

Gabriola Streamkeepers—Water levels and quality

## **Observations at Coats Marsh, Gabriola Island**

—with notes on Coats Marsh Creek, East Path Creek, and Stump Farm Streams.

### ***References:***

[RDN Coats Marsh Regional Park](#), 2011–2021 Management Plan, Appendix A.

[RDN Coats Marsh Weir Assessment](#), June 1, 2020, SRM Projects.

[Gabriola Riparian Areas](#), February 24, 2012, Madrone.

[RDN Berm Report](#), September 12, 2013.

[RDN Water Level Management](#), September 14, 2021, Madrone.

[RDN NHC/EDI Weir Replacement Study](#), April 12, 2023.

[RDN/NTBC Coats Marsh Weir Management Proposal](#), May 2, 2023.

[RDN NHC/EDI Decommissioning Plan](#), December 18, 2023.

[RDN NHC Beaver Dam Risk Assessment](#), January 10, 2024.

For an up-to-date list see [here](#) and for pertinent Gabriola Streamkeepers notes see [here](#).

[Coats Marsh hydrogeology](#) .

Water-levels' [summary](#).

Coats Marsh RP and 707 CP Trail [Maps](#): Maps Y and Z.

Gabriola Stream and Wetlands [Atlas](#) .

Coats Marsh Species [Checklists](#) .

Coats Marsh – human disturbance of breeding and migratory [ducks and geese](#).

Coats Marsh – [beaver dam stability](#).

Coats Marsh Management - [paper on](#), [weir decommissioning](#)

Coats Marsh brief [history](#).

Long-term precipitation (1944-2023) – [statistics](#). Updated every month and used as the “normal” meaning average precipitation at Coats Marsh.

## **Field observations—2024 (Jan.— )**

THIS FILE ([Field Observations 2024](#)) IS A SUPPLEMENT TO:

“[Observations at Coats Marsh, Gabriola Island](#)” File: 673.

For an up-to-date list of supplements see [here](#) .

Jan.03, 2024 (day 3091, 2922+169):ViGRG cum. 585.7 mm (norm. 566 mm).

The major inflow to the "lake" is sometimes quoted by RDN consultants to be East Path Creek (EPC). In fact, observations (File: [673u](#)) at the EPC culvert have shown that the creek contributes on average only about 35% of the total annual input. The inflow from the NE Arm sometimes exceeds this at certain times of the year, but this is more difficult to measure, and depends on the lack of infiltration in the NE Arm Wetland, which is only low later on in the season.

Although variable and difficult to quantify, there seems to be on occasions significant sources of inflow other than the combined inflows from EPC and the NE Arm Creek.

One interesting discovery was what appeared to be a drainage channel noted last summer when the lake water level was extraordinarily low (File: [673zc](#), p.ZC 544). On investigation today (there were no ducks

around), I found that this channel extends into the bush where it is obviously natural. The channel was ponded but no flow could be observed, even though EPC was flowing gently at the culvert; however, there was little doubt that at times this is a significant ephemeral watercourse. It and other smaller ones nearby appear to have attracted the beaver's passing interest.

This ties in nicely with my observations of years ago that the glaciofluvial smectite clay underlying the lake suggests the lake was more extensive at the time of its deposit at the end of the Pleistocene (File: [668](#)). My guess is that the lake was blocked by massive amounts of ice at its western end, and its immediate catchment area was thereby extended beyond the wetted perimeter of the lake today. This extension of the lake's perimeter acts to funnel runoff into the modern lake evidently often as subsurface or poorly-defined flows, with almost none infiltrating through the gleysol into the



sandstone bedrock while *en route*. Whether this is enough to account entirely for the "excess" inflow, I'm not sure. [see Jan.9 entry]

Rainfall statistics (File: [698](#)) updated to include years 2022-2023.

Jan.08, 2024 (day 3096, 2922+174):ViGRG cum. 653.9 mm (norm. 595 mm). Weir 579 mm WPB scale. [cal.datum: weir -0.068 m].

Wet snow.

