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Geneva Lake Environmental Agency 2026 Macroinvertebrate Survey: Assessing Lake Bottom Environments and their Macroinvertebrate Communities. A Snapshot of Species Community Structure, Water Quality, and Invasive Species Prevalence.

Abstract

During the 2026 field season, the Geneva Lake Environmental Agency conducted a shoreline macroinvertebrate survey at three nearshore sites: gravel, muddy, and sandy bottom environments. Sampling results were standardized to a 1.8-hour duration per site. Species richness ranged from 5-12 species across sites. Higher species richness was observed in muddy and gravel environments, with the lowest richness observed in the sandy environment. Species diversity (Shannon Diversity Index) ranged from 0.105-0.653 across sites. Species diversity was highest in the gravel environment and lowest in the sandy and muddy environments.
Macroinvertebrate pollution tolerance (Hilsenhoff Biotic Index) indicated good water quality at the gravel site and moderate water quality at the muddy and sandy sites. Overall water quality observed between the sites was moderate (HBI ≈ 4.9).

Invasive species dominance was observed at the gravel (native/invasive ratio = 0.60). muddy (0.93) and sandy (.78) environments
Invasive mussel abundance from lowest to highest was gravel bottom environment, sandy bottom environment, and muddy bottom environment.

Swimmer's itch associated host snails were substantially more abundant in muddy environments (123 individuals), amounting to approximately 86% of all potential host snails recorded across all sites. Swimmer's itch associated host snail abundance in gravel (28 individuals) and sandy (0 individuals) environments was much lower. These findings suggest that sandy nearshore environments may pose a greater risk for swimmer's itch exposure compared to gravel or muddy bottom environments. Gravel bottom environments were associated with a higher macroinvertebrate diversity, native species of dominance, lower invasive mussel abundance, and better water quality indicators. Continued monitoring of macroinvertebrate communities within different bottom environments may assist lake managers in targeting invasive species control efforts, informing recommendations on lake specific swimmer's itch risk, and understanding water quality trends.

Introduction

For the 2026 season, the Geneva Lake Environmental Agency (GLEA) decided to conduct their own macroinvertebrate survey alongside volunteers from the Fontana Ecology Club and interns from Walworth County's Land Use and Resource Management and Public Health Departments. GLEA's aim was to collect macroinvertebrate data on the species diversity, species richness, water quality, risk of swimmer's itch risk, and invasive species.

Benthic macroinvertebrate communities are widely used in lake ecological assessments because changes in their species richness, diversity, and tolerance can reflect changes with environmental stressors and water quality. The diversity and richness of benthic macroinvertebrates respond predictably to anthropogenic stressors, "metrics of richness and diversity are frequently used based on the well documented loss of richness and diversity to human-generated disturbances" (Poikane, 2016) Understanding how these metrics change over time can tell us the severity of anthropogenic stressors. It is important to collect this data routinely so yearly comparisons can be made and find where efforts should be focused, "as the majority of aquatic invertebrates have limited mobility, they can be good indicators of local water quality, integrating local and upstream watershed stressors" (WDNR, 2017). Macroinvertebrates are an important indicator of water quality not only because they don't travel very far, but they are also sensitive to environmental stressors, "macroinvertebrates are commonly used as indicators of aquatic ecosystem integrity because of their wide range of sensitivity to pollution and relative longevity" (Dou, 2022). Finding many sensitive species within a lake shows good water quality, while finding many tolerant species shows the water quality is poorer because they can tolerate the pollution stress.

Swimmers contracting "Swimmer's Itch" is a common phenomenon in freshwater lakes. This is when an aquatic flatworm larvae bites human skin and leaves a red bump or mark that remains itchy for a few days. This pest can be quite common, "swimmer's itch, also known as cercarial dermatitis, is an itchy skin reaction caused by free-swimming flatworm larvae in freshwater systems. These flatworms penetrate human skin during water exposure, with risk typically highest in shallow, nearshore waters where snail hosts and flatworm larvae release are most concentrated" (Verbrugge, 2004). Environments with a large amount of possible snail hosts may pose the greatest risk to contract swimmer's itch because humans are accidental hosts to the flatworm larvae, causing itching but no serious complications. Some of the snail species found in Geneva Lake are potential swimmers itch flatworm hosts (Soper, 2022 & Skála, 2020). Not every snail that can carry swimmer's itch is guaranteed to have it, though understanding how many possible hosts are within an area helps assess risk. Invasive snails also carry parasites, which can cause serious issues only if eaten/ingested (University of Illinois Extension & Oregon Department of Fish and Wildlife). This shows that both native and invasive snails carry parasites, though swimmers are more likely to be affected by the native snails due to the swimmer's itch parasite. Native snails are beneficial to the environment by grazing on algae, recycling nutrients, and contributing to the food web, with being a swimmer's itch host an unfortunate tradeoff. Native species specifically carry this flatworm because they evolved alongside them in native freshwater environments (Brant, 2013). Typical aquatic flatworms such as from the genus Planaria do not cause swimmers itch infections.

Finding more invasive than native macroinvertebrates in an environment can help lake managers understand which areas of the lake may be more affected/susceptible to invasive species. More invasive than native macroinvertebrates in certain areas can show which environments are more affected by invasive invasion (Hansen, 2013). It may help show which areas need more concentration on watercraft inspections at boat launches, because if an area has a higher population of invasive species, boats may be more likely to pick them up during recreation. Once boaters are finished recreating, watercraft inspection is key to prevent the spread of invasives to other lakes. Models of aquatic invasive species spread recommend strict watercraft inspection stations at high invasive population lakes to prevent the transport of invasives to new lakes (Haight, 2021). It is also important to note that watercraft inspection before entering lakes is pivotal to prevent new invasive species invasion to Geneva Lake.

