

Hamlet at Dirickson Pond
Comprehensive Water Quality Improvement Program for the
Quarry Pond/Lake System

On March 2, 2021 from 1:00 p.m. to 5:00 p.m., under sunny conditions and significant precipitation occurring within the last 24 hours and 40°F., a generalized watercourse assessment was conducted by Envirotech Environmental Consulting, Inc. at the request of the Homeowners Association. The objective was to determine potential sources and causes relating to the increased algae and/or Cyanobacteria blooms associated with water quality degradations.

Background Information

The Hamlet at Dirickson Pond water course is an existing quarry/borrow pit pond that retains a permanent pool of water on a perennial basis. It is subjected to seasonal fluctuations in the water column depth and elevations due to seasonal precipitation, ground water elevation, stormwater runoff, evaporation, and transpiration rate changes. The “Pond” (due to an average depth of greater than 7ft., surface acreage, and ecological classifications) system is classified as Lacustrine; therefore, thermoclines and stratification levels are most likely present and occurring within the water column during the summer months. The “Lake” is serving as a stormwater runoff basin with a series of curb cut street drainage swales which are contributing concentrated flows during significant rain events, and rear lot sheet flows as well. The lake system has a greater than 7’ average depth, with deep areas greater than 20’, and a shallow bench /wetland status fringe and transition zone. An erosive island system is present. The surrounding land use is made of residential lots with occurring ornamental turf management practices. The lake is Stormwater Quantity Storage, serving as a habitat for finfish, aquatic mammals, waterfowl, and all other organismal kingdoms. An extremely large and concentrated Canada Goose (*Branta canadensis*) population was observed, and in numbers far greater than water quality nutrient level sustainability overtime.

Objectives:

1. Introduce emergent aquatic vegetation along the Hamlet Lake system, shoreline and stormwater management swale inlets stabilization zones in order to decrease soil erosion and promote nutrient uptake.
2. Determine parameters negatively affecting the overall water quality of the system and develop a nutrient management plan including but not limited to: stratification determinations, benthic vegetation determinations, finfish populations etc.
3. Implement Canada Goose control practices as a preventive to possible negative impacts to the Quarry Pond/ Lake system; i.e., excess nutrients from feces, herbivory, etc.

Findings:

- Erosive and unvegetated shorelines were observed.
- Exposed soils were present in the swales.
- Excessive vertebrate nutrient waste from Canada Geese and other animals.
- Eutrophic and cyanobacteria conditions during the peak of the growing season. (See Appendix A)
- Land use: turf and ornamental lawns and beds associated with dwelling units, stormwater swale inlets, hardscape shoreline stabilization, living shoreline and erosive shoreline is apparent. Multiple exposed soil zones at the end of the swale run, and into the lake, were observed.
- Unknown Analytical Water Quality Parameters.

Recommendations:

1. Implement a Conservation Landscape Plan to include bench shelf shallow water aquatic plantings in order to increase soil stabilization along the Hamlet Lake System, shoreline and stormwater management swale inlet zones.
2. Water quality testing by collecting non-potable water samples from the quarry pond/ lake system and analyzing samples to determine if excess nutrient levels exist in the system that could be causing algal blooms.
3. The Canada Goose population is recommended to be controlled to the maximum extent possible and on a year-round basis with the Best Control and Management Practices principles and processes without deviation, and on an annual basis in perpetuity. Vertebrate feces in this concentration of deposit severely degrades water quality over time with “Nutrient Loading” (See appendix B).
4. Excessive algae and cyanobacteria bloom is a function of elevated nutrient levels within the water column. High Phosphorous levels (the most limiting nutrient) were observed. A Nutrient Management plan is recommended for the community as a whole regarding maintenance and management to surrounding turf management and landscape feature areas. Continuous bi-weekly monitoring of water column and permitter aquatic vegetation should occur. Monitoring and control of watershed/land use practices within the subdivision’s watersheds for any and all negatively contributing factors, including but not limited to, dog feces, Canada Geese feces, nitrogen usage applications, phosphorous usage applications, erosion and runoff should also be implemented.
5. Air Diffusion may be considered for water quality management and within deep sections of the lake. Air diffusion systems for improved dissolved oxygen concentrations, stratification mixing and cyanobacteria control.

Appendix A.

Historic Water Quality Photographs



Figure 1: Cyanobacteria Bloom from September 2020.



Figure 2: Cyanobacteria Bloom from September 2020.



Figure 3: Cyanobacteria Bloom in September 2020

Appendix B.