Jan.09, 2024 (day 3097, 2922+175):ViGRG cum. 679.9 mm (norm. 601 mm). Weir 637 mm WPB scale. [cal.datum: weir -0.010 m]. Cistern +166 mm SCB. [cal. datum: cistern +0.533 m].

Heavy rain with passage of a cold-front overnight. EPC culvert full. NE Arm spillway (shown below) flooded with a flow over and under East Path comparable with that observed at the EPC culvert.



The "drainage" channel observed last week [Jan.3) has a heavy flow, so heavy that I suspected some or most of it might be the principal estuary of EPC, not as I surmised an entirely new source. Why not traverse EPC to see where it goes? The watercourse is through dense rose thickets that are not a comfortable survey, but it wasn't too difficult this time of year. And yes indeed EPC does flow northward sub-parallel to the shore line for a bit before meandering down toward the lake and through the reeds along the shore (photo next page).

The two springs near the park entrance are flowing independently into the lake, each with roughly equal flows and each somewhat less than the EPC culvert flow but constituting together a significant fraction of that flow. Sorry, no measurements attempted.

Discussion with the resident at the west end (Lot 5) on the source of the drainage on his side of the berm. I'd convinced myself that it was leakage under the berm based on the results of WQ tests on either side of the berm were practically identical. (File: [673n](#), p. N232)<sup>1</sup> However, it is true that the flow usually stops in August when there still is water in the weirpool, but this could be because the leakage is fairly high up.

The resident however assures me that the lot to the south of his (Lot 4), which is on higher ground, does have a small natural pond, and this area might be where the water needing to be drained is coming from. What the source of this water is has thus reverted to being an open question.

I notice that the latest consultant's report (File: [6110](#), p.14) to the RDN records that the authors are "not qualified to quantify the beaver dam's stability or likelihood of failure; however, the following

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<sup>1</sup> E-mail November 19, 2015: "Conductivity of marsh 77  $\mu\text{S}/\text{cm}$  at 14.8°C (97 specific); conductivity of drain 71  $\mu\text{S}/\text{cm}$  at 14.7°C (89 specific); pH marsh = 7.3; pH drain = 7.1; marsh dissolved oxygen = 9.0 mg/L, 92% saturation (mostly rain); drain DO = 8.3 mg/L, 85% saturation (biological activity in the drainage area reducing DO perhaps?) The differences are insignificant, typical of puddles in the forest, and way below that of any serious groundwater. The water hasn't travelled far even on the surface."



information is provided for discussion based on our professional experience...".

Any quantitative assessment of risk involves two factors: the probability of an event happening, and the consequences if it does. The two multiplied together give a measure of the overall risk.

I can only repeat regarding the first factor my conversation with Professor Richard Brazier of Exeter University. He has been researching beaver dams in the UK since 2013. He wrote to me that: "considering the system that you refer to - which is a low-energy lake system - in my opinion, especially given the maturity of the dam, the chance of any catastrophic failure is non-existent". (File: [6111](#))

The second factor is the business of the three downstream landowners but I gather no in-depth discussions with the RDN have occurred.

A risk assessment has thus yet to be made.

Jan.11, 2024 (day 3099, 2922+177):ViGRG cum. 686.2 mm (norm. 601 mm).

Light snow but cold, overnight -10°C. Lake frozen.

Sometime in the next few days when I very cautiously approached the



cistern to see how the ducks were doing, found it unfrozen as it usually is during very cold snaps, but devoid of any ducks. I most certainly didn't scare any off and would have backed away had I heard or seen any indication that anyone was home. Many footprints around

the viewpoint, and traces on the ice of a lake duck taking off, so somebody has clumsily frightened them all away. Didn't used to happen, but it's the way of the future I guess.

Jan.17, 2024 (day 3105, 2922+184):ViGRG cum. 709.1 mm (norm. 647 mm).  
SWE = 0.1

Up until Jan. 16, no precipitation, warming up to close to zero. Heavy snow. Went looking for hair ice along the Marsh Trail. Didn't see any, but I did see snow squiggles (or snakes?).



