Tay River Macroinvertebrate Survey - 2009

A survey of a small Eastern Ontario river with a sparse Unionid fauna & enigmatic Crayfish, undertaken in the first year after Zebra Mussels were first observed there.

South bank of the Tay River, upstream of the Schoolhouse Bridge, 13 August 2009. oil © Aleta Karstad.

Orion Clark - Friends of the Tay Watershed

Frederick W. Schueler – Bishops Mills Natural History Centre

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ABSTRACT

The largest invertebrate animals in our local lakes and rivers, native freshwater mussels and Crayfish, are all threatened by invading alien species. Native crayfish are displaced or genetically swamped by the Rusty and Obscure crayfish (*Orconectes rusticus* and *O. obscurus*), while native mussels are suffocated by Zebra Mussels (*Dreissena polymorpha*), which have eliminated them from many lakes and rivers.

In 1995 the Bishops Mills Natural History Centre (BMNHC) began sporadic surveys of these species in the Tay River, finding a modest diversity of native mussels and Crayfish that couldn't be certainly identified as any of the native or invasive species.

Observations of clusters of Zebra Mussels attached to empty shells in Christie Lake in the fall of 2008, provided the stimulus for a detailed study. The Friends of the Tay Watershed (FoTW) successfully applied for a grant from the Shell Environmental Fund to conduct a study of the freshwater mussels and native crayfish which inhabit the Tay River and Christie Lake from Bolingbroke to Port Elmsley.

Freshwater mussels are a useful biological indicator of water quality and long term aquatic health due to their long life spans. Chronic water pollution problems can be associated with the disappearance of freshwater mussels. With the loss of mussel species from the invasion of Zebra Mussels, there will be a subsequent change in the ecology of streams and lakes, since native mussels (Unionidae) aerate the bottom by their burrowing, while Zebra Mussels smother the bottom with their matted shells and droppings.

Forty sites were sampled for existing species (living adults & dead shells) of clams, snails and crayfish. There were 10 shore visits and SCUBA-diving over 3 shoals in Christie Lake, in June, and 27 wading and rock-turning visits along the Tay River, in August. Water quality was also monitored by chemical analysis for seven parameters.

While many observations of other macroinvertebrates, amphibians, and reptiles were recorded and photographed, there were three findings that stand out:

1) Zebra Mussels have been present for a few years, and it's not clear how much they will increase. Video recording done by SCUBA divers on the shoals of Christie Lake found Zebra Mussels of a size that suggests they were at least four years old, and Zebra Mussels were found at five other sites in the Tay River in the course of the survey though in as-yet very low numbers. Analysis of the water chemistry data collected in the survey suggest that they may have the potential either to increase, or to remain at low abundances. Calcium levels above Perth are within the range where Zebra Mussels may or may not become dominant over the coming decade, while levels below Perth are higher, suggesting that there may be infestations there similar to those present in the Rideau River.

2) Elktoes are fairly common in a specific habitat. The Elktoe (*Alasmidonta marginata*), is a fairly common species of mussel in southwestern Ontario, but in eastern Ontario it was known to be common only in the Mississippi River below Almonte where it's threatened by increasing Zebra Mussels (FWS, personal observations). A single shell was found in 1995 in the Tay River in Perth, and another in 2007, but the survey found them living in a particular habitat: single layers of broken rock over flat bedrock. The biggest of these

populations was on the flats above the OMYA water intake, where Elktoes were at a density of about 1 in every 2 square metres. The vast majority of the mussels found at all sites were the Eastern Elliptio (*Elliptio complanata*); small numbers of six other species were found. Eroded shells and low numbers of most species suggest that conditions are marginal for many of them.

3) Most crayfish seem to be hybrids among a native species and two invaders. Uniformly tannish Crayfish found all along the Tay show a mixture of the characters of the native *Orconectes propinquus*, and the introduced *O. rusticus*, and *O. obscurus*, which are known from nearby lakes. Specimens will need to be studied before definite conclusions are drawn about their status. The native Blue-claw Crayfish, *Orconectes virilis*, was also found in smaller numbers.

4) The fauna of Christie Lake is less diverse than that of the River, with only 3 species of Unionids in samples from 13 sites.

5) Native aquatic snails are not abundant, and the only species that is widespread and abundant in the Tay River and in Christie Lake is the introduced ***Viviparus "georgianus*,"** the Banded Mystery Snail.

This study confirms that through partnerships and volunteers, valuable information can be gathered that should educate as well as influence decision making processes in the future. For further details, consult the Friends of the Tay Watershed website, www.tayriver.org and the Bishops Mills Natural History Centre website at http://pinicola.ca/outings/tay_survey.htm for the field notes of the survey, and http://pinicola.ca/outings/tay_visits.htm for previous visits.

Section 1: INTRODUCTION

The largest invertebrate animals in our local lakes and rivers, native freshwater mussels and crayfish, are threatened by invading alien species. Native crayfish are displaced or genetically swamped by the Rusty and Obscure crayfish (*Orconectes rusticus* and *O. obscurus*), while native mussels are suffocated by Zebra Mussels (*Dreissena polymorpha*), which has eliminated them from many lakes and rivers, including the Rideau River, into which the Tay flows.

Our "macro" invertebrates comprise fewer than a hundred species in total, and most are easily learned. These are big animals, and each species has as distinctive an ecological role as does any vertebrate. Conventional "macroinvertebrates" (which the BMNHC denominates "meso-invertebrates") are centimetre-scale Crustaceans, small Molluscs, larval Insects, and aquatic Oligochaetes & other worms, which are only identified to order or family in stream surveys. The truly "macro" invertebrates (routinely larger than 15 mm) are relatively few in number, so it's a valuable asset to know them as species. Many of these invertebrates are subject to replacement by alien invasives, or are on, or being considered for, SAR lists. In eastern Ontario there are 3 native and 3 alien Crayfish, about 15 Unionid mussels, the ecosystem-changing Zebra Mussel, a dozen larger native aquatic snails and 2 invaders, and the giant Bryozoan *Pectinatella magnifica.*

Each group's ecological role in aquatic communities is dictated by its trophic adaptation: grappling, filtering, or scraping. ***Crayfish*** use clawed legs and leg-like mouthparts and gills to be generalist predators, scavengers, detritivores, and even filter-feeders, of anything edible. The ciliated gills of ***Unionid Mussels***, in their primordial abundance, stripped plankton, bacteria, and sediment from the water by repeated filtering, and oxygenated sediments by their burrowing. Their life span of decades (perhaps centuries) provides stability to aquatic ecosystems, but chronic water pollution or sediment loading can eliminate them from streams or lakes. Short-lived ***Zebra Mussels*** have exploded to the primordial abundance of Unionids, and have clarified water in many streams and lakes by their filtering, while sealing the bottom off from oxygen, and providing a new habitat for a changed fauna of benthic "meso" invertebrates in their beds of tangled shells, bysus, and pseudofeces. ***Aquatic Snails*** scrape surfaces and sediments with their toothy radulae, or, in a few cases, filter plankton from the water (Schueler & Karstad 2009).

In 1995 Fred Schueler & Aleta Karstad, later to be the **Bishops Mills Natural History Centre** (BMNHC - http://pinicola.ca/bmnhc.htm) began sporadic surveys of these species in the Tay River, finding a modest diversity of native mussels and seeing Crayfish that couldn't be certainly identified as any of the native or invasive species. Their results have only been summarized in an initial report on the mussels to the MNR (Schueler 1996a, abstract published in ***Triannual Report***, 1996b) and a fact sheet produced for a public meeting about water-taking from the Tay (Schueler, 2003).

Friends of the Tay Watershed (FoTW) is a non-profit, charitable association, dedicated to preserving and enhancing the health of the Tay River Watershed. It was founded in mid-2001 to monitor and promote action to implement the recommendations of the Rideau Valley Conservation Authority's (RVCA 2002) *Tay River Watershed Management Plan.* Its mission is to carry out activities to ensure the ongoing care of the watershed and its related natural resources by involving landowners, water users, and other interested parties in programs aimed at improving the health of the Tay River Watershed. (from http://www.tayriver.org/association.php accessed 23 Oct 2009).

Observations, by Orion Clark, of clusters of Zebra Mussels attached to empty shells in Christie Lake in the fall

of 2008 provided the stimulus for this study. The FoTW successfully applied for a grant from the Shell Environmental Fund to conduct a study of the freshwater mussels and crayfish which inhabit the Tay River and Christie Lake from Bolingbroke to Port Elmsley.

Cohen & Weinstein (2001) reviewed the Zebra Mussel's calcium threshold and the implications for the limits to its spread through North America. They conclude that while Zebra Mussel populations are limited by availability of calcium, though there's no simple cut-off level, and different studies disagree on what the limit may be. The local demonstration of these limits is the Ottawa River, where Zebra Mussels are not established, despite the infusion of veliger larvae into the Ottawa from established abundant populations in the Mississippi, Rideau, and South Nation rivers.

In general, at less than 12 mg/L the chance of establishment is minimal, from 12-20 mg/L it is low, from 20-28 mg/L moderate, and above 28 mg/L the chance of establishment is high. Zebra Mussels observed or reported at the lower calcium levels probably represent either misidentifications, limited or inaccurate calcium data, or non-reproducing sink populations recruited from populations established upstream in higher calcium waters (Cohen and Weinstein 2001). In 2008, Cohen didn't change this range of values in analysing the chance that *Dreissena* could colonize sites in California (Cohen, 2007-2008).

The Tay flows between two waterbodies in the Rideau Canal system, from Bobs Lake and into the Rideau Canal. In 2003, sampling in Bob's Lake "appeared to contain zebra mussel veligers" (RVCA 2004), however testing hasn't found them there in subsequent years (Carabott 2008, O'Brien Mactaggart 2009). Most of Bobs Lake "is regarded as.. except for Green Bay, [being] within the Poor Growth range... Calcium concentrations in Green Bay are slightly higher, and put it in the Moderate Growth range" for Zebra Mussels (Carabott 2008). Zebra mussels were first found in the Rideau River in 1990, and in the upstream Rideau Lakes at least since 1993. By 1995 it had dominated almost the entire downstream half of the river, and it gradually increased upstream to abundance in 2005, and to the nearly complete elimination of diverse native mussel communities by 2008 (Schueler & Martel 2009).

The purpose of study was to establish a database of large invertebrates in the Tay River and Christie Lake before Zebra Mussels became abundant, while measuring the water chemistry that might affect the chance that Zebra Mussels could become abundant.

The BMNHC has traditionally sampled macro-invertebrates by "doing" streams at bridges: brief "hunting" visits to sites that attempt to maximize the list of species observed, while gathering qualitative data on relative abundance (Schueler, *et al.*, 2007)

1.1: DESCRIPTION OF SUBWATERSHED

The Tay River and Christie Lake are part of the Tay River Watershed, in eastern Ontario within the counties of Lanark, Leeds, and Frontenac. It is the largest subwatershed of the Rideau system, and is bounded by the Mississippi watershed to the north, the Black Creek watershed to the east, direct tributaries of the Rideau to the south, and Bay of Quinte drainages to the west.

The Tay flows in a northeasterly direction for 40 km (in a watershed which has an overall extent of 95 km) from the outlet from Bob's Lake at the Bolingbroke Dam through to Port Elmsley, where it empties into the Lower Rideau Lake of the Rideau Canal. The upper part of the Tay flows through the Canadian Shield of the Frontenac

Axis over igneous/metamorphic bedrock covered with a thin overburden.

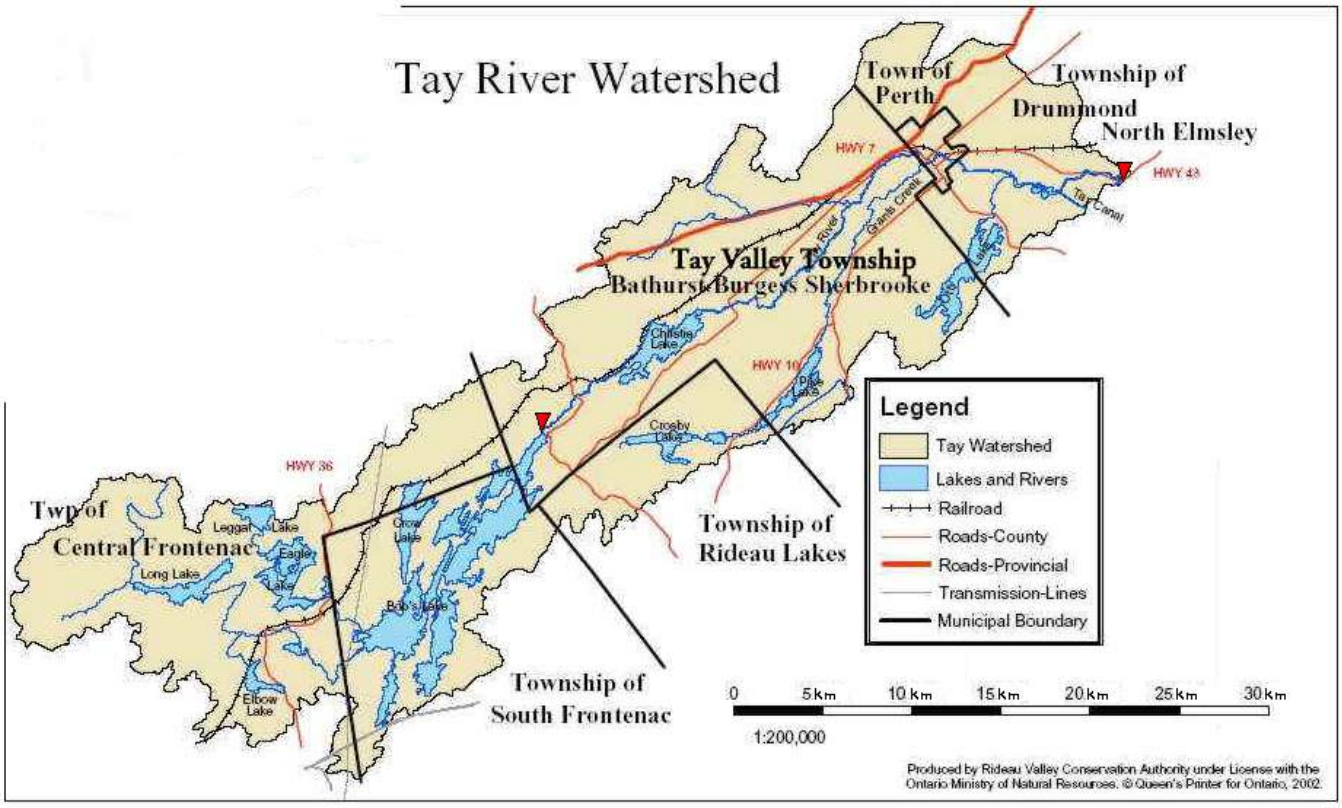
Water levels in Christie Lake and the Tay River are primarily under the control of Parks Canada through the control of the Bolingbroke dam at Bobs Lake. Parks Canada's motivation is to provide sufficient flow for navigation within the Rideau Canal while at the same time trying to meet the habitat requirements of the ecosystem. Judgements on whether to release more water from Bobs Lake to meet navigation requirements in the Rideau as well as satisfy environmental guidelines is based on a rule curve. The rule curve represents the ideal reservoir levels during the year. The rule curve is contained within a conservation zone that defines the acceptable range of water-level deviations. In dry seasons, flow rates from Bobs Lake cannot be maintained due to the limited storage. Hence, there can be periods of flow below the rule curve for periods of time that stress invertebrate populations. Whether or not this stress is cumulatively more severe than that from natural drought, it comes in a different temporal pattern than natural drought would.

The lower Tay (below the outlet from Christie Lake) flows through the Smiths Falls Limestone Plain and is impacted by agriculture and more population. Below Perth, the river spreads out into the extensive Tay Marshes and the historic Tay Canal, eventually flowing into Lower Rideau Lake at Port Elmsley. Along the Tay are important riparian corridors, provincially significant wetlands (Tay Marsh, Port Elmsley wetland) and many hidden indicators of biodiversity.

Table 1: Percentage Land use in the Tay Watershed (from Esseltine 2002)

Section of watershed	Agriculture		**Woodlot**	**Forest cover**	**Wetland**	**Lake**
	Crops	Pasture				
Bobs Lake to Tay River Christie Lake inlet (3628 ha)	0.80%	3.00%	--	69.6% (Shield)	9.40%	11.90%
Christie Lake (3581 ha)	0.8	2.1	0.2	71.4	5.1	19.5
Christie Lake outflow to Glen Tay (5384 ha)	13.4	17.7	5.8	50.1 (Shield + mixed hardwood)	11.3	1.7
Glen Tay to Perth (572 ha)	29.5	25.2	17.3	9.2 (mesic hardwood)	12.9	6
Perth to Beveridge Locks (6899 ha - includes Tay Marsh & Beveridge Marsh)	25.4	21.2	12	9.7 (mesic hardwood)	28.7	2.5
Tay Marsh to Port Elmsley (1236 ha)	28.9	30.4	11.3	11.7 (mixed hardwood)	11.9	5.2

Christie Lake is one of 14 smaller subwatersheds which forms the larger Tay Watershed. While the lake has a surface area of 646 hectares (6.46 km^2), the watershed area is 424 km^2 and the extent of the immediate drainage basin is approximately 67 km^2. The Tay River enters the lake at its west end, and flows out to the northeast. Christie lake possesses a long irregular shoreline of 27.4 km. The area of high biological activity and diversity includes about 35% of the lake area. This largely mesotrophic lake provides warm water habitat for 20 species of fish along with habitat for many amphibians, birds, mammals and invertebrates. While water levels are primarily under the control of Parks Canada through the control of the Bolingbroke Dam, the conservation limits set by the rule curve, provides good protection for the lake ecology. A high turnover of water volume (flushing rate of 2.7 times per year) means that sediments, pollutants and other debris do not accumulate quickly and the effect of nutrient enrichment is lessened. The non-provincially significant wetland (Christie Lake Wetland) definitely influences water quality and levels in the lake. The Christie Lake ANSI ("area of natural or scientific interest") makes a significant contribution to the biodiversity of the area.



Section 2: METHODS

From 23 June-14 August 2009, 40 sites (13 in Christie Lake & 27 along the Tay River; here bounded by red triangles) were sampled for species of snails, Crayfish, and living adults & dead shells of Unionids. Water quality was also monitored by chemical analysis for seven parameters. In order to facilitate the collection of data, detailed maps were constructed by the Lanark Stewardship Council. These are reproduced interspersed among the descriptions of the stations, and are available in *.pdf format at http://pinicola.ca/documents/ and http://www.tayriver.org/

2.1: Methods: Christie Lake survey

Collections of drifted shells from 10 sites on Christie Lake were collected in June and three shoals on Christie Lake were examined by two SCUBA divers in July for further information. A high definition video was made of the area examined by the divers.

2.2: Methods: Tay River stations

Site selection was expedited by the co-operation of landowners along the Tay River. Out of the 27 River sites selected, public bridges accounted for 9 (33%); private bridge points, 2 (7%) while private land or public land access points each accounted for 8, 29.5%, each. Ten sampling sites were also selected around Christie Lake.

Under the guidance of Fred Schueler and Aleta Karstad from Bishops Mills Natural History Centre, a more-or-less detailed description of each river site was recorded. This description included vegetation present in and around the sample area; weather conditions, other conspicuous organisms, as well as the collection of live and dead specimens of clams, snails and crayfish. Live Unionids were measured and photographed and returned to the steam. The progression of this process of recording and photography was assisted daily by the presence of at least three to a maximum of nine volunteers. Shell collections were labeled for sorting and future classification. After the field work was complete, the samples were sorted and labelled for storage in the BNMHC collection. Crayfish have been deposited in the New Brunswick Museum, and mollucs in the Canadian Museum of Nature.

Because we depended on day-to-day volunteers for most of the sampling, and because Unionids are sparse at most stations, we didn't attempt any quantitative protocols, but just measured & counted all the Unionids that were picked up, with a separate search for predator (=Muskrat) shell piles.

Orion did the water chemistry with a Hydrolab Surveyor Model 4, Aleta did computer input for the observations of the volunteers, and had to keep them supplied with bags, do all the photography, and answer many of the questions, while Fred was out searching for the piles of shells left at the Muskrat feeding spots, and turning rocks for Crayfish. At many sites Fred filled out a datasheet independently of the datasheet-like account Aleta and the volunteers composed, and these are merged in the datasheet records.

