VLAWMO Remote-camera surveys
Monitoring results from 2018-2020

By Dawn Tanner, PhD
Program Development Coordinator

VLAWMO makes it a priority to better understand our wetlands in a variety of ways. One way we do that is by conducting remote-camera surveys. These survey allows us to focus on areas near waterways and in wetlands to better understand mammal diversity in these areas and across our watershed. Birds are also photographed at remote-camera sites. They are not included in this monitoring report because birds are better sampled by other methods (e.g., point-count call surveys, visual detection, mist netting). Some mammal species are indicators of habitat health and water quality (e.g., River otters). These species are of particular interest to us as we work to learn more about wildlife diversity in our watershed. These data provide baseline information about species present in our watershed and help VLAWMO identify priorities for future monitoring efforts and water-quality improvement projects.

Protocol:

We worked with partners to obtain permission to conduct remote-camera monitoring at a range of sites. We targeted larger wetland complexes and wetland areas identified as priority according to the MN DNR Native Plant Communities data layer. This layer is available free from the MN DNR and is also available as a selectable layer on the VLAWMO GIS resource, available on the VLAWMO website.

A collection of 1-10 cameras, depending upon the size of the site, were deployed for a period of 4-11 weeks. To select a camera location, an observer first hiked the area, searching for areas near water or in wetlands with evidence of high amounts of animal sign (e.g., tracks, scat, trails, dens/burrows, claw marks on trees, feeding sites). We deployed cameras in a widely dispersed network with representative samples of available habitat types. Cameras were used during fall, winter, and spring. Summer sampling was avoided because of rapid vegetation growth that quickly obscures the camera and causes many false captures (i.e., photographs of waving vegetation). In Vadnais-Sucker Lake Regional Park, there are native habitat areas, lakes, channels, and the site has high habitat diversity. In this location, cameras were moved during the study period to encompass a larger number of locations than our collection of cameras would otherwise allow. For this site, we sampled a total of 9 locations with 5 cameras.

Cameras were set to capture photos during day- and nighttime (full 24 hours). An infrared (IR) sensor captured nighttime images. Flash was not used to avoid disturbing animals and disrupting behavior. IR photos are black and white and often show animals with glowing eyes. Glowing eyes are the result of a physical feature in the animals called the tapetum lucidum. This structure gathers light and reflects it in the animal's eyes and allows them to see well in low-light conditions. It also reflects the light back to the camera and gives animals glowing eyes in the photos. Cameras were set to rapidfire for 3 images, which means that, when a camera was triggered, it would take 3 photos in rapid succession without a delay between images. If an animal remained in front of the camera, the camera would continue to take 3 images each time it triggered. For small mammals that tend to stay in front of the camera, this results in a high number of photos. For more secretive and wary species, it means that at least a couple of photos are likely to result before an animal moves away and out of camera range.

Cameras were positioned along mammal trails/travel routes not perpendicular to them. An animal is likely to move quickly along a trail, and a camera perpendicular to the trail is more likely to miss the animal. An animal aimed along the path of movement is more likely to capture a collection of photos. Cameras were also positioned along logs into wetland areas when possible because these are often used as travel routes. Animal structures and high behavior locations (e.g., beaver lodges and otter latrines) were sampled when possible.

Cameras were placed low (~12 inches or 0.3 meters) on trees or other natural vegetation using a bungee cord. Cameras were labelled with tags to identify them as part of a VLAWMO project to reduce the threat of theft. No cameras were lost to theft or damage. A small amount of trapping lure was placed on unbleached lambs' wool on the ground or tucked into vegetation/logs in the focal area for the camera field of view.

For each location, a total number of trapnights is included. This is a standard unit of measure in remove-camera studies to allow more meaningful comparisons especially when different numbers of cameras are used in a given site. A trapnight = 1 camera per 1 night of operation. If 5 cameras are monitoring locations at a site for 5 nights, that would be a total of 25 trapnights.

