that program. A survey consists of 3 separate sampling sessions, or runs, of a predefined route.

Protocol:

A survey run begins at least 30 minutes after sunset. Runs are not conducted if wind speed is more than 8 mph. Warm, cloudy evenings with little or no wind and high humidity are ideal. A light rain is acceptable. Loud vehicle noise can obscure calls. Vehicles passing are noted. The observer listens for at least 5 minutes and counts all frog and toad calls heard. An index value is recorded for each species heard at each stop.

Call Index Values	
1	Individuals can be counted with space between calls
2	Individuals can be distinguished but there is some overlapping of calls
3	Calls are constant, continuous, and overlapping

Fourteen sampling locations were selected to encompass the range of wetland types found in the Vadnais Lake Area Watershed. They were not selected randomly. The sites were organized into 2 smaller routes (R1 = route 1 and R2 = route 2), each with 7 total sites. This was done so that monitoring could be split in the future if desired. Sites were numbered accordingly. For example: R1S1 through R1S7.

Locations included:

- remnant natural wetlands and created mitigation wetlands
- large wetland complexes and isolated pocket wetlands
- locations in 5 of our 6 communities
- areas designated primarily commercial, residential, and green space
- near the creek, large and small lakes, and nonimpaired and impaired lakes
- near major roads and small side roads