2.3: Methods: Water chemistry

All water chemistry data (except alkalinity which was determined by titration using a kit) was derived from a calibrated HYDROLAB Surveyor 4 model. We assessed 7 conveniently measured parameters (water temperature, pH, total dissolved solids, conductivity, total alkalinity, dissolved oxygen, % saturation of dissolved oxygen) related to the chances of establishment of Zebra Mussels. Since access was granted to the various reaches of the river without using canoes, the data collection was able to be conducted in 5 days (August 10-14th) in hot humid weather (Table 2).

For comparison, we have data taken by the RVCA on 15 July and 12 August, at four stations, which are close to four of our sites, but are not identical (Table 3).

Total alkalinity includes carbonate-bicarbonate alkalinity and hydroxide alkalinity, expressed as mg/L $CaCO_3$, so it doesn't directly reflect the calcium available to Zebra Mussels. Since we purchased new chemicals (and assumed no deterioration), we did not back-titrate the standard against an alkalinity reagent (that could have been purchased), and we assumed that the values would be adequately calibrated. In fact, they are about 1.5

times the values determined by the RVCA for adjacent sites (see Table 2).

The conductivity and pH values were checked against standards when the equipment was returned to Paul Hamilton at the Museum of Nature. We adjusted the pH values accordingly. The higher alkalinity value is reflected in a higher pH value (118 ppm or mg/L with a pH of 8.9- more hydroxide ; 92-96 ppm values with pH ranging from 7.57-7.81).

2.4: Methods: Curation & data handling

Shells were bagged with labels on cotton-fibre paper, and at all were frozen for at least 48 hours, to kill anything that might crawl between samples, and then were dried thoroughly in newspaper-lined shallow boxes. The samples were sorted to species, entered in the database, and labels laser-printed on cotton-fibre paper. Specimens will be deposited in the collection of the Canadian Museum of Nature.

Crayfish were held alive in an electric cooler, and preserved after arrival home. Unfortunately, some of these ate their labels before they could be preserved...

2.5: Methods: Statistics

In an interregnum between functional statistical packages at the BMNHC, statistics were calculated on the Vassar on-line statistics site, http://faculty.vassar.edu/lowry/VassarStats.html

Section 3: RESULTS

3.1: Results: Site Accounts: these are listed from west (upstream) to east (downstream). Results from previous visits are incorporated when the previous station was within the area which we sampled in 2009.

T1, Tay R at Richies Farm, below Bolingbroke. 31C/15, UTM 18TUE 798.7 572.4 44.76044N 76.51751W.

This site was visited only on 12 August 2009, TIME: 1400-1425. AIR TEMP: 29, sunny, Beaufort light breeze; weather for the past 48 hr was seasonally normal temperatures unseasonably wet. OBSERVER: Frederick W. Schueler, Aleta Karstad Schueler, Orion Clark, Lucy Welch, Drew Lampman. HABITAT: rushing river running from village & fields into Typha marsh.

water chemistry: sampling site at path down to river. T-1 - Water temperature 24.15 C, pH 7.88, Total Dissolved solids 808 ppm, Conductivity 126.5 u S/cm, Alkalinity 92 ppm $CaCO_3$, Dissolved Oxygen 5.82 ppm, percent saturation Oxygen 70.9%

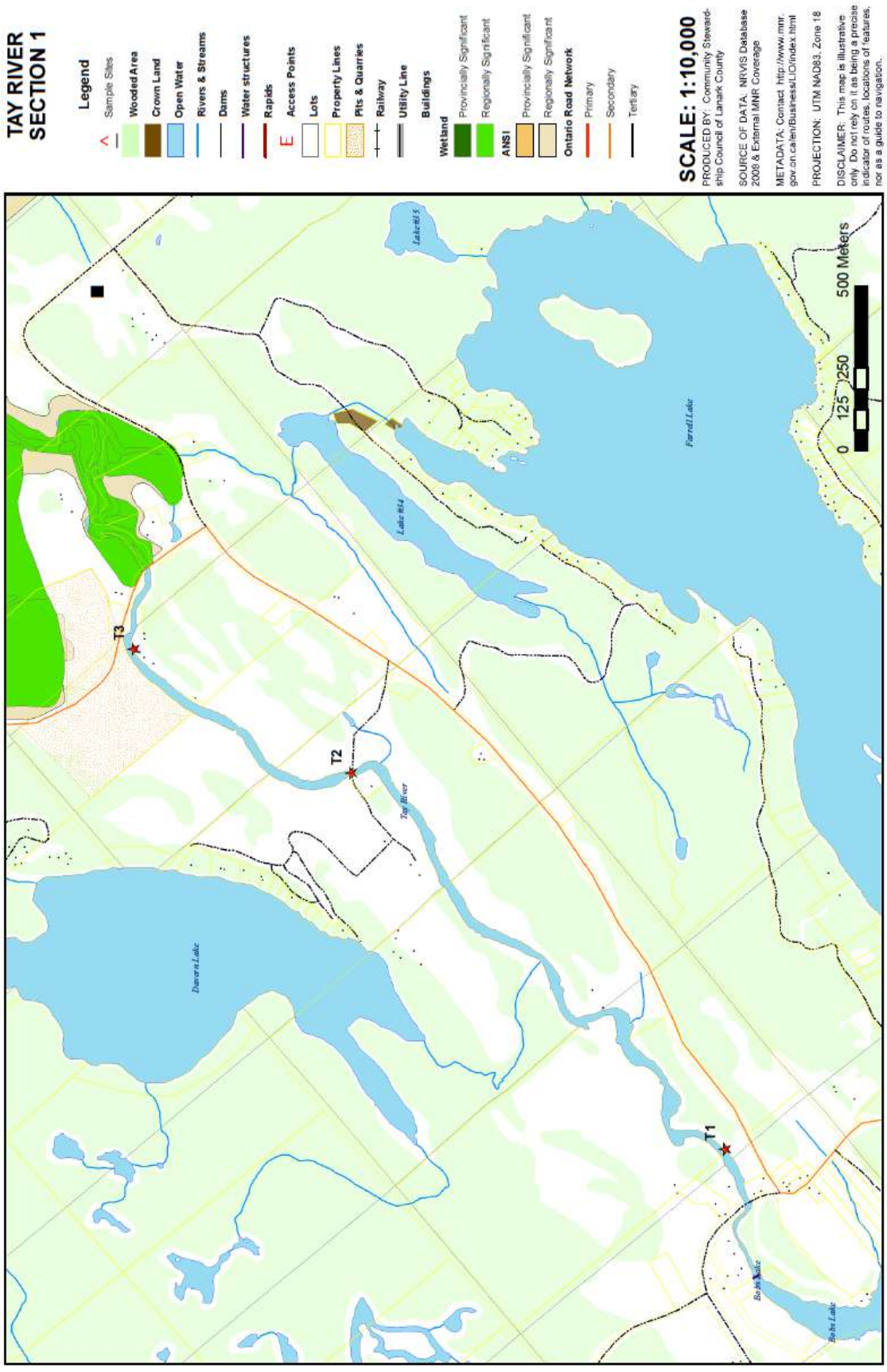
This is the Richie Farm, just below the Bolingbroke Bridge, a traditional right-of-way, down a grassy lane, just NE of the corner where the old school/church historical building is, through private land. The site was in a shallow valley. The terrestrial vegetation was coniferous/deciduous parkland (30% wooded). Human impact on the site was minimal; it's a traditional canoe launch site. Site wetlands were fringing riverine marsh. Dominant wetland plants were: *Typha* (Cattail), coming up from 70 cm depth - not sure if this is flooding or not. Development stage of *Typha* (Cattail) was mature seedheads.

Water at the site was permanent natural river. Water level was very high. The bottom was boulders & cobbles. Water quality was clear. Spaces under rocks were clear of sediment. Water movement was fast. WIDTH: 20 m LENGTH SAMPLED: 150 m MAX. DEPTH: 1.5 m DEPTHS SAMPLED: 0-1 m. Dominant aquatic plants were submerged brush-leaved *Potamogeton* (Pondweed). High water rapid clear stony river through marsh & forest. Orion: "The highest saturation of oxygen of any place we've done so far - the first one that's over 80%." Fred waded some distance downstream, but didn't see & couldn't do, anything in the rushing metre-deep water.

Unionids: Relatively few, but collecting impeded by high water. *Elliptio complanata* (Eastern Elliptio), 16 alive (mean=82.94mm (69 - 95) st. dev. =7.72), 3 very old shells, largest 89.5 mm, with periostracum nearly gone; ***Lampsilis*** (Lamp-Mussel), 2 alive:123, 125 mm; *Alasmidonta marginata* (Elktoe) 1 old 73 mm pair, periostracum nearly gone.

Crayfish: A single cheliped called *Orconectes cf rusticus* (Rusty Crayfish).

Zebra Mussels: none noted.


TAY RIVER
SECTION 1
Legend
Sample Sites
Wooded Area
Crown Land
Open Water
Rivers & Streams
Dams
Water structures
Rapids
Access Points
Lots
Property Lines
Pits & Quarries
Railway
Utility Line
Buildings
Wetland
Provincially Significant
Regionally Significant
ANSI
Provincially Significant
Regionally Significant
Ontario Road Network
Primary
Secondary
Tertiary
SCALE: 1:10,000
PRODUCED BY: Community Stewardship Council of Lanark County
SOURCE OF DATA: NRVIS Database 2008 & External MNR Coverage
METADATA: Contact http://www.mnr.gov.on.ca/en/Business/LIC/index.html
PROJECTION: UTM NAD83, Zone 18
DISCLAIMER: This map is illustrative only. Do not rely on it as being a precise indicator of routes, locations of features, nor as a guide to navigation.
0 125 250 500 Meters
T1
T2
T3
Lake #14
Farrell Lake
Tay River
Davern Lake
Bobs Lake

T2, Tay R at Davern Lane, 1.8 km NE Bolingbroke. 31C/15, UTM 18TUE 810.1 583.7 44.77086N 76.50334W.

This site was visited only on 12 August 2009, TIME: 1235-1330. AIR TEMP: 28 C, sunny, breezy. OBSERVER: Frederick W. Schueler, Aleta Karstad Schueler, Orion Clark, Lucy Welch, Drew Lampman. HABITAT: rocky/sandy river with treed shore through pastures & hayfields.

water chemistry sampling site on S bank just below the bridge. T-2 - Water temperature 25.17 C, pH 8.26, Total Dissolved solids 797 ppm, Conductivity 124.8 u S/cm, Alkalinity 92 ppm $CaCO_3$, Dissolved Oxygen 6.45 ppm, percent saturation Oxygen 80.2% **.**

Land ownership is a disputedly public road allowance, with private land all around. The site was in a valley. Bedrock was granite. Upland substrate was not assessed. The terrestrial vegetation was parkland / grassland (hayfields & pasture). Human impact on the site included recent bridge-building with cobble fill still unstable & pasturing on S side.

There were no wetlands at the site. Water at the site was permanent natural river. Water level was high. The bottom was boulders, cobbles, gravel, coarse sand. Water quality was clear. Spaces under rocks were clear of sediment. Water movement was medium fast 0.25 m/sec:. WIDTH: 15 m LENGTH SAMPLED: 150 m above & below bridge MAX. DEPTH: 1.5 m DEPTHS SAMPLED: 1.5 m, FWS with rock rake, Lucy swimming with goggles. Aquatic plants were nearly absent. Capture was by hand, dipnet, & rock rake. Cover checked included flat rocks & round rocks.

Unionids: Mostly large shells on the bottom, and some of uncertain identity, or with periostracum nearly eroded away, including our only living *Ligumia recta*. *Elliptio complanata* (Eastern Elliptio) 14 alive (mean=77.57mm (65 - 91) st. dev. =7.30) plus 6 fresh-perforate pairs, 1 valve, 1 fragment, largest 90 mm. Shells inflated, and largely bare of periostracum. *Ligumia recta* (Black Sand-Shell), one alive (140 mm), 2 pairs, 2 highly eroded valves, largest 141 mm; **Lampsilis** (Lamp-Mussel), One recently dead:120 mm, 3 F pairs, 1 fragment, 98 mm M pair completely devoid of periostracum; *Lasmigona costata* (Fluted Shell), one alive:112 mm, 3 pairs, largest 112.5 mm, strongly ribbed. *Pyganodon grandis* (Common Floater) two alive: 97.9 mm, slender shell & body, & 83 mm, deep shell & heavy body; 4 shells, 88 mm pair & 3 broken shells.

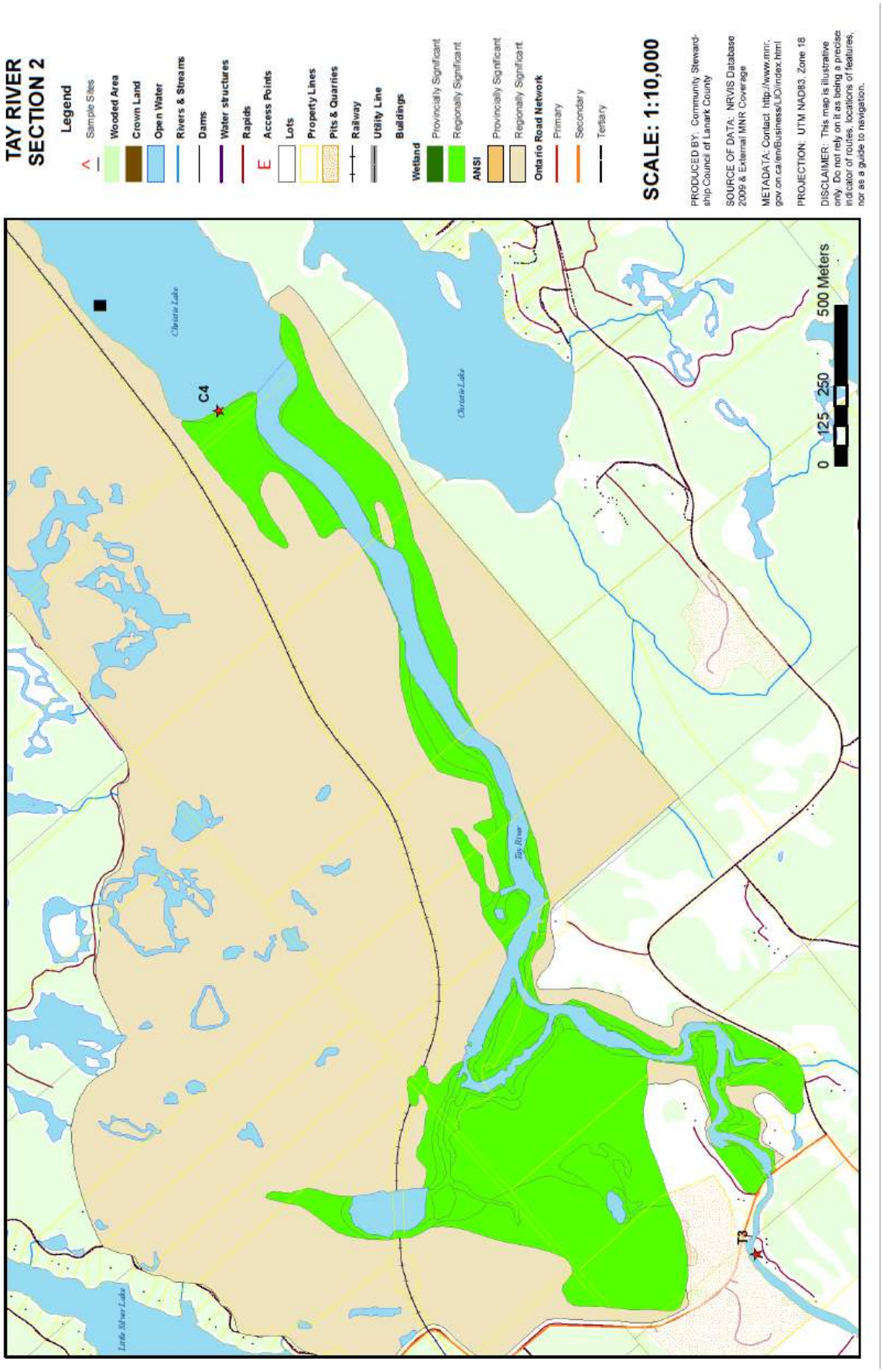
We also found a *Strophitus undulatus* (Squaw-Foot), alive:83 mm, very thin shell & meagre, whispy body, and another *cf Strophitus undulatus* 1 alive:78 mm.

Crayfish: 1 minute *Orconectes* juvenile photographed.

Zebra Mussels: none noted, but high water precluded a search underneath rocks.

Snails: *Viviparus georgianus* (Banded Mystery Snail), 4 adults taken with Unionids, largest 27.5 mm.

Herpetofauna: *Rana clamitans* (Green Frog) big female on shore just above bridge; *Rana pipiens* (Leopard Frog) 2 minute juvenile on shore just SE of bridge. One was 3 cm long, brassy green with pale inner spots. Lots of spots, very round - almost looked like a Wood Frog - light lip line as well, but it was a Leopard Frog. the other was darker green with black spots; *Hyla versicolor* (Tetraploid Gray Treefrog), sporadic hoarse calls; *Pseudacris crucifer* (Spring Peeper) a few bouts of calling.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C4
T3
Christie Lake
Little Silver Lake
Tay River
0 125 250 500 Meters

Other taxa: *Micropterus dolomieui* (Smallmouth Bass). many fingerling juveniles, one ca 30 cm TL ad under bridge as we leave. We didn't pay close attention to other species of fish; *Tamiasciurus hudsonicus* (Red Squirrel), calling heard, a juvenile AOR.

T3, Tay River above Deacon's Bridge, off Co Road 36. UTM 18TUE 813.9 590.3 44.77685N 76.49873W.

This site was visited only on 12 August 2009, TIME: 1146-1425. AIR TEMP: 28, sunny, Beaufort gentle breeze. OBSERVER: Frederick W. Schueler, Aleta Karstad Schueler, Orion Clark, Lucy Welch, Drew Lampman. HABITAT: small rocky/mucky river past farmstead & steep roadside slope.

Water chemistry: sample site right at dock. T-3 - Water temperature 23.63 C, pH 8.29, Total Dissolved solids 816 ppm, Conductivity 127.3 u S/cm, Alkalinity 80 ppm $CaCO_3$, Dissolved Oxygen 6.01 ppm, percent saturation Oxygen 72.5%

Land ownership is private land; Deacons' farm. The site was in a valley. Bedrock was granite. Upland substrate was not assessed. The terrestrial vegetation was parkland (60% wooded). Human impact on the site included farmstead, with road across river.

There were no wetlands at the site. Water at the site was permanent natural small river. Water level was high. The bottom was boulders, sand, & extremely soupy detritus. Water quality was clear. Spaces under rocks were clear of sediment. Water movement was medium, 0.3 m/sec. WIDTH: 12 m LENGTH SAMPLED: 100 m MAX. DEPTH: 1.5 m DEPTHS SAMPLED: 0-1 m. Dominant aquatic plants were strangely purpleish *Vallisneria americana* (Water-celery). Capture was by hand & dipnet.

There were lots of old shells on sand, and evidently eroding out of sand, on the N side of the river. mostly *Elliptio* with a few *Lampsilis* (Lamp-Mussel), under the *Thuja* tree across from the house & lawn.

Unionids: *Elliptio complanata* (Eastern Elliptio) 7 alive (mean=68.29 (54.00 - 80.00) st. dev. =9.51); the predominant species. "As collected" samples: 9 very old pairs, 5 old valves, 4 fragments, largest 80.7 mm, taken by Lucy Welch & Drew Lampman. There were also two preserved that were considered unknown on external criteria; one with highly inflated 60 mm shell, and one highly eroded 94 mm shell, which was an ultimate example of how a Unionid can survive with all its periostracum eroded away: the body was quite full and plump.

A *Lasmigona compressa* (Brook Lasmigona), 1 adult, captured, alive:94 mm, body preserved in isopropyl for DNA study. *Pyganodon grandis* (Common Floater), 2 alive:102 mm, released, 93 mm, preserved, 1 shell, a big old chalky broken pair eroding out of S bank of river.

