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.

For a more detailed 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 Management - paper on.

Coats Marsh brief history.

Long-term precipitation (1944-2021) – statistics. Updated every month and used as the "normal" meaning average precipitation at Coats Marsh.

Field observations—2023 (Sept.—Dec.)

THIS FILE (Field Observations 2023) IS A SUPPLEMENT TO:

"Observations at Coats Marsh, Gabriola Island" File: 673.

For an up-to-date list of supplements see here .

Sept.01, 2023 (day 2967, 2922+45): ViGRG cum. 36.2 mm (norm. 36 mm). Weir -413 mm WPB scale. [cal. datum: weir -1.060 m]. Temperature 15 cm down, +22°C. ViGRG = [1.092*Entrance Island + Nanaimo City Yard]/2

"Although the Province does offer protections to northern red-legged frogs through the establishment of approved Wildlife Habitat Areas (WHA), the project area is not identified as such and therefore the habitat is not offered special protections for this species." EDI Report p.263 to the RDN 2023.

Precipitation in August 53% below average and cumulative (calendar) annual to-date now 9% below average.

Coats Marsh Creek has ceased to flow at the South Road culvert, but deep disconnected pools of water remain on the upstream side. Small flocks of flickers on the hardpan trails, foraging maybe for ants.

Pockets of turbulent air rushing through the canopy while below there's only the slightest breeze. Reminds me of an express train, pulled by a King or Castle, powering through a rural railway station spewing steam and smut, but leaving those on the platform unperturbed.

Sept.02, 2023 (day 2968, 2922+46): ViGRG cum. 36.2 mm (norm. 36 mm). Cistern -742 mm SCB. [cal. datum: cistern -0.375 m].

[I should add to the caption above that the WHA actually only applies to provincially-managed Crown land, not parks or private land; however, changes to water level in the wetland affecting red-legged frog habitat may require Water Sustainability Act (WSA) authorisation.

"Asked what ecological damage may have been caused due to the siphon malfunction, [the RDN parks manager] said staff walked around the entire marsh following modification of the siphon 'and did not see any negative impacts on the marsh ecology due to the siphon running unexpectedly'."

GABRIOLA Sounder 33(19) p.12, May 10, 2023.

There is much discussion on this in the cited report. The management plan accompanying a WSA application needs to show how impacts to the habitat will be avoided, minimized, or, if necessary, compensated for as the WSA can be used to ensure that there is no net-loss of wetland habitat.

Red-legged frogs are also protected under the Wildlife Act which would require a permit to "relocate" them.

Also involved in any RDN decision regarding the future of the concrete weir would be co-owner NTBC, and Environment and Climate-Change Canada (ECCC), which oversees the federal ecological gifts program that contributed to the cost of acquiring Coats Marsh RP.]

Sept.04, 2023 (day 2970, 2922+48): ViGRG cum. 36.3 mm (norm. 38 mm). Research[1] on vegetated, shallow lakes (less than 0.6m deep) has shown that the perception that they are homogeneously mixed in temperature, dissolved-oxygen content, pH, and water chemistry may be wrong. Stratification and diel variations of the parameters within the strata can be very strong.

The biological consequences are as yet unknown, one of the several reasons I'm still searching for an optical dissolved-oxygen meter to use in place of the one that GSK used to possess, but has gone missing. If anybody knows of one I could borrow, or who could help me procure some reagents for a HACH OX-2P kit, please get in touch.

Sept.12, 2023 (day 2978, 2922+56): ViGRG cum. 40.5 mm (norm. 46 mm). Cistern -772 mm SCB. [cal. datum: cistern -0.405 m].

Water level still dropping 3 mm/day despite spotty rain.

[1] https://royalsocietypublishing.org/doi/10.1098/rspb.2017.1427

Fall is not the time to go looking for a new species of wildflower, but among the still-blooming "dandelions" in the marshes away from the trails, there might be one.[2] However, identifying unusual asteraceae among all the exotic yellow lawn weeds[3] is a challenge. A typical thrashing-around quandary for me is, could that be a smooth cat's-ear (*Hypochaeris glabra*)? or a much rarer autumn hawkbit (*Scorzoneroides autumnalis*)?

I'm not yet anywhere near being able to confidently identify these species, but it's absorbing to try.[4] In the old days, village children, physicians, and apothecaries would have had no problem.

I saw centaury and rosebay willowherb, but ignored the thistles.

Sept.18, 2023 (day 2984, 2922+62): ViGRG cum. 40.5 mm (norm. 55 mm). Cistern -785 mm SCB. [cal. datum: cistern -0.418 m].

Sept.19, 2023 (day 2985, 2922+63): ViGRG cum. 53.5 mm (norm. 57 mm). Weir -536 mm WPB scale. [cal. datum: weir -1.183 m]. RDN outer gauge 795 mm [no calibration].

[2] NE Arm and Canary Grass Meadow. Dandelions (*Taraxacum officinale*) actually bloom in spring.

[3] On Gabriola, hairy cat's-ears (*Hypochaeris radicata*) are currently everywhere in grassy, bald, unshaded areas. Other dandelion-like species flowering in the Coats Marsh area are smooth cat's-ear (*Hypochaeris glabra*), hairy hawkbit (*Scorzoneroides saxatilis*, illustrated? hairs are forked), and smooth hawksbeard (*Crepis capillaris*). I kept an eye out for a few never-been-recorded-on-Gabriola similar species, but never found any. These were *Crepis tectorum*; *Hieracium umbrellatum*; and *Scorzoneroides autumnalis*. Didn't see any *Taraxacum spp.* either.