This survey will provide a current snapshot in time of the macroinvertebrate community, water quality, risk for swimmer's itch in different environments, and invasive species abundance.

Methods

Three sites were chosen for sampling: George Williams College (42°33'56"N 88°33'23"W) (Gravel Bottom), Williams Bay west boat pier (42°34'41"N 88°32'14"W) (Muddy Bottom), and Bigfoot Beach (42°33'59"N 88°26'13"W) (Sandy Bottom). One period of time for data collection occurred at each site. These sites were chosen for sampling because of their different lake bottom environments. All sites were reached from shore, with approval from property owners if applicable. The start time and end time of sampling was recorded. Sampling methods included: kick net, shovel and large wire mesh sifter, small wire mesh sifters, rock picking, lifting sunken wood, and snorkeling. Organisms were transferred from debris or sampling equipment to white trays then sorted into ice cube trays by species using forceps and pipettes. Each individual found was categorized by species and the amount of each individual was recorded. Max depth surveyed was 1 meter. Approximate amount of shoreline surveyed at each site was 75 meters. All sites were surveyed on calm wave action, low wind, and sunny conditions.

Sampling was conducted for unequal durations among sites. To correct for differences in sampling time, observed macroinvertebrate counts were normalized to a standardized sampling duration of 1.8 hours (1hour 48 minutes) by multiplying each site's data by a time-based scaling factor. 1.8-hour standard sampling time was chosen because that was the longest sampling period among the sites. A measure of the *Shannon Diversity Index* and *Species Richness* was applied to each site. The species tolerance of each site was calculated using Willliam L. Hilsenhoff's (UW Madison) method or the Hilsenhoff Biotic Index (HBI). HBI is a measure of macroinvertebrate tolerance to organic pollution and related water-quality stressors, and used as an indicator of water quality. HBI assigns a number 1-10 based on the certain order, family, or genus tolerance to pollution/stressors, with a high tolerance corresponding to higher HBI values. From the HBI scale, ≤5.0 = Good water quality, 5.1–6.9 = moderate water quality, and ≥7.0 = poor water quality (Hilsenhoff, 1987). If the specific species of a taxa found cannot be identified within the HBI scale, the genus, family, or order of that taxa was compared to its corresponding HBI score. The standard HBI formula was used to calculate the tolerance level for each site considering the number of species found, population of each species, the tolerance of each species, and the total population of macroinvertebrates observed. Taxa not represented in the Hilsenhoff tolerance table were excluded from HBI calculations. Taxa excluded include: zebra mussels, quagga mussels, and roundworm. The population size of native freshwater snails that are potential swimmers itch hosts were compared between environments to determine risk for swimmer's itch at each environment. Note that a snail being capable of hosting the swimmer's itch parasite does not mean that each snail carries the parasite, so they will be referred to as "potential swimmer's itch snail hosts" throughout the paper. The amount of native species was compared to invasive species found at each site and was formed into a ratio where a value >1 indicates native species dominance and a value <1 indicates invasive species dominance.

Qualitative comparisons were made for this survey; however, no statistical analysis was performed as there was only one sampling event per site.

Quantitative observations made over the field season were included in the discussion of this survey to aid in future research of specific organisms on Geneva Lake.

Results

Species richness (total number of species per site) was found between each site and was highest in the Muddy Bottom Environment (12) and lowest in the Sandy Bottom Environment (5) (table 1). Species diversity using the Shannon Diversity Index (the variety and relative abundance of different species within a habitat) was found to be highest in Gravel Bottom Environment (SDI ≈ 0.653) and lowest in Sandy Bottom Environment (SDI ≈ 0.105) (table 1). Having a low species diversity means that the population of one or a few species dominates the habitat and having a higher species diversity means that the species populations are more balanced. The tolerance of the macroinvertebrate community within each site was found, with the lowest tolerance being Gravel Bottom Environment (HBI $\approx$ 4.3) and the highest tolerance being Sandy Bottom Environment (HBI $\approx$ 6.1) (table 1). Lower tolerance indicates better water quality (table 1).

Sample Site	Bottom Environment	Species Richness	Species Diversity (SDI)	Site Tolerance (HBI)	Water Quality
Site 1- George Williams	Gravel	12	0.653	3.543	Good
Site-2 Williams Bay	Muddy	12	0.461	5.026	Moderate
Site-3 Bigfoot Beach	Sandy	5	0.105	6.106	Moderate

Table 1- The three sample sites: George Williams College shoreline, Williams Bay west boat pier shoreline, and Bigfoot Beach shoreline along with their respective bottom environment types, species richness, species diversity, and site macroinvertebrate water quality tolerance. Water quality for each site is displayed based on the Site Tolerance (HBI) where ≤5.0 = Good water quality, 5.1–6.9 = moderate water quality, and ≥7.0 = poor water quality (Hilsenhoff, 1987).

The highest population of potential swimmer itch host snails was found in Sandy Bottom Environment (120) and the lowest population of host snails was found in Gravel Bottom Environment (10) and Muddy Bottom Environment (9) (graph3). Approximately 86% of all potential swimmer's itch snail hosts sampled in this study were found in the sandy bottom environment.

