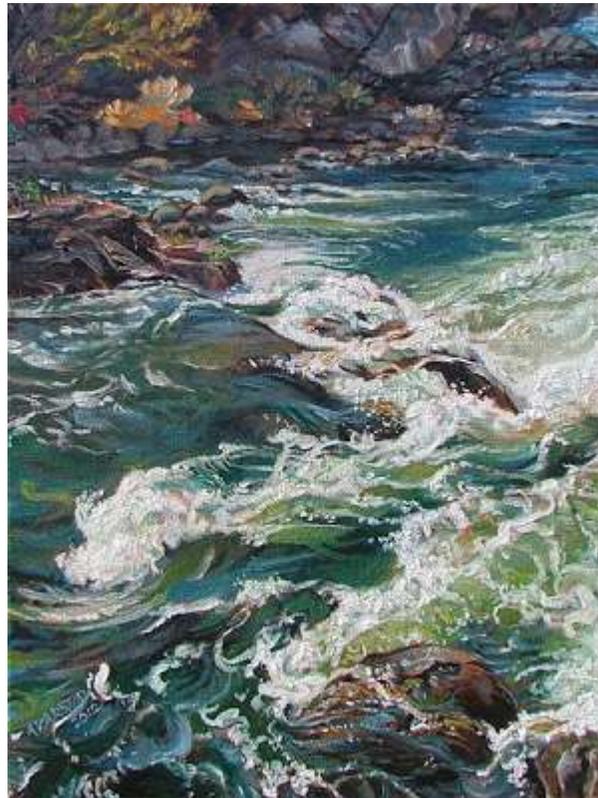


# Notes on the Status of Unionid mussels and large snails in the lower Vermilion River, Sudbury District, Ontario.



*Wabageshik Rapids*

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**Abstract:** The unionid fauna of the Vermilion River, sampled from 26 Sept – 1 Oct 2012 between 5 km E of Whitefish & 9.5 km SW of Nairn, consists only of *Lampsilis radiata siliquoidea* (Fat Mucket) and *Pyganodon cf grandis* (Floater). The usually uncommon Brown Mystery Snail, *Campeloma decisum* is abundant. In the lower Wanapitae River, these species are joined by *Elliptio complanata* and *Strophitus undulatus*. Both of these rivers have been exposed to historic pollution from the Sudbury smelters, and the relationship between this pollution and the composition, distribution, and morphological variation of the mussels deserves study. Proposed hydroelectric facilities will have as-yet-unevaluated consequences for the mussels and other fauna of these rivers.

**Notes on the Status of Unionid mussels and large snails in the lower Vermilion River, Sudbury District, Ontario** - Frederick W. Schueler & Aleta Karstad - November 2013

We conducted a survey of aquatic macroinvertebrates of the lower Vermilion and Wanapitae rivers, SW of Sudbury, Ontario, from 26 Sept – 1 Oct 2012, in connection with art & science paintings of chutes and waterfalls<sup>1</sup>. We followed the general procedures set out in our “How to do a Bridge”<sup>2</sup> protocol to sample the conspicuous biota of each site visited. The findings are reported here in response to the release of Xeneca Power Development's environmental report on their proposed Wabageshik Rapids Hydroelectric Generating Station<sup>3</sup> which neglects to discuss the impact of a planned meso-scale hydroelectric facility on the mussel populations it will affect.

**Survey Results:** In the Vermilion River, from 5 km E of Whitefish to 9.5km SW of Nairn, the only mussels found were *Lampsilis radiata siliquoidea*, called 'Fat Mucket,' 7 collections containing 336 specimens, and *Pyganodon cf grandis*, or 'Floater,' 6 collections containing 85 individuals. This is similar to a previous collection of shells from 6.7 km S Worthington: 110 *Lampsilis* and 2 *Pyganodon*. These species are the most abundant and widespread Unionids across northern Ontario. Our collections were less focused on snails, but the usually uncommon *Campeloma decisum* (Brown Mystery Snail), was noted at three sites, abundant at two, “many” at the other. A few *Helisoma campanulatum* (Bell-mouth Ramshorn) at one site was the only other species of snail noticed – this is usually the snail whose shells are most abundant on northern Ontario shores.

The 1 October visits to Wanapitae River and Bay from Hartley Bay found the usual northern Great Lakes/Ottawa drainage mussels in the Bay: *Elliptio complanata* (Eastern Elliptio) 7 specimens – species common, and 32 specimens - species abundant at two sites, while *Lampsilis r. siliquoidea* was represented by 2 shells at each of the two sites, and *Pyganodon grandis* by one fragmentary shell. A single possible *Ligumia recta* (Black Sand-Shell), may be an *Elliptio*. A very few smaller shells were seen at one site: one *Helisoma campanulatum*, two *Campeloma decisum*, and one *Sphaerium* (Fingernail Clam), around a Beaver lodge.

Along the lower Wanapitae River, *Pyganodon grandis* was by far the most abundant species at the sites visited. a predator shell pile above the Sturgeon Chute contained more than 700 shells, of which 145 were sampled, and 50 shells were found on a bank between falls of the Chute. These shells are fabulously variable in shape, from ordinary shapes to compressed like *Elliptio complanata* (Eastern Elliptio) to big-beaked inflated like *Alasmidonta marginata* (Elktoe) to more cylindrical than *Anodontoidea ferussacianus* (Cylindrical Floater). The shells range from fairly heavy, to light, and many have considerable salmon colour in the umbo. Downstream of here only a fresh broken pair and older fragment of this species were found.