Lampsilis (Lamp-Mussel) 10 shells mostly big old chalky shells, 2 fairly fresh pairs, all female-like; *Ligumia recta* (Black Sand-Shell) 1 big old chalky broken pair, 122 mm long eroding out of S bank of river.

Muskrat Pile: This was an old inactive shell pile in the water on the N shore under a Thuja, in the sandy bed of small rocky/mucky river past farmstead & steep roadside slope. *Elliptio complanata* (Eastern Elliptio), 8 old pairs, largest 76 mm, ca 16 valves & fragments, *Viviparus georgianus* (Banded Mystery Snail) 13 shells & fragments from old Unionid pile, largest 26.5 mm.


TAY RIVER
SECTION 3
Legend
Sample Sites
Wooded Area
Crown Land
Open Water
Rivers & Streams
Dams
Water structures
Rapids
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Lots
Property Lines
Pits & Quarries
Railway
Utility Line
Buildings
Wetland
Provincially Significant
Regionally Significant
ANSI
Provincially Significant
Regionally Significant
Ontario Road Network
Primary
Secondary
Tertiary
SCALE: 1:10,000
PRODUCED BY: Community Stewardship Council of Lanark County
SOURCE OF DATA: NRVIS Database 2009 & External MNR Coverage
METADATA: Contact http://www.mnr.gov.on.ca/en/Business/LIO/index.html
PROJECTION: UTM NAD83, Zone 18
DISCLAIMER: This map is illustrative only. Do not rely on it as being a precise indicator of routes, locations of features, nor as a guide to navigation.
C13
C5
C6
C12
Christie Lake
0
125
250
500 Meters

Snails: *Campeloma decisum* (Brown Mystery Snail) 11 shells & adults, specimen. in isopropyl, largest 21 mm; *Viviparus georgianus* (Banded Mystery Snail), 10 shells collected, largest 31 mm, abundance not remarked, 27.5 mm ad taken with Unionids. Dry Specimens sent to Eva Pip, Sept 2009.

Crayfish: one adult *Orconectes cf obscurus.*

Hepetofauna: *Rana catesbeiana* (Bull Frog) Large female, ca 130 mm SVL, at water's edge, swallowed a juvenile *Rana pipiens* which made squealing sounds after being swallowed. Green Frogs must also have been here, but there's no written record of them. Three *Chelydra serpentina* (Snapping Turtle) eggs at 1 m depth on shell pile 3 m from shore, 26 mm diameter.

Other taxa: *Micropterus dolomieui* (Smallmouth Bass) 2 large adults noted, others present. There's also *Lepomis* (Sunfish) present, especially where we dragged a large piece of roofing metal out of the river.

Tay R/Co Road 36. 31C/16, UTM 18TUE 816.3 589.9 44.77651N 76.49561W. On 26 July 2001, Frederick W., Aleta Karstad, & Jennifer H. Schueler took *Elliptio complanata* (Eastern Elliptio) 3 specimens, including one alive, and saw scattered shells at >1 m depth, and saw a large adult *Orconectes* Crayfish, either *O. virilis* or *O. rusticus*. In 2006 "high murky water seems too deep for Crayfish Camp survey. . . . but this may have been an unfortunate decision," and on 28 July 2009 "water [was] high and somewhat greenish, too deep right here to sample for macro invertebrates.."

Christie Lake Stations: These are listed from west to east. Except for Camp Opemikon, which is reported from a 2006 visit, shoreline sampling was conducted around the perimeter of Christie Lake at 10 different sites on 23 June 2009. All sites represented accessible (less than 1.3 m water depth and within wading distance) shoreline habitat around the perimeter, starting at a site adjacent to Station Bay. These sites were identified as C1-C10 . The three shoals were examined by SCUBA divers on 25 July 2009. All sites were georeferenced and specimens collected were tagged. All live specimens were photographed and returned to their native habitat.

C02, Christie Lake, adjacent to Station Bay, 1.3 km NW Big I., 44.81301N 76.44183W. HABITAT: lakeshore with gravel, boulders & clay sediment. OBSERVER: Orion Clark. 23 June 2009. **Christie Lake Macroinvertebrate Survey Site #2:** Just past Station Bay, similar vegetation to site #1 (*Vallisneria americana* (Water-celery), *Ceratophyllum demersum* (Common Coontail), *Elodea canadensis* (Canada Waterweed), *Potamogeton richardsonii* (Richardson Pondweed), *Myriophyllum exalbescens* (Northern Water-milfoil), *Potamogeton zosteriformis* (Flat-stemmed Pondweed), *Polygonum amphibium* (Water Smartweed).)

Unionids: *Elliptio complanata* (Eastern Elliptio), 22 shells; 3 pairs, 12 valves, 7 fragments, all old, largest 72.5 mm

Snails: *Viviparus georgianus* (Banded Mystery Snail) . 2 fairly fresh shells, larger 24 mm.

Zebra Mussel: 5 juvenile pairs, largest 17 mm.

Camp Opemikon, McManus Bay, 4.8 km ENE Bolingbroke. UTM 18TUE 838.1 596.6 44.78285N 76.46831W.

This site was visited only on 19 July 2006, TIME: 1445-1552. AIR TEMP: 26, sunny, hazy, calm. HABITAT: clearwater mesotrophic lake at Scout camp, mixed woods on knolly Shield. OBSERVER: Frederick W. Schueler, Aleta Karstad Schueler, Jamie Proctor, Ryan Hawke.

Land ownership is by Scouts Canada. The site was beach on lakeshore in knolly Shield. Bedrock was granitic. Upland substrate was organic soil (at surface). The terrestrial vegetation was coniferous/deciduous forest. Human impact on the site was a 68 yr recreation camp. Site wetlands were not examined, though fringing emergents along the lake may have been a wetland. Dominant plants here were: *Scirpus*, *Sparganium* (Bur-reed) in fruit, Swamp Milkweed, Joepyeweed, few *Lythrum salicaria* (Purple Loosestrife) with considerable Beetle damage.

Water at the site was permanent natural lake. Water level was seasonally normal. The bottom was sand & muck, with areas of old sawdust. Water quality was clear until roiled. Spaces under the few rocks were clear of sediment. Water movement was still with ripples. LENGTH SAMPLED: 100 m DEPTHS SAMPLED: 0-80 cm.

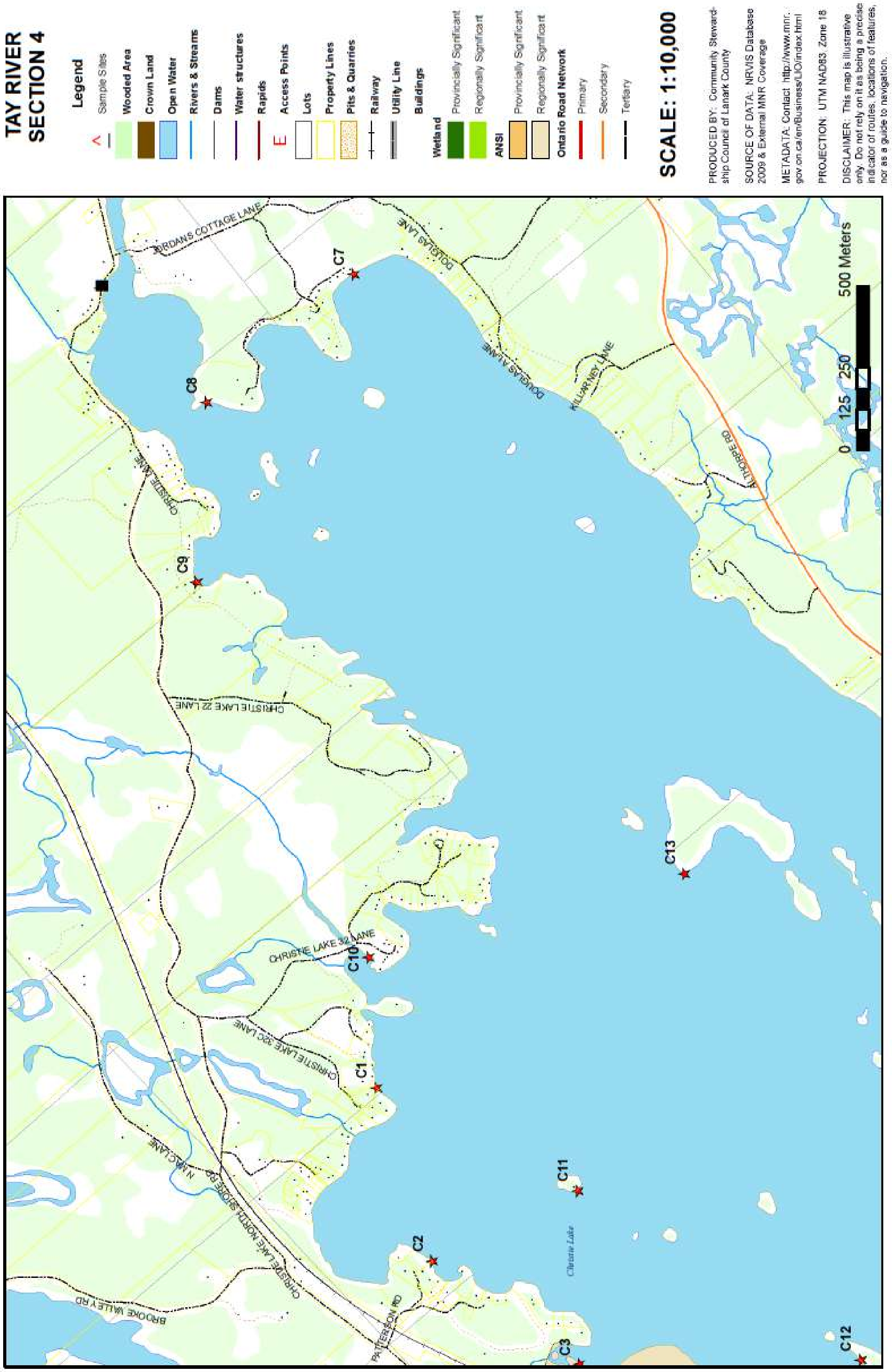
Unionids: *Elliptio complanata* (Eastern Elliptio), 15 shells found along the shore, the largest 78 mm; *Pyganodon grandis* (Common Floater), a 107 mm pair with high-beaked inflated shape & 2 fragments; *Lampsilis radiata* (Eastern Lamp-Mussel), one light elongate eroded broken valve was not saved.

Snails: *Viviparus georgianus* (Banded Mystery Snail), abundant, 8 collected & many seen alive.

Crayfish: Intelligent-looking camp counsellors said they never saw Crayfish here, and one said he'd specifically searched for Crayfish a few days before and hadn't found any.

Hepetofauna: Many juvenile, and one adult female *Rana pipiens* (Leopard Frog) were seen and one *Rana catesbeiana* (Bull Frog) called briefly. A single *Chelydra serpentina* (Snapping Turtle) nest was dug up by a predator behind the bathing beach.

Other taxa: *Gavia immer* (Common Loon) calling briefly. Drift from along untended shore between docks & canoes included a ca 12 cm TL *Lepomis cf macrochirus* (Bluegill),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0 125 250 500 Meters
C1
C2
C3
C7
C8
C9
C10
C11
C12
C13
JORDANS COTTAGE LANE
DOUGLAS LANE
KILLARNEY LANE
CHRISTIE LANE
CHRISTIE LAKE 22 LANE
CHRISTIE LAKE 32 LANE
CHRISTIE LAKE 32C LANE
CHRISTIE LAKE NORTH SHORE RD
BROOKE VALLEY RD
PATTERSON RD
Christie Lake

CS2, Long Island shoal, Christie Lake, 44.79964N 76.45196W HABITAT: shoal with translucent water, considerable debris undergoing decomposition. OBSERVER: Orion Clark, Goef Hall, Jeff King. 25 July 2009, **Christie Shoal Site #2**, sampled by SCUBA, translucent water - considerable debris undergoing decomposition - organic layer - considerable (Videos not available for examination at present)

Unionids: *Elliptio complanata* (Eastern Elliptio), 21 shells, (16 pairs, 5 valves) most old, largest 71.5 mm; 13 alive, photographed & released. *Pyganodon grandis* (Common Floater) 5 pairs, 1 fragment, very inflated, largest 93 mm, beak sculpture ripply; 3 adults captured, photographed & released. *Lampsilis radiata SUBSPECIES:siliquoidea* (Fat Mucket) 1 adult, female-like individual among other Unionids captured, photographed, and released.

Zebra Mussels: 12 juvs, largest 21.5 mm, most smaller, a few on photographed Unionids.

C04, Christie Lake, adj to Tay River inlet, 3.0 km WSW Big I., 44.79240N 76.46583W. HABITAT: lakeshore with silty bottom. OBSERVER: Orion Clark. Christie 23 June 2009, **Christie Lake Macroinvertebrate Survey - Site #4** Vegetation: *Lemna trisulca* (Star Duckweed), *Ceratophyllum demersum* (Common Coontail), abundance of *Elodea canadensis* (Canada Waterweed), Alternate leaved water milfoil, *Potamogeton robbinsii*, *Potamogeton zosteriformis* (Flat-stemmed Pondweed),

Snails: *Viviparus georgianus* (Banded Mystery Snail), 12 fairly fresh shells, largest 30.1 mm. *Helisoma trivolvus* (Larger Eastern Ramshorn), one 18.1 mm shell.

C03, Christie Lake, adj to Minnow Creek, 1.7 km WNW Big I., 44.80733N 76.45231W. HABITAT: lakeshore with thick organic sediment, choked with aquatic vegetation nearby. OBSERVER: Orion Clark. 23 June 2009. **Christie Lake Macroinvertebrate Survey Site #3** Vegetation: *Vallisneria americana* (Water-celery), *Ceratophyllum demersum* (Common Coontail), *Elodea canadensis* (Canada Waterweed), *Potamogeton pusillus*, *Potamogeton richardsonii* (Richardson Pondweed), *Urticularia vulgaris*, *Potamogeton zosteriformis* (Flat-stemmed Pondweed), *Hydrocharis morsus-ranae* (European Frogbit), *Polygonum amphibium* (Water Smartweed), *Nuphar variegatum* (Bullhead-Lily), *Nymphaea odorata* (Fragrant Waterlily).

Snails: *Viviparus georgianus* (Banded Mystery Snail) 7 old shells, largest 30.1 mm. Specimens sent to Eva Pip, Sept 2009.

Fingernail Clams: *Sphaerium cf striatum* one 14.5 mm fresh shell collected.

C01, Christie Lake, adjacent to Station Bay, 1.3 km NW Big I., 44.81301N 76.44183W. HABITAT: lakeshore with silty bottom. OBSERVER: Orion Clark. 23 June 2009. **Christie Lake Macroinvertebrate Survey Site #1** Vegetation: *Vallisneria americana* (Water-celery), *Ceratophyllum demersum* (Common Coontail), *Elodea canadensis* (Canada Waterweed), *Potamogeton richardsonii* (Richardson Pondweed), *Myriophyllum exalbescens* (Northern Water-milfoil), *Potamogeton zosteriformis* (Flat-stemmed Pondweed), *Polygonum amphibium* (Water Smartweed).

Unionids: *Elliptio complanata* (Eastern Elliptio) 5 old to fairly fresh pairs, largest 65 mm

Snails: *Viviparus georgianus* (Banded Mystery Snail) . 1 adult, 21.5 mm, taken alive.

CS1, Round Island shoal, Christie Lake, 1.2 km WNW Big I., 44.80747N 76.44565W . HABITAT: shoal with relatively clear water, near well vegetated island. OBSERVER: Orion Clark, Goef Hall, Jeff King. 25 July 2009 **Christie Shoal Site #1** sampled by SCUBA - since the water was relatively clear (settlement on island - disturbs bottom sediment - assume little siltation; Island - well vegetated - mixed forest.

Unionids: *Elliptio complanata* (Eastern Elliptio) . 21 shells (16 old pairs, 1 taken alive, 4 valves), largest 71 mm, most substantially smaller; 11 taken alive, photographed and released. *Pyganodon grandis* (Common Floater) 1 adult pgotographed and released.

Snails: *Viviparus georgianus* (Banded Mystery Snail), old 28 mm shell.

Zebra Mussels: Fresh 35.1 mm shell, 4 juveniles largest 13.7 mm; plus several on *Elliptio* that were captured, photographed & released.

C10, Christie Lake, Christie Lake Cottages & Marina, 1.2 km NNW Big I., 44.81329N 76.43685W. HABITAT: lakeshore with marina, firm sandy beach with some stones. OBSERVER: Orion Clark, 23 June 2009. **Christie Lake Macroinvertebrate Survey Site #10 -** Badours Creek nearby is choked with vegetation, Vegetation: *Vallisneria americana* (Water-celery), *Ceratophyllum demersum* (Common Coontail), *Potamogeton amplifolius* (Large-leaved Pondweed), *Elodea canadensis* (Canada Waterweed), *Potamogeton pusillus*, Alternate leaved water milfoil, *Myriophyllum exalbescens* (Northern Water-milfoil), *Potamogeton robbinsii*, *Urticularia vulgaris*, *Potamogeton zosteriformis* (Flat-stemmed Pondweed), *Hydrocharis morsus-ranae* (European Frogbit), *Megalondonta beckii*, *Nuphar variegatum* (Bullhead-Lily), *Nymphaea odorata* (Fragrant White Water-lily).

water chemistry: hydrolab. 27.17 C WATER TEMP, pH 8.29, Total Dissolved solids 863 ppm, Conductivity 135.5 u S/cm, ALKALINITY 86 ppm $CaCO_3$, DISSOLVED OXYGEN 6.28 ppm, 80.3% of saturation. (water chemistry was collected at this site on 15 August 2009).

Unionids: *Elliptio complanata* (Eastern Elliptio) . 11 shell, specimen. Christie Lake Macroinvertebrate Survey. 2 pairs, 7 valves, 2 fragments, none fresh, largest 66.6 mm

Snails: *Viviparus georgianus* (Banded Mystery Snail) 7 fairly old shells, 2 fresh or alive, largest 29.75 mm.

C05, Christie Lake, Boys & Girls Camp, 1.9 km WSW Big I., 44.79590N 76.45202W HABITAT: lakeshore with thick silt layer. OBSERVER: Orion Clark, 23 June 2009. **Christie Lake Macroinvertebrate Survey Site #5 -** adj to Christie Lake Camp - Vegetation: *Lemna trisulca* (Star Duckweed), *Vallisneria americana* (Water-celery), *Ceratophyllum demersum* (Common Coontail), *Potamogeton amplifolius* (Large-leaved Pondweed), *Elodea canadensis* (Canada Waterweed), Alternate leaved water milfoil, *Myriophyllum exalbescens* (Northern Water-milfoil), *Myriophyllum spicatum* (Eurasian Watermilfoil), *Potamogeton zosteriformis* (Flat-stemmed Pondweed), *Nymphaea odorata* (Fragrant White Water-lily).

Unionids: *Elliptio complanata* (Eastern Elliptio) 27 shells, 12 pairs, 11 valves, 4 fragments, most very old, largest 77 mm. *Pyganodon grandis* (Common Floater) 2 valves, larger 79.3, beak sculpture ripply/concentric on the smaller. Also a large fragment, that could be a *Lampsilis*.

Snails: *Viviparus georgianus* (Banded Mystery Snail) 29 fairly fresh shells, largest 30.6 mm. Specimens sent to Eva Pip, Sept 2009. *Helisoma campanulatum* (Bell-mouth Ramshorn) 2 old small shells.

C09, Christie Lake, Spring Bay, 1.7 km NNE Big I., 44.81817N 76.42253W. HABITAT: lakeshore with sandy base with thin layer of silt. OBSERVER: Orion Clark, 23 June 2009. **Christie Lake Macroinvertebrate Survey Site #9** - Vegetation: *Vallisneria americana* (Water-celery), *Ceratophyllum demersum* (Common Coontail), *Elodea canadensis* (Canada Waterweed), *Potamogeton pusillus*, *Potamogeton zosteriformis* (Flat-stemmed Pondweed), *Polygonum amphibium* (Water Smartweed), *Nymphaea odorata* (Fragrant White Water-lily).

Unionids: *Elliptio complanata* (Eastern Elliptio) . 12 shell, specimen. Christie Lake Macroinvertebrate Survey. 10 pairs, some fresh, 1 valve, 1 fragment, largest 62 mm

Snails: *Viviparus georgianus* (Banded Mystery Snail), 16 fairly fresh shells, largest 33.6 mm. Specimens sent to Eva Pip, Sept 2009. *Helisoma trivolvus* (Larger Eastern Ramshorn), single 10.2 mm old shell.