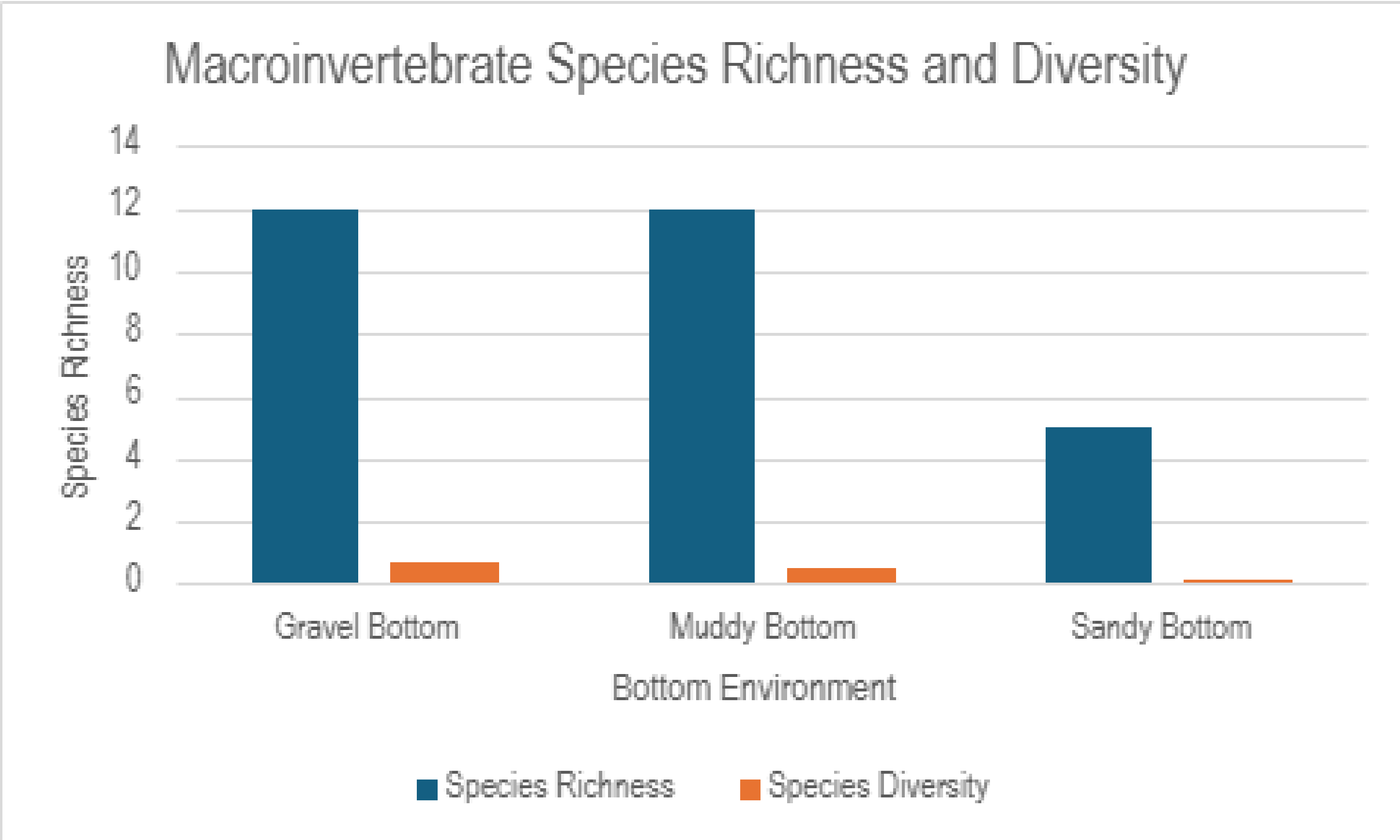
The total native species population and invasive species population was found across the sites where a value >1 indicates native species dominance and a value <1 indicates invasive species dominance. Site 1 George Williams College (Gravel Bottom) had a high native dominance (2.25) (table 2). Site 2 Williams Bay west boat pier (Muddy Bottom) had an invasive dominance (0.72) and site 3 Bigfoot Beach (Sandy Bottom) also had an invasive dominance (0.71) (table 2).

Native vs invasive species	Native Species	Invasive Species	Native/Invasive
Site 1 - George Williams	106	178	284
Site 2 - Williams Bay	170	182	352
Site 3 - Bigfoot Beach	122	156	278

Table 2- The three sample sites: George Williams College shoreline, Williams Bay west boat pier shoreline, and Bigfoot Beach shoreline along with their respective native and invasive species counts. A ratio of native/invasive species is included to show whether native or invasive species are dominant for a site. A value >1 indicates native species dominance and a value <1 indicates invasive species dominance.