Sites (and property owners) included in 2018-2020 remote-camera survey:

- Amelia Lake
- Birch Rotary Nature Preserve (Birch Rotary Board)
- Lambert Lake (private landowner)
- North Oaks Conservation Area and NOHOA Trail Network (NOHOA)
- Tamarack Nature Center (Tamarack Nature Center)
- Vadnais-Sucker Regional Park (St Paul Regional Water Services)

Site and camera data, including trapnights

Site	Locations	Total cameras	Dates	Weeks	Trapnights
Amelia Lake	3	3	March 13-April 7, 2020	~4	75
Birch Rotary Nature Preserve	1	1	May 7-June 12, 2019	~5	36
Lambert Lake	2	1 1	April 2-June 3, 2019 June 3-June 12, 2019	~10	71
North Oaks Conservation Area	7	5 2	Feb. 5-March 8, 2019 Oct. 3-Nov. 8, 2019	~10	227
Tamarack Nature Center	5	5	Oct. 19-Nov. 21, 2018	~5	165
Vadnais-Sucker Regional Park	9	2 1 2 2 1 1	Nov. 26-Dec. 12, 2018 Nov. 26-Dec. 22, 2018 Nov. 26, 2018-Feb. 3, 2019 Dec. 13-Dec. 20, 2018 Dec. 22, 2018-Feb. 3, 2019 Jan. 23-Feb. 13, 2019	~11	276