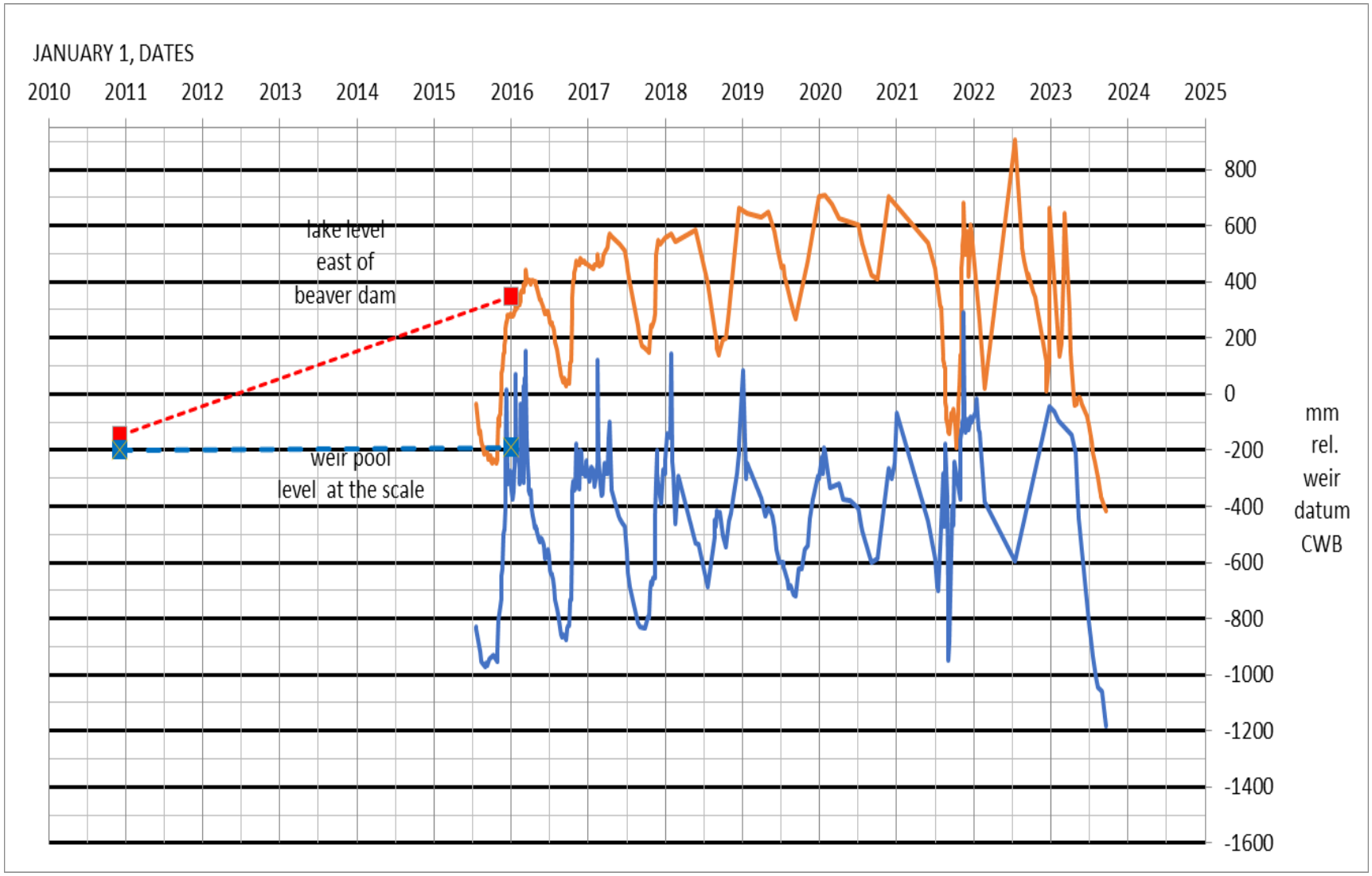
[4] Classical identification keys never work for me. One wrong or non-answer and you're off the rails. I'm looking forward to AI that accepts "maybe" answers; considers geography; considers variations in the plants of all species; accepts images, particularly of leaf morphology; and quantifies the confidence you should have in identifications.

Google Maps 2023

Because the marsh is shallow, reducing its volume by even a small amount causes a relatively large retreat of its margins and hence a relatively large change in the nature of its edge habitat. Ducks that nest in the forest (hooded mergansers and wood ducks) were not seen this summer.

Google Maps 2023.

The drained weirpool, the beaver dam, and the west end of the marsh beyond the dam. In past winters, flowing water in this area has delayed freezing when the marsh to the east is iced over, thus providing a refuge for winter resident waterfowl. Draining this spring by the syphons installed at the bequest of the RDN/NTBC has been so severe that it is doubtful these conditions will continue this winter.



CWB (crest of concrete weir used as a baseline) reported in NHC/EDI 2023 to be 97.0 m AMSL (above mean sea level).

The weirpool seen from the berm with the beaver dam in the background. Aquatic plants in the foreground on the right are yellow pond-lilies (*Nuphar variegata*). These are uncommon outside the weirpool embayment. The water seen here is mostly in the old drainage ditch.

Sept.25, 2023 (day 2991, 2922+69): ViGRG cum. 73.8 mm (norm. 69 mm). Cistern -756 mm SCB. [cal. datum: cistern -0.389 m].

Dry season is over. Water levels rising.

Flock of half-a-dozen wood ducks in the snags near at the cistern, very vocal, and the males looking very handsome.

Western cauliflower mushroom (*Sparassis radicata*) by an old fir stump. A confident identification, not a *Ramara* sp. Edible and hence rare. Nature reserves must have a no-harvesting rule. Parks maybe too.

An admirable, orange red-admiral, on the Marsh Trail among the alders and stinging nettles, obligingly waiting, as is their wont, while I fumbled with the camera. He/she must be migrating soon; winter on Gabriola is no place for a butterfly.

Sept.30, 2023 (day 2996, 2922+74): ViGRG cum. 95.6 mm (norm. 80 mm).

Precipitation in September 36% above average and cumulative (calendar) annual to-date now 6% below average. Nothing unusual; well within normal observed weather variations.

To add to footnote 3.[5]

Oct.04, 2023 (day 3000, 2922+78): ViGRG cum. 107.4 mm (norm. 91 mm). Cistern -732 mm SCB. [cal. datum: cistern -0.365 m].

One of the unremarked consequences of lowering the water level is that it will become much easier to walk along the shoreline as I did today, thereby destroying the seclusion that nesting waterfowl need.

