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Video: Spring awakening at Grenadier Pond

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Ann Zimmerman gives a great wave from behind a bold brace of phragmites.

Her binoculars are strung about her neck, her white hair is tied in a ponytail. She's wearing good hiking boots and trousers that appear to have an outback durability and a jacket the colour of just sprung grass.

Zimmerman swiftly reports the sighting of a red-winged blackbird and wonders whether the plentiful phragmites will be strong enough to serve as bird-life hosts, their stalks seeming too frail for avian support and their seeds too minute to be of much nutritional value.

Not that I know what phragmites are. Pronounced frag-ml-teez, the tall blond grasses with feathery headdresses dance to the sigh of the wind and play host to a skimming pair of swans.

Zimmerman's cheeks are both tanned and ruddy, and as she sets off in an easterly swoop around the southern lip of High Park's Grenadier Pond under a grey and not very cheery sky, she demonstrates the purposeful marching style of a British dog owner tramping across the moors in search of her afternoon cup of tea.

A glass of sherry would be welcome.

This is a story in search of spring — Sunday is the day! — and who better to lead the investigation than someone steeped in the limnological facts of life. Limnology — a poetry-worthy word for the study of inland aquatic ecosystems.

Just retired from the department of ecology and evolutionary biology at the University of Toronto, Zimmerman has responded to our inquiry: how does a pond awaken in the spring?

The Grenadier Pond ice is peeling back from the shoreline. A scrim of algae is painted a pretty green atop a breakaway collar of ice.

There's a great deal to be said about ice as a starting point. If there was a time when I knew that water does not achieve maximum density at its freezing point but rather at 4 degrees Celsius, it has long since left me.

Zimmerman primes the information pump with zinging emails in advance of our expedition. Physics 101: ice floats. "This property of water is crucially important, since without it lakes and oceans would freeze solid (from the bottom up) in winter and could not support life much beyond microbial life."

A white streak scars the middle of the pond, shore to shore, as if, Zimmerman says, the wind has been pushing the ice around. The remnants of the demarcation of a shinny rink can be barely seen, soon to melt into a spring swoon. There is no sign of the British Grenadiers who would march from Fort York in exercise formation. Legend has it that troops fell through the ice one wintry day, their bodies laid to rest in this watery grave. It isn't true, but then, the ice shimmers, and a grey shadow plays merrily.

At the shore — or the littoral zone, in Zimmerman's language — bright green stolons can be seen bobbling at the surface of the water. The gnarly stolons grow horizontally, fat fingers that sprout from rhizomes — roots and shoots — that themselves have broken from an aquatic plant host. Phragmites is one. Cattails — *Typha latifolia* — is another.

Zimmerman is concerned that the invasive phragmites will choke out the cattails.

Energetic friends of the pond — there are troops of them in the neighbourhood — have tried to halt their spread, hauling the grasses out by their roots. To no avail.

Like any inveterate pond explorer, Zimmerman, stick in hand, toes her boot into the water's edge. There's a small mammal skull bobbling about: pointy snout, nasty teeth — those canines could rip the throat out of a rat in a nanosecond. Zimmerman retrieves the trophy skull and carts it about



The Star's Jennifer Wells has been watching winter melt away from High Park's Grenadier Pond for more than a quarter century.

RANDY RISLING/TORONTO STAR/RANDY RISLING/TORONTO STAR

until a park employee offers positive identification. A possum skull, as it turns out. The plug-ugly marsupials have recently joined the pond's predator ranks. Possums will eat anything.

The conversation shifts to long ago.

Zimmerman grew up on the south shore of Lake Erie in Bowling Green, Ohio. Each and every summer there was that moment, that precise time, when the mayflies would swarm in vast armies as if released to the sound of a shotgun blast.

To the streetlights they were drawn, a brief moonlit dance before expiring onto the sidewalk and roadway in great, crunching, ankle-high heaps, leaving a treacherous slick of insect debris.

And then, poof.

"One year they were there," she says. "The next year they were gone." Just like that.

Here's the poetry again. The scientific word for mayflies: "*Ephemeroptera*," says Zimmerman, the weightless word puffing into the wind. Ephemeros: short-lived.

The mayfly of Zimmerman's youth was the Canadian sailor, or *Hexagenia*. The *Hexagenia*'s mud-burrowing nymphs (the pre-adult stage) may live for two years underwater. The airborne imago, or adult, will die within days, or hours. Here's a creepy bit of science: the adults have nonfunctioning mouth parts and thus take in no food. The female of the species expires within minutes of laying her eggs. Sailor flies under a sailor moon, decomposing beneath the lampposts.

The mayfly is sensitive to pollution. These are the things you learn. And when pollution rained down on Lake Erie, the algae bloomed and the lake was choked of oxygen. "Anoxic," says Zimmerman. Prior to pollution controls, the mayflies sighed and died and the aquatic and littoral food web — perch, pickerel — was denied a primary food source.