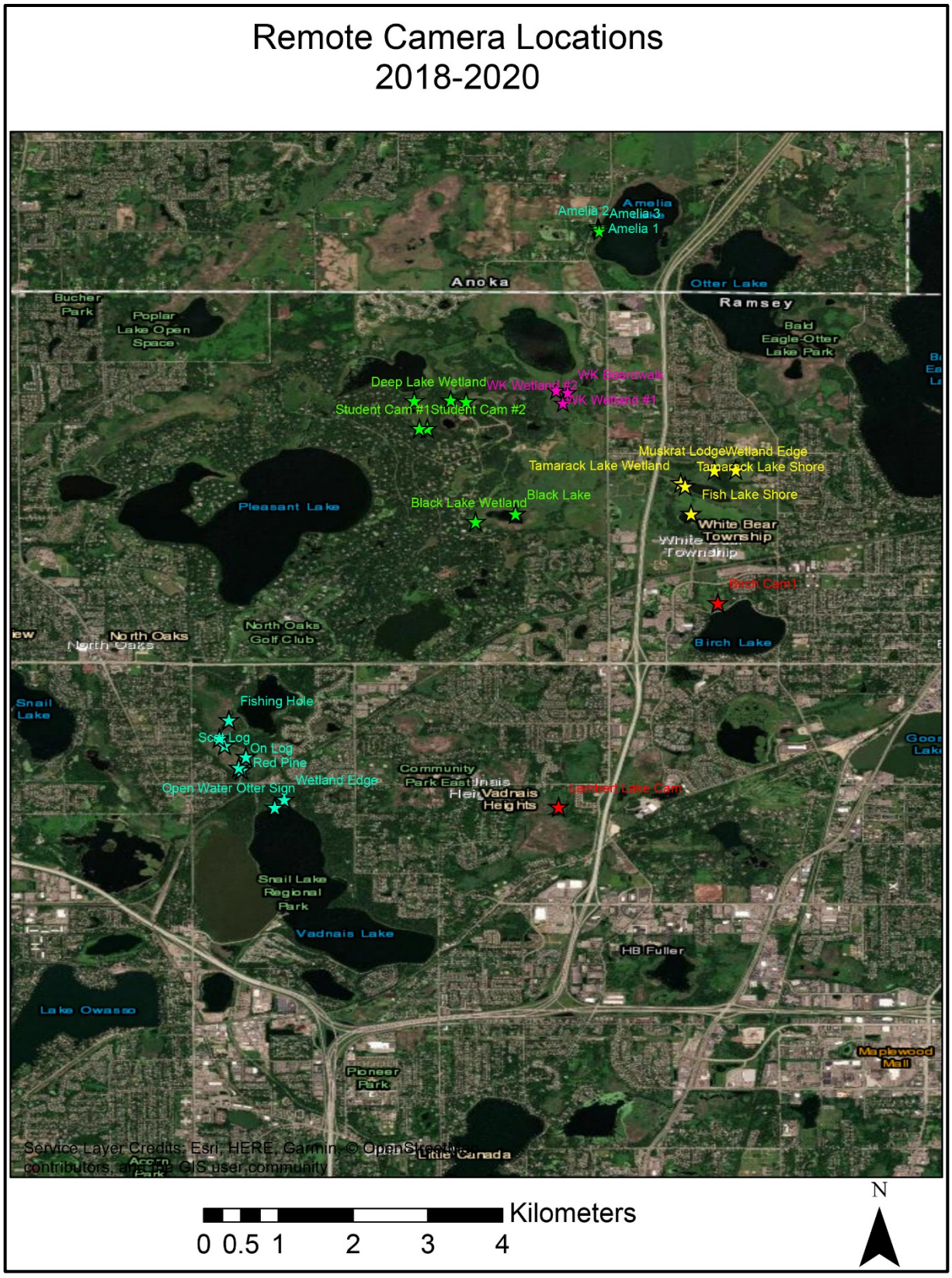

Figure 1: Sites and locations for the remote-camera surveys

Summary of mammal species detected across all sites: A total of 17 native mammal species were detected in the watershed. Domestic dogs and feral cats also were rarely seen. A list of mammal species across the watershed includes:

1) White-tailed deer
2) Coyote
3) Red fox
4) River otter
5) Raccoon
6) Virginia opossum
7) Mink
8) Ermine (or weasel spp.)
9) Eastern cottontail
10) Muskrat
11) Gray squirrel
12) Red squirrel
13) Northern flying squirrel
14) Muskrat
15) Peromyscus (White-footed or deer mouse)
16) Red-backed vole
17) Beaver
18) Domestic dog
19) Feral cat

Notes of interest:

Species of particular interest included: Coyotes, Red fox, and River otters.

Red fox were only detected on 1 occasion in Vadnais-Sucker Regional Park. Coyotes were abundant in all sites monitored except Birch Rotary Nature Preserve. These results support research documented for other urban areas that shows that coyotes tend to occupy higher quality habitat in parks and other green spaces. In areas where coyotes are abundant, Red fox are likely to shift into residential areas (Mueller *et al.*, 2018). Remote cameras for this monitoring effort were focused on the highest quality habitat areas available in the Vadnais Lake Area Watershed. Consequently, we observed high coyote occupancy and frequently observed coyote behavioral activity in the photographs. There are frequent anecdotal reports of Red fox activity in residential areas. We would expect to see more Red fox activity at camera sites if we focused on these areas.

River otters were frequently photographed in Vadnais-Sucker Regional Park and along Lambert Creek. This was somewhat of a surprise to staff and the general public. As follow-up of initial remote-camera data, VLAWMO requested reports from the public about River otter activity locations. Staff visited sites reported by residents and documented otter-activity sites observed during remote-camera exploration and setup. Many latrines, a den site, tracks, trails, and feeding areas were observed and documented. A map was generated with these results.