[New report](#) from the RDN received on a computer study of the consequences of beaver dam breaches (I think that's what I know as a "failure", there are "breaches" all the time in winter). Based on a conjectured "breach". Catastrophic dam failures in lake-like settings are [reported](#) to be extremely rare to non-existent.

Comments included in Version 2 of my [GSK brief](#) for Jan. 20 RDN/NHC/EDI Open-House on Gabriola.

Jan.20, 2024 (day 3108, 2922+186):ViGRG cum. 730.9 mm (norm. 664 mm).

The beaver seen.

Jan.22, 2024 (day 3110, 2922+188):ViGRG cum. 751.7 mm (norm. 675 mm).

Weir 616 mm WPB scale. [cal.datum: weir -0.031 m].

Trudging through snow, slush, and icy-puddles. Lake still mostly frozen, but the ice thinning rapidly (air 6°C).

No ducks sheltering in the weirpool. Unusual.

Jan.24, 2024 (day 3112, 2922+190):ViGRG cum. 770.6 mm (norm. 686 mm).

Weir 677 mm WPB scale. [cal.datum: weir +0.030 m]. Cistern +161 mm SCB. [cal. datum: cistern +0.528 m].

Weirpool overfull. Only the beaver debris/dam preventing flooding. East Path Creek culvert completely full but no flow over the path. NE Arm flowing strongly. NNE spillway flowing over East Path.

Flock of buffleheads, including one ring-necked "guest", boisterously enjoying open water out on the lake. No other ducks seen.



Discharge into Coats Marsh Creek. Rather more than the submerged pond leveller can handle (hard to see in the photo, but the level of water over the sill is higher than the top of the leveller).



An interesting, even if common, stone on the path. Something green that isn't botanical or my rubber boots. Chloritized basalt with flecks of white feldspar (Ca-plagioclase). About 210 million years old, formed long before Gabriola in an equatorial oceanic plateau, linked, some say, to the Galápagos hotspot. Brought by ice from Vancouver Island (maybe Neck Point, Karmutsen Fm.) a short while ago.



The beaver doesn't need the siphons to release potential floodwater. It also looks a bit dangerous to go out there to attend to the siphons. *Below:* The second beaver dam by the weir is raising the weirpool level.

In one month (Oct. 4 to Nov. 6, 2023), rainfall raised the lake level from -37 cm below the crest of the concrete weir to +52 cm above the crest of the concrete weir. At the same time, the level in the weirpool rose from 54 cm below the level of the sill (a severe drawdown) to 49 cm above it (partially blocked by the beaver).



Drawing water levels down in late-summer, regardless of the degradation of the ecology that might cause, in the expectation that levels will not return to pre-siphon levels is fraught. As was demonstrated in October last year, with the present design, a single pineapple express can negate any late-summer drawdown no matter how extreme the drawdown.





NNE Arm spillway. Not nearly as substantial as the NE Arm Creek, which it joins, more ephemeral, but contributes to “flash” flooding. Flows in watertracks rather than recognizable channels.

Rain making everything glossy. Even the afflicted leaves of the colourfully-barked arbutus trees.

Feb.1, 2024 (day 3120, 2922+198):ViGRG cum. 842.9 mm (norm. 728 mm).

Precipitation 261 mm in January, 53% above average. Wet and snowy, but not exceptionally so. Precipitation only just outside the one-sigma variation for the month in the equal-number-of-days-per-month calendar that I use. We had 358 mm in January 2006.

Feb.3, 2024 (day 3122, 2922+200):ViGRG cum. 844.8 mm (norm. 738 mm). Weir 591 mm WPB scale. [cal.datum: weir -0.056 m]. Sill depth 0.140 m.

No change in the beaver debris/dam's height.





Stump Farm Number 1 Stream as it leaves Canary Grass Meadow (looking upstream, NE).