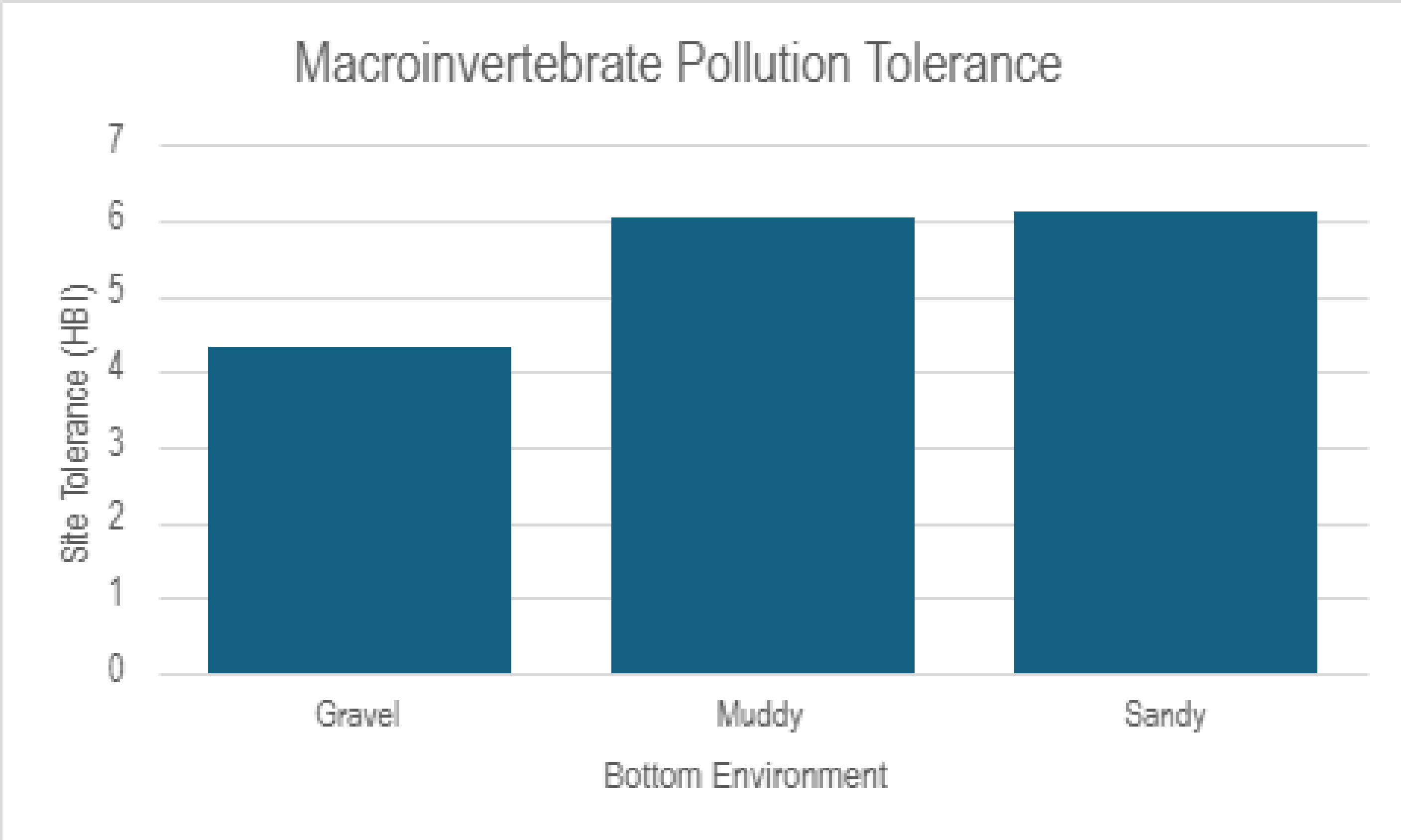
The lowest abundance of invasive mussels was found in Sandy Bottom Environment (1 mussel), second highest in Gravel Bottom Environment (178 mussels), and the highest in Muddy Bottom Environment (178 mussels) (Graph 5). Across the three sites, zebra mussels were dominant over quagga mussels (graph 5).