Zebra Mussels: 3 juvenile specimens largest 12.9 mm.

C08, Christie Lake, near Ottawa Pt, 2.0 km NE Big I., 44.81801N 76.41562W. HABITAT: lakeshore with firm base of sand and gravel with few stones. OBSERVER: Orion Clark, 23 June 2009. **Christie Lake Macroinvertebrate Survey Site #8** - Vegetation: *Scirpus* hardstem bulrushes, *Potamogeton zosteriformis* (Flat-stemmed Pondweed), *Ceratophyllum demersum* (Common Coontail), *Potamogeton pusillus*, Alternate leaved water milfoil, *Potamogeton richardsonii* (Richardson Pondweed), *Myriophyllum exalbescens* (Northern Water-milfoil).

Unionids: *Elliptio complanata* (Eastern Elliptio) 4 pairs, 2 valves, all old, largest 66 mm. *Pyganodon grandis* (Common Floater) one fairly fresh 64.3 mm pair, with ripply beak sculpture.

Snails: *Viviparus georgianus* (Banded Mystery Snail), 10 fairly fresh shells, largest 28.3 mm. *Helisoma campanulatum* (Bell-mouth Ramshorn) 2 maturing shells, larger 14 mm

CS3, Big Island shoal, Christie Lake, 0.2 km WNW neck of Big I., 44.80469N 76.43340W . HABITAT: shoal with translucent water, considerable debris undergoing decomposition. OBSERVER: Orion Clark, Goef Hall, Jeff King.25 July 2009. **Christie Shoal Site #3** sampled by SCUBA - translucent water - considerable debris undergoing decomposition - organic layer - considerable (Videos not available for examination at present)

Unionids: *Elliptio complanata* (Eastern Elliptio), 5 old broken up pairs, largest 68 mm; 13 taken alive, photographed & released. *Pyganodon grandis* (Common Floater)a broken pair, beak sculpture eroded away, and one taken alive, photographed & released.

Zebra Mussels:1 juvenile specimen, more on photographed Unionids.

C07, Christie Lake, Alan Jordan's farm, 2.0 km NE Big I., 44.81403N 76.41059W. HABITAT: lakeshore with firm sandy beach. OBSERVER: Orion Clark, 23 June 2009. **Christie Lake Macroinvertebrate Survey Site #7** - beach from which live clams were harvested and photographed, no record of distinctive vegetation from harvest site. Detritus picked up with sample included *Thuja occidentalis* (Eastern White Cedar) 5 cones, *Tsuga canadensis* (Hemlock) 1 cone, *Quercus borealis* (Red Oak) 1 acorn. Also a couple of woody bits. . .

Unionids: *Elliptio complanata* (Eastern Elliptio) 4 old & fresh pairs, 2 old fragments, largest 61.9 mm; plus 6 captured, photographed, and released.

Snails: *Viviparus georgianus* (Banded Mystery Snail) 30 fresh & old shells, largest 28.7 mm. Specimens sent to Eva Pip, Sept 2009.

C06, Christie Lake, across from McManus Point, 2.1 km SW Big I., 44.79076N 76.45067W. HABITAT: lakeshore with firm base of sand & gravel, few stones. OBSERVER: Orion Clark, 23 June 2009. **Christie Lake Macroinvertebrate Survey Site #6** - Vegetation: *Lemna trisulca* (Star Duckweed), *Ceratophyllum demersum* (Common Coontail), *Elodea canadensis* (Canada Waterweed), Alternate leaved water milfoil, *Myriophyllum spicatum* (Eurasian Watermilfoil), *Potamogeton zosteriformis* (Flat-stemmed Pondweed).

Unionids: *Elliptio complanata* (Eastern Elliptio) . 12 shells, 1 pair, 9 valves, 2 fragments, all old, largest 69.2 mm

Snails: *Viviparus georgianus* (Banded Mystery Snail), 8 fairly fresh shells, largest 26.7 mm

Resume Tay River stations:

T4, Tay River below Jordan's Bridge, 4.2 km SW Dewitt Corners. 31C/16, UTM 18TUE 888.2 638 44.82098N 76.40588W.

This site was visited only on 13 August 2009, TIME: 0930-1056. AIR TEMP: 24, sunny, calm. HABITAT: floating dock on slow weedy swampy-shores, muck-bed river. OBSERVER: Frederick W. Schueler, Aleta Karstad Schueler, Orion Clark, Chris Stone, Nick Mulder.

The dock is about 3 metres from shore, tethered by a rope, and wading to it our legs were half buried in muck ("silt" they call it). There are Cattails and Dogwood, and Royal Fern, Sweetgale with rafts of Pickerel Weed, and a few White Water Lilies. The bottom has *Vallisineria* (in bloom) and Coontail, *Myriophyllum* (Water Milfoil), narrower Pondweed, *Potamogeton cf richardsonii* (Richardson Pondweed) in bloom. The river is about 100 metres wide here, and slow, and mid-channel, it is at least 6 feet deep, according to Chris. Logs and wood waste on the bottom.

Fred waded about 250m upstream along a *Myrica gale*, Grass, and *Typha angustifolia* shore over a mucky bottom, noting large plants of *Spirodela polyrhiza* (Greater Duckweed), the only Duckweed here, and one ca 40mm *Pyganodon grandis* shell, the only Unionid seen along this shore.

One *Pyganodon* (Floater) shell, with both valves intact, found by Fred on the surface of the silt near the dock. After he got back from upstream, Fred found some live *Elliptio* by "gunging" with the smelt net in the muck near the dock.

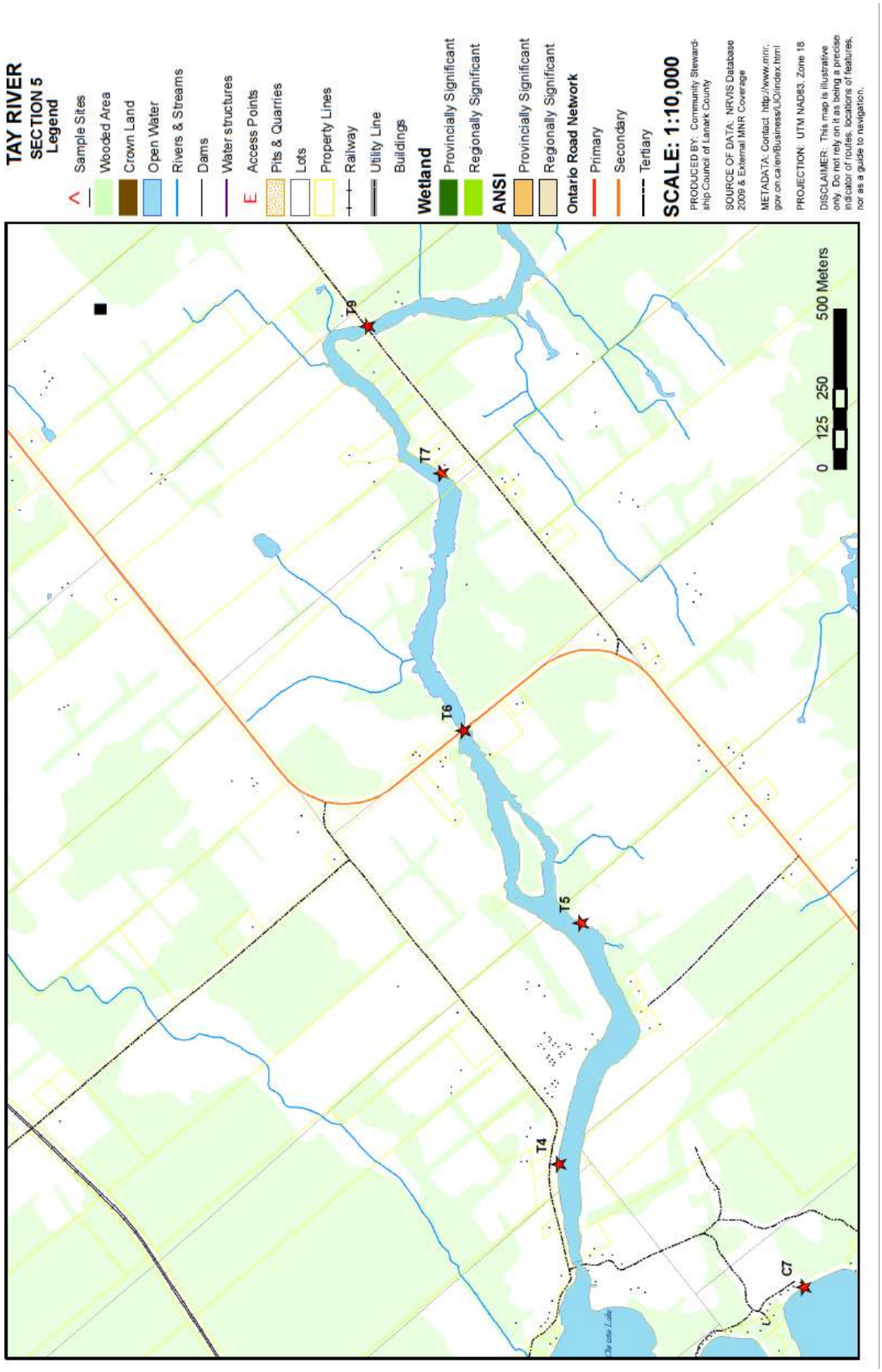
water chemistry: hydrolab. sample site at floating dock at waypoint. Water temperature 28.16 C, pH 8.24, Total Dissolved solids 862 ppm, Conductivity 134.8 u S/cm, Alkalinity 80 ppm $CaCO_3$, Dissolved Oxygen 5.93 ppm, percent saturation Oxygen 77.1%

Unionids: *Elliptio complanata* (Eastern Elliptio) Eight alive (mean=62.13 mm (42 - 75) st.dev.=11.1), pair 74.7 mm. *Pyganodon grandis* (Common Floater) One alive:62 mm, broken pair>82 mm, very thin, beak sculpture eroded.

Offshore from the Muskrat shell pile, about 250m upstream of the site, in 1 m depth, clear rock/cobble bottom of slow swampy-shore river, Fred found quite a striking change in the character of the bottom and of the Unionid fauna -- though later finding *Elliptio* in muck downstream tempers this difference somewhat. *Elliptio complanata,* a few alive, and 8 old pairs & 2 fragments, largest 79 mm. *Pyganodon grandis,* 1 adult, ca 85 mm alive, *Lasmigona costata* 1 old strongly ribbed 124.5 mm shell. Also, *cf Lampsilis*, an old worn fragment.

Muskrat shell pile: the only shell pile found was on a gravel/rock dock berm in swampy-shores of muck/sandy-gravel bed river, about 250m upstream of the site. *Elliptio complanata,* 22 pairs, 4 valves, 6 fragments, largest 79.2 mm. *Lampsilis radiata SUBSPECIES: siliquoidea,* two, 69.5 mm & 46.5 mm male-like pairs. *Dreissena polymorpha,* 15.3 mm pair.; *Viviparus georgianus* 22.4 mm shell picked up with Unionids.

Crayfish: *Orconectes virilis* (Northern Crayfish). 1 adult, seen. large individual seen swimming away, about 150m upstream from the site.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0 125 250 500 Meters
T9
T7
T6
T5
T4
C7

Snails: *Viviparus georgianus* (Banded Mystery Snail), abundant, 15 taken, largest 28 mm. *Campeloma decisum* (Brown Mystery Snail) 1 28mm adult, dipnetted. -- about 250m upstream of site *Viviparus georgianus* (Mollusca). abundant adult, shell, specimen. abundant on bottom.

Zebra Mussels: Eleven juveniles taken around the site, the largest 22.5 mm, most much smaller. About 250m upstream of site 20 were taken on rocks on the bottom, largest 25.5 mm.

Herpetofauna: *Rana clamitans* (Green Frog), 1 call, heard. *Hyla versicolor* (Tetraploid Gray Treefrog) , a few calls. About 250m upstream of the site, one *Rana catesbeiana* (Bull Frog), female, ca 110 mm SVL, on shore.

T5, Tay R at #438 Althorpe Rd (Pauline Clark's). UTM 18TUE 895.8 637.3 44.82046N 76.39631W.

This site was visited only on 12 August 2009, TIME: 0943-1038. AIR TEMP: 24, sunny, Beaufort gentle breeze. HABITAT: slow sandy river between lawn & swampy Red Maple shores. OBSERVER: Frederick W. Schueler, Aleta Karstad Schueler, Orion Clark, Lucy Welch, Drew Lampman, Pauline Clark.

The site was in a shallow valley. Upland substrate was not assessed. The terrestrial vegetation was a vast lawn. DOMINANT SPECIES: *Ulmus americana* (White Elm), lawn Grasses. This house has lawns down to the waters edge, on south shore - no other houses to be seen.

Site wetlands were fringing natural riverine treed swamp marsh on far shore (not visited). Dominant wetland plants were: *Pontedaria*, *Acer rubrum* (Red Maple), & bushes. NO:Typha were present. Water at the site was permanent natural slow river. Water level was high. The bottom was granite bedrock sand muck. Water quality was clear. Spaces under rocks were clear of sediment. Water movement was slow. WIDTH: 40 m LENGTH SAMPLED: 150 m, MAX. DEPTH: >1 m DEPTHS SAMPLED: 0-1 m. Dominant aquatic plants were mixed species. Capture was by hand & dipnet. Cover checked included round rocks.

The lady of the house says the turtles come up in the morning from the river to the house, to lay in the field and near the house, digging holes, oblivious to observers and even mowing. Observed Painted and Snappers, but has not identified a Blandings Turtle yet.

She asks Fred why the mature *Ulmus americana* (White Elm) at the waters edge is dying, he says Dutch Elm Disease. She has had Butternuts dying of canker as well. Fred collected a bag of shells from a Muskrat pile under a riverbank tree.

water chemistry: sample site at dock. T-5 - Water temperature 22.84 C, pH 7.13, Total Dissolved solids 868 ppm, Conductivity 135.3 u S/cm, Alkalinity 76 ppm $CaCO_3$, Dissolved Oxygen 5.31 ppm, percent saturation Oxygen 63.5%

Unionids: Only *Elliptio complanata* (Eastern Elliptio) was found. Thirty alive (mean=54.47 mm (30 - 70) st. dev. =9.29) plus 34 shells mostly quite fresh: 25 pairs collected, 1 63.5 mm alive, 8 valves, largest 88 mm.

Muskrat shell pile: from ca 50 m downstream of waypoint, *Elliptio complanata* (Eastern Elliptio), 164 pairs, 18 valves, largest 77 mm. Scattered up on the rocks along shore. *Lampsilis* (Lamp-Mussel), 57.5 & 72.7 mm elongate male pairs and *Pyganodon grandis* (Common Floater) , 78 mm valve & 4 fragments. Beak sculpture

eroded away. Five *Viviparus georgianus* (Banded Mystery Snail) shells, and 2 *Sphaerium* (Fingernail Clam) valves also included in sample.

Snails: *Campeloma decisum* (Brown Mystery Snail), 1 shell, 20.6 mm, taken with Unionids. *Viviparus georgianus* (Banded Mystery Snail) 14 adults & shells, largest 30.3 mm, taken with Unionids. Specimens sent to Eva Pip, Sept 2009.

Crayfish: A few shed *Orconectes* skins, none seen alive.

Fingernail clams: *Sphaerium simile,* 4 valves taken with Unionids

Zebra Mussels: Juveniles 18, 17 & 12 mm, taken with Unionids.

Herpetofauna: Pauline Clark had a *Sternotherus odoratus* (Stinkpot) shell, 90 mm PL, found on shore here ca 4 years ago. Specimen presented to the BMNHC.

Rana clamitans (Green Frog), a few juvs along shore; *Rana catesbeiana* (Bull Frog) a large adult along shore. *Hyla versicolor* (Tetraploid Gray Treefrog) one heard calling from swampy N shore of river. Three Turtle eggs found in water, 2 preserved in alcohol, 1 dried.

T6, Tay R/Co Road 6, Schoolhouse Bridge. UTM 18TUE 901.8 641 44.82386N 76.38878W.

There have been several previous visits to this site, beginning in 1998. This year's survey was on 11 August, TIME: 1534-1627. AIR TEMP: 27, sunny, breezy. HABITAT: High water, rocky clear river with marshy shores and mixed forest banks. Trees overhanging banks on downstream side. OBSERVER: Frederick W. Schueler, Aleta Karstad Schueler, Orion Clark, Macroinvertebrate Volunteers.

All that was recorded at the time was “Air 27 C 16h35, 2 m height on bridge abutment in shade... Small Dragonfly nymph noted. . . Golf ball removed from sample.” The datasheet was numbered, but it wasn't filled in.

On 23 August 1996, **Chara** (Stonewort) was abundant, plants at edge of main current. Most aquatic vegetation here is beds of *Elodea* and *Potamogeton*.

The best description of the site is from 19 July 2006 for the Crayfish Camp, when we characterized this as “the final station of the day -- as broad an expanse of rocks under clear water as one could well imagine, ranging from drifts of bowling-ball-like boulders grading down into gravel and then sand, to flat bedrock with isolated clumps of rocks. There was a peculiar pinkish form of what seems to be *Vallisneria* growing in cracks of the rocks, and a few other clumps of current-swept vegetation. The current was spread out over so large a cross-section that it wasn't too strong. We turned rocks, and had the active assistance of *Micropterus dolomieui* (Smallmouth Bass) in corralling *Orconectes propinquus* -like Crayfish into our grasp or nets (the Bass took a 25% finders fee).

On 13 August 2009 when Aleta undertook an oil painting from under the bridge span, looking S & upstream, the roadside shoulders were seething with nymphal Grasshoppers. Water was slightly higher than at the

previous visit. Aleta painted a scene upstream along a shore with emergents and *Decodon*, while the south shore below the bridge was a wall of chlorophyll: *Tsuga* among *Tilia*, with some *Acer saccharum* (Sugar Maple) and *Acer rubrum* (Red Maple), and some smaller trees along the water.

water chemistry: sample site at NE corner of bridge. T-6 - Water temperature 25.87 C, pH 8.43, Total Dissolved solids 858 ppm, Conductivity 134.5 u S/cm, Alkalinity 88 ppm $CaCO_3$, Dissolved Oxygen 6.67 ppm, percent saturation Oxygen 83.6%

Unionids: *Elliptio complanata* (Eastern Elliptio), on 11 August there were 49 alive, 38 of them without adherent Zebra Mussels mean=74.18 (48 - 89) st. dev. =10.3, and 11 (22%) with Zebras mean=70.27 (34 - 88) st. dev. =14.52. Shells quite inflated. One recently broken with dried body in anterior part of shell, 25 pairs, 2 valves, 3 fragments, largest 76.3 mm, many very extensively eroded.

Other species were *Lasmigona costata* (Fluted Shell), one alive:109 mm, and an old 110.5 mm shell; *Lampsilis* (Lamp-Mussel), a 100 mm male shell, and doubtful fragments.

Species composition has been quite consistent here through three samples. The first Unionid collection was on 23 August 1996. Twenty-seven *Elliptio complanata* (Eastern Elliptio) were taken, including 10 alive, 13 pairs, 4 valves, largest 92 mm. There were 20/sq m in places below bridge, in soil-like sediment between the strong main current and the deep-drifted loose muck of a marshy backwater NE of the bridge. In the strong current the clams were just scattered among the rocks. *Lasmigona costata* (Fluted Shell), 1 alive, 1 pair, larger 120 mm; a distorted specimen seen alive was alive was probably this species. *Lampsilis radiata SUBSPECIES:siliquoidea* (Fat Mucket). 2 old female pairs, larger 64 mm.

On 19 July 2006 the one striking Unionid was a very deeply corrugated 100 mm *Lasmigona costata* (Fluted Shell), standing vertically among the rocks. Other Unionids were *Elliptio complanata* (Eastern Elliptio), heavy, heavy-tooth shells 2 fresh, 1 old pairs, lgst (old) 84 mm, and **Pyganodon** (Floater) one ca 75 mm alive, very inflated shape, similar 55 mm pair collected with green markings parallel to growth lines.