Shells of three other species were found in low numbers: *Elliptio complanata*, 8 specimens from 3 sites; *Lampsilis radiata siliquoidea*, 12 shells from 2 sites; *Strophitus undulatus* (Squaw-Foot) 3 specimens from one site. Only a few snails were noted: a few *Goniobasis livescens* (Great Lakes Horn Snail); one *Physa* (Tadpole Snail), and one *Campeloma decisum*.

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1 Karstad, Aleta, and Frederick W. Schueler. 2012. *Precious Wild Rivers* (calendar for 2013). <http://karstaddailypaintings.blogspot.ca/2012/10/precious-wild-rivers-calendar-for-2013.html>

2 Schueler, Frederick W., Aleta Karstad, Jamie Proctor, and Ryan Hawke. 2007. *How to 'do' a bridge*. Trail & Landscape 41(1):38-49. <http://pinicola.ca/g2007a.htm>

3 Xeneca Power Development. 2013. Environmental Report, Wabageshik Rapids (Vermilion River) Hydroelectric Generating Station Project.

**Results - Xeneca Power Development's environmental report:** This anonymously-authored report does not mention Unionid mussels, the most conspicuous aquatic animals in the Vermilion River, and mentions snails only as identified at the class level (but called a family) as “Gastropoda.”

Simple googling would have found our report on the molluscan fauna of the proposed dam site:

“Back down along the river there was a single *Lampsilis radiata siliquoidea* (Fat Mucket) shell on the boulder bottom.... The striking thing in the Vermilion River, both here and above Wabagishik Lake, was the abundance of *Campeloma decisum* (Brown Mystery Snail) shells in patches on the bottom – many of them with some sort of orange coating on the outside. There were also scattered *Pyganodon grandis* (Common Floater) shells *in situ* and in feeding piles, those from feeding piles broken and those *in situ* intact.” (Schueler, Fred. 2012. Comment 4, *Above the Falls at Wabigishik* <http://karstaddailypaintings.blogspot.ca/2012/10/above-falls-at-wabigishik-oil-on-canvas.html> - 9 October 2012 at 123h40),

...as well as other comments about the other sites we visited, but Xeneca did not contact us for the rest of our results.

**Discussion - Toxic sediments:** It's no surprise that, with all the trees in the Sudbury area having been killed by smelter emissions during the first half of the 20<sup>th</sup> Century, rivers flowing through or past Sudbury would have accumulated a load of heavy metal pollutants. The Ontario Rivers Alliance summarizes this accumulation:

“The Vermilion River system in the Greater District of Sudbury has already been highly compromised by over 100 years of mining waste and effluent, and a long history of 9 upstream wastewater treatment facilities releasing treated, undertreated and untreated effluent into its waters. A 1986 MOE Sediment Study for Wabagishik Lake underscores this history when it reported contaminated sediment containing heavy metals such as nickel (24 times over the severe effect level (SEL), copper (5 times over the SEL), arsenic (3 times over the SEL); lead (1.5 times over the SEL), iron, and manganese over the SEL, and zinc, chromium and cadmium at elevated levels. ... downstream in the bay area where silt and sediment have collected over the years, an area that is very vulnerable to the extremes of flushing, dewatering, erosion and scouring.”<sup>4</sup>

Many studies of Unionids have found a “broad-based negative association with metals in sediments” (Roberts, *et al*)<sup>5</sup>, and the larval glochidia and juveniles are especially sensitive to these pollutants. Any disturbance of flows or the littoral zone would likely release these contaminants into the Vermilion, with deleterious effects on the mussel populations.

**Discussion – Species paucity:** It's very surprising to find only two species of Unionid mussels in a river where mussels are so abundant. The absence of *Elliptio complanata* is especially surprising, since

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4 1 Nov 2013 - <http://ontarioriversalliance.ca/wabagishik-rapids-generating-station-environmental-report-ora-part-ii-order-request/>

5 Roberts, Andrew D., Dave Mosby, John Weber, John Besser, Josh Hundley, Steve McMurray, and J. S. Faiman. 2009. *An assessment of freshwater mussel (Bivalvia Margaritiferidae and Unionidae) populations and heavy metal sediment contamination in the Big River, Missouri.*

this is the species which one would expect to be most abundant in such a stream, as it is in the French River. *Ligumia recta*, *Lasmigona compressa*, and *L. costata* might be expected here, as well as *Strophitus undulatus*, which is present in low numbers with *Elliptio* in the lower Wanapitae River.

The abundance of *Campeloma decisum*, and paucity of other aquatic snails suggests the hypothesis that this species is somehow resistant to pollution by heavy metals, an idea which may have application elsewhere..

**Conclusions:** Our surveys were undertaken in the course of a few days, and along short stretches of both rivers. As the former outlet of the Great Lakes, the French/Nipissing/Mattawa system deserves thorough surveys of its Unionid fauna,<sup>6</sup> and the discovery of the COSEWIC-Endangered Sturgeon-borne *Obovaria olivaria* (Hickorynut) in the Mississagi River<sup>7</sup> emphasises the importance of understanding the fauna of tributaries of the North Channel of Lake Huron. As the recipient of the water of the Vermilion, and a possible habitat of *Obovaria olivaria*, patterns of distribution along the Spanish River should be mapped.

The hypothesis that heavy metal pollution has reduced the Unionid fauna of the Vermilion River to two species should be studied, as should the idea that *Campeloma* may do better than other snails in such a polluted environment. Parallel studies of the Vermilion and Wanapitae would help to generalize the relationships between the fauna, pollutants, and natural & artificially modified patterns of water flow. Until levels of heavy metal pollution, distribution & abundance of mussel species, and morphological variation within species of mussels along the Vermilion are understood, and the release of toxins from disturbed sediment is modeled and the models are robustly found to be acceptable, no new structures or dams should be built on the river.