[5] I've never seen, within the CM Creek catchment, sow-thistles (*Sonchus arvensis*, *S. asper*, and *S. oleraceus*) or goat's-beard (yellow salsify, *Tragopogon dubius*). All these are introduced species, the former having prickly leaves, the latter not looking much like a dandelion. All are probably more at home in farmers' fields than in a nature reserve, but, for the record, all are known to grow somewhere on Gabriola. Weeds become more interesting if you try designing an ID guide using an Excel spreadsheet that cross-correlates descriptions with observations.

Only one duck observed, a summer resident mallard, too far away to be alarmed. The wood ducks have moved on.

Old drainage channel? Normally submerged. In the vicinity of the mouth of East Path Creek.

A view that has been through several drastic changes since the mid-20th century when humans began managing this wetland habitat.

Top left & right: *Agaricus*, *Amanita*, or *Lepiota* sp.? [6] Free gills and ring, but no visible volva or sign of a veil.[7] Gregarious. Too many all-white species and white-variants to be specific about species, and for me, even the genus in doubt. Need to leave them alone and see what develops. I left them all intact. Upper Little Creek riparian area.

Lower left: Fairy bonnets, *Mycena* sp. *M. tenax* perhaps? Gregarious. On dead wood. Common.

Lower right: Conifer tufts (*Naematoloma capnoides*)? Although these were located on the other side of the Upper Little Creek watershed, they have been previously observed within the CM Creek catchment area. Blackish spores may be more apparent when mature; cespitose on not-long-dead conifer; when young, looking like stemless pear-shaped puffballs.

Oct.07, 2023 (day 3003, 2922+81): ViGRG cum. 107.5 mm (norm. 100 mm).

A yellow sunflower/aster/daisy family flower, hard to pin down.

[6] *Lepiota* including species recently transferred to other genera, e.g. smooth parasol *Leucoagaricus leucothites*.

[7] No warts, but after heavy rain. Cap umbonate (knobby), the umbo low and sometimes faintly dirty-yellow. Among alder and cedar (mainly stumps). Colour tinge more apparent to the camera than the eye; white gills not looking pink or chocolate-brown, smoky-grey on one specimen only, but it's early days yet. Didn't test bruising, but no existing signs that they bruise yellow. Nowhere near a city. Odour weak, not unpleasant.

Uncommon within the park but locally easy to find. Some in a small grassy patch on banks of Coats Marsh Creek in the NW corner just downstream of the small wetland near the boundary; others on the Golf Course Trail.

[Stems: usually only one, many branches, almost hairless to hairless. Any hairs very short, not bristly, yellowish. Taproot.

Leaves: no basal rosette; hairless or sparsely microscopically short-haired; all narrow and stalkless or very nearly so. Upper stem leaves: entire, grass-like. Lower stem leaves: long, with a few well-spaced sharp teeth.

Bracts with short hairs, glandular, hairiness variable but always hairier than the stem. Hairs mostly yellowish; a few black or dark green. Outer bracts (phyllaries) usually appressed (as shown *right*, not *left*). Achenes (seeds) not beaked, ribbed.]

Narrow-leaved hawkweed (*Hieracium umbrellatum*) perhaps, though bracts are not noticeably black,[8] and hairs "shouldn't" be glandular. Although there are several other *Hieracium* spp. known in BC, they rule themselves out by being rare, having the wrong-shaped leaves, and having a substantial rosette of basal leaves.

An alternative fit is smooth hawksbeard (*Crepis capillaris*); it's common (a plus); almost has the right shaped leaves (a bit too often deeply lobed); glandular hairs (a plus); occasionally hairs may be black; can have a taproot (a plus); achenes not beaked, ribbed; but excepting again, it too often has a substantial basal leaf rosette (a strong minus).

In the end, I have to go with the hawksbeard, because it's common, but any not-too-technical key would likely eliminate it because of its basal leaves. The hawkweed fails mainly because it has never been seen on Gabriola, and the bracts are nowhere close to being as black as seen in some Google images, something not all keys mention.

[8] If so, update fn.3. Blackness emphasized in some non-technical books. Seems to be an end-of-life development.

Oct.12, 2023 (day 3008, 2922+86): ViGRG cum. 130.8 mm (norm. 117 mm).

"The season is changing, the darkness returning."

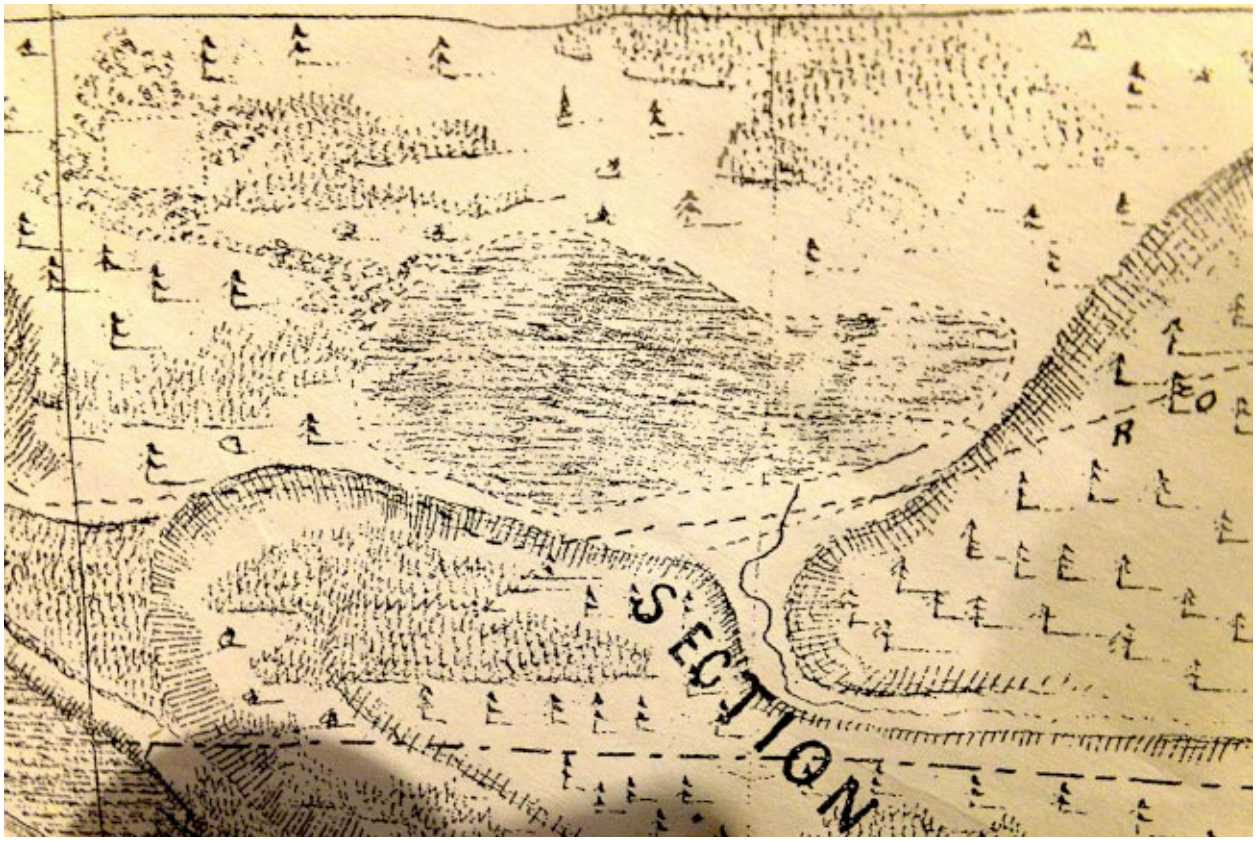
Coats Marsh Creek pools have survived the summer. Creek just starting to trickle at the South Road culvert but not further upstream.