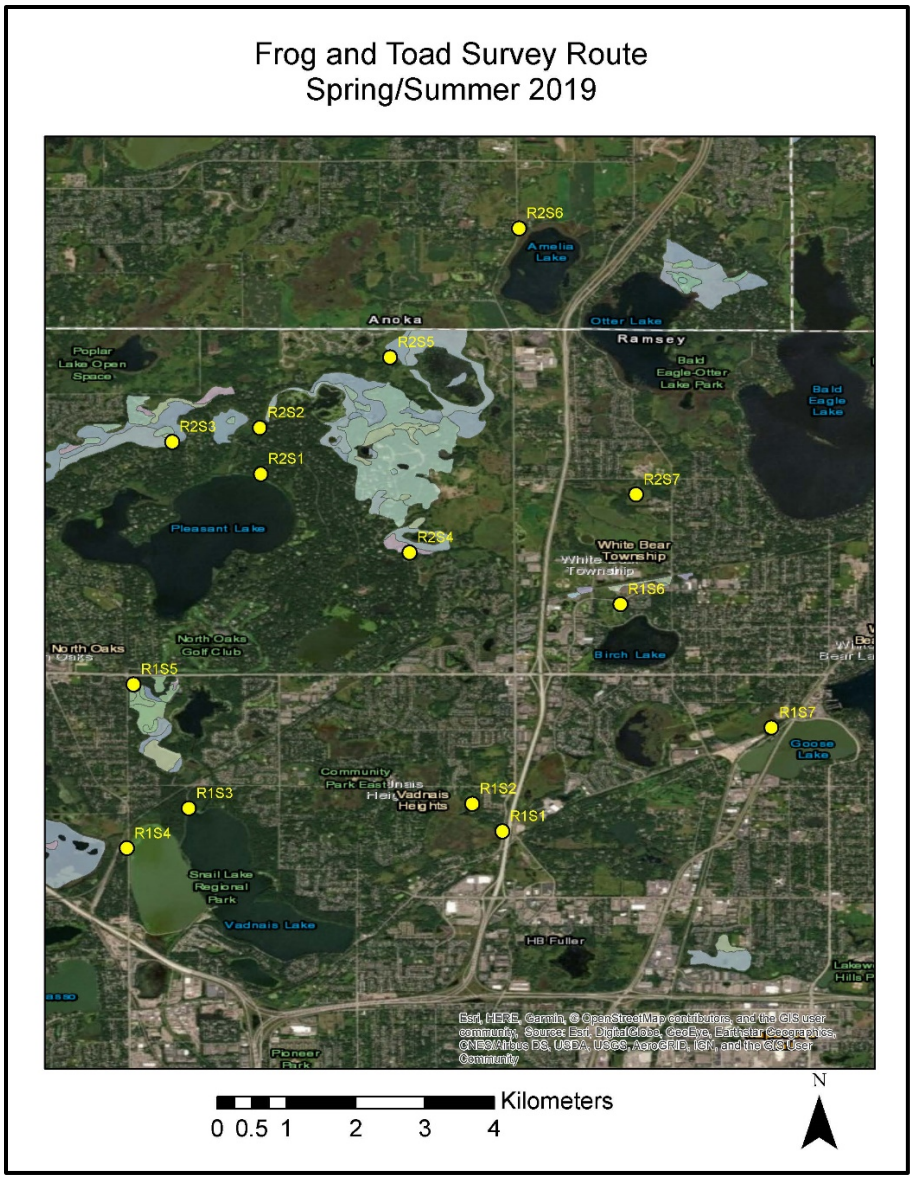


Figure 1: Frog and toad survey route for the Vadnais Lake Area Watershed during 2019. The same route was used in 2020, except that R1S2 was not included.

Timing and behavioral role of calling

Sampling runs were done during predefined timeframes to fully encompass the breeding windows for all Minnesota species. **The first run takes place between April 15-30, the second is May 20-June 5, and the third is June 25-July 10.**

Why do frogs call? Male frogs do the calling. They call in large groups to reduce the risk of predation on any one individual. It's safer to call in groups, even though that means competing with other males for the attention of the females. Predation risk is also why the whole group will get quiet if you're trying to listen to calls and get too close. If an owl calls, this can silence the group too. A few bravest individuals will cautiously start calling again when they feel the potential danger has passed. They do their best to

maximize the chance to breed while minimizing the chances of getting eaten.
Frogs and toads don't all call at the same time, nor all summer long. If they all called at the same time, it would be hard for individuals of the same species, especially quieter callers, to find each other. Instead, calling timeframes are staggered. Wood frogs are especially quiet and can be covered up by louder species, like Spring peepers. Wood frogs start calling as early as late March but continue into late April. Green frogs are a late caller. They start calling in early June and continue through late July. Frogs and toads don't call all summer long because young born late in the year would not have time to fully develop and successfully overwinter.

Minnesota species and predicted occupancy

Fourteen frog and toad species are documented in Minnesota. Of those 14 species, 1, the Bullfrog, is undesirable. Bullfrogs have been documented in the southeast corner of the Twin Cities metro area. Bullfrogs are native to the United States but are naturally found farther south and only at the very southern tip of Minnesota. They were often transported to new locations and released. Outside of their native range, they are regarded as a pest and often displace other frog and toad species.

Based on range maps, we identified 10 frog and toad species that might be found in the watershed. That group included the Bullfrog, which was not detected. We identified 9 native species that appeared to be possible; we detected 8 species. The remaining species that was not heard was the Mink frog. Mink frogs are reported in Anoka County. They have not been reported as far south as Amelia Lake. We will continue to listen for this species and would report a possible range expansion if it occurs in the future.

Species detected on 2019-2020 surveys (in order of seasonal calling):

1. Wood frog
2. Boreal chorus frog
3. Spring peeper
4. Northern leopard frog
5. American toad
6. Gray treefrog
7. Cope's gray treefrog
8. Green frog

- Not detected but identified as possible: Bullfrog and Mink frog

Figure 2: Frog and toad species detected during surveys

Wood frog *Lithobates sylvaticus* 	Boreal chorus frog *Pseudacris maculata* 	Spring peeper *Pseudacris crucifer* 
Northern leopard frog *Lithobates pipiens* 	American toad *Anaxyrus americanus* 	*Gray treefrog* *Hyla versicolor* 
Cope's gray treefrog *Hyla chrysoscelis* (indistinguishable from Gray treefrogs by sight; only detectable by call)	Green frog *Lithobates clamitans* 	

Synopsis of each run

The first run was completed on April 23, 2019. Four species were detected: Wood frogs, Spring peepers, Boreal chorus frogs, and Northern leopard frogs. Air temperature: 54°F.

The first run was completed on April 30, 2020. The same 4 species were detected as in 2019. Air temperature: 60°F. Wood frogs were not detected at as many locations as 2019. This may be because spring was early in 2020, and April 30 is the last date for the first run window. With climate change, it may be appropriate to consider moving the date ranges earlier to continue to capture the frog and toad diversity present. Northern leopard frogs were added at a couple of locations.

We noticed, anecdotally at this point, that often the large wetlands with dense Phragmites (Common reed) and cattail did not have very many frogs calling. Smaller, ephemeral, and some mitigation wetlands were filled were quite loud, which may be telling us important information about specific wetlands in our watershed and their importance to amphibians.