Graphs



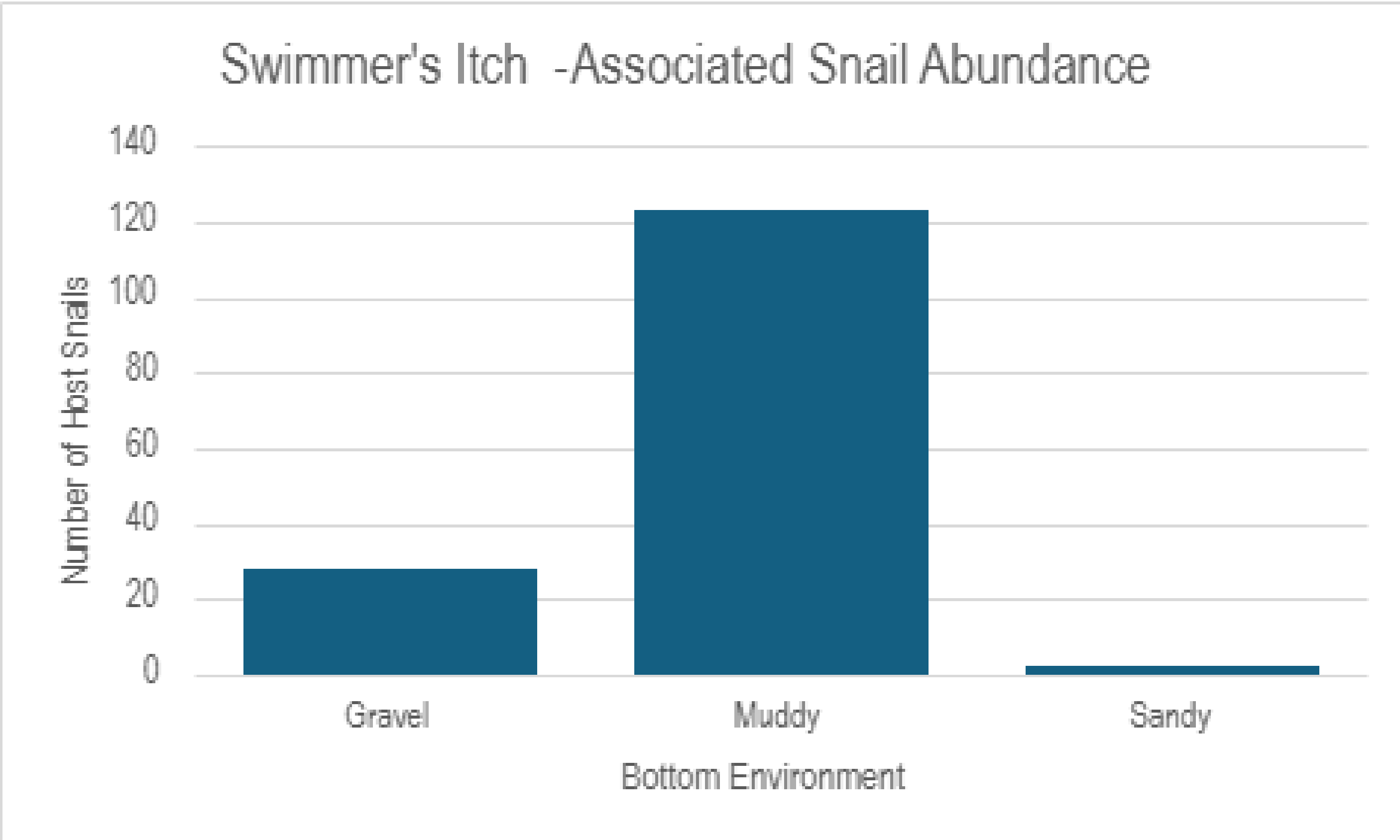
SOURCE: GLEA 2026

Graph 1- Macroinvertebrate species richness and diversity at three sites: George Williams College shoreline (Gravel), Williams Bay west boat pier shoreline (Muddy), and Bigfoot Beach shoreline (Sandy).



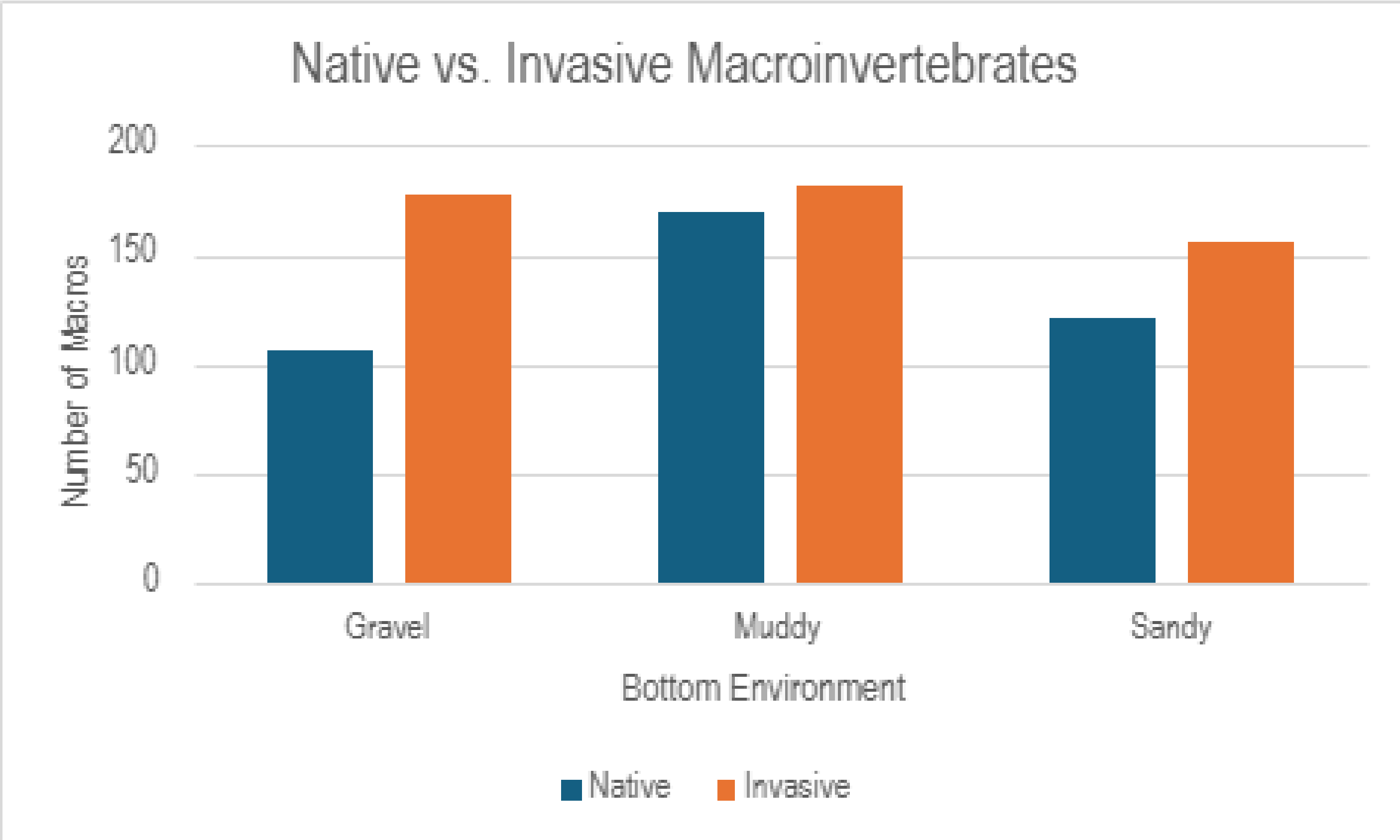
SOURCE: GLEA 2026

Graph 2- 1-5 = good water quality; 5-7 = moderate water quality; 7+ = poor water quality. Macroinvertebrate pollution tolerance (HBI scale) at three sites: George Williams College shoreline (Gravel), Williams Bay west boat pier shoreline (Muddy), and Bigfoot Beach shoreline (Sandy). Lower tolerance indicates better water quality at the site. Green=Low Tolerance, good water quality indicator. Yellow=Moderate Tolerance, moderate water quality indicator. Red=High Tolerance, poor water quality indicator.