Report in the Gabriola Sounder by Rachelle Stein-Wotten (continued):

4. Oct.11, 2023, 33(41, printed 40), RDN has Coats Marsh weir decommission design underway following federal approval, p.7; https://simplecirc.com/view_issue/38847

Comments: The concrete weir was built in the 1960s, not to alter the natural state of the wetland, but to restore it. The cut through the ridge where the weir is now had been made two decades earlier.

There is both historical and geological evidence that a wetland existed here long before any human activity. When the powers-that-be talk about restoring the wetland to its "natural" state, they sometimes mean to some arbitrary, or cherry-picked "historical" state, almost never to its undisturbed 19th-century state.



Survey 1874/5 showing the whole of the NW¼ and part of the NE¼ of Section 10. Coats Marsh is outlined and shown as an unforested swamp in the centre. East Path Creek (the solid wavy line) is marked all the way back to McGuffies Swamp, but no outlet from the marsh is apparent.

The history file: File 697.

The task as enunciated in the cited report of "placing large boulders so that we allow water to release but still hold water in the marsh at the same time" will require a novel solution. But isn't that what the existing baffle does now?

The fish that spawn in the lowest 100+ metres of upper Coats Marsh Creek were originally stocked in Hoggan Lake by the government in 1927. They also spawn in Goodhue Creek.

I'm going to give up trying to identify every mushroom I see. Portable DNA testers don't exist; I can't keep up with all the taxonomic revisions; and probably all of the species in the park also live elsewhere on the island and their identification is better attempted by experts rather than me.[9]

A *Russula* (its stipe would snap like chalk);

[9] I just regret the growing trend of mushroom foragers to leave an unsightly trail of mutilated specimens behind them. In my experience, some species that are harvested don't taste better than *Agaricus nesters* and are only useful mixed with other ingredients, soups and the like (*Mischpilze*). Harvesting may be sustainable as academics claim, but it sure spoils the enjoyment of others who just want to savour their presence.

a strikingly yellow-capped *Atheniella* (alone and unusual, looking like a wildflower from a distance);[10] and some *Suillus* (caps slimy, large radially elongated orangey-brown pores originally decurrent, veil remains on stipes, common).

Above right: Another of the common boletes (identified by a collector on the trail rather disconcertingly as "porcini". Possibly another kind of *Suillus?*);[11] and some sinister warty things, puffballs? …or are they? [yes, they fart. *Lycoperdon*]

Only one duck seen on the lake. Mallard.

Oct.19, 2023 (day 3015, 2922+93): ViGRG cum. 218.9 mm (norm. 142 mm).

Rain. Large puddles on the trails, but they're mostly gone a day later. All the water is replenishing groundwater reservoirs and the creeks won't be flowing anytime soon.

Five years ago, I had no problem identifying purple mushrooms as *Cortinarius violaceus*, but, armed with three new field guides, I'm not so sure they aren't *Laccaria (L.amethysteo-occidentalis* or *L.bicolor* perhaps*)*. The caps of those seen today are not so persistently violet as they might be. In some lighting, they appear brownish.

[10] *Atheniella* (formerly *Mycena*) *flavoalba* is a blue-listed taxon.

[11] Short decurrent yellow pores, small like sponge cake, bruising red-brown, cap margin inrolled, remains of a veil. My guess, not much more, would be very small/young *Suillus lakei*. Same species as on previous page.

Another unfamiliar sighting was a group in moss with red-brown caps covered in granules (not rain drops), white notched gills, stipe veil-draped, also with granules, ring indistinct. *Cystodermella granulosa* ?

Troops of tiny white fairy bonnets are always a delight to see. They catch the dim light under closed canopies so well on cloudy days that you often need to stop the AUTO camera aperture down. Some *Mycena* species like these are bioluminescent.

Oct.20, 2023 (day 3016, 2922+94): ViGRG cum. 219.0 mm (norm. 146 mm). Cistern -518 mm SCB. [cal. datum: cistern -0.151 m].

Easier ones to ID for a change. Tiger's eyes, fused, pores decurrent (*Coltricia perennis*). Frog pelt lichen (*Peltigera* sp.) in juniper moss.

Heavy rain has made a welcome change to the lake level. The air strangely turbulent, rippling and swirling the sunlit water this way and that midst scattered patches of calm.

No ducks visible but there may be some wood ducks hanging out in the snags, or so I thought. Stealthily working my way closer without spooking them, I see they're green-winged teals. Haven't seen them here for years. Maybe they approve of the conversion of the lake from a woody swamp to a grassy marsh.

And that lone duck out there. Not a mallard, a northern shoveller. The first of the fall migrants?