Spring peepers are thought to be declining in the metro area because of a loss of wooded wetlands. We heard Spring peepers at 64% of our stops, but the chorus wasn't strong in many locations, often composed of only a few individuals.

Vadnais-Sucker Lakes Regional Park is an excellent place to hear frogs and toads. All 4 species were present at the parking lot at the north shore of East Vadnais Lake (in 2019 and 2020).

The second run was completed on May 29, 2019. Five species were detected (for a total of 7 species detected): Spring peepers, Boreal chorus frogs, Gray treefrogs, Cope's gray treefrogs, and American toads. Air temperature: 65°F.

The second run was completed on May 27, 2020. Air temperature: 72°F. The same five species were detected as in 2019. Cope's gray treefrogs were added at a couple of locations.

As expected, Wood frogs and Northern leopard frogs were done calling. Spring peepers were still calling in a few locations. Boreal chorus frogs were no longer dominating the chorus, but they were still a noticeable presence. New frogs and toads detected included: American toads, Gray treefrogs, and Cope's gray treefrogs, for a running total of 7 species for the watershed so far.

The record-setter location was Long Marsh in North Oaks, which had 5 species calling: Spring peepers, American toads, Gray and Cope's gray treefrogs, and Boreal chorus frogs (in 2019 and 2020). There was still a full chorus of Spring peepers calling at this location.

Gray treefrogs largely dominated the chorus at all locations. They are distinguished from Cope's gray treefrogs by their call or by their DNA--call is much easier and faster. There is no way to tell these species apart by sight. In a loud constant chorus of Gray treefrogs, it can be difficult to distinguish the Cope's lower-pitched and faster trill. This is one reason the strength of the chorus is included in data collection. If there is a loud chorus of Spring peepers or Gray treefrogs, it may not mean that quieter species were absent but rather that they were covered up by other calls. Coloration on Gray and Cope's gray treefrogs can change rapidly as they camouflage with their environment. These treefrogs can range from creamy white, to gray, to bright green.

Figure 3: Gray treefrogs show a wide range in possible coloration and can change their color rapidly.

The third run was completed on July 1, 2019. Five species were detected: Boreal chorus frogs, Gray treefrogs, Cope's gray treefrogs, American toads, and Green frogs. Spring peepers were no longer calling. Green frogs were newly detected during this run (for a total of 8 species detected). Air temperature: 70°F.

The third run was completed on June 24, 2020. The same five species were detected as in 2019. Green frogs were added at a couple of sites.

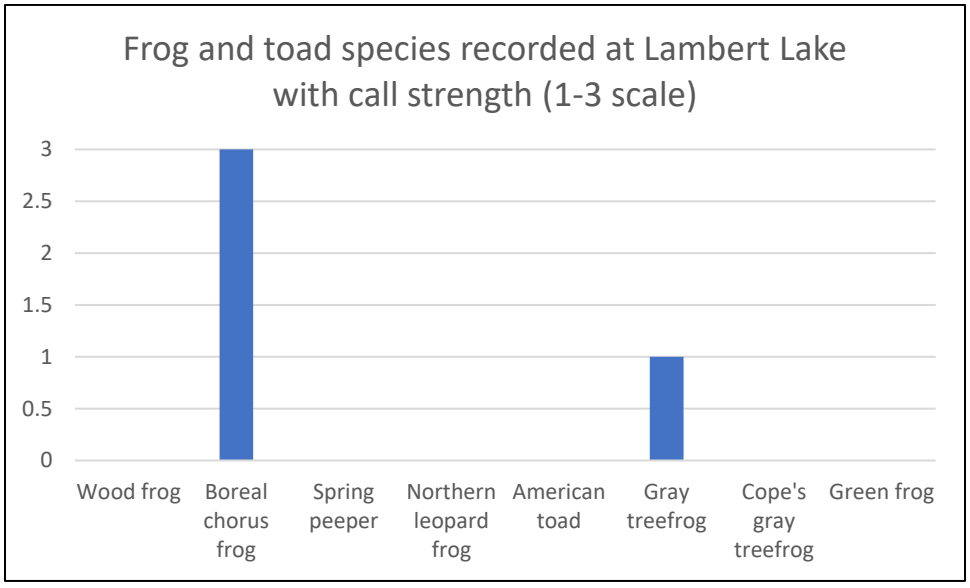
The most species heard at a single location on this run was at Amelia Lake in 2019. Four species were recorded: Boreal chorus frogs, Gray treefrogs, Cope's gray treefrogs, and American toads. Green frogs were recorded at 6 locations in 2019 and 9 locations in 2020.