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## Conspicuous Molluscs of the mid-Vermilion & lower Wanapitae Rivers

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EOBase Narrative beginning 26 September 2012. filtered by CLASS="[Mollusca]" .OR. NAME="visit" – terrestrial species and non-molluscan visits edited out. All Unionid records shared with DFO database, winter 2013.

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26 September 2012

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Canada: Ontario: Sudbury District: **Highway 144, 23.1 km SSW Gogama.** (25m waypoint), 41P/5, 47.48346N 81.84563W TIME: 1935:59. AIR TEMP: 6, clear, calm. HABITAT: lawn homesite in woods along river. OBSERVER: Frederick W. Schueler, Aleta Karstad Schueler. 2012/304/b, **visit** (event). natural history, driveby. WAYPT/232, Arctic Watershed rest stop. We've come S through the night not stopping at the many lakes along the S half of Highway

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6 Schueler, Frederick W., 2000. *Ligumia recta*, *Leptodea fragilis*, and *Anodontoides ferussacianus*, new to the Lake Nipissing Drainage, Ontario. Triannual Unionid Report 19:21.

7 Zanatta, D.T., and D.A. Woolnough. 2011. *Confirmation of Obovaria olivaria, Hickorynut (Bivalvia: Unionidae), in the Mississagi River, Ontario Canada.* Northeastern Naturalist.18(1):1–6  
<http://people.cst.cmich.edu/zanat1d/ZanattaWoolnough2011NEN.pdf>

144, all of which remain oases of malacological ignorance.

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27 September 2012

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*moved 132.0 km SSE.*

Canada: Ontario: Sudbury District: **Vermilion River, 379 Ronka Road, 6.7 km SSW Worthington.** (25m waypoint), 411/6, 46.32555N 81.46855W TIME: 1623:44. AIR TEMP: 17, sunny, breezy. HABITAT: rocky clearwater river, grassy/bouldery beavered shore at homesite. OBSERVER: Frederick W. Schueler. 2012/304/d, **visit** (event). natural history, walk. WAYPT/234, downstream end of visit to shore. . . . at what Herons call "the shallows. " The extensive mowed lawn ends at the brink of a terrace about 25 m back from the river.

*moved 0.07 km ESE.*

Worthington: **Vermilion River, 379 Ronka Road, 6.7 km S Worthington.** (200m alg shore), 46.32542N 81.46772W TIME: 1625-1705. AIR TEMP: 17, sunny, breezy. HABITAT: rocky clearwater river, grassy/bouldery beavered shore, through mixed forest. 2012/304/da, *Lampsilis radiata* *SUBSPECIES:siliquoidea* (Fat Mucket) (Mollusca). 235/abundant shell, specimen. many alive, 157 pairs, 78 valves, from stream & Beaver shell piles. - lots of living *Pyganodon grandis* (Common Floater) and this species sticking up from the bottom - the shells from more-or-less fresh piles along shore plus some dead at depth in situ. NO:Orconectes, NO:Viviparidae seen and no shells in sample - clear water, cobbly bottom - few beaver-chewed sticks - *Castor* said to have been brutally killed by neighbour last month.

Clearly female shells: 53 pairs, largest 91 mm, 29 valves, largest 105 mm - the only large valve, very heavy, as are the 5 largest pairs.

Intermediate shells: 53 pairs, largest 105.5 mm, 29 valves, some with nasuta-like posteriors.

Clearly male: 51 pairs, largest 107.5 mm, 20 valves; the larger ones heavy. Some shells very light and nrly toothless; some with nasuta-like posteriors.

(same location) 2012/304/db, *Pyganodon grandis* (Common Floater) (Mollusca). 10/common shell, specimen. many alive, shells from stream & Beaver shell piles. Three pairs, 5 intact, 2 fragmentary valves, largest 117 mm. Quite heavy and inflated shells, bak sculpture largely eroded away. Living ones much more abundant than shells (and some of these were picked up in situ on the bottom) suggesting a strong *Castorine* preference for *Lampsilis* (Lamp-Mussel).

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28 September 2012

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*moved 7.0 km WSW.*

Canada: Ontario: Sudbury District: **N shore Vermilion River, 3.1 km SE Nairn.** (150m alg shore), 411/5, 46.30961N 81.55647W TIME: 0809-0836. AIR TEMP: 3, foggy, calm. HABITAT: boatlaunch & pullout on clay shore of broad claybed river/brushy banks, water 14 C Al. OBSERVER: Frederick W. Schueler, Aleta Karstad Schueler, Linda Heron, Ron Basso.

2012/304/g, **visit** (event). natural history, walk, drift. WAYPT/235, walked along 150 m of shore for shells. Nothing visible in natural shore of *Juncus* & \<manna-grass> with *Sagittaria* (Arrowhead) at the edge of the water and *Elodea* and *Vallisneria* in the shallows - but lots of *Campeloma decisum* (Brown Mystery Snail) shells and some *Lampsilis radiata* *SUBSPECIES:siliquoidea* and *Pyganodon grandis* (Common Floater) shells, mostly trampled, in the pullout area, and lots of *Lampsilis radiata* *SUBSPECIES:siliquoidea* and *Pyganodon grandis* (Common Floater) alive just beyond the sterns of the boats, but no *Pyganodon* (Floater) among the shells picked up.

(same location) 2012/304/ga, *Campeloma decisum* (Brown Mystery Snail) (Mollusca). abundant shell, drift, specimen. shells from among sterns of boats. Largest 26.8 mm, a fairly old shell. A few *Helisoma campanulatum* (Bell-mouth Ramshorn) the only other species of snail noticed.