Found a copy of William Hoggan's pre-emption claim, July 1872. His sketch, made before there was a cadastral map of Gabriola, shows Coats Marsh as a swamp. The award made to him suggests the wetland was not counted as pre-emption acreage, presumably because it was judged not to be developable.

They got that wrong.

History File 697.

Oct.26, 2023 (day 3022, 2922+100): ViGRG cum. 287.4 mm (norm. 172 mm). Cistern -183 mm SCB. [cal. datum: cistern +0.184 m]. Weir -22 mm WPB scale. [cal. datum: weir -0.669 m].

My what a difference 4-inches of rain makes! Levels are back to the late-summer levels of five years ago and the hydraulic head of the beaver dam is approaching its old figure of almost a metre, File 673b .

Coats Marsh Creek is ponded and trickling. Both East Path Creek and Stump Farm Number 1 Stream are flowing strongly though I suspect the flows are

Left: Whenever there's rain these days, crowds of tiny orange mushrooms pop up in the mats of dark-green haircap mosses, looking like bird-scattered arbutus berries. Species?; too many possibilities. I just call them orange mosscaps and enjoy their company.

Right: Fluted black elfin saddle. Used to be called *Helvella lacunosa*, but that's what they have back east. Out west, I'm informed, we call them *Helvella vespertina*.

diminishing. Nothing from the NE Arm.

Ring-necked ducks (*right*) are here. These used to be our reliable winter residents. About a dozen.

Met a couple who live near-by. Said loons sometimes visit the lake. Never seen them myself. Seems unlikely as there aren't any fish, but I don't imagine they were mistaken. Herons and kingfishers have been known to drop by, but after a few hours they're on their way.

Nov.1, 2023 (day 3028, 2922+106): ViGRG cum. 309.8 mm (norm. 199 mm).

Mallards with spanking new coats have joined the ring-neckeds, buffleheads too, but so far only females who likely are here from back east beyond the mountains.

Precipitation in October 80% above average and cumulative (calendar) annual to-date now 6% above average.

Interesting that the common-knowledge truism concerning climate change "less rain in summer, more rain in winter" is only partially true.

I detect no statistical trend in annual precipitation, and, no doubt, we are getting less rain in summer (Jun.-Aug.), but the amount of rain we get in the depth of winter (Dec.-Feb.) hasn't increased over the years.

Instead, the summer shortfall is made up of more rain in the fall (Sep.-Nov.) and to a lesser extent in the spring (Mar.-May). With this change comes a change in its character. The "new" fall rain is like April-showers, sometimes heavy and very local rather than like the multi-day steady rain of winter.

Stump Farm Number 1 Stream has stopped flowing at the Canary Grass Meadow culvert. Little Creek is ponded and trickling at the Three Gates Wetland as is, surprisingly, Coats Marsh Creek at the Marsh Trail culvert.

Above: Calocera cornea. No forked tips otherwise it would have been *Calocea viscosa*.

Right: cheesy polypores. Little Creek.

John Clare's poem "Shadows of Taste" written in 1830 comes to mind:

---The man of science in discoverys moods
roams oer the furze clad heath, leaf buried woods,
and by the simple brook in rapture finds
treasures that wake the laugh of vulgar hinds
who see no further in his dark employs
the village childern seeking after toys.
Their clownish hearts and ever heedless eyes
find nought in nature they as wealth can prize ---

[John Clare, Major Works, Oxford World's Classics]

Disappointing that the RDN recreation and parks master-plan survey now in progress appears to show residents have little interest in nature reserves and ecological protection zones — tools needed for conserving ecosystems. Like the world in general. In the Anthropocene all available natural resources have to be devoted to satisfying the needs of a human population whose relentless growth is lauded, yet is so clearly not sustainable.

Nov.5, 2023 (day 3032, 2922+110): ViGRG cum. 334.1 mm (norm. 219 mm).

Clare's leaf-buried woods under bigleaf maples (*Acer macrophyllum* BLMs). The leaves are said to have 5-lobes, but if you're interested in comparing them with those of Douglas maples (*Acer*

glabrum DMs) with 3-5 lobes, or with those of vine maples (*Acer circinatum* VMs) with 7-9 lobes, you have to be careful. Distinguishing lobes from teeth of BLM leaves is not always straightforward. I've had to give up on field guides and invent my own system. It goes like this.

Turn the leaf over and look at the underside. There is always a vein dividing the leaf in half. This is the **midrib**, which starts at the base point (**BP**) where the leaf is attached to the leaf-stalk (petiole) and runs up to the top of the leaf (**leaf-apex**). This is one of what I call the **A-veins**.

Other A-veins have the following properties. They always start at the base point BP and hence are **palmate**; they come in pairs (one in each half of the leaf); they are always the thickest of the veins; they commonly terminate on the edge (**margin**) of the leaf at the apex of a lobe (**lobe-apex**). The total number of A-veins on a leaf is always odd (the midrib plus a variable number of pairs).

Any vein that does not start at the BP is not palmate and is a **B-vein**. Disregard these.

Veins that start at the **BP** but are noticeably thinner than A-veins; often either terminate on the apex of a tooth (**tooth-apex**), or end on the margin of the leaf without reaching an apex; these are **AB-veins**.

Leaves either have no AB-veins or only one pair of AB-veins and, if present, it is always the pair nearest the base of the leaf.

Leaves that appear to have two or more pairs of AB-veins are one of two kinds. The pair of supposedly AB-veins furthest from the base may be a pair of less well-developed A-veins terminating in a rather shallow lobe and they should be counted as such. It is common for the lowest of the A-veins to be less well-developed.

Or, if the supposedly AB-veins closest to the base on a large leaf are like thin or indistinct B-veins, then these should be disregarded, despite being palmate.

Douglas maple. DM leaves can be 3A, or 3A+2AB.

Vine maple (in the CM catchment area but not confirmed). VM leaves can be 5A + 2AB, 7A, or 7A + 2AB.

Bigleaf maple. Very common 5A+2AB. BLM leaves can be 3A+2AB, 5A, 5A+2 AB, or 7A.

Bigleaf maple. Occasional 3A+2AB. Just a few leaves on the tree looking like this.