Established by a tortuous bushwhack around deadfalls and through sometimes thorny thickets, following trickling water, puddles, waterlogged grassy patches and other hydrophytic vegetation, that Stump Farm No.2 Stream<sup>2</sup> is readily traceable upstream from the Stump Farm Trail culvert<sup>3</sup> eastward to a culvert on the Marsh Trail,<sup>4</sup> which, measured along the trail, is about 60 metres west of the entrance to the western burn-pile clearing. It's often ponded on the NE side of the Marsh Trail at the culvert location.

The elevation of the Marsh Trail culvert relative to the Stump Farm Trail culvert is small, hard to measure but six to eight metres in a distance of about 150 metres (hand-held GPS).

Where it originally came from to here, if anywhere, is unclear. Once on the SW side of the Marsh Trail it joins the Marsh Trail gutter, which peters out upstream at the burn-pile clearing entrance. The ground here was greatly disturbed by the construction of the elevated Marsh Trail with substantial drainage ditches on both sides.

It's hard to imagine water from the lake once flowing to this point; there appears to be no saddle in the higher terrain in the direction of the lake. There's also no surface watercourse I can see between the lake and the Coats Marsh Trail that crosses the Calypso Trail (the shorter of the Weir Trails File:[656](#) Map Z).<sup>5</sup>

I suspect that Stump Farm No.2 Stream has its own catchment area and was never sourced from the lake, but that instead the original outlet followed the existing outlet where the drop-off in elevation rate below the weir is greater than it is for the number two stream. It makes sense that the builders of the weir would not want to go to the trouble of re-routing the established route of Coats Marsh Creek.

There are also indications of glaciofluvial deposits on Lot 5 suggesting that this was the route of meltwater at the end of the Pleistocene.

Feb.13, 2024 (day 3132, 2922+210):ViGRG cum. 868.4 mm (norm. 785 mm). Weir 565 mm WPB scale. [cal.datum: weir -0.082 m]. Sill depth 0.088 m. Cistern -94 mm SCB. [cal. datum: cistern +0.273 m].

With a week of little rain, you'd expect the RDN to ease up on the drawdown of the lake level—thereby matching output to input and maintaining equilibrium. But no, they continue to draw down the winter reserve. An infuriatingly pointless exercise. Today, I did not see a single duck on the lake. The wetland's environment is being degraded by off-island, ill-informed decision-makers for no good reason.

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<sup>2</sup> Stump Farm No.2 Stream is a tributary of Stump Farm No.1 Stream, which is a tributary of Coats Marsh Creek.

<sup>3</sup> Stump Farm Trail / Stump Farm Stream No.2 crossing (PVC) is at 49°9.270' N, 123°48.922' W, elev.≈100 m.

<sup>4</sup> Marsh Trail / Stump Farm Stream No.2 crossing (PVC) is at 49°9.198' N, 123°48.877' W, elev.≈108 m.

<sup>5</sup> Why, by the way, does the RDN permit bikers to use this trail when the management plan doesn't? The trail is narrow and mossy, and is where calypso orchids (*Calypso bulbosa*) once grew in abundance. These flowers are exceptionally sensitive to trampling (Pojar & Mackinson, 1994).

Feb.15, 2024 (day 3134, 2922+212):ViGRG cum. 868.6 mm (norm. 794 mm).

The references in my brief (File: [6112](#)) addressed to Gabriola Streamkeepers (GSK) concerning the RDN's weir decommissioning plan (File: [6113](#)) had links that didn't work. I've fixed that without changing the content of the file beyond adding two additional references:

- [12](#) Recording of the meeting of the RDN Regional Parks and Trails Select Committee, February 6, 2024
- [56](#) Gabriola SOUNDER report of that meeting.

The RDN staff report to the Regional Parks and Trails Select Committee on Feb.6, 2024, which contains a summary of the preliminary report of the public engagement process, is in File: [6114](#) .

It was recommended at the referenced committee meeting to engage a biologist to assess impacts of the weir decommissioning project and look at mitigation measures, but without change to the overall objective of removing the weir.