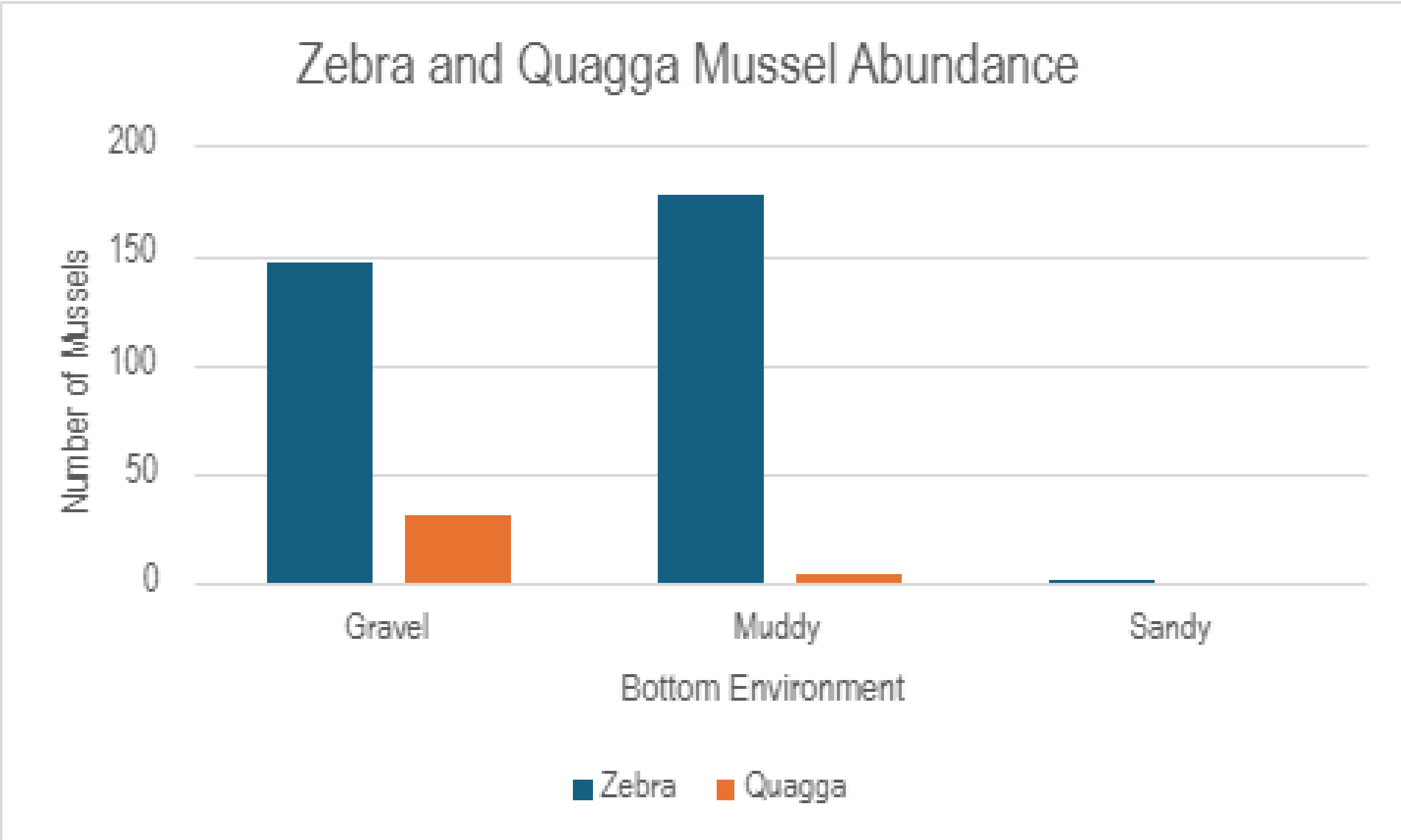
SOURCE GLEA 2026

Graph 3- Abundance of potential swimmer's itch snail hosts at three sites: George Williams College shoreline (Gravel), Williams Bay west boat pier shoreline (Muddy), and Bigfoot Beach shoreline (Sandy). The population of potential snail hosts was counted at each site for a period of time, standardized, then displayed here.



SOURCE: GLEA 2026

Graph 4- Amount of native and invasive individuals found at three sites: George Williams College shoreline (Gravel), Williams Bay west boat pier shoreline (Muddy), and Bigfoot Beach shoreline (Sandy). The population of macroinvertebrates was counted at each site for a period of time, standardized, then displayed here.



SOURCE: GLEA 2026

Graph 5- Amount of zebra mussel and quagga mussel individuals found at three sites: George Williams College shoreline (Gravel), Williams Bay west boat pier shoreline (Muddy), and Bigfoot Beach shoreline (Sandy). The population of mussels was counted at each site for a period of time, standardized, then displayed here.

Water Quality and ecosystem health Assessment

Site 1 George Williams College (Gravel Bottom) scored the lowest for macroinvertebrate water quality tolerance (graph 2), showing that the water quality at this site was overall good. Site 2 Williams Bay west boat pier (Muddy Bottom) and Site 3 Bigfoot Beach (Sandy Bottom) had a higher macroinvertebrate water quality tolerance (graph 2), showing that the water quality at these sites were moderate. This indicates that gravel bottom environments may be associated with higher water quality compared to muddy bottom or sandy bottom environments.