(same location) 2012/304/gb, *Lampsilis radiata* *SUBSPECIES:siliquoidea* (Fat Mucket) (Mollusca). 20 shell, specimen. shells from among sterns of boats, 3 pairs, 10 valves, 7 fragments. Mostly very fresh, largest 79 mm.

*moved 0.06 km W.*

**N shore Vermilion River, 3.0 km SE Nairn.** (25m waypoint), 46.30952N 81.55721W TIME: 0819:41. AIR TEMP: 3, foggy, calm. HABITAT: boatlaunch & pullout on clay shore of broad claybed river/brushy banks, water 14 C AI. OBSERVER: Frederick W. Schueler, Aleta Karstad Schueler. 2012/304/g, **visit** (event). natural history, walk. WAYPT/236, downstream extent of sample.

*moved 6.1 km SW.*

**N shore Wabagishik L(Vermilion R), 7.0 km SSW Nairn.** (25m waypoint), 46.27223N 81.61546W TIME: 1011. AIR TEMP: 10 ca, sunny, breezy. HABITAT: cobble shore of clearwater lake at outlet. OBSERVER: Frederick W. Schueler, Aleta Karstad Schueler, Linda Heron, Ron Basso. 2012/305/b, **visit** (event). natural history, walk. WAYPT/237, landed boat here & got out & walked downstream. - *Juncus* & *Carex* in the water, *Spartina pectinata* along the shore, *Physocarpus opulifolius* (Ninebark) densely back a little - *Pyganodon grandis* (Common Floater) shells from one pile and scattered ones, including 2 with flesh along 100 m of shore. A length of monofilament line with two spherical sinkers included in sample. AKS photo of tiny *Lobelia cardinalis* (Cardinal Flower) in bloom, which we're to see at something like 200 m spacing along shores all day.

(same location) 2012/305/ba, *Pyganodon grandis* (Common Floater) (Mollusca). 26 shell, specimen. shells from one pile & scattered along shore. . . . includng 2 with flesh. 14 pairs with at least 1 valve intact, 5 broken pairs, 2 intact, 5 broken valves, plus fragments. Largest 114 mm.

*moved 0.58 km WSW.*

**Vermilion River, Wabagishik Rapids, 7.4 km SSW Nairn.** (25m waypoint), 46.26964N 81.62207W TIME: 1052:15. AIR TEMP: 12 ca, sunny, breezy. HABITAT: extensive 20-50 cm boulder flats in low clearwater river. OBSERVER: Frederick W. Schueler, Aleta Karstad Schueler, Linda Heron. 2012/305/d, **visit** (event). natural history, walk. WAYPT/239, downstream end of wide 20-50 cm boulder flat. . . . above steep rapids. Normally-submerged Moss is ca 40 cm above current water level.

moved 0.09 km W.

**N shore Vermilion River, Wabagishik Rapids, 7.5 km SSW Nairn.** (25m waypoint), 46.26960N 81.62324W TIME: 1131-1650. AIR TEMP: 14 ca, sunny, breezy. HABITAT: rocky ledge in mixed forest above chute of clearwater river. OBSERVER: Aleta Karstad Schueler, Frederick W. Schueler. 2012/305/e, **visit** (event). natural history, oil. WAYPT/240, "a nice place to paint". - above the greatest drop of the river here. *Pinus strobus* (White Pine) / *Acer rubrum* (Red Maple) / *Quercus rubra* (Red Oak) / *Comptonia peregrina* (Sweet-fern) / *Physocarpus opulifolius* (Ninebark) / *Gaultheria procumbens* (Wintergreen) on gravelly soil above gorge.

moved 0.22 km WSW.

**N shore Vermilion River, Wabagishik Rapids, 7.5 km SSW Nairn.** (25m waypoint), 46.26903N 81.62592W TIME: 1312:36. AIR TEMP: 14 ca, sunny, breezy. OBSERVER: Frederick W. Schueler, Linda Heron. 2012/305/g, **visit** (event). natural history, walk. WAYPT/241, "BH-06-01 211.377 ELEV" on one stake. . . . among several on slope among *Rhus typhina* (Staghorn Sumac) & *Pinus strobus* (White Pine) / *Acer rubrum* (Red Maple) / *Quercus rubra* (Red Oak) brush - stakes presumably marking the location of the planned dam.

moved 0.13 km WSW.

**N shore Vermilion River, Wabagishik Rapids, 7.7 m SSW Nairn.** (25m waypoint), 46.26861N 81.62752W TIME: 1331. AIR TEMP: 15 ca, sunny, breezy. HABITAT: rocky clearwater river. OBSERVER: Frederick W. Schueler. 2012/305/h, *Lampsilis radiata* *SUBSPECIES:siliquoidea* (Fat Mucket) (Mollusca). 1 shell, specimen. WAYPT/242, heavy old 113.5 mm pair at 50 cm depth. . . . on boulder bottom. The only unionid seen downstream to here & beyond to lake. *Physocarpus opulifolius* (Ninebark) shore here with clump of *Quercus macrocarpus* trees - an *Orconectes virilis* (Northern Crayfish) carapace a bit downstream one of the few signs of crayfish seen today, except for copious crayfishy *Procyon lotor* (Raccoon) scats on many shores.

moved 0.18 km N.

**Vermilion River, 7.6 km SSW Nairn.** (25m waypoint), 46.27023N 81.62761W TIME: 1345ca. AIR TEMP: 16 ca, sunny, breezy. HABITAT: muddy/sandy *Spartina pectinata* shore of bay of clearwater river. OBSERVER: Frederick W. Schueler, Linda Heron, Larry & Rosalyn Becks. 2012/306/a, **visit** (event). natural history, walk/light/driveby. WAYPT/245, landed boat here. FWS to walked the shore for shells, the others to seek archeological ruins up the slope.