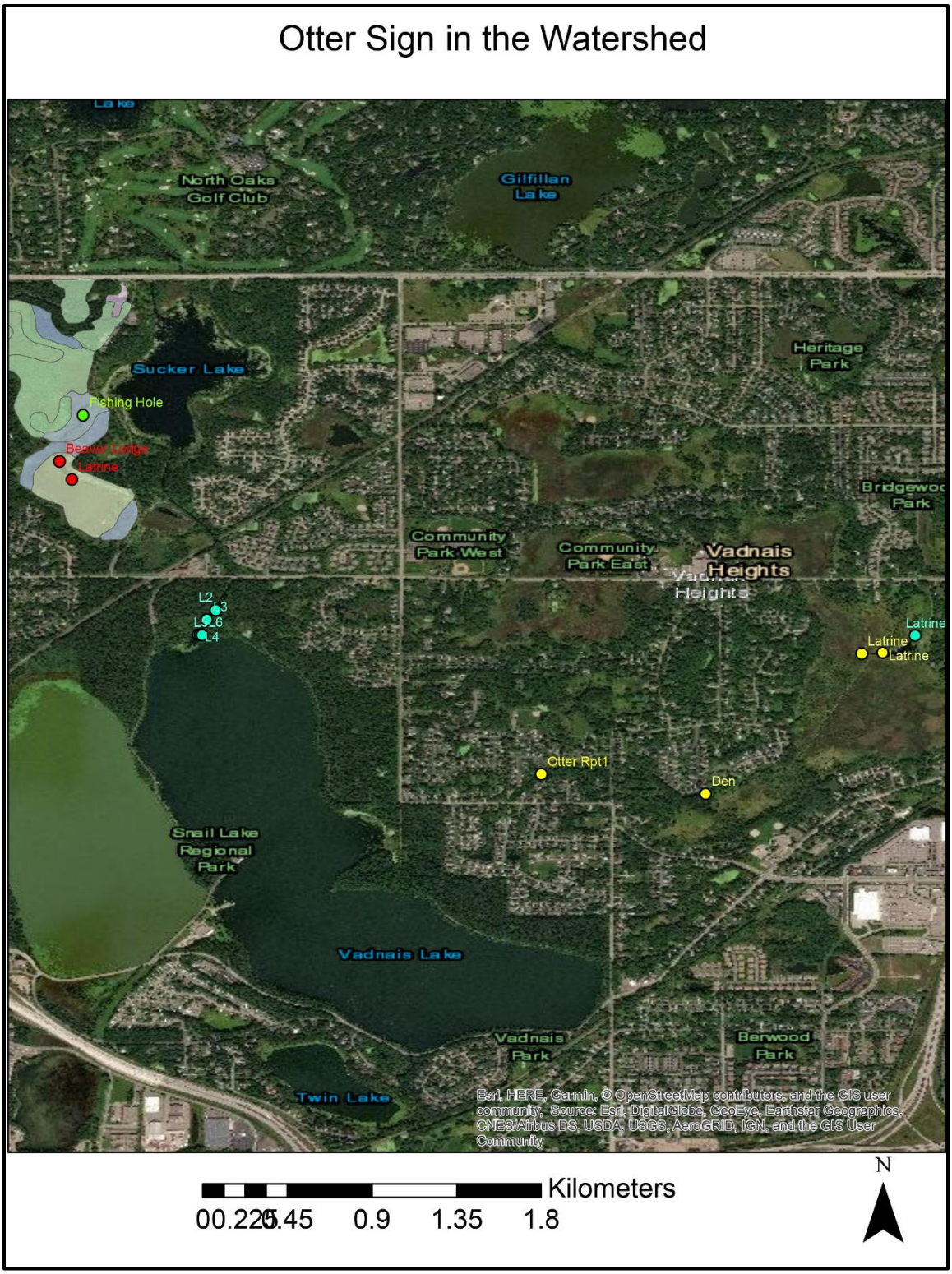

Figure 2: Otter sign observed during fall, 2018, through spring, 2019.

River otters are of particular interest to VLAWMO because they are apex predators that bioaccumulate environmental toxins (e.g., PBDEs, PCBs, lead, mercury) and are indicators of water quality and habitat health (Dornbos et al. 2013; Nelson & Schulte 2015; Holland et al. 2018). A healthy population of otters bodes well for water quality, which is of additional importance because East Vadnais Lake is the drinking-water reservoir for many residents of St. Paul and surrounding communities. Otters need healthy wetlands and sympatric species closely associated with water (e.g., beavers). Urban otters may face more challenges surviving (e.g., high quality habitat areas separated by road networks) and have increased exposure to disease and pollutants than their more rural otters. Research has shown that Sea otters are 3 times more likely to be infected byToxoplasma gondii, a parasite carried by domestic cats,near freshwater flow areas (Shapiro et al. 2019). Otters and other mustelids are also more likely to be infected by this parasite in urban areas (Barros et al. 2018). The risk of Toxoplasmosis to a developing human fetus is the reason pregnant women are advised to avoid cleaning the litter box. As a watershed with important freshwater resources and a highly urbanized landscape, these kinds of disease issues are important to understand more clearly. These are issues VLAWMO is working to pursue as we increase focus on improving water quality and better understanding, conserving, and restoring wetlands in the watershed.

Remote cameras provide potentially useful information about activity patterns of wildlife. A recent paper published in Science conducted a global study of published research that used remote cameras and radio telemetry. The authors found that many wildlife species are shifting their activity patterns to be more nocturnal in urban areas. They hypothesized that animals do this to avoid negative encounters with humans by separating themselves in time rather than space (Gaynor *et al.*, 2018). The authors recognized that there may be negative consequences of this shift including: reduced foraging/feeding time, increased stress hormone production, and overall decreased activity. The study concluded that "such responses can result in marked shifts away from natural patterns of activity, with consequences for fitness, population persistence, community interactions, and evolution."

In the watershed, there is not an opportunity to conduct a full-scale research project to look at River otter activity patterns. However, we were able to conduct monitoring of a single latrine site in a rural location (outside of Long Prairie, Minnesota, along the Long Prairie River) and compare that activity to data collected in the watershed (Figures 3, 4, and 5). The results of that comparison support the conclusions of the global paper referenced above. We saw higher activity use throughout 24 hours in the rural setting. We saw greatly reduced activity during daylight hours in the urban setting.