Muskrat shell pile: On 11 August Fred went downstream, 0.1 km ENE of the site, 44.82430N 76.38780W, muddy shore of fast deep clear granite-boulder/ gravel/ muck river under overhanging Soft Maple trees. The pile contained 81 *Elliptio complanata* (Eastern Elliptio), 22 pairs, 24 valves, 35 very worn fragments, largest 89 mm. *Lampsilis* (Lamp-Mussel), 5 shells, 3 pairs, 2 valves, largest 70 mm; *Lasmigona costata* (Fluted Shell), 1 fairly old 105 mm pair; *Pyganodon grandis* (Common Floater) a heavy, inflated, 110 mm pair; *Strophitus undulatus* (Squaw-Foot) , a 76 mm pair. Also a a few Sphaeriidae shells, 8 broken *Viviparus georgianus* (Banded Mystery Snail) shells (Specimens sent to Eva Pip, Sept 2009), *Campeloma decisum* (Brown Mystery Snail), 2 small shells, 1 large fragment, *Dreissena polymorpha* (Zebra Mussel) 4 pairs, largest 19.5 mm, taken with Unionid shells.

Crayfish: *Orconectes* have been observed here since 1996, and in 2006 they were called "*Orconectes cf propinquus*," which is what is suggested by the 2009 samples which have rostral carina but no black abdominal bands.

Snails: *Viviparus georgianus* (Banded Mystery Snail) 18 adults taken, the largest a 34.2 mm old shell; on 23 August 1996 this species was abundant all over the bottom. *Campeloma decisum* (Brown Mystery Snail), 19 & 22.5 mm shells; *Helisoma trivolvus* (Larger Eastern Ramshorn), a fresh maturing 17.3 mm shell; *Helisoma campanulatum* (Bell-mouth Ramshorn), a fresh mature 15.7 mm shell.

Zebra Mussels: None seen in 2006 or previously, in 2009 Thirty-two were collected, the largest 25.5 mm, and more were seen here than in other places along the Tay, but they're still very scattered and not covering an estimateable portion of the bottom. Eleven measured that were attached to living *Elliptio* averaged 12.55mm (8 - 24) st.dev.=4.23.

Herpetofauna: On 11 August 2009, a *Nerodia sipedon* (Northern Water Snake), ca 60 cm TL, was swimming right across the strong current downstream of the bridge, and a *Chelydra serpentina* (Snapping Turtle) egg was found lying on algae on the bottom.

On 23 August 1996 many juvenile *Rana pipiens* (Leopard Frog) and 1 juvenile *Rana clamitans* were seen.on shore, with a big female *Thamnophis sirtalis* (Common Garter Snake) DOR and crushed.

On 28 July 2009 there were lots of predator-opened Turtle nests & digging, mostly SW of the bridge, but some in all quadrats, presenting a very dug-up scene. Both *Chelydra serpentina* (Snapping Turtle) and *Chrysemys picta* (Painted Turtle) eggs were identifiable among the opened nests.

Hyla versicolor (Tetraploid Gray Treefrog) was calling sporadically through the visit on 13 August 2009, 17h10-18h42., and sporadic single calls of *Rana clamitans* (Green Frog) were heard, and a big female was seen on shore NE of bridge.

Other taxa: Two nests of *Sayornis phoebe* (Eastern Phoebe) were seen under the bridge on 11 August; one of them not as fresh as the other.

Micropterus dolomieui (Smallmouth Bass) are the most conspicuous animal at all visits, on 23 August 1996, these were abundant, 15-25 cm, crowding around whenever the bottom was disturbed; one large *Micropterus salmoides* (Largemouth Bass) was seen, and there were many *Lepomis* (Sunfish).

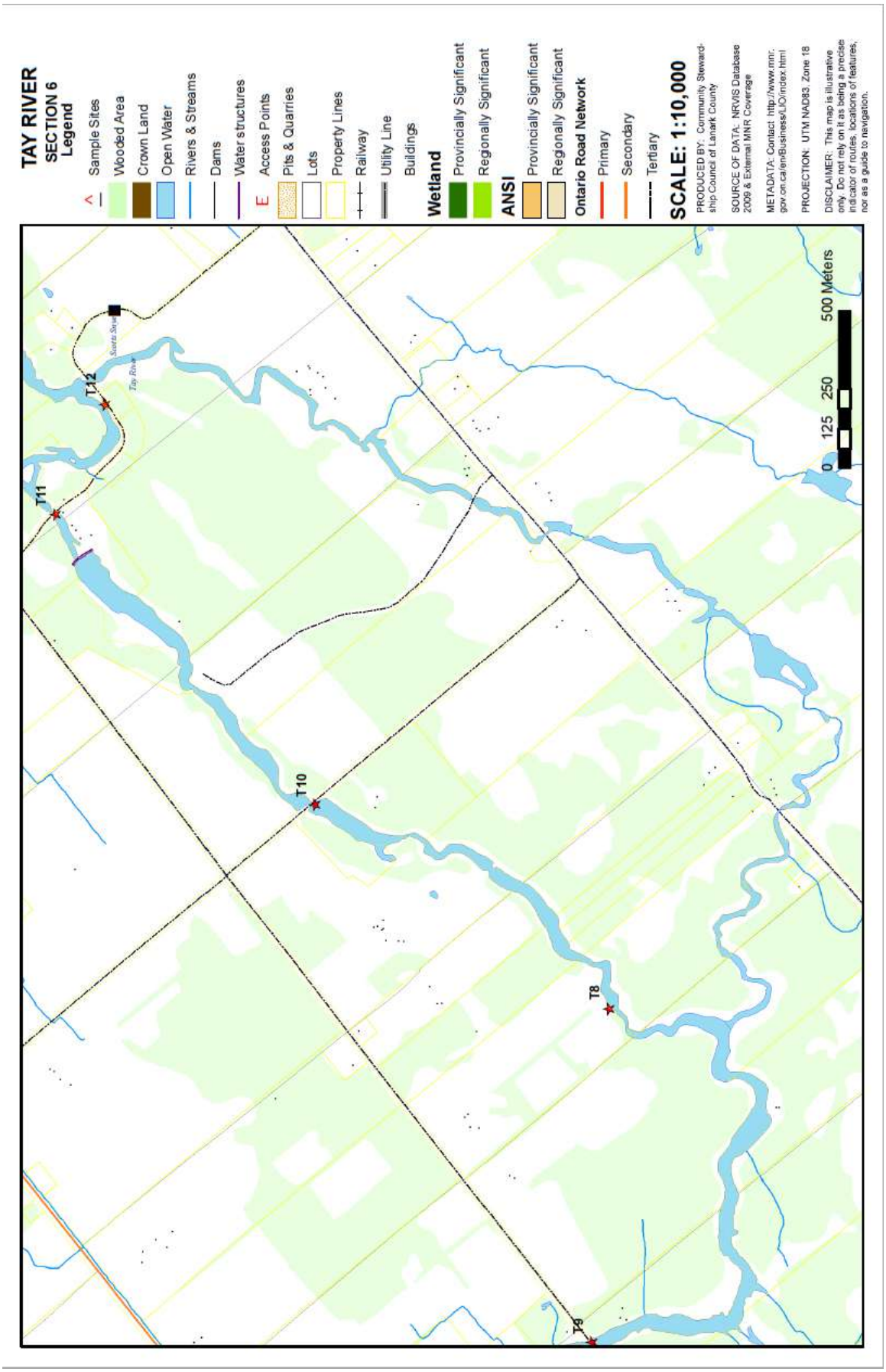
On 13 August an *Ondatra zibethicus* (Muskrat) was seen swimming with mouthfulls of vegetation upstream of the bridge, and there was a constant stream of cut-off macrophyte parts coming down the river in the main current.

T7, Tay R at #2522 2nd Conc. Bathurst (Chris Stone's)

. 31C/16, UTM 18TUE 909.8 641.7 44.82461N 76.37861W.

This site was sampled only on 11 August 2009, after lunch, TIME: 1311-1430. AIR TEMP: 27, cloudy, calm. HABITAT: broad shallow sand-bed river past lawn residence & swampy woods. OBSERVER: Frederick W. Schueler, Aleta Karstad Schueler, Orion Clark, Chris Stone, Macroinvertebrate Volunteers.

This is the river past Chris Stone's house, with a lawn coming down towards the water and lots of Pickerel Weed, all along the far bank, a small amount of Purple Loosestrife behind, and White Water Lilies.


TAY RIVER
SECTION 6
Legend
Sample Sites
Wooded Area
Crown Land
Open Water
Rivers & Streams
Dams
Water structures
Access Points
Pits & Quarries
Lots
Property Lines
Railway
Utility Line
Buildings
Wetland
Provincially Significant
Regionally Significant
ANSI
Provincially Significant
Regionally Significant
Ontario Road Network
Primary
Secondary
Tertiary
SCALE: 1:10,000
PRODUCED BY: Community Stewardship Council of Lanark County
SOURCE OF DATA: NRVIS Database 2009 & External MNR Coverage
METADATA: Contact http://www.mnr.gov.on.ca/en/Business/LIO/index.html
PROJECTION: UTM NAD83, Zone 18
DISCLAIMER: This map is illustrative only. Do not rely on it as being a precise indicator of routes, locations of features, nor as a guide to navigation.
0 125 250 500 Meters
T12
T11
T10
T8
T9

Water chemistry: hydrolab. sample site near dock. T-7 - Water temperature 24.57 C, pH 7.25, Total Dissolved solids 887 ppm, Conductivity 138.5 u S/cm, Alkalinity 92 ppm $CaCO_3$, Dissolved Oxygen 5.49 ppm, percent saturation Oxygen 67.1%

Unionids: *Elliptio complanata* (Eastern Elliptio), 19 alive (mean=62.16 mm (31 - 71) st. dev. =8.71) + 30 shells, shells all along shore, scattered on bottom, largest 85 mm. About 20% of the shells were quite fresh, and none were highly eroded.

Other species were *Lampsilis* (Lamp-Mussel), 2 alive, 54 & 100 mm; 3 shells, male-like 71 mm pair & 78 mm valve; old female 59 mm valve. *Lasmigona costata* (Fluted Shell) one alive:100 mm; *Pyganodon grandis* (Common Floater) a fragile broken up pair.

Snails: *Viviparus georgianus* (Banded Mystery Snail) captured all along shore, alive:18 mm, 10 shells & juveniles taken, largest 25 mm. *Lymnaea stagnalis* (Great Pond Snail), 1 adult, captured, 35 mm; *Helisoma campanulatum* (Bell-mouth Ramshorn) old 11.5 mm maturing shell taken; *Helisoma trivolvus* (Larger Eastern Ramshorn) a 15.3 mm maturing shell taken.

Muskrat shell pile: The only Unionid in the pile was *Elliptio complanata* (Eastern Elliptio), 92 pairs, 41 valves, largest 82 mm. *Viviparus georgianus* (Banded Mystery Snail), 10 beaten-up shells taken with *Elliptio* shells, along with some bark chips.

Crayfish: Orconectes, dead fragments taken with Unionid shells and 3 with carina both constricted & carinate, which would seem to be rusticus x propinquus on the basis of the rostra.

Zebra Mussels: Fair numbers of small ones scattered on rocks & shells. 5 taken, largest 19.5 mm.

Herpetofauna: *Rana clamitans* (Green Frog) several juveniles along shore; *Rana pipiens* (Leopard Frog), 1 juvenile seen on lawn. *Pseudacris crucifer* (Spring Peeper) 1 heard calling from swampy woods; *Thamnophis sirtalis* (Common Garter Snake) (herp). 1 juvenile or neonate on lawnside grass. *Chelydra serpentina* (Snapping Turtle), 1 sunken egg with nodules of greenish algae on it. Controversy surrounded 3 eggs exposed in a little cavity under flag of path at water's edge, 27.2 x 14.4 mm, shell hard, not leathery.

Other taxa: *Micropterus dolomieui* (Smallmouth Bass), common, 1, ca 30 cm TL, noted approaching a crayfish.

T8, Tay R at Bolger's farm (2nd Conc. Bathurst). 31C/16, UTM 18TUE 925 643.5 44.82644N 76.35945W.

This site was sampled only on 12 August 2009, after an abortive visit on 11 August when some members of the party were deterred by distant thunder, and we retreated without sampling.

12 August 2009 TIME: 1502-1604. AIR TEMP: 28.5, sunny, breezy. HABITAT: rocky Beaver-influenced clearwater river in Thuja/mixed woods. OBSERVER: Frederick W. Schueler, Aleta Karstad Schueler, Orion Clark, Lucy Welch, Drew Lampman.

We drove down a long forested lane, parked about 100 m from the river, and walked into a field access, taking the mowed hayfield down to the river. We beat a path through the rank vegetation along the shore to access the

river where there are a few emergent granite boulders, but Aleta went upstream a little to the shade of Birch and the Cedar that overhangs the river, to find an office for the notebook computer.

Land ownership is private (Bolger's farm). The site was in/on a shallow valley. Bedrock was granite. Upland substrate was not assessed. The terrestrial vegetation was *Thuja* -lined woods along river; hayfields inland. Human impact on the site included current haying and streamside-chair recreation.

Wetland plants were *Ponterderia* in muck downstream. Water at the site was permanent natural Beaver-influenced river. Water level was high. The bottom was bedrock, boulders, cobbles, gravel, sand, loose detritus/peat/muck. Water quality was clear. Spaces under rocks were clear of sediment. Water movement was fast. WIDTH: 15-30 m LENGTH SAMPLED: 200 m MAX. DEPTH: 70 cm DEPTHS SAMPLED: 0-70 cm. Dominant aquatic plants were submerged filiamentous algae. Capture was by hand & dipnet. Cover checked included flat & round rocks.

“Lucy and Drew came to sit on the rocks by the shore, where my office is in the shade, and spread out their clams on the flat granite rocks. The only clam found alive is a *Lasmigona costata* (Fluted Shell) of 100 mm, which Drew found in the muck near where they entered the river, downstream several metres from my Cedar forest office. He said that it was deeply buried, and hard to extract. PHOTO. I also took a PHOTO of a shell of one bearing a thin, minutely spongy encrustation of something orange, in overlapping colonies of about 6 or 7 mm in diameter. It was near the margin of the shell. Collected into a ziplock with some water. The pile they brought back contains several *Elliptio* and parts of at least four other *Lasmigona* costata. The only crayfish they found were part of a shed skin and a single large claw.

“Just where I am, the river narrows in a riffle, and then where Orion took his water chemistry, it widens out on both banks into little marshy backwater bays.

15h35: Fred just brought back a sample from a shell pile just across the river in a backwater behind a ledge, that was a whole lot of beaver-modified sticks and cut green branches. A lot of the shells were in shallow water, so probably a Beaver pile. Includes *Strophitus* and *Ligumia recta* (Black Sand-Shell). He'd gone downstream to the ledge below this current riffle without seeing anything but *Elliptio.* There's a bed down there, on this side, that's very soft organic muck. It might have *Pyganodon/Utterbackia*, semi-floating unionids, and he would have made a mess of that if he'd had the wire net - very low density muck. “

15h40: Fred was going out towards the riffle to turn some stones for crayfish, and said "Aha!" Reached into the water and came up with a shell of *Lampsilis radiata silliquoidea*. Fred caught one *Orconectes* - and then a couple more, in a shallow flat area with moderate current, and algae streaming off the rocks. NO:Dreissena seen here.

water chemistry: hydrolab. sample site in main current near waypoint in N-side bay. T-8 - Water temperature 26.76 C, pH 8.64, Total Dissolved solids 850 ppm, Conductivity 132.9 u S/cm, Alkalinity 88 ppm $CaCO_3$, Dissolved Oxygen 6.72 ppm, percent saturation Oxygen 85.8%

Unionids: *Elliptio complanata* (Eastern Elliptio): captured throughout in all stream habitats, 11 alive, mean=60.73 (50 - 69mm) st. dev. =5.48, 16 pairs, 2 fragments, many highly perforate, largest 80.5 mm; *Lasmigona costata* (Fluted Shell) one alive, 100 mm, deeply buried & hard to extract in muck in backwater, with deeply regular, beautiful ruffle-rows of ribs. Also a photo of a shell bearing a thin, minutely spongy encrustation of something orange, in overlapping colonies of about 6 or 7 mm in diameter. It was near the

margin of the shell, a total of 4 old shells in various states of erosion, all broken or perforate, largest 118 mm

Pyganodon grandis (Common Floater) stubby fresh 49 mm pair, beak sculpture eroded away; *Lampsilis radiata SUBSPECIES:siliquoidea,* 58.5 mm fairly fresh pair & 2 large *cf Lampsilis* hinge fragments.

Muskrat shell pile: *Elliptio complanata* (Eastern Elliptio), 166 shells (105 pairs, 3 hinge fragments, 11 valves, 37 old valves, 10 fragments), a sample from a shell pile in backwater behind ledge, on S shore, that contained a whole lot of beaver-modified sticks and cut green branches. Many of the shells were in shallow water, and posterior margins of many shells are nibbled, so it is probably a Beaver pile. Other species were *Strophitus undulatus* (Squaw-Foot), one 63.5 mm fairly old pair, and *Ligumia recta* (Black Sand-Shell), a 135 mm fairly old pair.

Snails: *Viviparus georgianus* (Banded Mystery Snail) abundant, all over rocks & bottom, 3 collected, largest 24 mm. Specimens sent to Eva Pip, Sept 2009. *Helisoma campanulatum* (Bell-mouth Ramshorn) 11 mm shell; *Lymnaea stagnalis* (Great Pond Snail) 27 mm shell.

Crayfish: a few in one shallow flat area (25 cm depth) with moderate current & algae streaming off the rocks. 1 cheliped & juv shell, 24 mm M, 23.5 mm F in preserved.

Herpetofauna: *Rana catesbeiana* (Bull Frog) 2 adults seen. ca 110 mm SVL M, ca 120 mm SVL F in the stream. *Rana pipiens* (Leopard Frog), 1 juvenile, seen. ca 55 mm SVL green juv in drying hay of adjacent hayfield. - others had seen some here on the way in. *Hyla versicolor* (Tetraploid Gray Treefrog) sporadic calling including a few times at 15h38.

T9, Tay R at 2nd Concession Bridge. 44.82676N 76.37283W.

This site had previously been sampled on 30 July 1998, when it was described as “clear sand/gravel/boulder bed river.” This summer's visit was on 11 August 2009, TIME: 1441-1528. AIR TEMP: 27, sunny, breezy. HABITAT: rocky/marshy river in low mixed woods. OBSERVER: Frederick W. Schueler, Aleta Karstad Schueler, Orion Clark, Macroinvertebrate Volunteers.

Location is a bridge right-of-way. The site was in a shallow valley plain. Upland substrate was not assessed. The terrestrial vegetation was coniferous & mostly deciduous forest. DOMINANT SPECIES: *Acer rubrum* (Red Maple), *Pinus strobus* (White Pine), *Tsuga* (Hemlock), *Betula papyrifera* (Paper Birch), *Fraxinus* (Ash). Human impact on the site included "residuum along stream". There were no wetlands at the site. Water at the site was permanent natural slow river. Water level was high. The bottom was boulders cobbles sand. Water quality was clear. Spaces under rocks were clear of sediment. Water movement was medium. WIDTH: 30 m, MAX. DEPTH: 1.2 m. Dominant aquatic plants were submerged massed of filiamentous green algae adhering to rocks, & small-leaved *Nymphaea* (White Waterlily). Capture was by hand & dipnet. Cover checked included flat rocks & round rocks.

water chemistry: hydrolab. sample site at the water’s edge on the northeast corner of the bridge**.** T-9 - Water temperature 25.41 C, pH 8.33, Total Dissolved solids 855 ppm, Conductivity 133.7 u S/cm, Alkalinity 81 ppm $CaCO_3$, Dissolved Oxygen 6.83 ppm, percent saturation Oxygen 85.2%

Unionids: *Elliptio complanata* (Eastern Elliptio), common, 80 alive (mean=69.08 (45.00 - 88.00) st. dev. =7.51), 16 old (perforate) pairs, 9 old valves, 4 fragments, 16 fairly fresh pairs, largest 85.7 mm. *Lasmigona*

costata (Fluted Shell) 1 alive:107 mm; *Pyganodon grandis* (Common Floater) 1 broken 71.3 mm shell, beaks eroded, quite anterior, and overall profile somewhat cylindrical for this species.