Results by sampling location with short site descriptions:

Yellow highlighted site names are high diversity locations. A green highlighted site name means all 8 species were detected at the site between both years. In the graphs, blue bars show species detected both years. Rust-colored bars show species only detected in 2019. Yellow bars show species added (only detected) in 2020.

Route #1

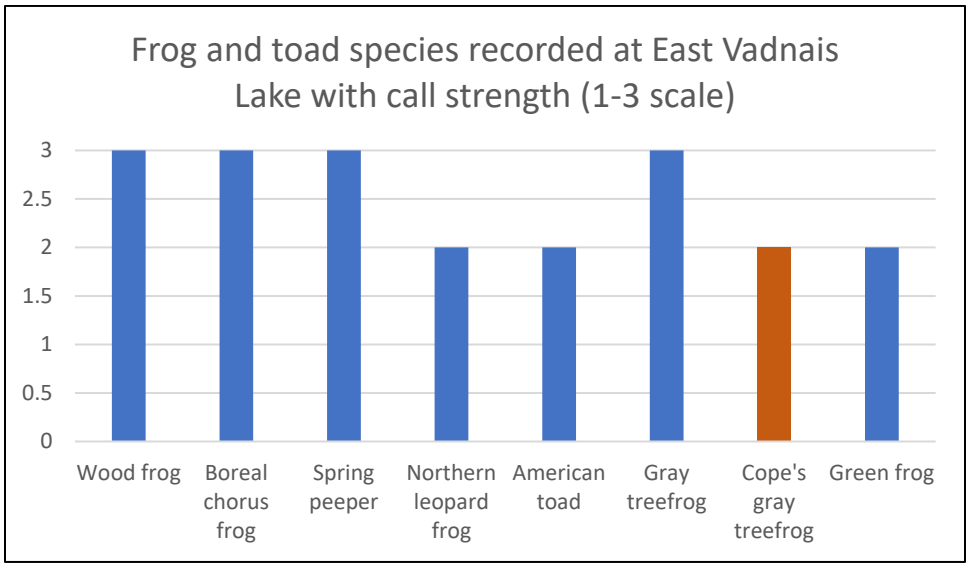
R1S1: Vadnais Heights: On the east side of Lambert Lake. This location is accessible from Centerville Road. There is a small pull-off and meadow to the east of Centerville Road. This is a large, intact wetland with limited diversity (e.g., high cattail and native Phragmites). Only Boreal Chorus frogs and Gray treefrogs were detected at this site. Both species were heard in 2019 and 2020, with the same maximum call strength.



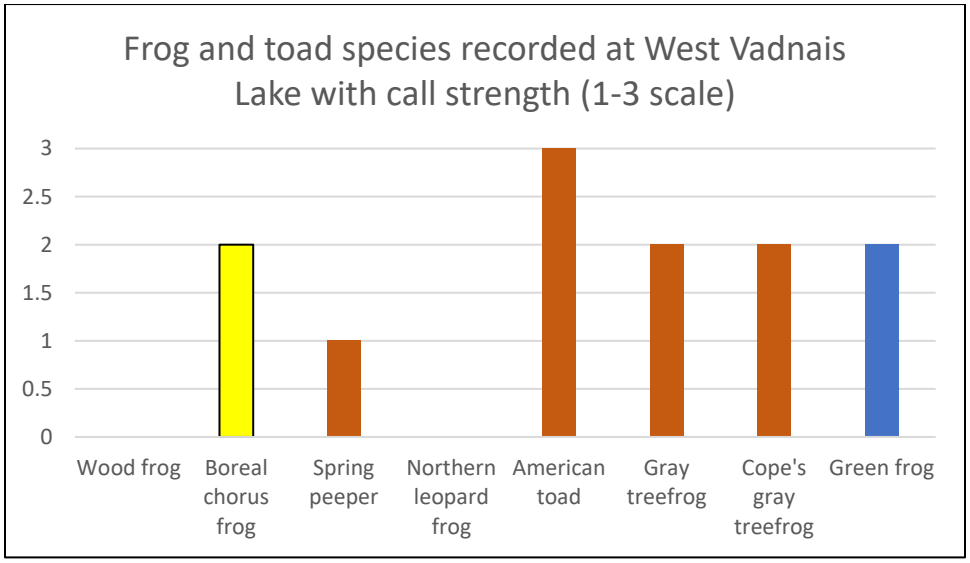
R1S2: Vadnais Heights: This is along the road next to the retention pond and site of future meander construction. There is a small wooded wetland that was built as a mitigation wetland. Higher diversity was heard here than the larger wetland area that is connected within the area. Wood frogs, Boreal chorus frogs, Gray treefrogs, and American toads were heard at this site in 2019. Green frogs were heard at this site during site visits for project work in 2020. This site was not included in the survey during 2020 to avoid disturbing residents living at the site (which is private property).