As a result of this research, VLAWMO is working with partners to conduct a small radio telemetry study on River otters. Otter activity will help us prioritize wetland areas for increased protected, conservation efforts, and restoration. A wetland survey and delineation is scheduled for summer 2020 and focused in the East Vadnais and Sucker Lake subwatershed. The otter telemetry study and wetland delineation will further illuminate wetland needs and prioritization for the watershed.

Figures 3, 4, and 5: Otter activity at rural (~17 months of data collected) versus urban (~6.5 months of data collected) latrine sites.

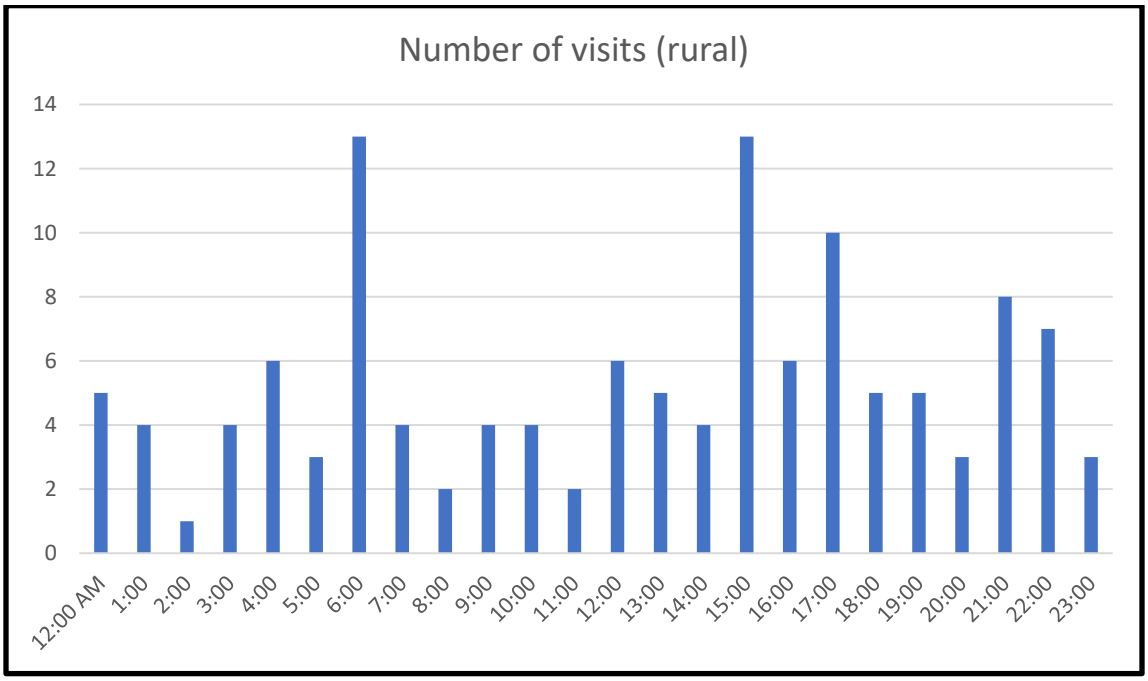

Figure 3: Otter activity at latrine sites (rural)