Because site 1 George Williams College (Gravel Bottom) scored high overall for species richness and diversity, gravel bottom environment may support a more balanced and stable organism community compared to the other sites (graph 1). Along with high species richness and diversity, gravel bottom environment showed a high dominance of native species (graph 3), further supporting that gravel bottom environment supports a more balanced and stable organism community than sandy or muddy bottom environments. This also supports the idea that gravel bottom environments may be better at maintaining good water quality and have more resistance towards the invasion of invasive species. This is based on the data that showed gravel bottom environments have more sensitive macroinvertebrates and have a dominance of native species. It is worth noting that combined observations of site 3 Bigfoot Beach (Sandy Bottom) showing low species richness, high site tolerance, dominance of invasive species, and high abundance of swimmer's itch snail hosts may indicate that sandy bottom environments are more susceptible to invasive colonization, maintain lower water quality parameters, and put swimmers more at risk of contracting swimmers itch. Site 2 Williams Bay west boat pier (Muddy Bottom) had similar results to Site 1, differing slightly in the overall species community and abundance.

Higher water quality based on macroinvertebrate tolerance in Gravel Bottom Environments may be attributed to the very large particle size of the sediment, which is better at resisting wave forces than Muddy Bottom or Sandy Bottom Environments. Sandy and Muddy Bottom Environments are likely more susceptible to nutrient and contaminant resuspension in the water column because of their fine particle size. Sediment resuspension would lower water quality, which could be a possible explanation for why more tolerant species and an invasive dominance were found in muddy and sandy bottom environments. Invasive species are considered tolerant species because they can live in a broad range of temperature, oxygen level, and substrate type. They also grow rapidly, feed on a wide variety of organic matter, and are highly resistant to disturbances such as sediment resuspension, wave action, and habitat change. Site 2 and 3 having a high species tolerance along with a dominance of invasive species supports the idea that sandy and muddy bottom environments are more susceptible to human disturbances (wave action, boat turbulence, swimmer activity, construction) and invasive species colonization, generally maintain a moderate water quality.

The overall average water quality for the sites in this survey was moderate, based on the HBI tolerance average of 4.9 across sites. This is an indicator that the macroinvertebrate community is already somewhat adjusted to environmental stressors. Monitoring how the HBI tolerance of the macroinvertebrate community changes over time can help show how the ecosystem is responding to environmental stressors.

Discussion

Based on the findings of this survey, gravel bottom environments maintain the highest water quality compared to sandy or muddy bottom environments based on the presence of less tolerant species and native species dominance. This is supported by gravel bottom environments also having the highest species richness and species diversity, showing a stable, well-balanced ecosystem. Sandy or muddy bottom environments were not found to have poor water quality, but moderate water quality was observed based on the macroinvertebrate tolerances and invasive dominance. Increased wave action by boating, boat turbulence, and swimmer activity is known to be high on Geneva Lake and occurs almost every day during the boating season. Since human activity is known and these bottom environments have not changed recently, it is assumed that the water quality trends found in this survey are somewhat related to human activity. Gravel bottom environments are possibly the most resistant bottom environment to human activity on Geneva Lake; supporting a diverse and rich species community, maintaining native species dominance, and supporting the persistence of sensitive species.

Potential swimmer’s itch host snails were approximately 4 times more abundant in muddy bottom environments than in gravel or sandy bottom environments. This distribution likely reflects substrate preferences of the potential host species, as sandy sediments provide suitable conditions for grazing and movement. In contrast, gravel and muddy bottom environments were dominated by non-host species. Because host snails were concentrated in sandy bottom environments, these areas may present a greater risk of swimmer’s itch to recreational swimmers than gravel or muddy bottom environments.

Not everyone is affected by swimmers itch the same. Some people are more resistant, and some are more susceptible to allergic reactions. If a swimmer finds themselves contracting a bothersome amount of swimmer's itch, lake managers can help find the right area to swim. Generally, open deep water gives swimmers less of a chance to contract swimmer’s itch because they are farther from the nearshore area where snail hosts release free swimming swimmers itch larvae that bite human skin. CDC guidelines recommend avoiding known infested waters if you are continually contracting swimmer’s itch and avoid swimming in shallow waters. Through the findings of this study, it may be favorable for lake managers to recommend swimming at rocky beaches if swimmers don’t want to contract swimmer’s itch or if they are having an ongoing problem with it. On Geneva Lake, rocky beaches/swim areas include Fontana Village South Beach, Linn Pier public swim area, and the west end of Williams Bay Public Beach. Rocky Bottom Environments can also be reached for swimming and recreation by anchoring your boat near the shore.

It may be beneficial for lake managers to recommend gravel bottom nearshore areas to property owners who want to reduce the chance of swimmer's itch, help to maintain good water quality, and prevent invasive species colonization (with proper WDNR approval and permits). It is worth noting that the highest amount of zebra and quagga mussels were found in muddy bottom environments attached to plants, debris, and scattered stones. The lowest amount of zebra and quagga mussels were found in gravel bottom environments. This may be explained by the greater chance of sediment resuspension in muddy areas, increasing the nutrient uptake of the mussels. The soft bottom may also cause the mussels to favor attaching to scattered debris and plants in muddy areas, where there is little chance of being scraped off. Whereas in gravel bottoms, hard surfaces for mussel attachment are plentiful, though these stones turn and scrape against each other by heavy wave action, possibly resulting in difficulty for the mussels to stay colonized on the gravel substrate.