On 30 July 1998 this was the best place I'd seen for Unionids all day. *Elliptio complanata* (Eastern Elliptio) abundant,many alive, few recently dead, 4 pairs, largest 80 mm picked up. *Ligumia recta* (Black Sand-Shell) 2 old eroded pairs, larger 136 mm, 1 larger one alive. *Lampsilis* (Lamp-Mussel) 2 old light pairs, larger 127 mm; *Strophitus undulatus* (Squaw-Foot), 1 light 69 mm pair; and *Lasmigona costata* (Fluted Shell), an old 100 mm pair & smaller hinge fragment – both very coarsely corrugated.

Muskrat shell pile: *Elliptio complanata* (Eastern Elliptio) . 1 alive+71 shells, mostly fresh, & small, largest 77 mm from one pile and 17 pairs (2 of them old) and 3 valves in a second Muskrat pile, largest 84.5 mm. *Ligumia recta* (Black Sand-Shell) 1 old 131.5 mm valve; *Lampsilis* (Lamp-Mussel) a fresh 112.5 mm male valve. Sample includes an orange & green segmented Leech- or Oligochaete-like 141 mm rubbery fishing lure and 3 juvenile. *Viviparus georgianus* (Banded Mystery Snail) shells, three **Hirudinea** (Leech), and 1 *Orconectes cf propinquus* x rusticus, from inside *Elliptio* shells.

Snails: the only collected specimen was one *Campeloma decisum* (Brown Mystery Snail), fresh 24.5 mm shell, taken with Unionids, plus the 3 *Viviparus* taken in the muskrat pile. In 1998 an old *Viviparus georgianus* shell was noted.

Zebra Mussels: not abundant; 1 measured with Unionids, 21 mm, 2 taken;13.6, 23.1 mm.

Crayfish: *Orconectes cf propinquus* x rusticus, 3 small adult males, two with rostra slightly carinate, but also slightly constricted. In July 1998, an adult, dead, specimen was the only Crayfish seen, despite turning several stones. It was identified as *Orconectes rusticus* (Rusty Crayfish), and listed in the OFAH RUSTY CRAYFISH DATABASE (March 2007): “CONFIRMED.”

Herpetofauna: *Thamnophis sirtalis* (Common Garter Snake) 1 seen, active, ca 60 cm, climbing the grassy bank up toward the road.*Nerodia sipedon* (Northern Water Snake) 1 adult seen, ca 60 cm, swimming in river. *Hyla versicolor* (Tetraploid Gray Treefrog) 1 bout of hoarse calling heard.

On 30 July 1998 there was a big *Chelydra serpentina* (Snapping Turtle) nest opened by a predator at SE corner of bridge.

Other taxa: *Micropterus dolomieui* (Smallmouth Bass), common adults, seen; *Perca flavescens* (Yellow Perch), 1 reported; *Semotilus corporalis* (Fallfish), noted.

T10, Tay R at Menzie-Munro Sideroad bridge. UTM 18TUE 931.5 652.8 44.83491N 76.35147W.

On 30 July 1998 this was a slow clear river, bed streaming with Green Algae, where it was “implausible to seek Unionidae due to high water & rain. This summer's visit was on 11 August 2009, TIME: 1146-1243. AIR TEMP: 25, sunny, Beaufort light breeze. HABITAT: clearwater marshy sandbed river through Soft Maple swamp. OBSERVER: Frederick W. Schueler, Orion Clark, Macroinvertebrate Volunteers.

Land ownership is a right-of-way at bridge. The site was in a shallow valley plain. Bedrock was not exposed. Upland substrate was not assessed. The terrestrial vegetation was parkland/fencerows. DOMINANT SPECIES: Soft Maple much more than *Thuja occidentalis* (Eastern White Cedar). Human impact on the site included 10-

15 cm rocks 20 m up & downstream of new bridge and forming the embankment.

Site wetlands were permanent fringing natural shrub swamp and marsh. Dominant wetland plants were: *Pontederia*, scattered *Lythrum salicaria* (Purple Loosestrife). *Typha* (Cattail) were absent. *Osmunda regalis* (Royal Fern) and *Cornus* (Dogwood) bushes along the shores downstream.

Water at the site was permanent natural river. Water level was high. The bottom was cobbles around bridge, sand & mud elsewhere. Spaces under rocks were clear of sediment. Water movement was medium. LENGTH SAMPLED: 200 m around bridge. MAX. DEPTH: 1 m. Dominant aquatic plants were submerged *Potamogeton cf* richarsonii, *Vallisineria americana* (Water-celery #mis-spelled#), and some *Elodea canadensis* (Canada Waterweed) in dense beds away from bridge, obscuring view of the bottom. Capture was by hand & dipnet.

water chemistry: hydrolab. sample site at water's edge on south west side of bridge. T-10 - Water temperature 24.15 C, pH 6.88, Total Dissolved solids 877 ppm, Conductivity 136.9 u S/cm, Alkalinity 90 ppm $CaCO_3$, Dissolved Oxygen 5.18 ppm, percent saturation Oxygen 63.1%

Unionids: *Elliptio complanata* (Eastern Elliptio), 6 adults (mean=54.50 (48 - 70) st. dev. =7.30) scattered in weedbeds, shells were 11 pairs, 1 valve, 5 fragments, largest 65.7 mm. Shells fresh to dissolved out within, but most with intact periostracum, fragments highly eroded. *Lampsilis* (Lamp-Mussel) in weedbeds, 1 alive 90 mm, fragments of 2-3 old shells.

Snails: *Viviparus georgianus* (Banded Mystery Snail), scattered on bottom, 56 shells & 8 alive, largest 29.3 mm. Living ones counted as opercula in the frozen & thawed sample. Specimens sent to Eva Pip, Sept 2009. *Campeloma decisum* (Brown Mystery Snail), 15 & 28.5 mm shells seen.

Crayfish: *Orconectes cf rusticus x propinquus.* Found under rocks of bridge fill & in weeds. Those working the weedbeds said that the "Crayfish were mostly in weeds. " They would seem to be *O. rusticus x propinquus* on the basis of the carinate & constricted rostra, but with none of the colour-pattern elements of these species. *Orconectes virilis* (Northern Crayfish), a big one under rocks of bridge fill escaped capture, and a 42 mm male in sample neglected in fridge before preservation.

Muskrat shell pile: *Elliptio complanata* (Eastern Elliptio) . 6 alive+15 shells adult, shell,, specimen. from Muskrat pile under Soft Maple 100 m above bridge on S shore. 12 pairs lightened by internal dissolution, but with intact periostracum, 2 fresh valves, 1 fragment. Largest 73.5 mm, one of the valves, all the rest much smaller. this was the only shell pile to be found. Snails: *Viviparus georgianus* (Banded Mystery Snail) 8 shells, largest 24 mm; *Helisoma trivolvus* (Larger Eastern Ramshorn) 2 juvenile shells.

Herpetofauna: *Nerodia sipedon* (Northern Water Snake) the posterior half of a late-term gravid female shedding snakelets near bridge was our most tragic herpetelogical observation of the survey. *Rana clamitans* (Green Frog) was represented by a few juveniles along shore, and *Rana catesbeiana* (Bull Frog) by 1 bout of calling at 12h39. There was a scattering of old Turtle eggshells on the embankment S of bridge; these may have been from 2008.

Other taxa: *Micropterus dolomieui* (Smallmouth Bass) were common and conspicuous in the stream. Other conspicuous fish were *Ambloplites rupestris* (Rock Bass), netted by FWS, and *Semotilus corporalis* (Fallfish), seen.

Zizania palustris (Northern Wild-rice) scattered plants in bloom.

T11, Tay R at Noonan Sideroad bridge. 44.84245N 76.34000W.

On 30 July 1998 this was "bouldery rapids in clear river below old mills" with woods that contain *Fagus* (Beech), *Tilia* (Basswood), *Betula alleghaniensis* (Yellow Birch), *Acer saccharum* (Sugar Maple), and *Thuja occidentalis* (Eastern White Cedar). This summer's visit was on 11 August 2009, TIME: 1030-1144. AIR TEMP: 25, light overcast, Beaufort light air. HABITAT: shallow rapid river through mixed forest. OBSERVER: Frederick W. Schueler, Orion Clark, Macroinvertebrate Volunteers.

Land ownership is stream at road right-of-way. The site was in a shallow valley. The terrestrial vegetation was partly coniferous mostly deciduous forest. DOMINANT SPECIES: *Acer* (Maple), *Fraxinus* (Ash), *Tilia*, *Tsuga* - brushy young woods in secondary succession verging on brushy oldfield in places. Human impact on the site included current bridge and former mill (now not evident). There were no wetlands at the site. Water at the site was permanent natural river, uninterrupted rapids in reach sampled. Water level was nearly bankfull. The bottom was boulders cobbles gravel. Water quality was clear. Spaces under rocks were clear of sediment. Water movement was fast. WIDTH: 20 m LENGTH SAMPLED: 100 m upstream from bridge MAX. DEPTH: 60 cm DEPTHS SAMPLED: 0-60 cm. Capture was by hand dipnet. Cover checked included flat rocks & round rocks.

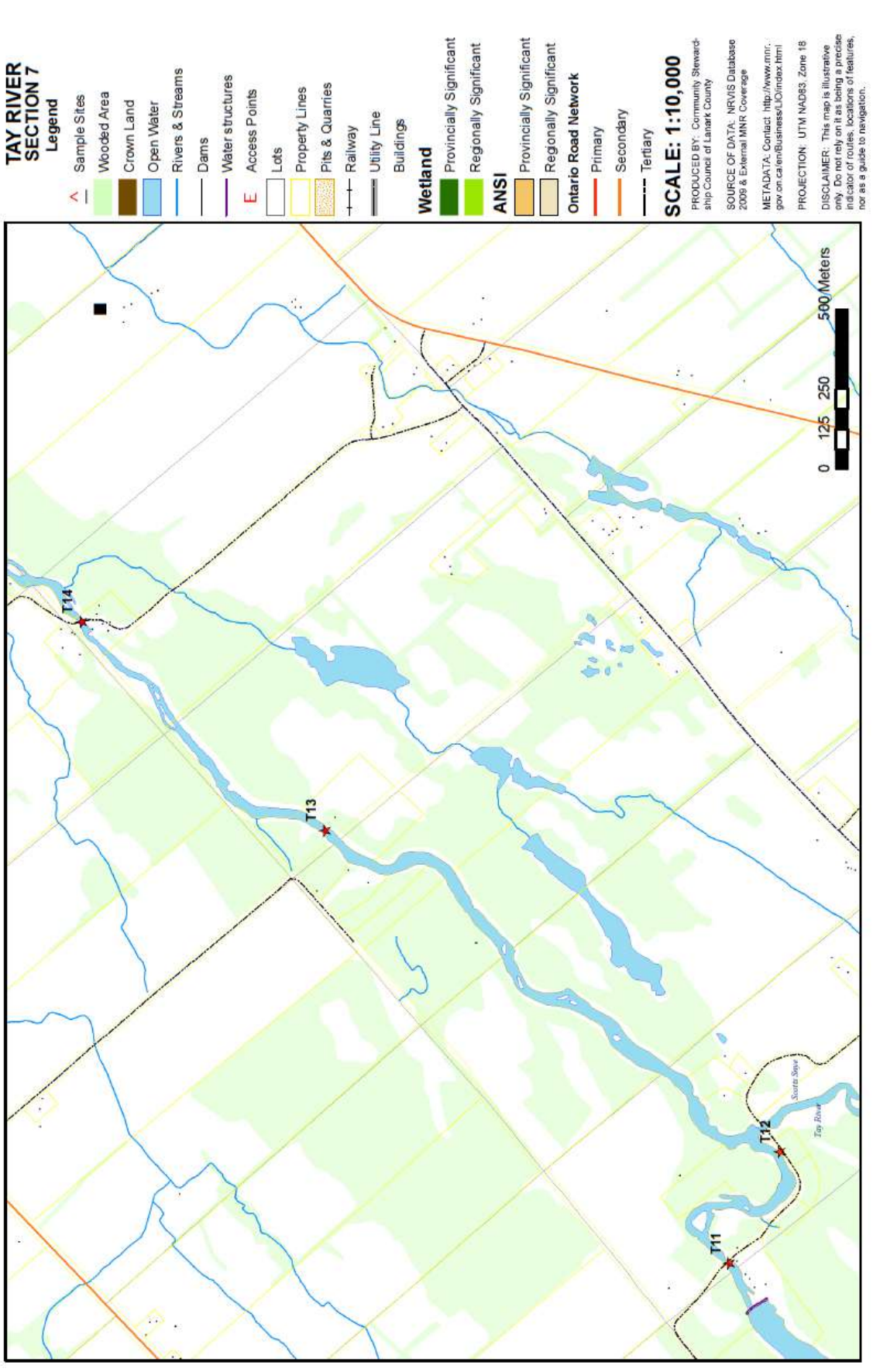
water chemistry: hydrolab. sample site upstream of bridge on S shore. T-11 - Water temperature 24.05 C, pH 7.34, Total Dissolved solids 866 ppm, Conductivity 129.4 u S/cm, Alkalinity 80 ppm $CaCO_3$, Dissolved Oxygen 5.64 ppm, percent saturation Oxygen 68.5%

Unionids: In this bouldery situation, relatively few Unionids were found . *Elliptio complanata* (Eastern Elliptio) 13 alive (mean=64.88 (44.5 - 76) st. dev. =7.06), and 1 old 63.5 mm pair, 3 fragments collected, all very eroded. Only two specimens of other species, captured alive and released: *Lasmigona costata* (Fluted Shell) 81 mm. *Alasmidonta marginata* (Elktoe) 78 mm.

Snails: *Viviparus georgianus* (Banded Mystery Snail) common, 11 mostly highly eroded shells taken, largest 28 mm. *Helisoma trivolvus* (Larger Eastern Ramshorn), 17.7 mm, maturing, fairly fresh shell; *Helisoma campanulatum* (Bell-mouth Ramshorn), 11 mm, maturing, old shell. Sample includes a highly eroded fish bone.

Crayfish: *Orconectes cf propinquus* 3 adult specimens, all with carinate rostra, no dark abdominal band.

Herpetofauna: *Bufo americanus* (American Toad) 1 juvenile captured, 23.4-8.75 mm. *Pseudacris crucifer* (Spring Peeper) 1 bout of calling at 11h15.


TAY RIVER
SECTION 7
Legend
Sample Sites
Wooded Area
Crown Land
Open Water
Rivers & Streams
Dams
Water structures
Access Points
Lots
Property Lines
Pits & Quarries
Railway
Utility Line
Buildings
Wetland
Provincially Significant
Regionally Significant
ANSI
Provincially Significant
Regionally Significant
Ontario Road Network
Primary
Secondary
Tertiary
SCALE: 1:10,000
PRODUCED BY: Community Stewardship Council of Lanark County
SOURCE OF DATA: NRVIS Database 2009 & External MNR Coverage
METADATA: Contact http://www.mnr.gov.on.ca/en/Business/LIO/index.html
PROJECTION: UTM NAD83, Zone 18
DISCLAIMER: This map is illustrative only. Do not rely on it as being a precise indicator of routes, locations of features, nor as a guide to navigation.
0 125 250 500 Meters
T14
T13
T12
T11
South Sand
Tay River

T12, Tay R at Noonan Sideroad, Flat Rock Public Access. 31C/16, UTM 18TUE 944.2 659.5 44.84110N 76.33556W.

Sampled only on 11 August 2009, TIME: 0920-1038. AIR TEMP: 25, light overcast, Beaufort light breeze. HABITAT: rocky/sandy clearwater small river in Soft Maple woods/roadside picnic area. OBSERVER: Frederick W. Schueler, Aleta Karstad Schueler, Orion Clark, Macroinvertebrate Volunteers.

Land ownership is municipal picnic area with private land all around. The site was in a shallow valley. Bedrock was metamporphic gneiss. Upland substrate was not closely observed but seemed sandy. Soil moisture was assumed to be at field capacity. The terrestrial vegetation was successional parkland (70% wooded). DOMINANT SPECIES: *Acer rubrum* (Red Maple) / *Acer saccharinum* (Silver Maple). Human impact on the site included recreational picnic area and old logging waste in bed of stream.

Wetlands were fringing marshy areas. Dominant wetland plants were: *Pontederia* (Pickerel-weed) and *Sagittaria* (Arrowhead) in bloom. Development stage of *Typha* (Cattail) was mature seedheads.

Water at the site was permanent natural pool & riffle river. Water level was high. The bottom was bedrock boulders cobbles gravel sand mud bark chunks; about 20% actual bedrock, 20% sand and chunky sawmill waste & cobbles.

Water quality was clear. Spaces under rocks were exceptionally clear of sediment. Water movement was medium fast. Dominant aquatic plants were submerged *Potamogeton* (Pondweed) blooming, some *Vallisneria americana* (Water-celery), and other liner-leaved species patchily in sandy substrates, with scattered *Hydrocharis morsus-ranae* (European Frogbit) along the shore.

About 100m NE of here the Scott Snye rejoins the Tay, and from the Noonan Sideroad bridge, this very different wide shallow stream has Beaver dams above and below the bridge.

Capture was by hand & dipnet. Cover checked included flat rocks round rocks - all underwater the shores are submerged.

water chemistry: hydrolab. sample site at flat rock of picnic area. T-12 - Water temperature 23.52 C, pH 7.12, Total Dissolved solids 872 ppm, Conductivity 136.5 u S/cm, Alkalinity 80 ppm $CaCO_3$, Dissolved Oxygen 5.34 ppm, percent saturation Oxygen 64.3%

Unionids: *Elliptio complanata* (Eastern Elliptio), 42 alive (mean=49.10 mm (13 - 68) st. dev. =11.30) and 76 shells (63 pairs, 13 valves, largest 69.5 mm). *Alasmidonta marginata* (Elktoe) 4 alive (mean=73.5 mm (67 - 82) st. dev. =5.68) and 5 shells 1 fairly intact, 4 perforate pairs, largest 77 mm. *Lampsilis* (Lamp-Mussel) 3 taken alive, 84, 75, & 107 mm, 1 fresh pair, 4 old pairs, 2 valves, 3 fragments. Largest shell 102 mm, the old pairs extensively perforate. *Lasmigona costata* (Fluted Shell),2 fresh pairs, fresh valve, 3 fragments, largest 92.5 mm, these are strongly ribbed.

Muskrat shell pile: *Elliptio complanata* (Eastern Elliptio)28 old pairs, 8 old valves, largest 65 x 37.5 mm, exemplifying the deep profile of many of the shells here. Otherwise there was only 2 old pairs & 1 old valve of *Alasmidonta marginata* (Elktoe), largest 66 mm; these are very dissolved away.

Snails: *Campeloma decisum* (Brown Mystery Snail), 5 fresh shells, largest 23 mm.

Crayfish: Six specimens of *Orconectes* would seem to be *O. rusticus x propinquus* on the basis of the constricted & carinate rostra. The shed skin of small individual was also found.

Herpetofauna: At 09h33. A few calls of *Hyla versicolor* (Tetraploid Gray Treefrog) were heard, and at the Scott Snye bridge a few calls of *Rana clamitans* (Green Frog) and *Rana septentrionalis* (Mink Frog) were heard.

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A *Nerodia sipedon* (Northern Water Snake), about 75 cm long was watched as it held its position in the current, watching the People.

T13, Tay R at #166 Leonard Sideroad (Nancy Wildgoose). 31C/16, UTM 18TUE 954.2 673.6 44.85400N 76.32317W.

Site visited on 10 August, TIME: 1633-1711. AIR TEMP: 28, cloudy, breezy. HABITAT: fast, highwater, clear rocky river among woods & lawn residences. OBSERVER: Frederick W. Schueler, Aleta Karstad Schueler, Orion Clark, Philip Scott.

This is the most idyllic spot yet. There is a house on the northeast side, that I can't see much of except the roof and an internet tower. They have left a riparian strip of a few metres along the river, thick with bushes and trees - Silver Maple it looks like, mostly. A wider strip is left by the Wildgoose household, except for a canoe-launching access of trampled *Iris* leaves, it is 10-20 metres of wildness between the lawn and the river edge. A beautiful old stone house with a rust-brown door and a green roof, and Hydrangeas by the front steps, beyond an arched wooden bridge with massive rusty steel rails.