Corrective Actions – Recommended Canada Goose Control Management
Practices

Canada Goose Characteristics

The Canada goose has the most widespread distribution, and is the most abundant of all North American species of geese. But unlike its migratory cousin, the resident Canada goose has become a permanent and problematic resident in suburban and urban communities. Weighing up to 8 kg (18 lbs.), giant geese gain extra fat reserves which help them tolerate cold winter temperatures in the northeastern United States. Resident geese typically breed between April and August and each nesting pair produces about 5-6 eggs per year. Scientists estimate that there are about 1 million resident geese in the Atlantic flyway population.

Invasive History

Economic Impact

Resident geese are a particular concern in the agriculture industry. Grasses and grains like soybeans, corn and wheat are favorite foods of resident geese. Geese and airports don't mix! Between 1990 and 2000, Canada Geese were implicated in 505 strike causing damage to civil aircraft. Each year, bird strikes cause \$350 million in damages.

Health Risks

Bacteria in goose droppings may harm water quality in ponds, lakes, and reservoirs. Resident geese have tested positive for the West Nile Virus, a mosquito-borne pathogen that causes flu-like symptoms in humans.

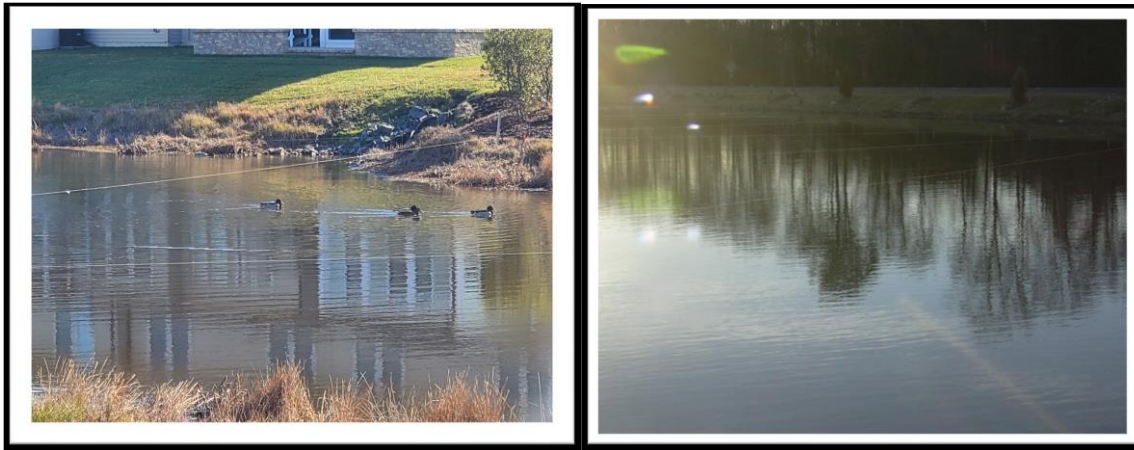
Property Damage

Goose droppings are rich in phosphorous and nitrogen. Not only may a large flock of geese over-fertilize lawns, they can also increase nutrient runoff and algae growth in ponds and lakes. Parks, manmade wetlands, and golf courses provide favorable habitat for resident geese, but large gaggles graze heavily on grass and aquatic plants, uprooting vegetation which increases maintenance costs.

Canada Goose Control Practices

Monofilament Grid and Exclusion Grid Installation

Exclusion Monofilament grid installation prevents and discourages geese from entering ponds from the embankments while overwater monofilament grids deter geese from roosting and entering the water column from the air. Stakes are placed around the pond perimeter allowing the monofilament to cross the pond several times. Geese tend to rest, land and take off in open water. The monofilament grid denies the geese access to the pond which deters feeding on adjacent lawns. Labor and installation are complimentary when a Comprehensive Maintenance and Management Program is in place.



Flight Control Application and How it Works

- Anti-feedant (consequence): Geese experience a temporary but very effective digestive irritation, usually within 20 minutes, when they eat turf treated with FlightControl® PLUS.
- Visual Warning (threat): Geese have four retinal cones (unlike humans, who have three) and have the unique ability to recognize FlightControl® PLUS in the ultraviolet light spectrum in addition to the visible light spectrum in which humans see. The appearance of turf treated with FlightControl® PLUS is unnatural and, once conditioned to the digestive reaction, the visual signal of the treated turf provides a warning to the geese not to eat the turf. Studies have shown that birds will refuse to eat food treated with the active ingredient in FlightControl® PLUS once they are conditioned.



Treated turf appears natural when viewed by humans.



Treated turf appears speckled when viewed by geese in the UV spectrum.

What will the geese do after I treat my turf with FlightControl® PLUS?

- Geese will sample the area. They may react by shaking their heads, drinking water, pecking at their bellies and rubbing their necks. (20 minutes for response time).
- As the geese sample, the conditioning process begins.
- Geese will not die as a result of eating FlightControl® PLUS.
- They may feed several times, drinking in between, while being conditioned to respond.
- Geese will learn that a treated area is not a good place to feed.
- Geese have no choice but to find an alternative food source. This conditioning usually takes one to two days.
- New droppings should decrease, and existing droppings will continue to age if allowed to remain in the drop zone turf, turning white with age.