Grenadier Pond has had its own woes. Any study of the pond inevitably reaches back to Zimmerman's research of 25 years ago, when she charted the pond's beginnings from the receding waters of prehistoric Lake Iroquois, to the cutting of trees on the pond's watershed, the construction of the railroad between the pond and Lake Ontario (followed by Lake Shore Boulevard) and the extensive shoreline uprooting in the 1950s in favour of a concrete edge on the pond's southern and lower eastern shore. The effect of the concrete necklace was to eliminate macrophyte, or aquatic plant life, regeneration in those areas. "We didn't know any better," says Zimmerman, pointing out partially submerged remnants of the concrete rim. Rehabilitation efforts have resulted in the ongoing natural reclamation of the shoreline.

Macrophytes are keystone species, essential to the ecological equilibrium of the pond. There are emergent macrophytes: the cattail is one. And floating-leaved macrophytes: those would be your water lilies with pretty names like *Nymphaea odorata*, or perfumed water lily. The pond's submergents include various perennial pondweeds that form dense underwater homes — or "predation refugia," as the experts say — for zooplankton (small, free-swimming invertebrates). The pondweeds survive the winter by storing food in their underground stems.

They're down there. Somewhere.

So, too, are the benthic invertebrates, small organisms that, Zimmerman notes, live in contact with the substrate and the underwater stems of the macrophytes. Some, such as crayfish, live out their lives entirely in water.

Zimmerman sends an explanatory email to a pleading writer: "Although mostly invisible, these organisms are important elements of the aquatic food web — they help decompose plant and other organic material, mix the sediments (just like terrestrial earthworms, there are aquatic worms that churn up pond sediments). Benthic inverts also serve as a source of food for birds and fish. On a calm day with clear water, you may be able to see examples of many benthic fauna moving about if you watch carefully."

The crayfish are hidiers, and become active only at night. What is slowly moving around down there? Perhaps some *Gammarus* amphipods, or scuds, scavenger eaters who are in turn hosts for frogs and fishes and birds.

What can we see?

Well, the mallards are out in force, the drakes with their emerald green heads and sun-yellow bills, the hens in their dreary brown housedresses.

At the north end of the pond the thinning ice makes for playful sport. The ducks plough through the sugar-thin pond surface like ocean liners cutting a seaway through the marsh. The beaver have marked their trails through the mesh of marsh grasses. There are plentiful signs of beaver chew — downed tree trunks with pencil-sharp ends down on the shore, stouter projects abandoned. There is no beaver lodge in sight, suggesting that the beaver here may be burrowing into the bank of the pond.

A pair of swans hovers haughtily near the shore, bright white against the red spines of the dogwood. One raises a wing in grand display before twisting that great grand neck into full contortion and starting to peck away at its underwing. A few cattails display a blaze of green.

The pelagic, or open-water, zone remains frozen solid. Not until the ice leaves the pond and the water starts to freely circulate in response to the

wind, will the diatom bloom. The unicellular organisms are members of the family of freshwater algae and form the foundation layer for the pond's food pyramid.

Zimmerman explains that as the pond thermally stratifies — that would be warmer water on top, cooler water on the bottom — the diatoms are replaced by green algae, which, in turn, are small enough to be eaten by the zooplankton, which in turn are eaten by the fish.

What you don't want is a subsequent bloom of blue-green algae, which can be too large for the zooplankton to eat, potentially resulting in a biomass buildup that can ultimately remove oxygen from the pond waters as well as restricting light to plant species.

Short story: the littoral zone drives energy from the macrophytes to the benthic invertebrates to the fish community. In the pelagic zone, the course of energy is from phytoplankton to zooplankton to planktivorous fish — the plankton eaters — to the piscivorous, or fish-eating, fish.

Where are the frogs?

The American toad — the short and squat *Bufo americanus* — overwinters in the soil. Not until the frost leaves the ground will it emerge and head for the pond. The males will trill, pairs will mate, and the females will lay their long string of eggs in the pond waters.

By then the damselflies and dragonflies — the devil's darning needles — will be on display.

Unlike the toads, the pond's damselflies overwinter in the water in their nymph, or antepenultimate, stage, having grown from eggs deposited last autumn. They will molt in the late spring: the skimming bluet, the orange bluet, the eastern forktail, the widow skimmer. The skimming bluet has historically made the pond home, says Bob Yukich, one of the park's most impassioned naturalists. As the pond struggled with the disequilibrium of its ecosystem, the skimming bluet disappeared. "It's come back," Yukich says, "which has a lot to do with the health of the pond."