Site 1 George Williams having a strong native species dominance along with the lowest abundance of invasive mussels across the sites may show that the clean boats clean waters inspections are most successful at the boat launch closest to that area, the Fontana Public Boat Launch. It may be favorable for lake managers to understand their practices to help inform other boat launches around the lake on the best practices for Geneva Lake CBCW inspections.

Since gravel bottom environments are the most environmentally stable, native dominant, and relate to higher water quality, it may be favorable for lake managers to have a focus to protect these bottom environments from disturbances such as pier over-colonization, shallow slow no wake buoys, new invasive species, and gravel removal. Gravel bottom environments are possibly the most suitable environments for recreational swimming as they potentially have the lowest risk for swimmer’s itch contraction, lowest abundance of sharp mussels in the substrate, and are related to good water quality.

Qualitative observations on macroinvertebrate species found within Geneva Lake over the 2025 Geneva Lake Environmental Agency field season:

- Great pond snails are commonly found on pier horses and underwater structures near the surface of the water.
- Liver elimia snails are commonly found on pier horses, underwater structure, gravel, and boulders.
- Ramshorn snails are commonly found on seaweed and in sandy environments. Rarely on pier horses.
- Pointed campeloma snails are commonly found buried in muddy or sandy sediment, look for depressions in the sediment where debris accumulates and use a shovel/sifter to sift through the sediment to find these snails. One of the most beautiful and sturdy shells in the lake.
- Bladder snails are commonly found throughout sandy, muddy, and gravel environments along with being attached to seaweed. Occasionally on pier horses.
- Invasive banded mystery snails are commonly found crawling along nearshore beaches in waist deep water.
- Chinese mystery snails are rather rare to find on the lake. They have been found in deep water ~5 meters deep attached to structures. They can also be found in streams inside of their shell during the dry season scattered amongst rocky banks.
- Zebra mussels and quagga mussels are currently found all over the lake on pier structures and bottom substrates. You will commonly find them on pier cribs deeper in the water.
- Rusty crayfish are commonly found hiding between boulders, under debris, and under rocks in caves they have dug. If you snorkel at the Linn Pier Swim Area and check under rocks there, you will find some.
- Small rare native macroinvertebrates can be found using a kick net in a stream and by using a plant rake to rip up seaweed, then placing that seaweed in a container with water to wash them into solution.

Further research goals

The data collected during this study can be supported and reinforced by conducting future studies following the same methodology, though with multiple sample instances taken at each site. Sampling is recommended to occur at least every two years, preferably each year, with around 3 sample days for each site (can be spread out through the season to account for macroinvertebrate seasonal dynamics). Sampling times can range from 1 to 2 hours for optimal data collection. This would allow for statistical analysis to be run per site to determine if the data is consistent over the course of sampling periods. It will also help prove or refute claims or comparisons made in this study.

Focusing a robust study on swimmer's itch snail host abundance may give lake managers an idea where swimmer's itch is more common to be contracted, guiding recommendations.

Comparisons of this study to past and future macroinvertebrate surveys will give a better idea of how macroinvertebrate communities have been changing over time, invasive species colonization progression, and how water quality has been changed over time relating to tolerant species.

Areas of uncertainty

Uncertainty lies where human error can occur, or when variables are uncontrolled. Human error included in this study: verbal counts translated to written counts, different number of surveyors and skill level at each site, exact measurement of site survey area, and losing/dropping collected macroinvertebrates back into the water. Other areas of uncertainty include: trophic effects and predation effects on macroinvertebrate community within each sample site and the presence/absence of recent unknown disturbances to sites. As this survey represents a single sampling event for each site and did not qualify for statistical testing, findings should be interpreted as preliminary observations. Host snail abundance does not necessarily indicate known parasite presence.

Recommendations for next study to address uncertainty: write data counts on waterproof paper and verbally confirm counts between counter and transcriber, maintain number of surveyors at each site as close as possible, measure distance of survey site and keep consistent between sites, ensure species identification is done by at least two confident individuals that have studied the common species of macroinvertebrates, take pictures of unknown or unfamiliar species for later determination, conduct site surveys within close time periods of each other (do all sites within a week for one part of season and then do the same for another part of the season), and note any disturbances observed (high boat traffic, weather conditions, and water clarity). Additional monitoring across multiple seasons and sites would improve the confidence in substrate specific findings and swimmer’s itch risk assessments.

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Raw data collected:

Species	Gravel Bottom	Muddy Bottom	Sandy Bottom
Flat Worm	6	7	0
Stonefly	0	0	0
Mayfly	0	0	0
Roundworm	0	0	0
Mosquito Larvae	0	0	11
Aquatic Beetle	4	0	0
Damselfly	2	0	0
Dragonfly	0	0	0
Isopod	2	0	0
Scud	23	21	4
Leech	2	11	1
Caddisfly	2	5	0
True bug	0	0	0
Aquatic Earthworm	4	0	1
Zebra Mussels	147	178	0
Quagga Mussels	31	4	0
Rusty Crayfish	0	0	0
Native Crayfish	0	0	0
Midge larva	1	0	0
Water Penny	1	0	0
Beetle Larva	12	0	0
Water Mite	23	1	0
Pointed Campeloma	0	2	0
Liver Elimia	28	11	0
Great Pond	0	0	0
Ramshorn	0	0	0
Bladder Snail	0	0	0
Banded Mystery	0	112	0
Chinese Mystery	0	0	0
TOTAL:	284	352	17
Lake Bottom Type:	Gravel	Mud	Sand
Standardized hours:	1.8	1.8	1.8
Coordinates:	42°33'56"N 88°33'23"W	42°34'41"N 88°32'14"W	42°33'59"N 88°26'13"W