Bigleaf maple. 9 palmate veins! 5A+4AB=5A+2AB+2B=5A+2AB. Uncommon, one or two per walk.

Bigleaf maple. Unusual leaf with 7 palmate veins, 5A+2AB or even 7A if you reckon the teeth at the base are lobes. Not like other leaves on the tree.

Bigleaf maple. 5A. Occasional, but most leaves have at least a trace of a pair of AB-veins.

Obviously you can't identify the species of a tree based on the shape of one leaf. If you find a 3A+2AB leaf for example, you won't have to look long to find lots of 5A+2AB leaves if you are under a BLM. Easily confused on the basis of leaf shape alone are DMs and ninebarks (*Physocarpus capitatus*) but those of maples are opposite and of ninebarks alternate. Both have reddish petioles.

The leaves of the bigleaf maples are putting on a show this year. Their bright sunny yellows catching the grey wintry light standing out sharply against the gloomy blue-green of the conifers.

Nov.6, 2023 (day 3033, 2922+111): ViGRG cum. 338.3 mm (norm. 224 mm). Cistern +156 mm SCB. [cal. datum: cistern +0.523 m]. Weir 494 mm WPB scale. [cal. datum: weir -0.153 m]. Sill depth 0.08m.

On the lake, few ducks to be seen, but amongst those out and about there was one male bufflehead and a pair of wood ducks.

Higher than average rain has rapidly re-filled the lake. Stability, with no danger of flooding, will require that the weir outflow capacity into Coats Marsh Creek is never less than the inflow into the lake plus precipitation. File 673u

At the moment, East Path Creek is running, but at less than half the culvert's full capacity. There is no flow across East Path at the NE Arm spillway, but there is ponding on the wetland side. Infiltration in the catchment area east of the park, and the seasonal expansion of the area, is evidently still in progress, so if it keeps raining there is plenty of potential for the inflow to increase.

The syphons appear not to be in operation and are deeply buried in vegetation. All of the flow into the weirpool is coming from spillways in the main beaver dam.

Coats Marsh Creek is running, the majority of the water coming from the Clemson pond leveller, which is not yet at full capacity. The drainage pipe on private land is also contributing some water derived from leakage under the berm.

Above: The largest natural spillway in the main beaver dam. Used by the beaver both to reduce overflow and to move back and forth across the dam. The syphon system seen here on the left of the spillway is hidden in vegetation. *Below*: the pond leveller currently doing its job.

Water flowing over the crest of the baffle (at the sill) is contributing water, but the volume is less than that flowing through the leveller and seems less than it has been in the past given the level of the weirpool.

The difference between the level of the sill and the water level of the weirpool is currently (0.640-0.153) = 0.49 m; yet the depth I measure at the sill is only about 0.08 m.

Above: The debris, now an engineered beaver dam, reducing the flow over the baffle. [Blurring due to raindrops on the lens]

Below: Coats Marsh Creek flowing modestly at the culvert under the Marsh Trail.

This difference is due to the renovation on the part of the beaver of the debris, now a dam, amassed just a few metres upstream of the weir. Water is forced to flow in shallow spillways over it.

Lowering the flow over the baffle could have serious repercussions if the weirpool level were to continue to rise. The pond leveller is too small to handle floodwater on its own.

Nov.8, 2023 (day 3035, 2922+113): ViGRG cum. 339.8 mm (norm. 234 mm). Weir 466 mm WPB scale. [cal. datum: weir -0.181 m].

Warm wet weather confusing some of the male tree frogs. They crrr'k as if it were April.[12]

Looking back on my notes on sluice gates (File 673zb, pp.ZB521-3,

[12] Not a "ribbit", more like the sound of the ratchet in a come-along.

July 2023) I see that an unstated assumption was that the design goal was to have floodwater never rising above the crest of the concrete weir (CWB). It is however true that in the past water has risen higher than CWB but not high enough to breach the berm at +0.30 m CWB, which is a more important design objective.

The dam at the weir is effectively raising the level of the baffle, which reduces the capacity of the weir to allow floodwater into the creek, this reduction in turn allowing floodwater to accumulate which it will continue to do until flooding of the weir and deck occurs and a match between in- and out-flow is established.

Using the formula in the earlier note, raising the baffle from 2 ft.(-0.61 m) below CWB to say 1 ft.(-0.30 m) below CWB will reduce the no-overflow-of-the-weir equilibrium flow from 486 L/s to 177 L/s. To make up for this, the weir has to be flooded to add 309 L/s more water to that flowing through the notch.

Flooding would increase the weir's width by 18 ft. (not including the notch), and we would need its depth above CWB to be 0.098 m (3⅞ in.) to provide the extra 309 L/s. This ≈0.1 m would put a dent in the 0.3 m "freeboard" of the berm,[13] but not enough to jeopardize the freedom from inundation of residential land.

The NE Arm wetland. A squelchy solitude, not yet ready to shed surplus water.

[13] That is ignoring inconvenient details like the effect of the deck obstructing the flow, and the behaviour of the pond leveller. Doing that is above my pay scale.

Raising the weir overflow to say +0.2 m CWB would release a total of 883 L/s additional to whatever is flowing through the notch, which is perhaps why the local residents, who witnessed the flood of March 2014 without it breaching the berm, are not anxious about what the beaver has been doing now.

All of which raises the possibility of re-designing the weir without using a sluice gate. The steps would be: (1) raise the deck above the "floodwater" level so it no longer obstructs any flow; (2) replace the wooden baffle with a permanent concrete one; (3) change the design of the weir so that it is no longer just a vertical 2 ft. wide notch, but an engineered T-structure with the top of the T being 20 ft. wide and a foot or whatever deep. Need something to stop water scouring away soil at the ends. Flow through the top of the T when the notch is full then no longer being "flooding" but flood relief.

Nov.14, 2023 (day 3041, 2922+119): ViGRG cum. 377.1 mm (norm. 272 mm). RDN outer gauge 1705 mm [no calib., est. +0.495 m using 260 mm, ref. Aug.27]

Still. Very little wildlife seen on the water.