Tall deciduous forest borders the river looking downstream to its northward curve, and a beautiful Silver Maple leans out, shading nearly half the water's flow. The water is very clear, and pale yellow in colour, and moving swiftly, about 80 cm per second. The bottom is a jumble of every size and colour of rock and gravel.

Fred has gone downstream and is poking under stones along the shore. *Sparganium* (Bur-reed) growing along the shore, only one flowering spike of Purple Loosestrife, near the bridge. Mixture of Raspberry, Grape, and Jewelweed clambering over the loose rocks at the bridge abutment.

17h01: Philip brought two live clams and measured them with Orion's plastic calipers. After working upstream of the bridge a bit, Philip wades down to meet Fred, with a viewing box. They are about 150 metres downstream, nearly where the river begins a gentle turn.

Finish 17h11: Fred climbs tiredly up onto the bridge, lifting his bag of clams and crayfish up in the wire dipnet, for Philip and Aleta to sort and measure on the bridge.

water chemistry (water sampling visit) (event). natural history, hydrolab. sample site on S shore just below bridge. T-13 - Water temperature 25.89 C, pH 7.83, Total Dissolved solids 860 ppm, Conductivity 134.5 u S/cm, Alkalinity 80 ppm $CaCO_3$, Dissolved Oxygen 6.01 ppm, percent saturation Oxygen 75.6%

Unionids: *Elliptio complanata* (Eastern Elliptio) 3 alive (58 & 61 mm) 36 pairs, 4 valves, 5 fragments, largest 75.3. Upstream sample mostly taken by Philip; 3 pairs & all valves were old. The sample also included *Ligumia recta* (Black Sand-Shell), 115.7 mm moderately old pair; *Lampsilis* (Lamp-Mussel), 2 female pairs, larger 83 mm.; *Alasmidonta marginata* (Elktoe) 1 alive, 68 mm, and 85 mm pair.

Muskrat shell pile: Fred waded about 100m downstream (NNE) looking for a shell pile, he found a small pile, which contained a *Ligumia recta* (Black Sand-Shell) and an *Alasmidonta* pair. *Lampsilis* (Lamp-Mussel) shells are scattered on the bottom, and there's a fair number of small *Elliptio* tucked in among the rocks. These specimens were evidently combined with the general sample.

Crayfish: *Orconectes* are few, and not caught by turning rocks in the main current: they're under and among rocks where the current is slower - but still sparse there.

T14, Tay R at Bowes Sideroad bridge. UTM 18TUE 960.7 681.2 44.86093N 76.31508W.

On 30 July 1998, Fred found that "the terrific volume of clear but turbulent water, and the coarse pale broken rocks making up the bottom, it's very hard to look for Unionids here." he suspected that the shells he found "may have come from upstream. above the old mill dam, but getting past the dam will require lower water levels."

This year's visit was on 10 August, TIME: 1519-1616. AIR TEMP: 30, light overcast, Beaufort light breeze. HABITAT: rushing limestone-rocky river in mixed woods below old broken mill dam. OBSERVER: Frederick W. Schueler, Aleta Karstad Schueler, Orion Clark, Emily Upham-Mills, A.Bouchilloux, Phil Scott.

The old dam is upstream of the bridge, and we start on the downstream side of the bridge. On the east side of the bridge the mud is churned by Cattle tracks, where they evidently come to drink, though none are present now. A group of teenagers is swimming in the deep fast water between the dam and the bridge. One of them comes to join us, using one of the glass bottomed buckets.

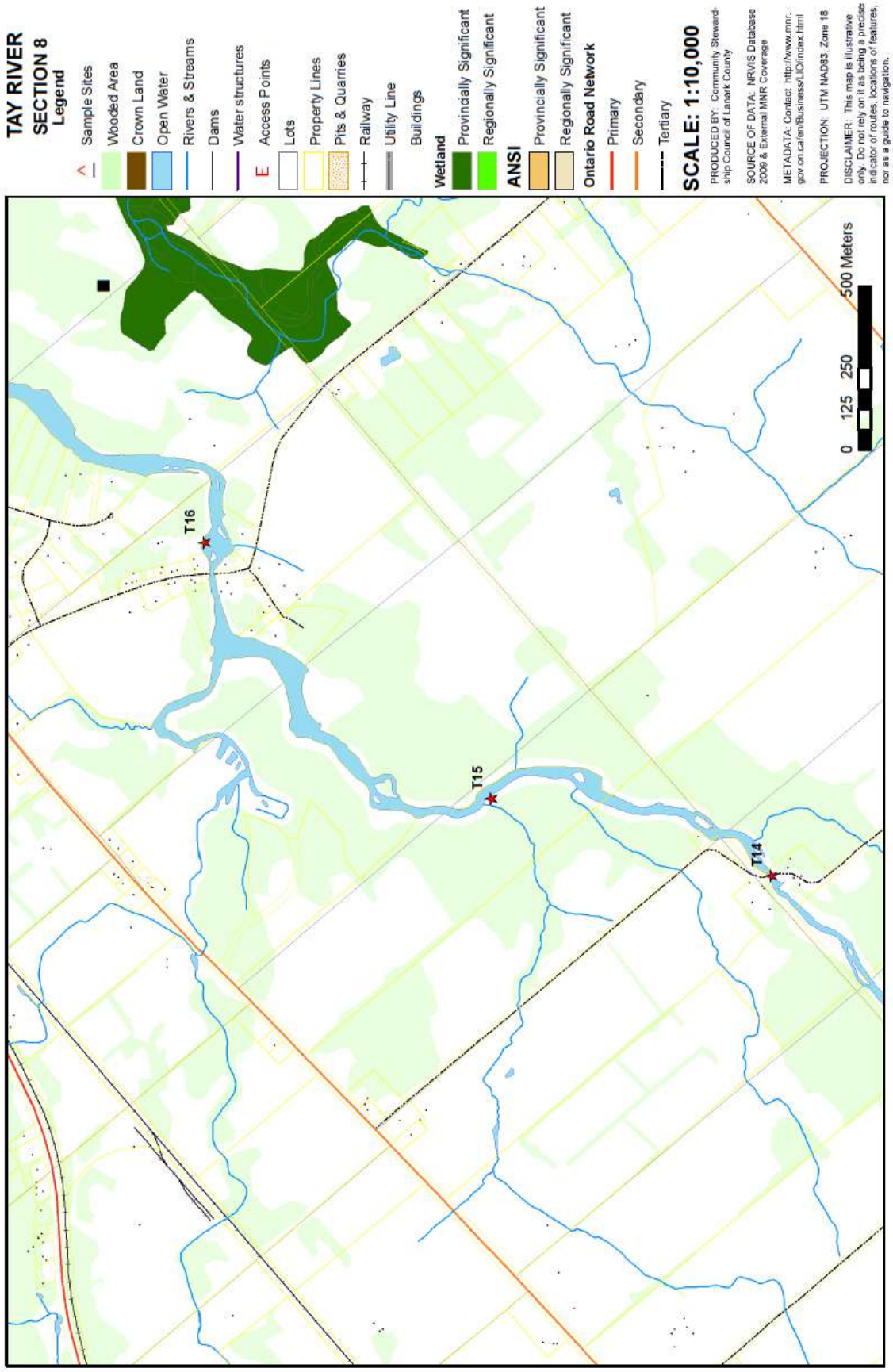
An island 150 m downstream has a clump of *Acer saccharinum* (Silver Maple) on its upstream side, and is otherwise all Grass and *Lythrum salicaria* (Purple Loosestrife). The river here has a broken limestone bottom. Fred and Philip waded downstream to the foot of three islands, where there was violent waterflow over angular broken rock. Philip came up a brook-like channel behind the islands. Fred came up the main channel. There was too much water to find Crayfish in the main channel.

Then Fred pushed into the stream above the old mill through brushy ruins. It was a huge dam, and upstream there is no impoundment, but there is a nice straight reach that would be a hunting-worthy riffle in at lower water levels. Water is arm-pit-deep by the mill, and in the rapid below this deep area rocks were too deeply piled to find anything under them.

water chemistry: hydrolab. sample site below bridge, on S shore. T-14 - Water temperature 25.45 C, pH 7.85, Total Dissolved solids 862 ppm, Conductivity 134.8 u S/cm, Alkalinity 84 ppm $CaCO_3$, Dissolved Oxygen 5.86 ppm, percent saturation Oxygen 73.4%

Unionids: Very few Unionids were found here, only 2 fresh, 3 old pairs & fragment of *Elliptio complanata* (Eastern Elliptio), largest 67.5 mm, with no periostracum, and *Lampsilis* (Lamp-Mussel) 1 old, very eroded away shell, ca 89 mm, & uncertain fragment.

On 30 July 1998, only two small old pairs of *Elliptio complanata* (Eastern Elliptio), 1 old eroded valve of *Ligumia recta* (Black Sand-Shell), and an old eroded hinge fragment that may have been *Lasmigona costata* (Fluted Shell). It was suspected that these battered shells may have come from upstream above the old mill dam.


TAY RIVER
SECTION 8
Legend
Sample Sites
Wooded Area
Crown Land
Open Water
Rivers & Streams
Dams
Water structures
Access Points
Lots
Property Lines
Pits & Quarries
Railway
Utility Line
Buildings
Wetland
Provincially Significant
Regionally Significant
ANSI
Provincially Significant
Regionally Significant
Ontario Road Network
Primary
Secondary
Tertiary
SCALE: 1:10,000
PRODUCED BY: Community Stewardship Council of Lanark County
SOURCE OF DATA: NRVIS Database 2009 & External MNR Coverage
METADATA: Contact http://www.mnr.gov.on.ca/en/Business/LIO/index.html
PROJECTION: UTM NAD83, Zone 18
DISCLAIMER: This map is illustrative only. Do not rely on it as being a precise indicator of routes, locations of features, nor as a guide to navigation.
0 125 250 500 Meters
T16
T15
T14

Herpetofauna: On 30 July 1998 2 juvenile *Rana clamitans* (Green Frog) were seen on the bank and a large adult *Chelydra serpentina* (Snapping Turtle) was seen buried in silty muck below *Decadon* in a backwater.

This August a juvenile *Thamnophis sirtalis* (Common Garter Snake), ca 30 cm TL, was interviewed in roadside grass, and another under rotten planks in bedrock/Ragweed barrens near a ruined house, where an adult *Rana clamitans* (Green Frog) was also found.

Other taxa: There was lots of cutting and dragging activity by *Castor canadensis* (Beaver) near the bridge, including cutting of Fraxinus (Ash).

T15, Tay River above OMYA water intake, 1.1 km SW Glen Tay. UTM 18TUE 963.1 689.7 44.86863N 76.31229W.

Only visit on 10 August 2009, TIME: 1430-1508. AIR TEMP: 29 ca, light overcast, breezy. HABITAT: shallow limestone bedrock/slab river, banks low, brushy & mixed deciduous woods. OBSERVER: Frederick W. Schueler, Aleta Karstad Schueler, Orion Clark, Emily Upham-Mills, A.Bouchilloux, Phil Scott.

We parked at 1159 Christie Lake Road, the OMYA water-taking site, and went down to the river at the OMYA water intake. The water inlet is a quiet concrete arch with no flow at the time of our visit. There's a big earth-covered pumphouse back from the water, where we parked.

Entering river at the path from the OMYA pumping station, most of the bottom we can see is smooth limestone bedrock, with a strong flow of clear water over it. Shores are low and wooded, mixed deciduous, brushy banks, patches of tall Joe Pye weed, lots of *Laportea canadensis*. Fred says "Woosh! *Alasmidonta marginata!"* with an orange foot. "I think we've just doubled the number of specimens known from the Tay River!" The rest of the crew worked this riffle, while Fred waded downstream, trying to find more *Alasmidonta*, or drifted shells, but without success.

water chemistry: hydrolab. sample site on N bank at waypoint. T-15 - Water temperature 25.64 C, pH 7.85, Total Dissolved solids 862 ppm, Conductivity 134.8 u S/cm, Alkalinity 84 ppm $CaCO_3$, Dissolved Oxygen 5.86 ppm, percent saturation Oxygen 73.4%

Unionids: *Alasmidonta marginata* (Elktoe), 7 alive and 5 shells; all living ones found in broad area of broken slabs of rock on top of smooth bedrock. All had orange feet extended when they were found. alive: 65, 72, 76, 73, 79, 78, 78 mm mean=74.43 mm (65 - 79) st. dev. =4.56. Shells were 5 pairs, 1 fresh, 3 perforate, 89.6, 82, 80.7, 70, 68.35 mm; mean=78.13mm (68.35 - 89.6) st. dev. =7.94. Overall, n=12 mean=75.97mm (65 - 89.6) st. dev. =6.46

Six pairs of *Elliptio complanata* (Eastern Elliptio) from the *Alasmidonta* bed, 5 pairs and 1 fragment from downstream of there, largest 67 mm. Seventeen living ones from throughout the Alasmidonta bed were small, mean=55.59mm (48 - 67) st. dev. =4.19. One 75 mm *Lasmigona costata* (Fluted Shell) pair from downstream of the Alasmidonta bed, and a 59 mm old eroded pair and 2 fragments of *Lampsilis* (Lamp-Mussel).

Snails: *Campeloma decisum* (Brown Mystery Snail) fresh 17.5 mm, old 24.3 mm shells.

Crayfish: *Orconectes cf obscurus* 2 under 1 stone. Hard to hunt because of the strong current.

Herpetofauna: *Rana clamitans* (Green Frog), many juveniles seen all along the shore, and, in the sparsely

grassed clearing in Burr Oak woods where we parked, an adult female *Rana pipiens* (Leopard Frog) seen among throngs of Grasshoppers, and a *Hyla versicolor* (Tetraploid Gray Treefrog) heard giving a few calls.

Other taxa: Here we only noted a couple of Insects, which we're usually not recording: *Calopteryx maculata* (Ebony Jewelwing) a pair in copulation, seen.at the inlet (these are also all over, at most places where we come down to the river) and *Gerris* (Water Strider) "skating on the water, bracing themselves on their oartips, hopping forward when they drift back."

Tay River bridge/0.8 km SSE Glen Tay intersection. 31C/16, UTM 18TUE 969.9 698.4 44.87651N 76.30378W.

We have been sampling this site since 2 August 1996, but the most complete notes came from 19 July 2006: HABITAT: highwater clear river, low weirs, limestone bedrock/sand bed, in village. OBSERVER: Frederick W.Schueler, Aleta Karstad, Jamie Proctor, Ryan Hawke.

Those who are familiar with the crystal torrent of the Tay know that it usually runs torrentially in a bed of deep-piled stone, making it hard to say how abundant Crayfish are anywhere along its course. Naturally, with high water levels everywhere, the Tay was as much higher as might be expected, which made it even harder to catch stuff there than it is usually. But we withstood the violence of the current to scoop a few *Orconectes propinquus* and *Orconectes rusticus* (Rusty Crayfish) and what look like hybrids out of the stream around the Water Snake Island at Glen Tay.

We entered the stream at a road right-of-way, with private land all around. The site was a shallow valley. Bedrock was exposed but not examined (limestone/granite?). The terrestrial vegetation was deciduous parkland (50% wooded). Human impact on the site included surrounding lawn-village and a low boulder weir across river above bridge. Site wetlands were absent, but there were riverine wetlands upstream and a low island with Ash(?) trees.

Water at the site was permanent natural river. Water level was high. The bottom was bedrock boulders cobbles. Water quality was yellowish & very clear. Spaces under rocks were clear of sediment. Water movement was fast: ca 1.5 m/sec. WIDTH: 15 m LENGTH SAMPLED: 150 m MAX. DEPTH: 1 m DEPTHS SAMPLED: 0-60 cm. Water temperature 26 C, at 20 cm depth, in river edge fast flow, 12h38. Dominant aquatic plants were masses of floating *Elodea canadensis* (Canada Waterweed). Capture was by hand & dipnet. Cover checked included flat & round rocks.

Unionids: On 2 August 1996 1 alive & 10 pairs of generally small *Elliptio complanata* (Eastern Elliptio) and 2 pairs, 1 valve of what I called, *Lampsilis cf ventricosa* (Pocket-Book) .were taken from"the clear river... low weirs here... little impoundments, over limestone bedrock, chunks of bedrock, gravel and sand."
14 August 1999, 6 *Elliptio* and 1 *Lampsilis* , and on 10 August 2009, 1 31 mm *Lampsilis* shell, from the central lagoon of the island.

Crayfish: On 19 July 2006 the few *Orconectes* we found seemed to be in optimal high velocity rocks with a supply of *Elodea* -- none in the slower water below the Nerodia Island. "We withstood the violence of the current to scoop a few *Orconectes propinquus* and *Orconectes rusticus* (Rusty Crayfish) and what look like hybrids out of the stream around the Water Snake Island at Glen Tay."

Snails: On 19 July 2006, one very eroded *Campeloma decisum* (Brown Mystery Snail), and on 10 August 2009,

Campeloma decisum (Brown Mystery Snail), two taken alive, 21.6 & 21.8 mm.

Herpetofauna: *Nerodia sipedon* (Northern Water Snake), seen on the island just below the bridge on 2 August 1996, 14 August 1999, 19 July 2006, and 10 August 2009. *Rana catesbeiana* (Bull Frog) seen on 2 August 1996, 19 July 2006, and 10 August 2009. both of this species obviously make regular use of this island. On 19 July 2006 a *Chelydra serpentina* (Snapping Turtle) egg was found in the water.

Other taxa: 10 August 2009, *Corydalus cornutus* (Dobsonfly), 1 larva dipnetted, under cover, a big Hellgrammite under a large rock in main current near island.

T16, Tay R at #582 Glen Tay Sideroad (David Taylor). UTM 18TUE 970.8 698.5 44.87659N 76.30261W.

Sampled on 10 August 2009, TIME: 1215-1325. AIR TEMP: 28 ca, light overcast, windy. HABITAT: marsh-fringed bay of clearwater rocky river in village. OBSERVER: Frederick W. Schueler, Orion Clark, Emily Upham-Mills, A.Bouchilloux, Phillip Scott.

This is within wading distance of the Glen Tay bridge (above), but the site is at David Taylor's dock which we reached through mowed lawns, veritable hedge of tall *Impatiens capensis* (Spotted Jewelweed) and *Laportea canadensis* (Wood Nettle) hides the shoreline from view. Tall stands of *Eupatorium maculatum* (Spotted Joe Pye Weed) mark the entrance to the floating dock.

Fred gathered a bagfull of random-taken shell-pile shells from downstream of the dock, in fine sand, old logging waste.