(same location) TIME: 1350-1423. AIR TEMP: 16 ca, sunny, breezy. OBSERVER: Frederick W. Schueler. 2012/306/ac, *Pyganodon grandis* (Common Floater) (Mollusca). 25 shell, specimen. 13 pairs, 7 partial pairs, 5 valves & fragments, none fresh. Largest 114.5, many quite heavy-shelled. Scattered along shore in situ and in feeding piles, those from feeding piles broken and those in situ intact.

(same location) 2012/306/ad, **Lampsilis** (Lamp-Mussel) (Mollusca). 1 shell, specimen. old eroded-away 106 mm pair, very compressed.

(same location) 2012/306/ae, *Campelema decisum* (Brown Mystery Snail) (Mollusca). abundant shell, specimen, drift. in big drifts on bottom & scattered along shore, largest 29.5

mm. . . . an old shell with incomplete spire. This was the only conspicuous species in the drift, though the sample includes a few Spahaeriidae.

*moved 0.07 km WSW.*

**Vermilion River, 7.6 km SSW Nairn.** (25m waypoint), 46.26996N 81.62847W TIME: 1420. AIR TEMP: 16 ca, sunny, breezy. 2012/306/ab, **visit** (event). natural history, walk. WAYPT/244, other extent of survey. - not many shells this side of the boat. A shallow-water bay in the flats near here had no shells at all, suggesting that Molluscan distribution is sporadic in this river.

*moved 2.2 km WSW.*

**N shore Vermilion River, 9.3 km SW Nairn.** (25m waypoint), 46.26409N 81.65615W TIME: 1512. AIR TEMP: 17 ca, sunny, breezy. HABITAT: heavily beaver-affected steep clay grassy shore of deep clearwater river below 2 nd. 2012/306/f, **visit** (event). natural history, walk. WAYPT/249, let off here at site of former homestead. . . . to work downstream with Marigold the Dog looking for shells - but finding none. Tiny *Lobelia cardinalis* (Cardinal Flower) plants again in bloom at the before-mentioned 200 m spacing.

*moved 1.5 km ENE.*

**S shore Vermilion River, 8.2 km SSW Nairn.** (25m waypoint), 46.26725N 81.63682W TIME: 1600-1611. AIR TEMP: 17 ca, sunny, breezy. HABITAT: heavily beaver-affected sand/clay/gravelly grassy bay of clearwater river through 2. OBSERVER: Frederick W. Schueler, Linda Heron Larry & Rosalyn Becks. 2012/306/jb, *Campeloma decisum* (Brown Mystery Snail) (Mollusca). many lodge, specimen. shells on Castor lodge, drifted on shore & bottom. Field notes were "I should have just picked more shells from the lodge, instead of trying to find them on the bottom or in drift where they were weathered." Sample is a mix of drift and fresher shells. <<a subsample of 2 23.3, 22.5 mm shells mistakenly packaged separately>>

(same location) 2012/306/jc, *Pyganodon grandis* (Common Floater) (Mollusca). 8 shell, specimen. 4 valves, 1 pair, 1 fragment, largest 110.5 mm, shells from along shore. <<. . . in a subsample mistakenly packaged separately>>

2 fragments in the "main" sample.

(same location) 2012/306/jd, *Lampsilis radiata SUBSPECIES:siliquoidea* (Fat Mucket) (Mollusca). 5 shell, specimen. 3 pairs, 2 valves, mostly fresh, largest F 75 mm, largest M 93 mm.

*moved 1.7 km ENE.*

**N shore Wabagishik L(Vermilion R), 7.0 km SSW Nairn.** (25m waypoint), 46.27223N 81.61546W TIME: 1723. AIR TEMP: 10 ca, sunny, breezy. HABITAT: cobble shore of clearwater lake at outlet. OBSERVER: Frederick W. Schueler, Aleta Karstad Schueler, Linda Heron, Ron Basso. 2012/307/ba, **visit** (event). natural history, walk. back to boat, and motor back across lake to landing. Back to boat 1723 17 ca, SNY, BRZ - 17h29 7 *Phalacrocorax auritus* (Double-crested Cormorant) in flight across lake.

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29 September 2012

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*moved 28.9 km ENE.*

Canada: Ontario: Sudbury District: **Vermilion R at Centennial Park boatlaunch.** (25m waypoint), 411/6, 46.39074N 81.27941W TIME: 1656:48. AIR TEMP: 15, cloudy, Beaufort moderate breeze. HABITAT: trampled shore of deep claybed/rocky-shore river at old bridge embankment, water 16 C. OBSERVER: Frederick W. Schueler. 2012/307/e, **visit** (event). natural history, wade. WAYPT/255, begin walk around old bridge abutment. . . . picking up shells, which are scattered along this trampled shore, or out in the water in situ.

*moved 0.07 km WNW.*

**Vermilion R at Centennial Park, 2.8 km ENE Whitefish.** (100m site), 46.39104N 81.28023W TIME: 1657-1711. AIR TEMP: 15, cloudy, Beaufort moderate breeze. HABITAT: trampled/marshy shore of bay of claybed/rocky-shore river at old bridge embankment. 2012/307/fa, *Lampsilis radiata* *SUBSPECIES:siliquoidea* (Fat Mucket) (Mollusca). 38ca shell, prey of predator, specimen, Muskrat shell pile. collection around old bridge abutment, mostly not very fresh. Four attached definitely-female pairs, 10 left, 8 right valves, largest 78 mm

Four attached male-like pairs, 12 right valves, 13 left valves, largest 96.5 mm

(same location) 2012/307/fb, **Pyganodon** (Floater) (Mollusca). 10ca shell, prey of predator, specimen, Muskrat shell pile. collection around old bridge abutment, mostly not very fresh. All old, 1 pair, 3 valves, 6 fragments, largest 101.5 mm, beaks eroded, beaks low.