Nov.15, 2023 (day 3042, 2922+120): ViGRG cum. 378.5 mm (norm. 277 mm). Cistern +133 mm SCB. [cal. datum: cistern +0.500 m].

Top: Beaver dam, Nov. 14, 2023 ,gently overflowing.
Above: *Calocea viscosa* end-of-life stag's horn fungi on wood.

Nov.20, 2023 (day 3047, 2922+125): ViGRG cum. 381.2 mm (norm. 300 mm).

Autumn in the woods. Season of shedding trees and yellow-leaved shrubs;

Skies a patchy sun-streaked mosaic of layered greys;

My shadow at noon, over two and a half times my height;

Mats of mosses, soft-underfoot, some reflecting a bright forest-green light;

Lichen'd deadfalls brought down by the gales;

Cankered leaves of Oregon-grape, burgundy, ruddy, and sunset-red;

Maple-leaf strewn trails, and paths fringed with seedlings too eager to get-out-of-bed;

Time soon to wear gloves, my finger-tips are cold;

A multitude of mushrooms, toad-stools, and molds;

A head-turning owl among bare-branched alders;

A silent song-bird fluttering unseen in the bush;

A chattering, inquisitive, self-confident squirrel;

The sound of a woodpecker's drumming moving easily, like slanted sunbeams, 'tween the trunks of the trees;

Evergreens quietly preparing for winter dormancy;

Heavy rain on leaves of undergrowth shrubs, making them all shiny and glossy, and on sun-dried bracken and tawny reeds, turning their dull-brown more auburny;

Top: ♂ ring-neckeds. *Above*: ♀ buffleheads. Strange mix. Very few ducks on the lake. It looks disturbed. Nov. 20.

Solitary chorus-frogs rehearsing their ratchety croaks, never failing to fall silent upon my approach;

Dampness and puddled sloughs and the rotting debris of summer everywhere; yet,
Doug.-firs and grand-firs; arbutus and cedars; salal and sword-ferns and prickly-leaved grapes; pale-green lichens draped on dead twigs and branches; tree-coats and carpets and cushions of mosses; places where forbs and grasses grow; without snowflakes dancing, all below to obscure, all are enhancing the forest's *verdure*.

[with apologies to Edwardian ladies who kept country diaries]

Nov.23, 2023 (day 3050, 2922+128): ViGRG cum. 387.2 mm (norm. 317 mm). Cistern -194 mm SCB. [cal. datum: cistern +0.173 m]. Weir 518 mm WPB scale. [cal. datum: weir -0.129 m]. Sill depth 0.07m.[14]

RDN have been out on the dam meddling with their syphons and creating a disturbance. It's all to no common-sense purpose, just to tick the check boxes of legal-department-driven bureaucracy aided by ferry-in-for-a-day experts who have no detailed knowledge of the working of the wetland, nor have sought to acquire any from local residents.

[14] Hard to come up with an explanation as to why an increase in the weirpool level should decrease the depth of water flowing over the sill. Not an easy measurement to make as the water is moving so fast that even if the ruler is held exactly parallel to the flow, a "bow" wave still perturbs the reading.

Seclusion, tranquility, and being left-alone, used to be reasons the wetland was favoured by several species of waterfowl and other wildlife at various times of the year, but the human traffic on the beaver's dam and the constant unseasonal yo-yoing of the level of the water appears to have put an end to that.[15]

A few ring-neckeds and buffleheads, males and females, in the weirpool. No ducks seen out on the lake.

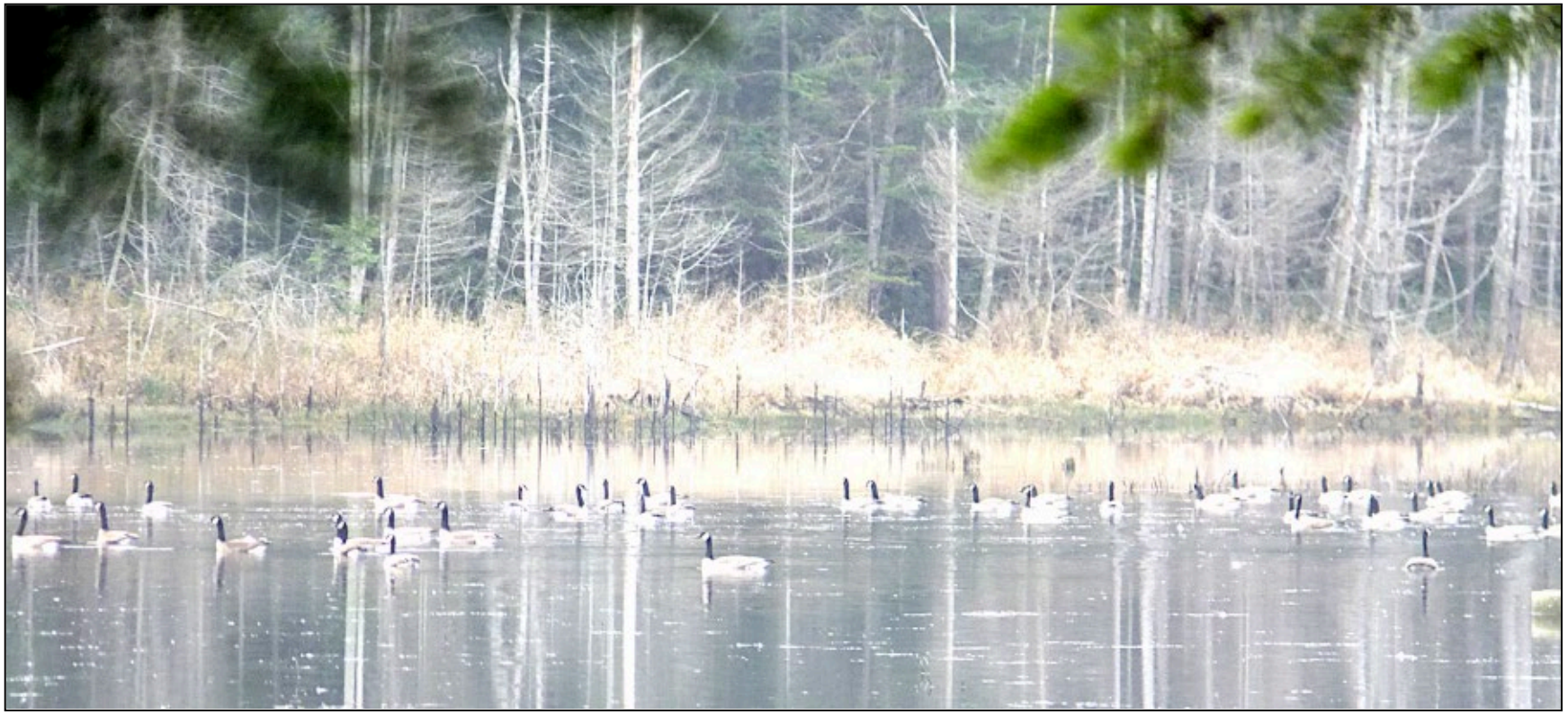
Good to see them in their courting gear, but just a small fraction of the numbers that used to be here in November.

