Introduction

Carthage’s ISWG team (Invasive Species Working Group) has been and still is undergoing a long term monitoring program studying invasive species in riparian areas throughout Kenosha County, WI. Riparian zones are transition areas where both terrestrial and aquatic landscapes coexist together; because of this the team is sampling and assessing all three key areas: the aquatic zone, sampling in the water, the riparian zone; where the water and land meet, and the terrestrial zone; land within close proximity of water. Because most invasive species are generalists, and non-native they have high dispersal rates with low predation or limiting factors to slow their spread. With this study we are able to monitor how dispersal is affected by up/down stream movements and access and predict these invasive species.

Site Selection

Lakes in this study are all located within Kenosha County with each site based on several key factors, accessibility being the most influential. Accessibility with or without public boat launches, public or private access, and inlets/outlets were noted for each site to examine transfer rate of invasive. Also urban or rural settings, highly developed or natural ecosystems and human disturbances were noted to examine human influence.

This year we sampled five lakes: KD Lake (New Munster, WI), Rock Lake (Trevor, WI), Mud Lake (Bristol, WI), George Lake (Bristol, WI) and Silver Lake (Silver Lake, WI).

KD Lake is a newly opened public access lake. No boats are allowed and only catch and release fishing is permitted on specific dates. The lake has no housing developed around the lake and there is a defined riparian zone. No inlet/outlets are connected however there is a small spillway if the water levels are too high.

Rock Lake is a medium sized lake with no boat launch however people do carry in row boats and canoes from shore. It has housing around the entire lake with a large section of cattails at one end of the lake. The name Rock Lake comes from its origin, before it filled it was a rock quarry and is known to be very deep in the center.

Mud Lake is a small lake with no boat launch and has housing covering close to one fourth of the shoreline. Mud Lake is connected to George Lake through the Dutch Gap Canal; because of this these lakes are key in trying to indentify inlet/outlet spread of invasive species. George Lake is a medium sized lake with public boat access and housing around about 75% of the shoreline.

Silver Lake is a large lake with public boat access and housing/businesses covering over half of the shore line. This lake is heavily used by fishermen, boaters, and beach access. There is an outlet stream as well as large patches of cattails around portions of this lake.
Species Overview

After taking samples at each location four native aquatic species and two invasive aquatic species were identified as being the most prevalent. Listed below are each of the identified species with a description of each.

Native Species

Skunk Weed (*Chara*) – A submersed aquatic plant native to the United States. Known for giving off a skunky smell, usually noticed once by water’s edge, also is known for having a gritty, calcified texture.

Coontial (*Ceratophyllum demersum*) – An Aquatic plant that grows beneath the water surface. Coontail is known for its dark green bushy appearance and is found throughout all of temperate North America.

Canadian Waterweed (*Elodea*) – A rooted submersed aquatic plant native to North America, it is distinguished by its long slender stalk filled with clusters of finely-toothed leaves.

Water Celery (*Vallisnera Americana*) – A rooted submersed aquatic plant native to North America Wild Celery is known for its grass like appearance with very slender/narrow leaves a white rooting system that resembles common grasses of North America.

Invasive Species

Eurasian Milfoil (*Haloragaceae sibericum*) – A submersed aquatic plant native to Europe, Asia, and North Africa, Eurasian Milfoil was first discovered in southern Wisconsin in the 1960’s. However since then it has spread throughout the entire state due to its ability to reproduce by fragmentation. With fragmentation reproduction it allows Milfoil to spread up and down stream easily as well as from transfer from boats and other vessels entering or leaving waterways.

Curly Leaf Pondweed (*Potamogaton crispus*) – A submersed aquatic plant native to Europe, Asia, Africa, and Australia, Curly Leaf Pondweed was accidentally introduced in the United States in the 1880’s by aquarium trade. Curly Leaf reproduces by releasing turions; a light weight bud that is easily carried downstream or on the body of animals. These turions germinated when there is still a thin layer of ice covering the water, making it one of the first to appear in spring, allowing it time to take over before native plants germinate.

Methods

The sampling techniques used to gather aquatic samples for submerged plant life was the Rake Technique. With this method a double sided rake was thrown from shore, dock, or boat and pulled in to acquire a sample. Once collected the sample was separated by species, identified and was given an estimation of percent biomass.
Results

Curly-leaf Pondweed was found at every site except for KD Lake. Eurasian Water Milfoil was found at Silver, Rock, and George Lakes. Coontail (*Ceratophyllum demersum*), a native species, was found at every site except for KD Lake. Chara (*Chara* spp.), another native species was found at every site except for Mud Lake. Wild Celery (*Vallisnera Americana*) was found at every site but George Lake. Other Native species including Native Water Milfoil, Elodea, and Duckweed were found at various sites with Rock Lake being the only lake to host Native Water Milfoil; and Elodea only being found at George and Rock Lakes. Mean species richness was calculated from each of the lakes by taking the mean of each sample’s species richness. Silver Lake had the highest mean species richness with 4.33 species and KD Lake with the lowest with 1.33 species. (Figure 1.)

Mean percent of invasive species were also calculated and compared to mean percent native species. This was done by taking mean percents of both Eurasian Water Milfoil and Curly Leaf Pondweed per sample combined and by taking mean percents of all native species combined. (Figure 2) No invasive species were found at KD Lake. Silver Lake had the highest percentage of invasive species with 33.6% and as stated earlier KD Lake with the lowest with 0%.

![Figure 1](image-url)
Discussion

Looking at previous records, data also shows that lakes with higher percentages of invasive have lower richness. However data collected this year shows that the lake with the highest percentage of invasive also has highest richness (Sliver Lake with 33.6% of the samples taken were invasive species and with a species richness of 4.33). This high concentration of diversity and invasive species could be from the high amount of boat traffic on the lake.

When found, Eurasian Water Milfoil typically grew in large areas, usually dense zones with stems reaching surface of the water. However, Curly Leaf Pondweed was not found in dense mats, but only in individual plants mixed within other species. Agreeing with previous research, where Curly Leaf Pondweed was observed it did not appear to have noticeable impact on native species or species richness of the lake.

Figure 2

![Mean Percent Invasives Species Per Sample](chart.png)