Bob Yukich can tell you many things. He can check his records to confirm the exact date — Aug. 6, 2008 — when he spotted two male Halloween pennant dragonflies patrolling the southwest corner of the pond. The last prior recording of a Halloween pennant, with its brown and pale orange spotted wings, was in 1906.

(Yukich also reports that he once observed a great blue heron swallowing a Norway rat whole, head first.)

Dragonflies. Dragonflies are complicated. Or at least the green darner — *Anax junius* — is especially so, as noted by the authors of the journal *American Midland Naturalist*. With its turquoise abdomen and moss green head and thorax, the darner is a common sight in the park. But not all darners overwinter in ponds as damselflies do. Some are resident populations; some are migratory. Migrating populations head south in the early autumn.

These are pieces of information that Ann Zimmerman keeps at her fingertips.

The air is cold. It is early afternoon. Bird song has not yet reached its full orchestration in the park. Zimmerman occasionally cantilevers her arm as birders do, binocs to eyes, up, then down. She notes that sparrows appear to have roused the recently returned purple martins from their nest.

Months from now, the pond waters will again begin to cool. The temperatures of the top and bottom of the pond will equalize, Zimmerman notes, before a fall diatom bloom, nature's nod that the pond, again, is ready to return to its winter hibernation.

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Pumpkinseed

Happiest in weedy waters, pumpkinseed, *Lepomis gibbosus*, is a sunfish noted for the crimson spot it sports on each gill cover. An all-day feeder, the pumpkinseed will crush snails, feast on all manner of larvae and, when the spirit moves, devour other pumpkinseeds. The Toronto and Region Conservation Authority also lists the bluegill sunfish, *Lepomis macrochirus*, among the pond's bony fish population.

Phragmites

About 45 per cent of Grenadier Pond's shoreline was cleared of macrophytes, or aquatic plants, in the 1950s as a concrete ledge was laid around the pond's southern and easterly edges. Extensive shoreline restoration efforts have focused on macrophyte regeneration. The pond's shallow emergent marsh plants include various sedges, as well as sweet flag, a species of arum that spreads via a creeping rootstock and that shoots small, flag-like flowers from its spiky stalks. The phragmites, tall, invasive grasses, are on the march around the pond's perimeter.

Largemouth bass

Grenadier Pond's top predators, the northern pike and the largemouth bass, both disappeared from the pond and were restocked in the mid-1990s. When the pond waters warm to the mid-teens, the bass will set their nests in the pond's vegetative bed. After the females lay their eggs, the males will guard the nest from predation by the likes of their fellow fish pond travellers, the pumpkinseeds.

Great blue heron

Standing more than a metre tall, the great blue heron, *Ardea herodias*, wades into the shallow waters of the pond to feast on a fish supply that features at least 10 species. Herons, which favour the pond's marshlands to the north and along its western shore, are equally interested hunters of salamanders and toads, not to mention the occasional brunch of a tasty rodent.

Daphnia

Of the small, free-swimming invertebrates we know as zooplankton, the genus *Daphnia* is one of the largest, feeding on free-floating microscopic algae. Zooplankton, including smaller species like *Bosmina*, are a primary player in the understory of the pond, as are the pond's copepods, tiny crustaceans that feed on algae and organic debris. All are important fish food sources.

Micrasterias

When biologists speak of phytoplankton, it is the desmids that throw them into a deep, rapturous swoon. Beautifully shaped and bright, bright green, the desmids are algae common in lakes and bogs. *Micrasterias truncate* is exceptionally pretty, its two semi-cells appearing as mirror images connected by a clear isthmus.

Cattails

Along with water lilies, cattails have been the standard bearer for the pond's emergent macrophytes, at least until the phragmites came along. Growing as high as two metres, the common cattail is rooted to the pond bottom, its sturdy, sky-pointing stems providing popular landing sites for birds. Even before the official start of spring, the cattails throw out rhizomes, new beginnings that can be seen bobbling through the surface of the pond.

Brown bullhead catfish

What look like chin whiskers are more formally known as barbels, those filaments that catfish use to find small bottom feeders scuttling in the pond's nether regions. Bullheads, with their scaleless skin and sharp spine, feed at night. By late spring, the bullheads will spawn, nesting in submerged vegetation or crannies fluffed out of the sedimentary pond bottom.

Green darner dragon fly

Sometimes called mosquito hawks and sometimes called the devil's darning needles, numerous species of dragonflies and damselflies can be seen darting and dashing about the pond's surface commencing in early summer. The green darner is perhaps the most common, but look out too for eastern amberwing, blue dasher and the grimly named black saddlebags.

Orange bluet damselfly

Damselflies and dragonflies mate in flight. The orange bluet, the skimming bluet, the eastern forktail and the widow skimmer are all common at Grenadier Pond. All of these species deposit their eggs in the pond in late summer. After overwintering in the pond, the damselflies will emerge in early summer.