This project is now a bureaucratic exercise on the part of the RDN, NTBC, and provincial government (effectively an entity) to avoid paying the costs of preserving this wetland environment. Complicit to a lesser degree, but nevertheless complicit, are GaLTT and the Islands Trust for not supporting and not giving the marsh ecological-protection zoning, the existence of which would have at least facilitated more community-level involvement.

What has not been done by the RDN is to investigate alternative scenarios that would reduce costs and perceived liabilities to something reasonable (the consequences part of a complete risk assessment), and to investigate the actual probabilities of the risk event of the various scenarios in a less exaggerated and more informed manner than the analysis of the NHC (the probabilities part of complete risk assessment). Included in the risk assessment should be the risk that the entire marsh will be drained as a result of beaver-dam failure or long-term decay.

I'd rather have seen such investigations being done by a not-for-profit organization, and to intimately involve people who are acquainted with the marsh; live by the marsh; have an understanding of its irreplaceability; value it as a living remnant of the ecology of the island as it once was; value it as a place of tranquility and refuge from the consequences of the growth in human population; think the needs of wildlife should sometimes be given substantial priority over human needs (nature reserves and natural forests over parks); and who know its long history.

Managing the marsh from a distance, almost entirely without local and up-to-date knowledge, including hiring consultants who are similarly without such knowledge, and who waste substantial amounts of time and money producing reports with content that reflect those failings, and without affording a modicum of control and influence to islanders, is in my view, shall I say, "clumsy".

Feb.16, 2024 (day 3135, 2922+213):ViGRG cum. 868.6 mm (norm. 799 mm).

Only a light ground frost at sea level, but enough of a drop in temperature with altitude to produce frozen puddles, *pipkrakes* (needle ice), and small examples of hair ice up on the trails in the Coats Marsh Creek catchment area, even if an hour or two after the mid-day sun had got to work.

The hair ice seen was on dead alder (*Alnus rubra*) developing on the wood recently exposed by shedding bark, locations where I have seen white-rot fungus.

There were holes in the discarded bark, but too large and too widely spaced to create hair ice. Probably the work of woodboring beetles.





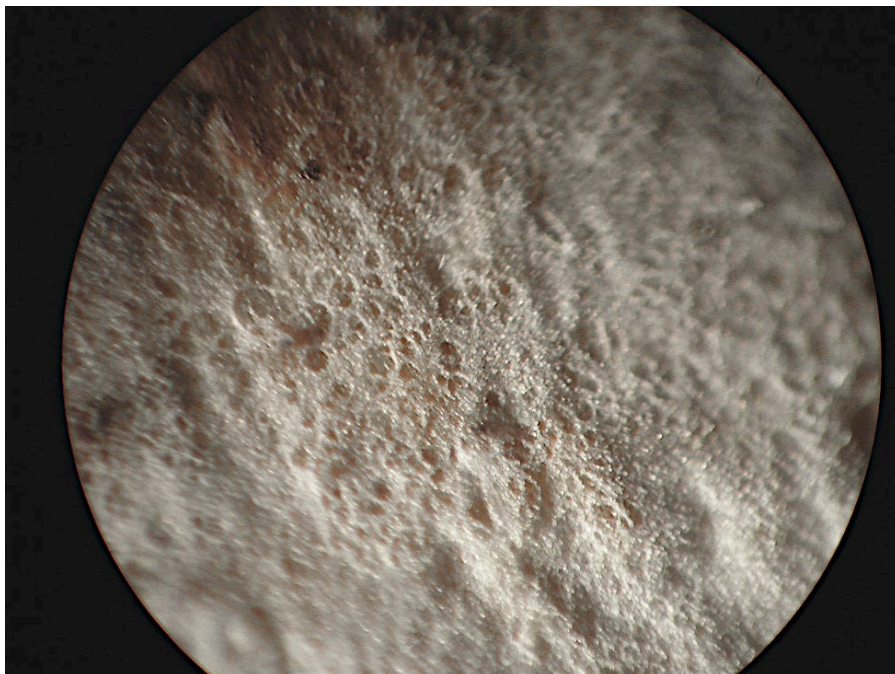
I'm working on the fungus beneath it being *Exidiopsis plumbescens*, but there's quite a way to go yet before that's anything more than a guess.