***R1S3: Vadnais Heights:** The north shore of East Vadnais Lake. This area has multiple wetlands. The lake area itself did not have calling frogs and toads. A small wetland on the north end of the lake, next to the parking area and a wooded wetland on the north side of the parking lot both had a lot of species calling. All 8 species were heard at this site. Based on frog and toad diversity, this protected area provides habitat for all species detected as part of this survey. It provides information that may help with restoration and as baseline information for other wetlands in the watershed. The graph below shows

the species detected and maximum call intensity if a species was detected on more than 1 run. Cope's gray treefrogs were detected in 2019 and not in 2020.



R1S4: Vadnais Heights: The northwest shore of West Vadnais Lake. There is a small wetland on the north end of the lake near the railroad tracks that had a weak Spring peeper chorus in 2019. There is also a fairly low plant diversity wetland on the west shore of the lake that supported Green frogs late in the season. Although this area is spatially near and appears connected, frog and toad diversity was lower than the location on East Vadnais Lake. Six species were detected here among both years. Boreal chorus frogs were added in 2020. In year 2, Spring peepers, American toads, and Cope's gray treefrogs were not detected. A graph of this site is shown for comparison with East Vadnais Lake.



***R1S5: Vadnais Heights:** Sucker wetlands. There are various wetlands at this site, both near the lake and along the park road to the main parking lot. Wood frogs, Spring peepers, Boreal chorus frogs, Gray

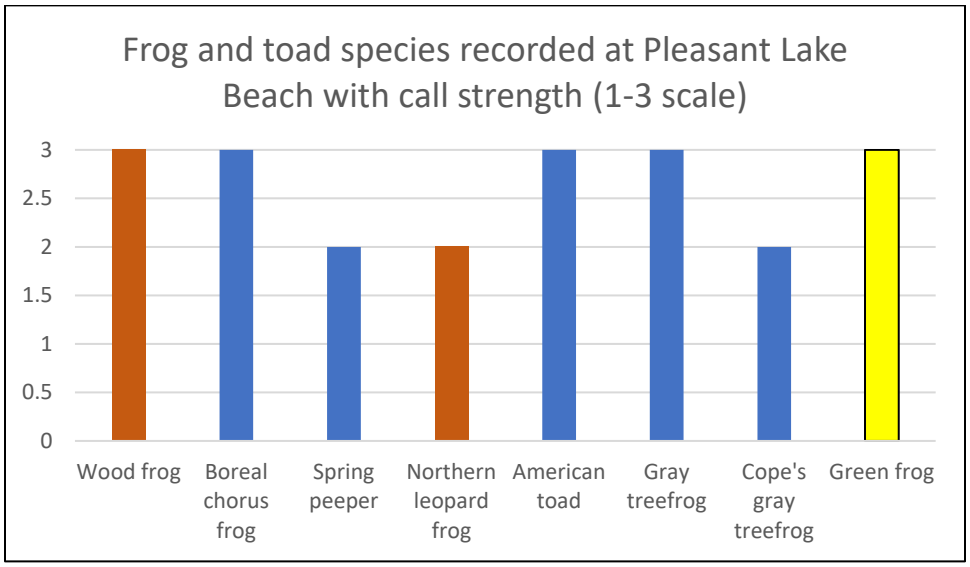
treefrogs, American toads, and Green frogs were all recorded with strong choruses at this location in 2019. These species plus Cope's gray treefrogs were recorded in 2020.