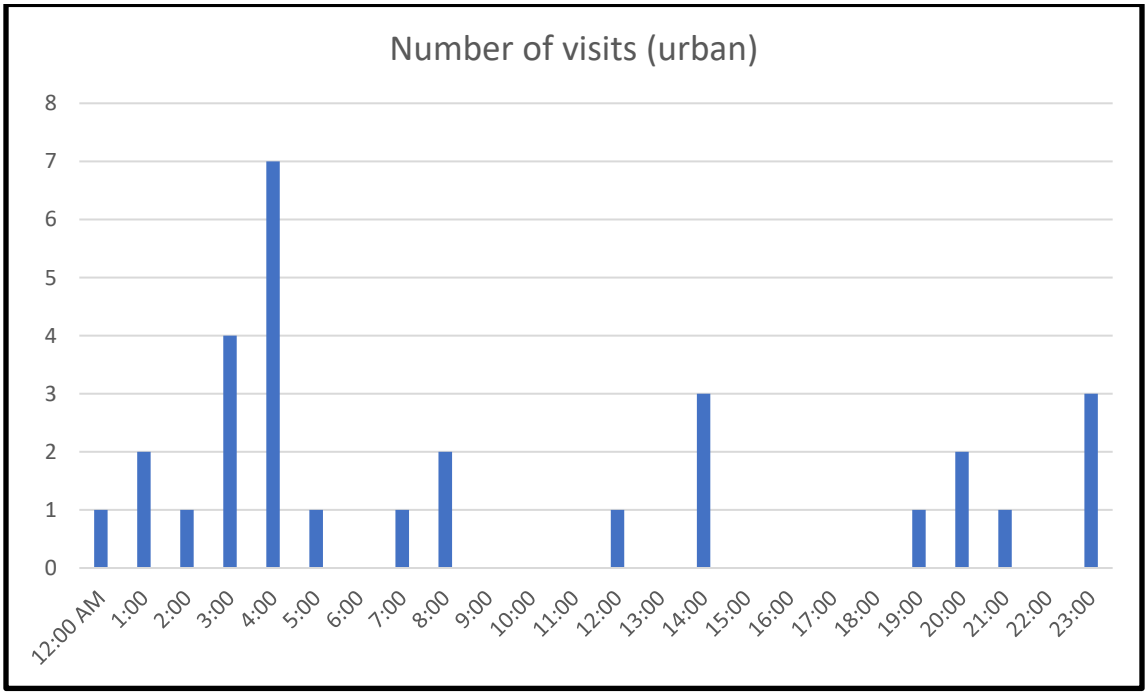

Figure 4: Otter activity at latrine sites (urban)