FlightControl® PLUS has a unique patent and is unlike any other Canada Goose Repellent on the market today. FlightControl® PLUS is NOT made from grapes and will not wash off in rain or irrigation. Compare for yourself the difference between FlightControl® PLUS and other repellents.

Egg Addling

Addling is the process in which the eggs are destroyed, or loss of development occurs. The resident Canada goose nest and egg depredation order authorizes registered landowners and local governments to destroy resident Canada goose nest and eggs on property, under their jurisdiction, to prevent harm to people, property and/or crops. Eggs may be shaken, punctured, or oiled with 100% corn oil. However, EECl only uses the corn oil treatment method for this process. The addling procedures are complimentary when the Comprehensive Maintenance and Management Program is in place. Please refer to Egg Addling Procedure below for the Resident Canada Goose Nest & Egg Depredation Order.

Egg Addling Registration Procedure

In the event your Home Owner Association (HOA) is interested in having Canada Goose nests and eggs destroyed it should follow the procedure described below:

- 1) Access the Resident Canada Goose Registration Login System (RCGR) Website
<https://epermits.fws.gov/eRCGR/geSi.aspx>
- 2) Once on the site, Login with a User ID and Password
- 3) The HOA must register each year between January 1 and June 30 of the year in which the nests and eggs will be destroyed for authorization to destroy resident Canada goose nests and eggs on the property under its control.
- 4) Subsequently, by October 1 each registrant must return to the website to report the number of nests and eggs which were destroyed, for each month and location county. The HOA must report even if it conducted no activity.
- 5) The HOA will not be able to register for future seasons if it has an outstanding report after December 31 of the present year.
- 6) In order to further assist the HOA, the site has other information available for review such as a User's Guide, Frequently Asked Questions, Management of Canada Goose Nesting, Text of Regulation, State Agency Contacts and Information and Summary Data.

After the authorization has been obtained by the HOA to destroy resident Canada goose nests and eggs, Envirotech may be engaged by the HOA to destroy the nests and eggs.

Mistaken Kindness

Feeding geese, ducks, fish, and other forms of wildlife is a “mistaken kindness”. Our resident and migratory waterfowl, mammals, reptiles, and fish are important parts of local and global ecosystems. They rely on specific energy sources from their environment and assist to keep the ecosystem’s natural balance. Wildlife is not adapted to acquire energy and essential nutrients from human food sources in most cases. Often, feeding animals makes them nutrient deficient and susceptible to disease because the energy source is not natural to the systems of the organism. For instance, Avian species have gizzards for grinding seeds, macro-invertebrates and other natural energy sources as opposed to breads that people may feed ducks and geese. This may in turn lead to disease. Feeding wildlife also initiates domestication of the animals and this is damaging to the population, ecosystem and may pose threats to the community in some situations. Feeding wildlife “conditions” the animal, in some cases, to never leave the source for artificial food acquisition and the animals may never leave the vicinity, then causing populations to grow exponentially. Excess nutrients may quickly alter water chemistry and set of algae blooms.

Resident Canada Goose Depredation

A depredation permit can be obtained in order to capture and physically remove the residential Canadian Geese from the community during the malt season using a Canada Goose NestBlaster cannon. EECI would meet with the community’s HOA in a collaborative meeting in order to determine the target area and most effective locations to complete the depredation activity. Once the target locations are determined the cannon will be set up in a camouflaged location the day prior to the depredation activities. The netting “cannon” is safely set-up with caution for our team, the public, and our fowl friends. The netting quickly captures large amounts of geese, which are handled with care and placed into transportation holding cages. Birds are transported to a designated facility, approved by the Delaware Department of Natural Resources and Environmental Control (DNREC). While there are a number of techniques for capturing birds, cannon netting has proven useful due to its ability to catch a large number of birds, at once, for permanent removal. Strict protocols and procedures will be followed at all times to ensure the safety for the birds. Birds are covered as soon as possible to reduce stress. Carrying boxes are used to transport the birds to prevent them from seeing escape routes and human activity.