Nov.26, 2023 (day 3053, 2922+131): ViGRG cum. 387.2 mm (norm. 334 mm). Cistern -296 mm SCB. [cal. datum: cistern +0.071 m].

A grey day, misty, several large V-shaped skeins of honking geese heading toward the big island, just skimming below the cloud and scarcely being above the tops of trees. The leaders called a time-out at the lake. Could have been over a hundred in all.

Nov.29, 2023 (day 3056, 2922+134): ViGRG cum. 387.4 mm (norm. 352 mm). Cistern -395 mm SCB. [cal. datum: cistern -0.028 m]. Weir 503 mm WPB scale. [cal. datum: weir -0.144 m].

[15] I know, such observations don't prove a cause-and-effect relationship. Bad science, but still….



Inside of peeled bark on a dead redcedar.

Goldenrod (*Solidago canadensis*)

Nov.30, 2023 (day 3057, 2922+135): ViGRG cum. 397.4 mm (norm. 358 mm).

Precipitation in November 38% below average and cumulative (calendar) annual to-date now 3% below average.

Dec.05, 2023 (day 3062, 2922+140): ViGRG cum. 468.1 mm (norm. 388 mm). Cistern -79 mm SCB. [cal. datum: cistern +0.270 m].

River of rain. Drainage channels have become ephemeral creeks. Quite a few ducks out and about, but I left them undisturbed.

Dec.06, 2023 (day 3063, 2922+141): ViGRG cum. 468.2 mm (norm. 394 mm). Weir 558 mm WPB scale. [cal. datum: weir -0.089 m]. Sill depth 0.10m.

day	weirpool level m	depth of water above the baffle m	sill water level m	delta m
3033	-0.15	0.08	-0.56	0.41
3050	-0.13	0.07	-0.57	0.44
3063	-0.09	0.10	-0.54	0.45

Weirpool level is level of water in the weirpool relative to the crest of the concrete weir (CWB).

Depth of water above the crest of the baffle. Difficult to measure with better than centimetre accuracy. The decrease in the depth of water as it flows over the baffle due to the acceleration of the water

(the drawdown) is going to be ignored. If there is no water flowing over the baffle, depth is just taken to be zero.

Sill water level is calculated as the level of the crest of the baffle (-0.640 m CWB) plus the depth of the water crossing the crest of the baffle.

Delta is the weirpool level less the sill water level, which is approximately the amount the beaver's dam/debris is allowing the level of the weirpool to rise.[16] Delta is of course subject to alteration by the beaver and humans clearing away some of the dam/debris.

I'll include updates to this table in the water-levels file (673b).

Dec.08,2023 (day 3065, 2922+143): ViGRG cum. 470.2 mm (norm. 406 mm). Weir 576 mm WPB scale. [cal.datum: weir -0.071 m]. Sill depth 0.135 m.

The debris/dam at the weir, December 8, 2023. More than one engineer been working on it ?

Dec.10,2023 (day 3067, 2922+145): ViGRG cum. 491.2 mm (norm. 419 mm). Weir 594 mm WPB scale. [cal.datum: weir -0.053 m]. Sill depth 0.15 m.

[16] Again, ignoring the contribution of the drawdown. Only positive values of delta are of interest; the analysis is not pertinent when the weirpool level is below that of the crest of the baffle.

The last pool of upper Coats Marsh Creek. Known to be fish habitat despite conjectures by off-island experts to the contrary.

Dec.11,2023 (day 3068, 2922+146): ViGRG cum. 491.3 mm (norm. 425 mm). Cistern +150 mm SCB. [cal. datum: cistern +0.517 m].

East Path Creek flowing strongly and water from the NE Arm has started to flow over and under East Path and to contribute to the rising lake water level. Lake seems completely recovered from the effects of syphoning.

Dec.15, 2023 (day 3072, 2922+150): ViGRG cum. 512.8 mm (norm. 449 mm). Weir 582 mm WPB scale. [cal. datum: weir -0.065 m].

Apropos of nothing in particular, curious close geometrical resemblance between the seven palmate veins of most big-leaf maple tree leaves (5A+2AB) and those of the petroglyph at DgRw228.

Dec.20, 2023 (day 3077, 2922+155): ViGRG cum. 536.7 mm (norm. 480 mm). Cistern +105 mm SCB. [cal. datum: cistern +0.472 m]. Weir 573 mm WPB scale. [cal. datum: weir -0.074 m].

New report from the RDN, a draft of the plan to remove the weir rather than repair or renovate it, and turn the weirpool into a kind of garden, leaving only the beaver dam protecting the shallow-water wetland, once a glacial meltwater lake, from its possible and likely eventual complete destruction, as was planned when the marsh was drained by the landowner in the 1940s.

Dec.30,2023 (day 3087, 2922+165): ViGRG cum. 576.1 mm (norm. 541 mm). Weir 579 mm WPB scale. [cal.datum: weir -0.068 m].

The marsh's soundscape is seldom without the call or wingbeat of a raven.

Dec.31,2023 (day 3088, 2922+166): ViGRG cum. 576.3 mm (norm. 548 mm).

Precipitation in December 5% below average and annual 3% below average. More rain in October than in December, but that happens every 5 or 6 years or so. ◊ previous file next file