(same location) TIME: 1711:48. AIR TEMP: 15, cloudy, Beaufort moderate breeze. 2012/307/f, **visit** (event). natural history, walk. WAYPT/256, end collection around old bridge abutment. Most shells from piles on the less-trampled N side of the abutment.

I head N towards park beach - all Cattails heavy-headed *Typha latifolia* (Broad-leaved Cattail) in marsh here.

*moved 0.31 km NNW.*

**Vermilion River above Centennial Park, 2.8 km NE Whitefish.** (25m waypoint), 46.39334N 81.28240W TIME: 1729-1730. AIR TEMP: 15, cloudy, Beaufort moderate breeze. HABITAT: rocky bar into wide stretch of claybed/rocky-shore river below rapids around island A. 2012/307/g, **visit** (event). natural history, walk. WAYPT/257, saw lots of Unionid shells along shore. - *Pyganodon grandis* (Common Floater) and *Lampsilis radiata* *SUBSPECIES:siliquoidea* in coming past the Park, but no concentrated feeding piles, except 1 that was trampled - there's a pile across the channel here, on the island, but the water is too deep to wade. Soo Crossing waypoint is 200 m E of here on the main channel of the river. Head back towards the park along bay to the west that I cut off by wading its outlet & inlet on my way north to here.

*moved 0.07 km W.*

**Vermilion River bay between Centennial Park & CPR tracks.** (25m waypoint), 46.39332N 81.28330W TIME: 1740-1745. AIR TEMP: 15, cloudy, breezy. HABITAT: rocky shore of bay of claybed/rocky-shore river along rail embankment. 2012/307/ha, *Lampsilis radiata* *SUBSPECIES:siliquoidea* (Fat Mucket) (Mollusca). 36 shell, prey of predator, Muskrat shell

pile, specimen. WAYPT/258, entire feeding pile from among boulders. 15 pairs, 17 valves, 4 fragments. largest M:95 mm, largest F:79 mm, some with pinkish-tinged nacre.

There was a bigger pile a bit W but having picked up this sample I left it untouched - Beavers have worked this shore heavily, and small trunks of *Acer rubrum* (Red Maple), *Fraxinus* (Ash), *Quercus rubra* (Red Oak) and *Quercus macrocarpa* (Bur Oak) are clumpily gesturing with sprouts - a bit west there's a deposit of spring drift, which would have been harvestable in the spring, but is rotting away now - maybe from the spring before this? No shells seen at the muddy head of the bay.

(same location) 2012/307/hb, *Pyganodon grandis* (Common Floater) (Mollusca). 6/many shell, prey of predator, Muskrat shell, specimen. 4 valves, 2 fragments, from feeding pile from among boulders. Largest 90 mm.

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30 September 2012

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*moved 0.36 km SE.*

Canada: Ontario: Sudbury District: **Centennial Park boatlaunch, 2.8 km ENE Whitefish.** (25m waypoint), 46.39095N 81.28010W TIME: 1908-1945. AIR TEMP: 14, cloudy, sunset, Beaufort light air. HABITAT: gravel parkinglot/old bridge embankment at deep claybed/rocky-shore river. OBSERVER: Aleta Karstad Schueler. 2012/308/fc, **visit** (event). 1 natural history, oil. painting of Soo Crossing falls from water's edge.

*moved 0.10 km SE.*

**Vermilion R/Reg Road 55, 2.8 km ENE Whitefish.** (25m waypoint), 46.39039N 81.27915W TIME: 1920:31. AIR TEMP: 13 ca, overcast, calm. HABITAT: deep claybed/rocky-shore river at hwy bridge. OBSERVER: Frederick W. Schueler. 2012/308/g, **visit** (event). natural history, walk/light/driveby. WAYPT/262, waypoint from bridge in midchannel. - scattered Unionid shells on rock embankments of the bridge, and a connected bay like the one S of the railway line N of the highway on the W side. A nice pedestrian walkway on this bridge though the grating floor doesn't appeal to Marigold the Dog.

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1 October 2012

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*moved 54.3 km SE.*

Canada: Ontario: Sudbury District: **Rooks' cottage Wanapitae Bay, 2.3 km WNW Hartley Bay.** (25m waypoint), 411/2, 46.04103N 80.78827W TIME: 1054. AIR TEMP: 14, sunny, Beaufort light breeze. HABITAT: steep shore of deepwater bay in bedrock/barren Shield area. OBSERVER: Frederick W. Schueler, Aleta Karstad Schueler, Jim Rook. 2012/309/ca, *Elliptio complanata* (Eastern Elliptio) (Mollusca). 7/common shell, specimen. WAYPT/267, scattered very fresh shells on shore. Five pairs, 2 valves, nacre shining pale greyish. Largest 85 mm. A brief stop to pick up bottled water.

(same location) 2012/309/cb, *Lampsilis radiata* *SUBSPECIES:siliquoidea* (Fat Mucket) (Mollusca). 2 shell, specimen. 84 mm F pair & 77 mm valve on shore.

(same location) 2012/309/cc, *Pyganodon grandis* (Common Floater) (Mollusca). 1 shell, captured. fragmentary pair, thin shelled & inflated. Not retained.

*moved 1.43 km NW.*

**mouth Wanapitae River, 3.6 km WNW Hartley Bay.** (25m waypoint), 46.04930N 80.80246W TIME: 1102. AIR TEMP: 16, sunny, Beaufort light breeze. HABITAT: slow grassy claybed/deadhead river through Soft Maple/White Pine woods. 2012/309/d, **visit** (event). natural history, seen, boatby. WAYPT/268, a striking shoreline. Zizania/Nuphar in water, Scirpus/Spartina pectinata/tall Grass along shore/Soft Maple/White Pine woods - we proceed upstream slowly because of numerous deadheads.