Goose Control Management Plan

		Jan	Feb	Mar	Apr	May	Jun	July	Aug	Sep	Oct	Nov	Dec
		Seasons for Canada Geese			Mating	Mating							
	Seasons for Canada Geese			Nesting	Nesting	Nesting							
	Seasons for Canada Geese					Gosling Maturing & Foraging	Gosling Maturing & Foraging						
	Seasons for Canada Geese							Molting	Molting				
	Seasons for Canada Geese	Pond Hopping & Foraging	Pond Hopping & Foraging						Pond Hopping & Foraging	Pond Hopping & Foraging	Pond Hopping & Foraging	Pond Hopping & Foraging	Pond Hopping & Foraging
Services Provided by Envirotech Environmental Consulting, Inc.	Seasons for Canada Geese			Egg Adding and Nest Destruction Program	Egg Adding and Nest Destruction Program	Egg Adding and Nest Destruction Program							
	Seasons for Canada Geese	Flight Control Application (as needed)											
	Seasons for Canada Geese	Monofilament Grid System and Exclusion Fencing											
	Seasons for Canada Geese										Hunting Season		
	Seasons for Canada Geese	Hunting Season										Hunting Season	Hunting Season

- April—August area indicates period when geese are unwilling (nesting or unable (gosling maturation and molt) to fly. FlightControl PLUS may still be used to condition geese to avoid feeding in treated areas during this period.
- Applying FlightControl PLUS right after snow melt (spring infestations) or after the final mowing (fall infestations) will allow maximum repellency time before the next mowing. For summer infestations, apply FlightControl PLUS immediately after mowing. Reapply after two or three mowing's if geese continue to pressure the property.
- Geese may attempt to reclaim an established feeding site once the repelling power of FlightControl PLUS has been removed by mechanical mowing.

Key:

- Non-Lethal Methods
- Lethal Methods

**Non-Lethal Methods Include:
(Most Cost Effective)**

- Monofilament grids
- Pond perimeter buffers
- FlightControl applications

Lethal Methods Include:

- Egg adding and nest destruction (permit required)
<https://epermits.fws.gov/eRCGR/geSi.aspx>
- Resident Hunt (as per Res. Goose Season) (license required)

Appendix C.

Dirickson Pond Charting and Depth Mapping



Figure 1: Aerial Imagery



Figure 2: Pond Contour Map (1' Contours)



Figure 3: Pond Bathymetry Map

Appendix D.

Corrective Action – Recommended Nutrient Management Program

Nutrient Management Program

- Continuous bi-weekly monitoring of water column and permitter aquatic vegetation should occur. Monitoring and control of watershed/land use practices within the subdivision's watersheds for any and all negatively contributing factors, including but not limited to, dog feces, Canada geese feces, nitrogen usage applications, phosphorous usage applications, erosion and runoff should also be implemented.
- A water quality test should be completed by collecting non-potable water samples from the quarry pond/ lake system and analyzing samples to determine if excess nutrient levels exist in the system that could be causing algal blooms.
- If after the water quality test has been completed the phosphorus level exceed the acceptable levels a Phoslock Program is recommended in order to reduce the amount of readily available phosphorous in the water column for algal growth.

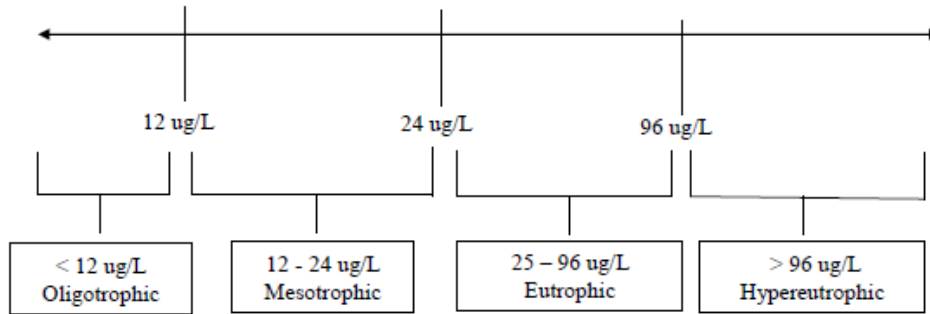


Figure 1: Phosphorous Levels Diagram

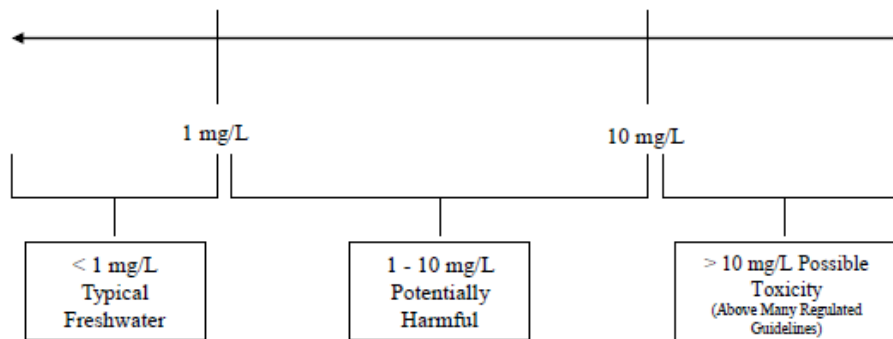


Figure 2: Nitrates+Nitrites Levels Diagram