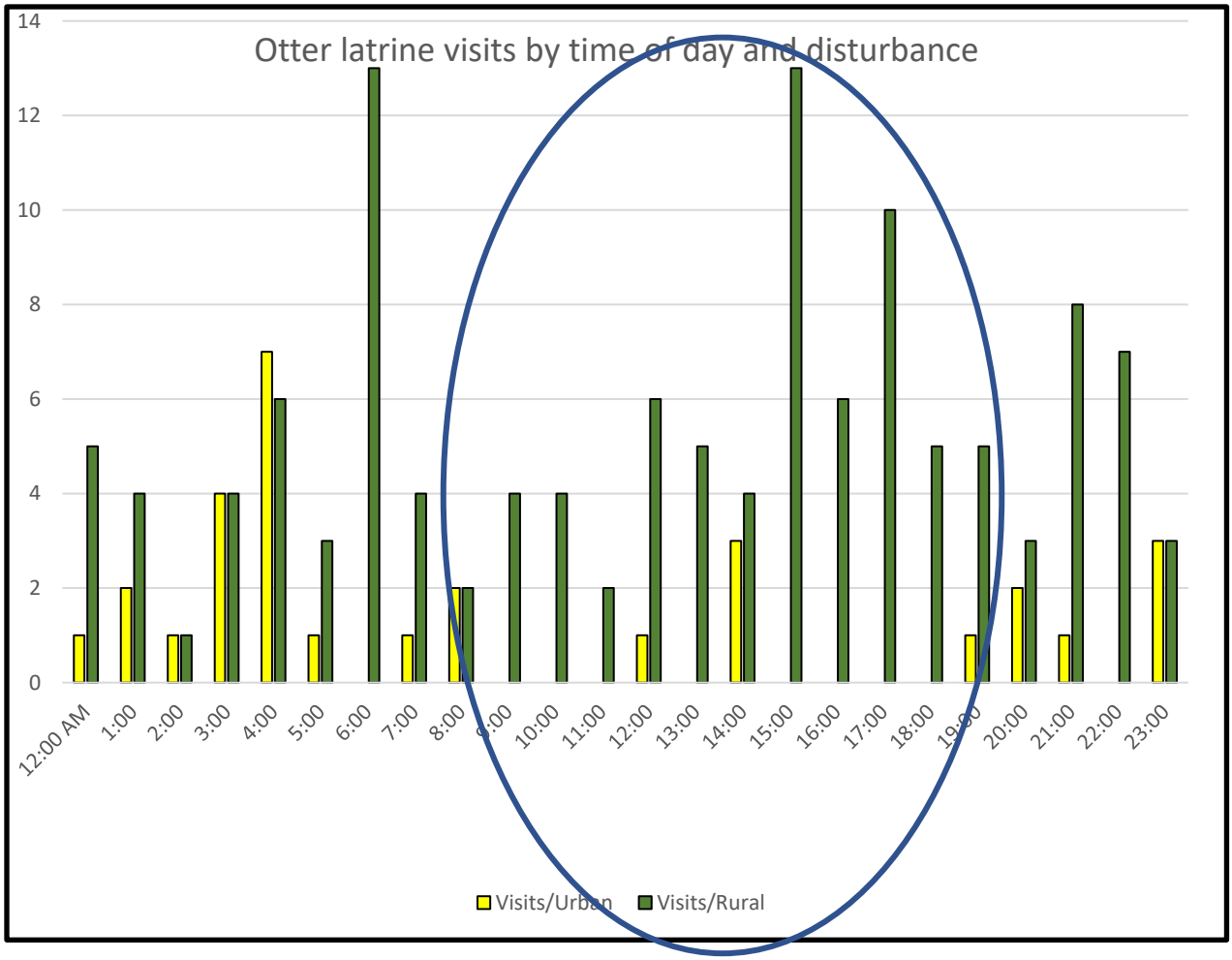

Figure 5: This graph shows urban and rural visits at latrine sites by River otters side by side. Otters are active throughout day and night hours at the rural site. Visits to the latrine during daylight hours are greatly reduced at the urban site.

Mammal species detected on 2018-2020 survey by site with short descriptions and interesting notes:

Amelia Lake wetlands: Amelia Lake is a MN DNR lake of biodiversity significance. It has abundant Water willow, which is a plant of conservation significance and one that is highly sensitive to development. Development around Amelia is low and consists of a few large residential parcels with houses that are positioned well away from the lake. Wetland vegetation is dense around the lake. In the spring, large mats of vegetation break off and form ephemeral floating islands. The lake is a hotspot for migrating waterfowl. It also has a population of Flowering rush, which is an invasive emergent plant, that has been reported by MN DNR and USGS. Current management has not focused on controlling Flowering rush. Avian visitors to the cameras included Great blue herons and Sandhill cranes. **Mammals included: Beaver, Mink, Muskrat, and Raccoon.**

Amelia Lake Sample Photos

Mink

Raccoon

Great blue heron

Sandhill crane

Beaver

Muskrat

Birch Rotary Nature Preserve: This site is among the smaller habitat areas included in the camera study. The nature preserve is ~31 acres, and much of the area is wetland. There are high densities of frogs and toads and many interesting plant species. The camera site was located south of the boardwalk and accessible by kayak. A small, muddy platform was kept clear by geese grazing. The camera was aimed at this open area and mounted on a metal post sunk into the peat. Mammal diversity was low at this camera site. There were interesting avian visits including a family of Wood ducks, Great blue heron, and Sandhill cranes. **Mammals included: Mink and Raccoon.**

Birch Rotary Sample Photos

Mink

Raccoon

Great blue heron

Sandhill crane

Wood duck family

Wood duck family

Lambert Lake/Pond: Lambert Creek flows through this wetland area and storm pond. Lambert Lake is 182 acres. The area is the site of a large construction project including remeander of the creek and replacement of vinyl sheetpile with steel. As part of site visits and prep for upcoming construction, staff noticed an otter latrine site on the creek just before it flows into Lambert Pond. The camera produced surprising results. Otter and coyote activity were both high. Behavioral observations included otters breeding (4/19/19) and a coyote/otter interaction where both were at the site at the same time. The otter appeared first, the coyotes were on the scene shortly after with their ears perked up, the otter moved toward the coyotes in an aggressive fashion, the coyotes jumped back, and then came in to check it out. The otter appeared to retreat to water safely. There were many instances where an otter would come during the night and roll all around in the grass. A coyote would come by shortly after, kick in the grass, defecate, and otherwise work to scent over what the otter left behind. This was also a popular Wild turkey lekking site, and White-tailed deer activity was regular throughout the day.
Mammals included: White-tailed deer, Coyote, River otter, Raccoon, Mink, and Virginia opossum.