Microscope pictures after letting the wood sample thaw and dry, so we're not looking at frost. Resolution no better than 10 $\mu$ m.

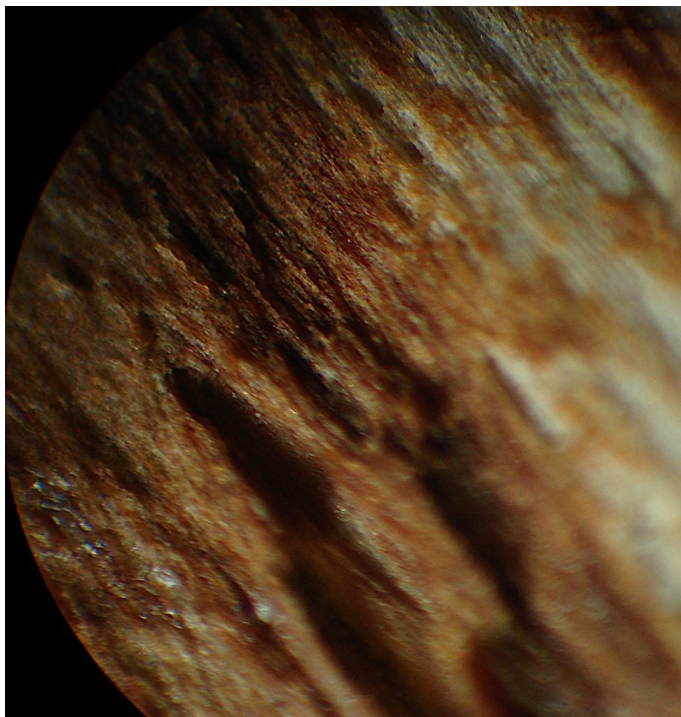
Fungus looking like a light-dusting of icing-sugar but more fibrous in places, like a layer of solidified foam. Aerial hyphae?

The white dusting has a thin underlayer that holds it all together as a sheet that can be gently peeled off the wood. Not-completely-eroded wood and places where there are small holes in the fungus sheets are coated with an amber varnish, like congealed honey.





In eroding vascular channels, the varnish has sometimes been drawn into extremely fine threads (<10 $\mu$ m), and these are sometimes adorned with waxy fragments, like a necklace. Scattered black bunch-of-grape-like clusters on the fungus surface, firmly attached, but might be beetle feces. This fungus is more common on Gabriola than hair ice.



Feb.19, 2024 (day 3138, 2922+216):ViGRG cum. 872.2 mm (norm. 812 mm).

Three bird-related sightings: small, winter flock, in the 10-20 range, of American robins (*Turdus migratorius*); a varied thrush (*Ixoreus naevius*), so more often heard than seen; and a common raven (*Corvus corax*) and a hawk of some kind (red-tailed?) circling round each other like boxers in a ring at the start of a fight, each wondering whether the first blow of the fight will be coming or going. They broke off after a while without contact.

Feb.23, 2024 (day 3142, 2922+220):ViGRG cum. 891.7 mm (norm. 829 mm).

First spring flowers in the waterlogged NE Arm (frogs rather than voles), unfortunately a half dozen mid-sized daphne-laurel plants (*Daphne laureola*). They're still "rare" but working on becoming "occasional". Taken care of I hope, but even cutting them at ground-level doesn't guarantee the larger stems won't go on to flower without roots.

Quite a few buffleheads and ringed-necks. Unusual these days. Also a couple of wood ducks and a few mallards.





Wood duck exploring the snags created by the beaver. So far as I know Coats Marsh is the only place wood ducks breed on Gabriola Island.

Feb.28, 2024 (day 3147, 2922+225):ViGRG cum. 926.2 mm (norm. 849 mm).  
Weir 543 mm WPB scale. [cal.datum: weir -0.104 m]. Sill depth 0.081 m.