*moved 1.8 km WSW.*

**Wanapitae River, 5.2 km WNW Hartley Bay.** (25m waypoint), 46.04592N 80.82586W TIME: 1117. AIR TEMP: 17, sunny, Beaufort light air. HABITAT: slow grassy claybed/deadhead river through Soft Maple/White Pine woods, water 14 C. 2012/309/i, **visit** (event). natural history, seen, boatby. WAYPT/273, ca 5 m tall boulder-like rock on shore. . . . with *Umbilicaria* on its vertical face. We're going past curiously eroded and chewed up hard clay banks with Beaver and Muskrat holes, and what look like *Condylura* burrows all through them - NO:Spartina along here and NO:Scirpus - a bit further on we come to a brood of fledged *Anas platyrhynchos* (Mallard) a few *Branta canadensis* (Canada Goose) and a *Phalacrocorax flies* by - drift on the deadheads is all *Vallisneria*.

*moved 2.4 km N.*

**Wanapitae River below Sturgeon Chute, 6.4 km NW Hartley Bay.** (150m alg shore), 46.06763N 80.82889W TIME: 1214-1239. AIR TEMP: 18, sunny, Beaufort light air. HABITAT: gravel/clay/bedrock grassy shore of bay of claybed river below chute. OBSERVER: Frederick W. Schueler. 2012/310/a, **visit** (event). natural history, walk. WAYPT/276, scattered shells from 150 m along shore. Walked around the shore to here without seeing any concentrations of shells - these scattered along here - waypoint on downstream bedrock ledge - small *Goniobasis livescens* (Great Lakes Horn Snail) on stones, a couple taken incidentally - sample mixed with drift from 310/b.

(same location) 2012/310/aa, *Goniobasis livescens* (Great Lakes Horn Snail) (Mollusca). few/common adult, shell, specimen. small, on stones, a couple taken incidentally.

(same location) 2012/310/ab, *Elliptio complanata* (Eastern Elliptio) (Mollusca). 3 shell, specimen. 2 fresh, 1 old pairs from along shore, largest 68.5 mm.

(same location) 2012/310/ac, *Pyganodon grandis* (Common Floater) (Mollusca). 2 shell, specimen. fresh broken pair & older fragment from along shore.

(same location) 2012/310/ad, *Strophitus undulatus* (Squaw-Foot) (Mollusca). 3 shell, specimen. 2 fresh, 1 old pairs from along shore, largest 51.5 mm.

(same location) 2012/310/ae, **Anodontinae** (Mollusca). 2 shell, specimen. 77 & 82 mm inflated fresh pairs from along shore. Not clear if these are *Pyganodon* (Floater) or *Strophitus*.  
(same location) 2012/310/af, *Lampsilis radiata* *SUBSPECIES:silivoidea* (Fat Mucket) (Mollusca). 10 shell, specimen. 8 pairs, 2 valves, from along shore, largest M 87 mm, largest

F 80 mm.

*moved 0.54 km N.*

**Wanapitae River above Sturgeon Chute, 6.8 km NW Hartley Bay.** (25m waypoint), 46.07243N 80.83019W TIME: 1348-1415. AIR TEMP: 19, sunny, breezy. HABITAT: steep clay/grassy shore of claybed river above chute, below mixed open woods, water 14 C. OBSERVER: Frederick W. Schueler, Jim Rook. 2012/310/da, *Pyganodon grandis* (Common Floater) (Mollusca). 145/abundant shell, prey of predator, Muskrat shell pile, specimen. WAYPT/278, 20% of shellpile at Beaver-trampled/burrowed shore. - this is the upstream end of the portage trail on the N shore of the river, and just going down to the water a few m upstream there's this huge shell pile in the steep shore. The south shore, across the river, looks much less steep, but it couldn't well have produced more shells. Lots of debarked sticks in the water.

These include 51 pairs, 28 broken pairs, 36 left valves 48 right valves (adding 65 to the count by the rule of 1.5), and a pile of fragments (not counted). The largest 104 mm. If this sample was 20% of the entire pile, then the pile comprised more than 700 shells.

These shells are fabulously variable in shape, from ordinary shapes to compressed like *Elliptio complanata* (Eastern Elliptio) to big-beaked inflated like *Alasmidonta marginata* (Elktoe) to more cylindrical than *Anodontoidea ferussacianus* (Cylindrical Floater). 79.5, 82.5, 92.3, 87.7, 79.6 mm valves removed for identification kits.

(same location) 2012/310/db, *Elliptio complanata* (Eastern Elliptio) (Mollusca). 1 shell, prey of predator, Muskrat shell pile, specimen. 76.5 mm pair from shellpile at Beaver-trampled/burrowed shore. Nacre slightly blueish-tinged white. This species 0.07% of the entire pile.

(same location) 2012/310/dc, **Physa** (Tadpole Snail) (Mollusca). 1 adult, Muskrat shell pile, specimen. 12 mm ad from shellpile at Beaver-trampled/burrowed shore. In 70% ethanol.

(same location) 2012/310/dd, *Campeloma decisum* (Brown Mystery Snail) (Mollusca). 1 juvenile, Muskrat shell pile, specimen. 14 mm juv from shellpile at Beaver-trampled/burrowed shore. In 70% ethanol.