Lambert Lake Sample Photos

White-tailed deer

River otter

Coyote

3 Coyotes

Mink

Wild turkey

North Oaks Conservation Area: North Oaks includes large wetland complexes and a 620-acre conservation easement with Minnesota Land Trust. The trail system is owned and management by the North Oaks Home Owners' Association (NOHOA). This large network of natural habitat is home to many mammal species. During the first monitoring session in Jan.-Feb. 2019, the coldest part of winter hit with deep snow and frigid temperatures. Mammal diversity at the cameras was low. We only saw: White-tailed deer, Coyotes, Short-tailed weasel, and Domestic dog. Coyote behavior was very interesting. In an area with fairly low human disturbance, coyotes appear curious and actively investigated the camera sites, even rolling in the snow and blowing it out of the way with their noses. Because diversity at the camera sites was lower than expected, we came back during fall 2019 with two University of Minnesota Service-Learning students. They each set up their own camera site, and let it run for ~5 weeks. With only these 2 cameras, we 9 mammal species including fascinating behavior of diurnal and nocturnal squirrels actively caching food for the winter in the same log. Mice feed on the cached food when the squirrels aren't around. A weasel came by looking for mice and investigated the very place where they had been only moments earlier. A pair of flying squirrels visited the site together and, of course, curious coyotes had their noses checking things out everywhere. There was a total of 11 mammal species among locations at this site.

Mammals included: White-tailed deer, Coyote, Raccoon, Short-tailed weasel/Weasel spp., Virginia opossum, Eastern cottontail, Gray squirrel, Red squirrel, Northern flying squirrel, Peromyscus (White-footed or Deer mouse), and Domestic dog.

North Oaks Conservation Area Sample Photos

Coyotes

Coyote

Northern flying squirrel

Raccoon

Red squirrel

Weasel spp.

Tamarack Nature Center: This was the first site that VLAWMO placed cameras for this survey. The nature center has a variety of habitat types including small ponds, Fish Lake, Tamarack Lake, large wetlands, restored prairie, and woodland. Cameras were placed to focus on wetland and lakeshore areas. A total of 9 mammals species were documented. Coyotes were recorded at all 5 camera locations. One camera was placed looking at a muskrat lodge. Activity at this site was especially interesting and included the pair working together to prepare the lodge for winter.

Mammals included: White-tailed deer, Coyote, Short-tailed weasel, Virginia opossum, Muskrat, Gray squirrel, Red squirrel, Peromyscus, Red-backed vole.

Tamarack Nature Center Sample Photos

Pilleated woodpecker

Short-tailed weasel

White-tailed deer

Red-backed vole

Virginia opossum

Muskrats

Vadnais-Sucker Regional Park: This park has a high diversity of native wetland habitats. Remote cameras were placed to sample all of the habitat types indicated in the area according to the MN DNR native plant communities layer. River otter activity was especially high in this park. Coyote activity was too. This is the only location where we documented Red fox presence. There were a total of 12 species (11 native species and Feral cat).

Mammals included: Coyote, Red fox, Raccoon, River otter, Mink, Short-tailed weasel, Eastern cottontail, Muskrat, Gray squirrel, Red squirrel, Peromyscus, and Feral cat.

Vadnais-Sucker Regional Park Sample Photos

River otter

Raccoon

River otter

River otter

Red fox

Coyote

Eastern cottontail

Coyote and Trumpeter swans

Coyote interaction and Mink
(from separate photos at the same location)

Coyote

Coyote behavior (Compiled)

Red squirrel

Education and outreach component

Videos and slideshows were published on the VLAWMO website and facebook page as sites were completed. Posts were popular and generated a high amount of social-media traffic. Articles were featured in the White Bear/Vadnais Heights Press and North Oaks News. *Upcoming photo exhibit captures wildlife in area wetlands* was published in the White Bear/Vadnais Heights Press, March 6, 2019, and *Remote cameras glimpse wetland life in North Oaks* was published in the North Oaks News in the April 2019 issue. A photo exhibit featuring wildlife in the watershed was on display at the White Bear Lake Ramsey County Library during March-May, 2019. An otter themed event was hosted by VLAWMO in celebration of World Otter Day for a children's storytime session on May 24, 2019. Storytime was well attended and featured an otter story, puppet skit, and live music with otter prizes for the kids.

Conclusions

Remote cameras are a useful tool in helping managers understand species present in an area. They are not the only tool and others are better for understanding density and abundance. Baseline information, such as that reported here, is important in informing effectiveness of initiatives and projects with goals of improving water quality and habitat function. Particular species, indicators of habitat health and water quality, can help us explore further and identify locations for prioritization within the watershed

Remote cameras provide a glimpse into behavior of wildlife at sites throughout the watershed. People often are unaware of the wildlife around them and are surprised by the diversity we've documented. Sharing photos via social media offers a means to increase engagement, curiosity, and may encourage people to explore these and other natural areas in the watershed.

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