***R1S6: White Bear Lake:** Birch Rotary Nature Preserve. This site supports strong populations and choruses of frogs and toads. Frogs and toads were often calling during the day during pilot trips and visits to the sites for other monitoring reasons. Six species were detected here in 2019. Northern leopard frogs and Spring peepers were not detected here in 2019. Wood frogs were not detected in 2020.

R1S7: White Bear: Goose Lake/Sobota Slough. Boreal chorus frogs, American toads, and Gray treefrogs were detected at this site.

Route #2: North Oaks sites had a high diversity of frog and toad species present. Loud choruses were also heard throughout North Oaks, as observers traveled among sampling locations. Choruses were heard along roads, from numerous wetlands adjacent to these roadways.

***R2S1: North Oaks:** Pleasant Lake Beach. A small wooded wetland located on the north side of the parking lot. This was a high diversity location throughout the season with all 8 species detected among both years. Green frogs were added in 2020. Wood frogs and Northern leopard frogs were only detected in 2019.



***R2S2: North Oaks:** Deep Lake Trail at Chickadee Lane. Seven species were detected at this site. Only Northern leopard frogs were not detected in 2019. Wood frogs were not detected in 2020.

***R2S3: North Oaks:** Long Marsh. The survey location is located on the gravel road that is part of the NOHOA hiking trail system. There are wetlands on both sides of the trail. There is a small wooded wetland to one side and a large meandering wetland to the other. This was a highly diverse site with strong choruses documented during each visit. Six species were detected in 2019. Northern leopard and Green frogs were detected in 2020.

R2S4: Lino Lakes: Amelia Lake. The survey location is on the north shore of the lake. Five species were detected. Spring peepers, Northern leopard, and Green frogs were not detected. 2019 and 2020 were the same.

***R2S5: North Oaks:** Wilkinson on Crescent Lane. This is a mitigation wetland that is supporting a high diversity of frogs and toads. A barred owl was also heard at this site, which caused the chorus to quiet until the owl flew away. Northern leopard and Green frogs were not detected in 2019. Green frogs were detected in 2020. Cope's gray treefrogs were not detected in 2020. Spring peeper choruses were especially strong at this site on both the first and second run. This mitigation wetland may be especially important in providing habitat to this species that has been declining in the Twin Cities metro area.

***R2S6: White Bear Township:** Tamarack Nature Center. The sampling location is location behind the nature center on a small pond/wetland area adjacent to the trail system. Six species were detected in 2019. Northern leopard and Green frogs were not detected in 2019. Both of these species were detected in 2020 in addition to the previous 6 species from 2019.

***R2S7: North Oaks:** Southern shore of Black Lake. Coyotes were heard at this site. There are also 2 wetland areas. There is a small mitigation wetland to the south and audible from the sampling location. There is also the extensive wetland area near the trail system around Black Lake. Six species were detected in 2019. Northern leopard and Green frogs were not detected in 2019. Green frogs were detected in 2020 for a total of 7 species. Cope's gray treefrogs were not detected at this site in 2020 (but were in 2019).

Education and outreach component

An article about the survey presentation, *Frogs and toads in North Oaks*, was published in North Oaks News for the June 2019 issue. That article included promotion for an identification and audio training session for residents at the Pleasant Lake Beach. The session was well held on May 31, attended by groups including whole families attending, and a total of ~30 residents. The session was informal, fun, and got people excited about listening to spring and summer sounds in a more meaningful way. VLAWMO and NOHOA plan to make a frog and toad event an annual one and continue to emphasize the importance of healthy landscape connections (wetlands to uplands and waterways) for amphibians and other wildlife.

Conclusions

Spring peepers were detected at 9/14 sampling locations or 64% of the sites in 2019; five of those sites were in North Oaks. Spring peepers were heard at 100% of the North Oaks sites in 2019. It would be useful to watch Spring peeper presence over time to see if a declining trend is documented. Mitigation wetlands often were documented supporting Spring peepers. These could be more closely monitored and considered for restoration over time if degradation is occurring. Northern leopard frogs were heard at the fewest locations (2/14 or 14%) in 2019, but these are very quiet callers and may have been covered up by strong choruses of louder species. They overlap in calling timeframe with Boreal chorus frogs, American toads, and others, which had strong choruses in many locations. In 2020, Northern leopard frogs were heard at 3/13 locations (23%), and 2 of those were additions in 2020. Among both years, Northern leopard frogs were heard at 5/14 sites (36%). This emphasizes the importance of using

multiple years in establishing baseline data. Northern leopard frogs have not been a species of concern in the watershed nor other areas of the state.