*moved 0.10 km SSE.*

**Wanapitae R at Sturgeon Chute, 6.7 km NW Hartley Bay.** (25m waypoint), 46.07157N 80.82990W TIME: 1400-1630. AIR TEMP: 20, sunny, breezy. HABITAT: bedrock shore of chute in claybed river through Soft Maple/White Pine woods. OBSERVER: Aleta Karstad Schueler, Frederick W. Schueler, Jim Rook. 2012/310/e, **visit** (event). natural history, oil. WAYPT/279, painting of chute.... The water is said (fide Jim) to be the highest it's been since May - partly due to releases from dams upstream.

*moved 0.05 km S.*

**N shore Wanapitae River within Sturgeon Chute.** (25m waypoint), 46.07108N 80.82984W TIME: 1507-1517. AIR TEMP: 22, sunny, breezy. HABITAT: steep clay/grassy shore of claybed river between falls, below Paper Birch/mixed woods. OBSERVER: Frederick W. Schueler. 2012/311/a, *Pyganodon grandis* (Common Floater) (Mollusca). 50ca shell, prey of

predator, Muskrat shell pile, specimen. WAYPT/280, scattered fresh shells 40-200 cm above water. Many fairly heavy, but others light. Also (perhaps uncorrelated with thickness) many have considerable salmon colour in the umbo and more widely. Generally low-beaked and cylindrical - this is between falls in the chute and maybe the shells with different thickness were in water of different velocities. 26 right valves, 32 left valves, 4 pairs. largest a *Lampsilis*-heavy 110 mm valve with white nacre.

*moved 0.25 km SSE.*

**Wanapitae R at foot Sturgeon Chute, 6.5 km NW Hartley Bay.** (50m site), 46.06898N 80.82871W TIME: 1525-1534. AIR TEMP: 20, sunny, Beaufort moderate breeze. HABITAT: gravel/clay/grassy shore of bay of claybed river along mixed brushy woods below chute. 2012/311/bc, *Elliptio complanata* (Eastern Elliptio) (Mollusca). 3 shell, seen. in trampled, cf anthropogenic cluster of shells on beach. - drift on beach is *Vallisneria* and *Castor* -peeled sticks & *Pinus strobus* (White Pine) needles.

(same location) 2012/311/bd, *Lampsilis radiata* *SUBSPECIES:siliquoidea* (Fat Mucket) (Mollusca). 2 shell, seen. in trampled, cf anthropogenic cluster of shells on beach.

*moved 2.1 km SW.*

**Wanapitae River, 6.8 km WNW Hartley Bay.** (25m waypoint), 46.05329N 80.84395W TIME: 1708:08. AIR TEMP: 17, sunny, Beaufort light breeze. HABITAT: grassy shore claybed/deadhead river near beaver lodge/Red Maple woods. OBSERVER: Frederick W. Schueler, Aleta Karstad Schueler, Jim Rook. 2012/312/aa, **visit** (event). natural history, walk. WAYPT/284, got out to walk along shore for shells.

*moved 0.02 km ESE.*

**Wanapitae River, 6.7 km WNW Hartley Bay.** (25m waypoint), 46.05323N 80.84369W TIME: 1709. AIR TEMP: 17, sunny, Beaufort light breeze. HABITAT: Beaver lodge on grassy/Red Maple-forested bank of claybed/deadhead river, water 14.. 2012/312/ba, *Lampsilis radiata* *SUBSPECIES:siliquoidea* (Fat Mucket) (Mollusca). 1/common shell, specimen. WAYPT/285, freshly pulled up onto surface of lodge. . . . with *Vallisneria* & mud.

*moved 0.16 km ESE.*

**Wanapitae River, 6.6 km WNW Hartley Bay at docks.** (25m waypoint), 46.05254N 80.84184W TIME: 1714:36. AIR TEMP: 17, sunny, Beaufort light breeze. HABITAT: grassy shore claybed/deadhead river near beaver lodge/Red Maple woods. 2012/312/ab, **visit** (event). natural history, walk. WAYPT/286, end of walk along shore for shells. - shells seen only at Beaver lodge in the 180 m I walked along shore.

*moved 3.4 km ESE.*

**Wanapitae Bay, 3.2 km WNW Hartley Bay.** (25m waypoint), 46.04453N 80.79988W TIME: 1746-1751. AIR TEMP: 16, sunny, Beaufort light breeze. HABITAT: Beaver lodge on bedrock/cobble shore of French River bay. 2012/312/ga, *Elliptio complanata* (Eastern Elliptio) (Mollusca). 32/abundant shell, prey of predator, specimen. WAYPT/291, fresh shells from around Beaver lodge. - many more not collected. 18 attached pairs, 5 valves, 8 assembled pairs, 1 alive, largest 102 mm (the living one), shells both elongate and compressed, pale nacre. 75.4, 71, 76.5, 73.5, 78.5, 75 mm valves removed for identification kits.

(same location) 2012/312/gb, *Lampsilis radiata* (Eastern Lamp-Mussel) (Mollusca). 2 shell,

prey of predator, specimen. only 2 small pairs seen around Beaver lodge, 57 & 57.5 mm.

(same location) 2012/312/gc, **cf Ligumia recta** (Black Sand-Shell) (Mollusca). 1 shell, prey of predator, specimen. 96 mm pair, may be an *Elliptio*.

(same location) 2012/312/gd, *Helisoma campanulatum* (Bell-mouth Ramshorn) (Mollusca). 1 shell, drift. only 1 shell, from drift.

(same location) 2012/312/ge, *Campeloma decisum* (Brown Mystery Snail) (Mollusca). 2 shell, prey of predator, drift. only 2 old shells seen around Beaver lodge. 1 picked up, not retained.

(same location) 2012/312/gf, **Sphaerium** (Fingernail Clam) (Mollusca). 1 shell, drift. taken with Unionids around Beaver lodge.