Precipitation 88 mm in February, 32% below average; reckoned on an equal-number-of-days per month and equal-number-of-days per year basis. Annual to date 16% above average. Curiously, February is the month of the year that shows the highest decrease in long-term average monthly precipitation; yet, the 3-month winter season (Dec./Jan./Feb.) remains virtually unchanged.

Mar. 2024

Mostly interrupted. Human biological issue.

Hair ice spotted (Lucy H.) and a sample of the dead wood (alder) recovered later showing white smear-like mold. You can see some in the photograph on the barkless wood. Anybody know how to identify this down to the species level?



Mar.29, 2024 (day 3177, 2922+255):ViGRG cum. 1037.8 mm (norm. 944 mm)

No breeze. No raven calls. Even Harmac silent. Distant woodpeckers drumming trees for insects, otherwise the forest is quiet. Stump Farm No.1 creek running.

Mar.31, 2024 (day 3179,

2922+257):ViGRG cum. 1037.8 mm (norm. 944 mm). Weir 512 mm WPB scale. [cal.datum: weir -0.135 m]. Cistern +130 mm SCB. [cal. datum: cistern +0.497 m].

Precipitation 110 mm in March, 2% above average. Annual to date 13% above average.

Lake at a good level. Coats Marsh



*Previous page:* Spring fruit, dark-chocolate spores, lovely chestnut colour when wet. Hollow stipes.

*Below:* Frog pelt lichen with the fungal part showing tooth-like fruit (apothecia).

Creek running. East Path Creek ponded but not flowing. Scattered buffleheads, mallards, a Canada goose, and a lone female hooded merganser. Deer in the NE Arm. Barred owls calling at noon, happening quite a bit lately.



Early spring mushrooms here and there, Amanitas maybe (*A. aprica*, *muscaria*, *gemmata*?).

It would be a lot easier to tell if foragers and others professing to be interested in mushrooms didn't feel free to destroy them or treat them as golf balls.



Probably *Viola orbiculata*, known to grow in the park. *V. gabella* also grows here.



“Do not go where the path may lead;  
 “Go instead where there is no path, And  
 leave a trail.”  
 Ralph Waldo Emerson

Apr. 10, 2024 (day 3189, 2922+267):ViGRG cum. 1043.8 mm (norm. 973 mm).

Canary Grass Meadow is still ankle-deep in water, and looking much like the weirpool may look after the RDN “renovations”, but without the Hooker’s willow.

This wetland, along with the NE Arm and SE Arm wetlands doesn’t hold water for more than a few weeks at the start of the dry season because of infiltration into the fractured-sandstone bedrock.



Although the beds of these wetlands are layered with clay-rich gleysol (the result of the weathering of plagioclase-rich glacial-flour that accumulated when these were meltwater lakes at the end of the Pleistocene), this gleysol layer is evidently far from being perfectly impervious, unlike the thicker layer of the same material underlying the main Coats Marsh wetland.

Dredging the main Coats Marsh wetland, by thinning or removing altogether its metre-thick layer of gleysol, would remove its exceptional ability to retain water throughout the dry season.



Apr. 11, 2024 (day 3190, 2922+268):ViGRG cum. 1045.9 mm (norm. 975 mm). If you're puzzled by the GABRIOLA Sounder picture (April 10, p.6) of the weirpool area, try reversing left and right so east is on the left, not right. Not the only mistake EDI has made due to their unfamiliarity with the marsh.

Wild strawberries (*Fragaria virginiana*) after spring shower, and at the other end of life's journey, an Oregon grape leaf.

Apr. 14, 2024 (day 3193, 2922+271):ViGRG cum. 1045.9 mm (norm. 982 mm).

East Path Creek dry. Duck population sparse.

A few calypso orchids, cherry blossom (*Prunus emarginata*), abundant shepherd's cress in places (*Teesdalia nudicaulis*), but so far not an exceptional spring for flowers, at least in the CM ecosystem.

◇ [previous file](#)