Areas of especially strong choruses and a high diversity of species included many areas of North Oaks, the Vadnais-Sucker Park area, and Tamarack Nature Center. These areas should be priority for further wetland investigation and survey work. Restoration may be warranted in some locations to maintain existing diversity. Wetlands around West Vadnais Lake have been found to have high invasive species presence, as results of vegetation surveys. These areas are connected to the park, which supports both a higher diversity and stronger choruses (likely larger actual numbers) than the wetlands around West Vadnais. Efforts such as invasive species control and restoration may have the potential to improve these areas for frogs, toads, and amphibians in general. Amphibians are important indicators of environmental health. What we detect in the environment about diversity and abundance likely corresponds to other guilds and ecosystem health more broadly.

Appendix

Appendix A: Data table

Route 1: Highest call index value recorded among 3 runs in both years shown

Species	R1S1	R1S2	R1S3	R1S4	R1S5	R1S6	R1S7
Wood frog	-	1	3	-	3	3	-
Boreal chorus frog	3	3	3	2	3	3	3
Spring peeper	-	-	3	1	3	-	-
Northern leopard frog	-	-	2	-	-	-	-
American toad	-	2	2	3	3	3	3
Gray treefrog	1	3	3	2	3	3	3
Cope's gray treefrog	-	-	-	2	2	2	-
Green frog	-	*Recorded off survey	2	3	2	1	-

Route 2: Highest call index value recorded among 3 runs shown

Species	R2S1	R2S2	R2S3	R2S4	R2S5	R2S6	R2S7
Wood frog	3	2	3	1	3	3	3
Boreal chorus frog	3	3	3	3	3	3	3
Spring peeper	3	2	3	-	3	1	3
Northern leopard frog	2	-	1	-	-	1	-
American toad	3	3	3	3	3	3	3
Gray treefrog	3	3	3	3	3	3	3
Cope's gray treefrog	2	3	3	3	2	3	2
Green frog	-	1	1	-	3	2	1

Appendix B: Call descriptions

Calls were recorded and described for Blog posts. The descriptions are included here for future incorporation into an ESRI StoryBoard.

Descriptions of audio recordings

Sounds of a spring evening at Vadnais-Sucker Lakes Regional Park.

When I listen to the recording, the first sound that I focus on is the loud, high-pitched call of the Spring peeper. These frogs are surprisingly loud for their tiny size. Next, I notice Boreal chorus frogs. Their call is often described as running your finger along a comb. Think about clicking the tines of the comb 3-4 times as your run your finger along it pretty quickly. Then notice the lower pitched, kind of grumbling persistent calls, like they're doing a lot of gossiping. These calls are made by Wood frogs and are pretty much continuous in this recording. They are beautiful little frogs with a distinctive black mask. They move from wetland areas to upland habitats after breeding. Connected areas between wetlands and forested areas are important for Wood frogs. They overwinter in the leaf litter in upland areas and travel back to wetlands in the spring to breed. Loud choruses of Wood frogs were detected in the Rotary Nature Preserve at Birch Lake and at Tamarack Nature Center. (Dawn Tanner)

Sounds of an early summer evening at Long Marsh in North Oaks and at Tamarack Nature Center:

The calls in this first recording are on the quiet side. Boreal chorus frogs (that sound like running your finger down a comb) and Spring peepers (loud single peeps) are present again. Add to that the long, steady trill of the American toad, and the loud fluttery trill of Gray treefrogs. In this clip, you can hear how the Gray treefrogs are a little way in the distance and a strong chorus. You will not likely hear any Cope's gray treefrogs standing out with all of the other noise. You will be able to distinguish them in the next recording.

These calls were recorded at the small wetland area at the entrance of Tamarack Nature Center. Here you can clearly hear the higher-pitched, melodic trill of the Gray treefrog. Listen for another call that sounds similar, but is faster and lower pitched. That's the Cope's gray treefrog. American toads come in around 15 seconds with their sustained trill. Boreal chorus frogs are clear and easy to distinguish in this recording also. (Dawn Tanner)