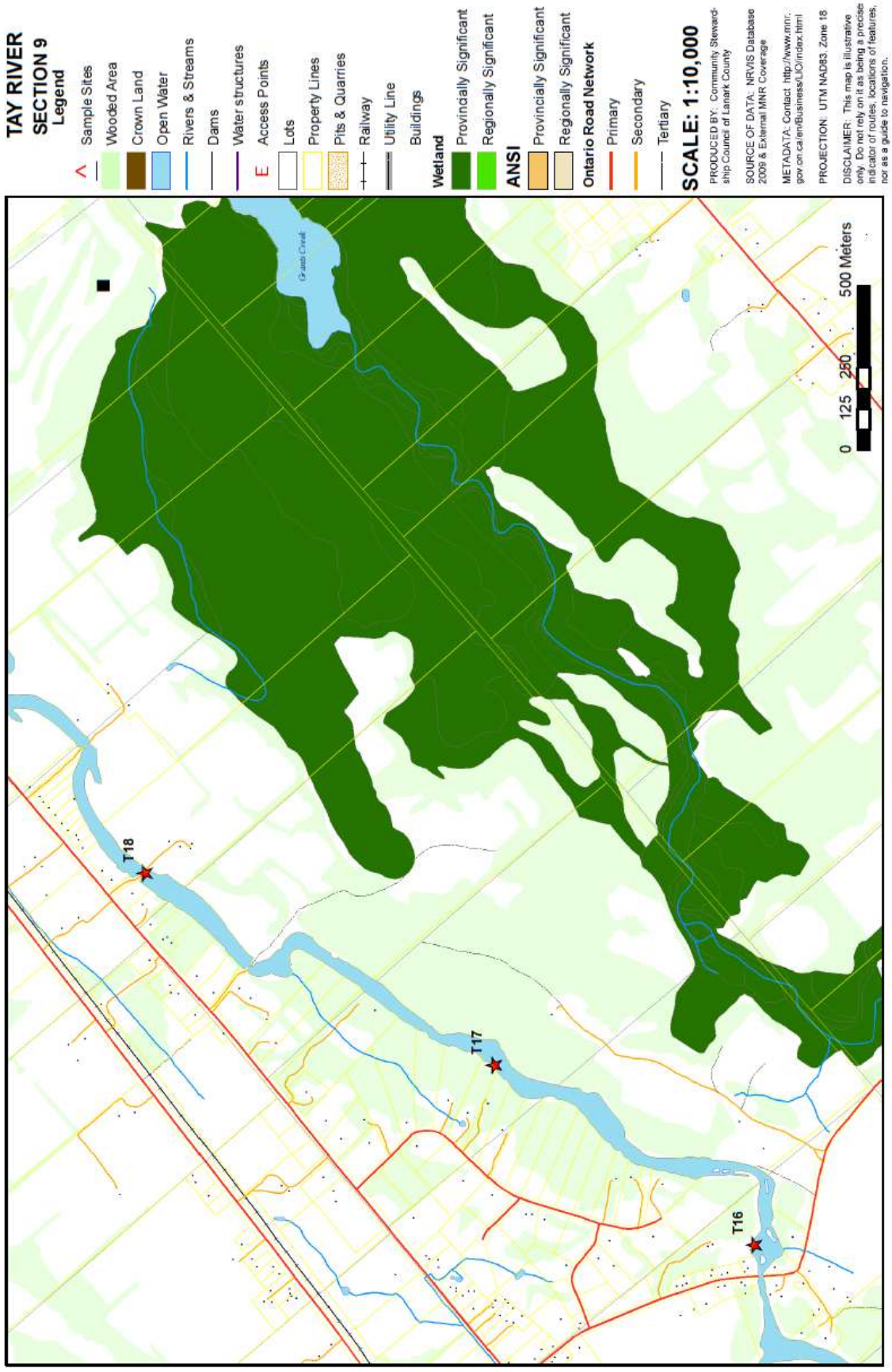
13h25 Aleta back from Perth with an inverter from Canadian Tire, to plug into the car to run the new computer. Orion reports 2 live *Lampsilis*, Emily said that one of them was displaying its mantle flaps. Measurements 70, 72 mm.

water chemistry: hydrolab. sample site at dock. T-16 - Water temperature 22.63 C, pH 7.57, Total Dissolved solids 938 ppm, Conductivity 146.1 u S/cm, Alkalinity 96 ppm $CaCO_3$, Dissolved Oxygen 6.31 ppm, percent saturation Oxygen 76.1%

Unionids: Sampling wasn't very systematic here. Two **Lampsilis** (Lamp-Mussel), 70 & 72 mm, were seen alive, with one displaying (Orion & Emily), and 8 shells were picked up. A non-random sample by Fred included : 1 old 96 mm strongly ribbed pair of *Lasmigona costata* (Fluted Shell), and 8 pairs, 3 valves, all old, largest 63 mm, of *Elliptio complanata* (Eastern Elliptio).

Snails: *Campeloma decisum* (Brown Mystery Snail) 5 mostly old shells, largest intact 20 mm, though there's a much larger incomplete shell., and 1 14.4 mm immature shell of *Helisoma trivolvus* (Larger Eastern Ramshorn).

Crayfish: a big, F-looking, *Orconectes virilis* and a uniformly tan juvenile *Orconectes cf obscurus* in a big rockpile on sand.


TAY RIVER
SECTION 9
Legend
Sample Sites
Wooded Area
Crown Land
Open Water
Rivers & Streams
Dams
Water structures
Access Points
Lots
Property Lines
Pits & Quarries
Railway
Utility Line
Buildings
Wetland
Provincially Significant
Regionally Significant
ANSI
Provincially Significant
Regionally Significant
Ontario Road Network
Primary
Secondary
Tertiary
SCALE: 1:10,000
PRODUCED BY: Community Stewardship Council of Lanark County
SOURCE OF DATA: NRVIS Database 2006 & External MNR Coverage
METADATA: Contact http://www.mnr.gov.on.ca/en/Business/LIO/index.html
PROJECTION: UTM NAD83, Zone 18
DISCLAIMER: This map is illustrative only. Do not rely on it as being a precise indicator of routes, locations of features, nor as a guide to navigation.
0 125 250 500 Meters
T18
T17
T16
Grants Creek

"Muskrat" shell pile: a bagfull of random-taken shell-pile shells from fine sand & old logging waste bank of channel below the dock: *Elliptio complanata* (Eastern Elliptio):106 pairs, 15 valves, 3 frgmants, largest 92 mm, but most much smaller; **Lampsilis** (Lamp-Mussel):7 pairs, 1 freshly dead with body dried after freezing, 2 valves, 2 fragments, largest 96 mm; *Ligumia recta* (Black Sand-Shell) : 119 mm old eroded fragment of fairly large shell.

Other taxa: *Pandion haliaetus* (Osprey) four circling around, squeaking at each other "Tew! Tew!" ...and yodeling a little.

T17, Tay R at #177 Somerville Drive (Colin Stephenson's). UTM 18TUE 976.3 706.4 44.88381N 76.29584W.

The previous visit to the site was on 14 August 1999, on an Eastern Ontario Biodiversity Museum canoe trip, when we collected 6 old and eroded *Elliptio complanata* (Eastern Elliptio) shells, an old eroded *Ligumia recta* (Black Sand-Shell) pair, and two *Lampsilis* (Lamp-Mussel) shells, a fresh 85 mm valve & old smaller valve.

This year's visit was on 10 August 2009, TIME: 1100-1120. AIR TEMP: 27 ca, sunny, breezy. HABITAT: slightly green-turbid river with coarse sand bed with angular broken rock, through forest. OBSERVER: Frederick W. Schueler, Aleta Karstad Schueler, Orion Clark, Emily Upham-Mills, A.Bouchilloux, Phil Scott.

We walked about 150 metres down a slightly sloping trail from Colin Stephenson's house, through a Maple forest to the sunlight of the river edge, and then took a little path to the dock.

Green Frogs scattered along the shore, none calling yet. Gyrinidae swimming in a cluster near shore. Fred says clear visibility is about to one metre, but the water is too cloudy to see the bottom deeper than that. Coarse sand bottom with angular broken rock, very little organic sediment. The far shore looks as if it is being grazed above a metre from the water. The forest is mixed right along the shore, with some Cedar and Spruce as well as the Basswood and Poplar.

11h15 Emily sees a live mussel displaying its orange fringed mantle, opening and closing rhythmically; Fred reports a couple of plants of Wild-rice, caught one *Orconectes cf obscurus* upstream about 50 metres from the dock; Astrid comes to the dock with live clams to measure; Fred says we have been finding some great big Plecoptera (Stonefly) larvae. Most of the aquatic vegetation is *Vallisineria*, scattered out there, and swathed in adherent algae

water chemistry: hydrolab. sample site at dock. T-17 - Water temperature 22.81 C, pH 7.21, Total Dissolved solids 930 ppm, Conductivity 145.5 u S/cm, Alkalinity 76 ppm $CaCO_3$, Dissolved Oxygen 6.11 ppm, percent saturation Oxygen 72.6%

Unionids: *Elliptio complanata* (Eastern Elliptio), 12 alive (mean=62.47 mm (40 - 105) st. dev. =22.42) and 81 shells (65 pairs, 9 valves, 7 fragments, largest 106 mm), largest quite compressed, with almost no periostracum. Two *Lampsilis* (Lamp-Mussel) were seen alive, one displaying her orange fringed mantle opening and closing rhythmically (Emily); another alive, 85 mm, and shells, 4 pairs, 2 fragments, largest 108 mm (male shell). *Lasmigona compressa* (Brook Lasmigona) was represented by an old chalky 72 mm valve.

Crayfish: *Orconectes cf obscurus* 3 adults, upstream ca 50 m from dock, and 1 chela. These had carinate rostra, but none of the colours of O. propinquus. *Orconectes virilis* (Northern Crayfish); soft-shelled male, 40.6 mm.

Snails: *Campeloma decisum* (Brown Mystery Snail) . 3 shell, specimen. old shells, 7.5, 8.5, 7 mm.

Herpetofauna: *Rana clamitans* (Green Frog), several adult & juvenile, seen scattered along the shore, none calling. *Rana catesbeiana* (Bull Frog), 1 juvenile, ca 80mm SVL, in water's edge.

Other taxa: *Zizania palustris* (Northern Wild-rice). A few in bloom, upstream of the dock.

T18, Tay R at #471 Christie Lake Rd (Ruth Craig's bridge). 31C/16, UTM 18TUE 982.2 717 44.89344N 76.28865W.

Visited only on 10 August 2009, TIME: 0920-1045. AIR TEMP: 26 ca, sunny, F 3. HABITAT: deep slow marshy-bank river through residential area. OBSERVER: Frederick W. Schueler, Aleta Karstad Schueler, Orion Clark, Emily Upham-Mills, A.Bouchilloux, Phil Scott.

This was the first visit of the survey. We access the River at one-lane private bridge with iron railings. Force 3 breeze rippling the water. Appears quite deep, about 30 metres wide. Bed of the main channel is sand & gravel On the west bank near the bridge, the house has a mowed lawn, to within a few metres of the water edge, where the shore becomes steep and is tall grass, bushes and *Vitis riparia* (Frost Grape) vines. They have a deck built out on pilings - different levels with railings. The rest of the shore is natural along both banks. Looking south. Fred and Philip start by checking the southeast bank, where the shore is reedy emergents and a few isolated patches of Pickerelweed with spikes of purple bloom, *Lythrum salicaria* (Purple Loosestrife) behind, among grasses.

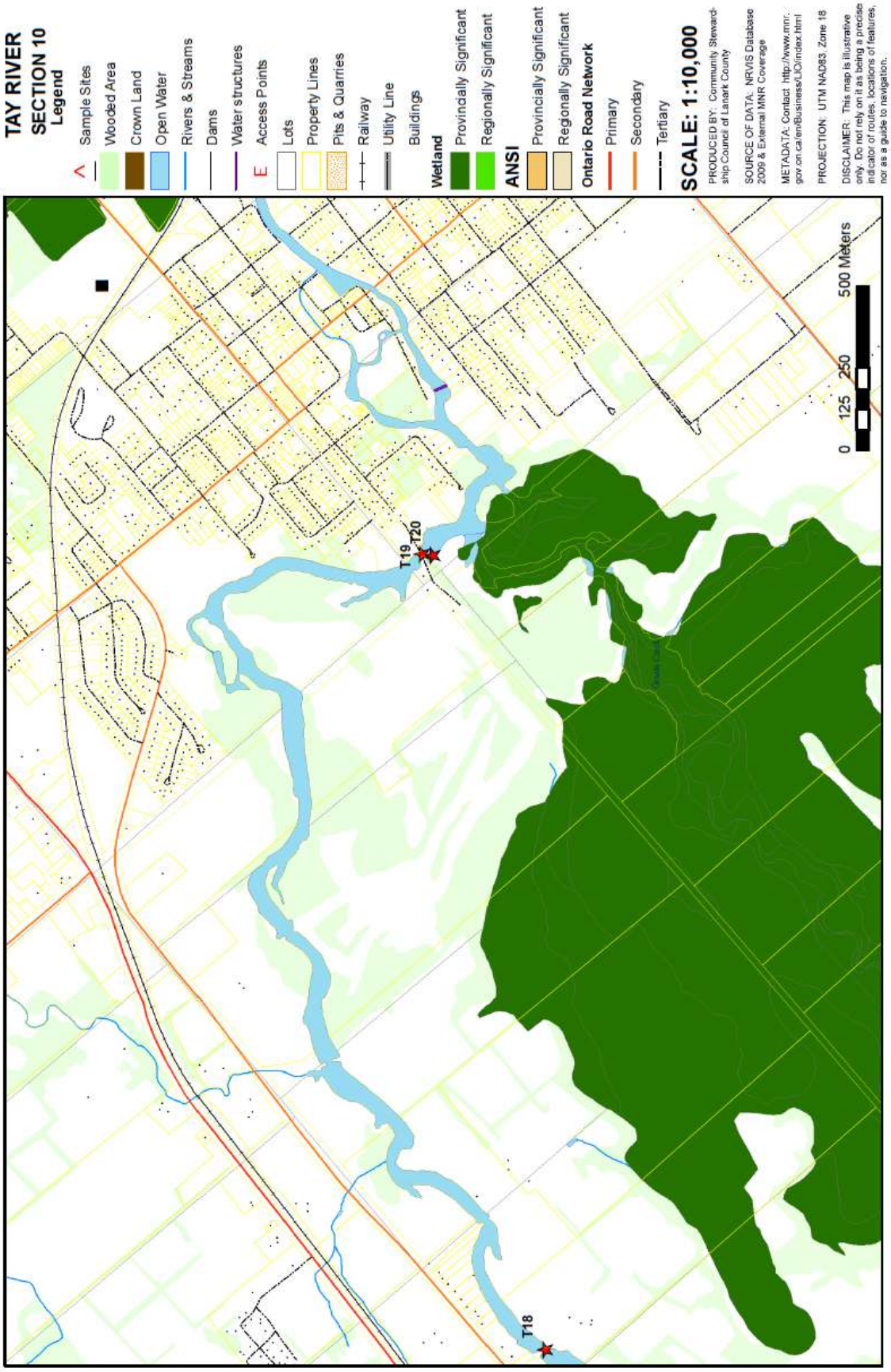
Narrow margins of *Nymphaea odorata* (Fragrant White Water-lily), with some white flowers among the pads further down on the west shore. Trees along shore look to be *Acer* (Maple), *Fraxinus* (Ash), *Salix* (Willow). Fred and Philip found lots of juvenile *Rana* (True Frog) in the marshy edges. At least one was a Leopard Frog, the rest were Green Frogs. A lot of bark fragments through the muck. The Purple Loosestrife is moderately chewed up by *Galerucella*, but is blooming well due to the wetness of the season.

Looking north, downstream, the shore is natural and marshy, one big bank of Pickerelweed and grasses with yellow heads glowing in a halo above the leaves, magenta flames of *Lythrum salicaria* (Purple Loosestrife) picked out by the sun - treed with Maples, the shoreline posted regularly along with old rotted stumps and roots just at the water edge. The west side has houses and lawns, the first few leaving a riparian strip of several metres, and the next few, out of sight, having lawns mowed to the edge. Fred and Philip have found a thin Unionid shell fragment, a golf ball, a beer bottle, and a 40 cm Watersnake seen by Philip.

Vallisneria americana (Water-celery) is in bloom, & in fruit in the sand & gravel of main flow of the river.*Spirodela polyrhiza* (Larger Duckweed) was the only Duckweed seen, and *Hydrocharis morsus-ranae* (European Frogbit) was fairly common, almost all leaves intact (not chewed by herbivores). .

10:05, Emily and Astrid arrive; 10:15 PHOTO Fred, Philip, Orion at north east shore, with dip nets, Fred found one baby *Elliptio complanata* (Eastern Elliptio), and a lot of *Campeloma decisum* (Brown Mystery Snail) about a dozen collected, buried in fine sand below and east of the bridge, in the shade of a big Silver Maple. A pair of *Bombycilla cedrorum* (Cedar Waxwing) are insect catching from a tree by the bridge.

10:25 Philip scares an 80 cm *Nerodia* sipedon from the rocks in the bridge abutment into the water upstream of the bridge.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0 125 250 500 Meters
T18
T19
T20

10:35 Emily and Astrid, hunting below the deck on pilings, saw three Damselflies, one blue with a green tail, and another colour, blue-grey all over – flying around each other, may have been sex difference. *Cardeulis tristis* flying, 2 large 15 cm Bull Frogs, one 4 cm Green Frog, and a handfull of dead Campeloma shells.

FWS & Philip went upstream along the S shore about 100 m, blindly groping in muck and finding no shells. there's bark and woodchips in the muck here, but no *Campeloma*.

Unionids: No species other than *Elliptio complanata* (Eastern Elliptio), 37 alive & shells. 57 mm fresh pair & 58.3 mm old valve & fragment & 18.5 mm juvenile below bridge by gunging with wire net

Snails: *Campeloma decisum* (Brown Mystery Snail), 37 alive & shells most below bridge by gunging with wire net, largest 25 mm, in loose sandy bottom, with chunks of bark & Maple leaves, none upstream in loose muck. *Helisoma trivolvus* (Larger Eastern Ramshorn) 13.5 mm maturing shell below bridge taken by dipnetting.

Herpetofauna: *Rana catesbeiana* (Bull Frog), 4 adults seen, 2 ca 90 mm SVL, and 2 large ones. *Rana clamitans* (Green Frog) abundant juveniles seen along shore, with at least one *Rana pipiens* (Leopard Frog), though many of these little *Rana* went unidentified. *Thamnophis sirtalis* (Common Garter Snake), 1 adult, seen in creekside tall grass; *Nerodia sipedon* (Northern Water Snake), 1 adult seen on bridge abutments by Phillip.

Other taxa: *Castor canadensis* (Beaver), lots of sign of dragging & feeding on emergent herbs.

T19, Tay R at Peter St Bridge. UTM 18TVE 006.4 720.7 44.89714N 76.25808W.

The first visit to this site was on 13 October 1995, when it provided a bonanza of Unionid shells in a predator shell pile, including the first Tay specimen of *Alasmidonta marginata.* Subsequent visits didn't find any new concentrations of predated shells (27 December 1996, once in 1997, 30 July 1998, 19 July 2006, and 7 September 2007 "NO:Unionidae evident in bright sunlight & clear water though there's a steady flow here, and the entire bottom can be scanned").

This year's visit was on 13 August 2009, TIME: 1153-1243. AIR TEMP: 27, sunny, breezy. HABITAT: slow rock-bottom marshy-shore river. OBSERVER: Frederick W. Schueler, Aleta Karstad Schueler, Orion Clark, Chris Stone, Nick Mulder.

Land ownership is municipal right-of-way, with private land all around. The site was in/on shallow valley. The terrestrial vegetation was Soft Maple forest. Human impact on the site included the bridge (concretized and rebuilt since last visit), golf course back from water on S side, town on N side. Site wetlands were permanent fringing riverine Beaver-influenced marsh with a big Beaver lodge downstream of the bridge on the south side. Dominant wetland plants were: *Pontederia* (Pickerel-weed), *Typha angustifolia* (Narrow-leaved Cattail). Development stage of *Typha angustifolia* (Narrow-leaved Cattail), was mature seedheads. Water at the site was permanent natural somewhat canalized river. Bottom vegetation is *Myriophyllum* or Coontail, and a fine, detritis-clogged aufwuchs-style algae. Frogbit and White Waterlilies, as well as a spatulate-bladed plant with a grass-blade like stem, growing right at the SE corner of the bridge where notes were taken.

Water level was high. The bottom was boulders & muck. Water somewhat greenish-turbid, but turbidity increased markedly at about 12h20. Spaces under rocks were clear of sediment. Water movement was medium. LENGTH SAMPLED: 200 m (FWS) 50 m around bridge (others). Capture was by hand & dipnet.

Chris saw about six "normal-looking crayfish" and tried to catch strange Smallmouth fry, Sunfish, Sucker fingerlings about 10 cm, large pectoral fins. On the rocks that Chris overturned, there are two or three Catastomids just sitting there on the overturned rocks, just "munchin' away" on the under-rock aufwuchs.

Fred collected shells from a Beaver pile downstream of the bridge, no living clams. Damselflies were mating.

Spirodela polyrhiza (Larger Duckweed) with a lot of reddish or brown individuals, floating sparsely against other plants; the only Duckweed here. *Lythrum salicaria* (Purple Loosestrife), Jewelweed, and St Johnswort as well as Dogwood, among the traprock by the bridge abutment.

water chemistry hydrolab. sampling site on S shore below bridge. T-19 - Water temperature 26.02 C, pH 7.81, Total Dissolved solids 930 ppm, Conductivity 125.3 u S/cm, Alkalinity 80.8 ppm $CaCO_3$, Dissolved Oxygen 4.59 ppm, percent saturation Oxygen 57.4%

Unionidae: On 13 October 1995, 179 *Elliptio complanata* (Eastern Elliptio) shells were collected from big piles along banks, old light eroded shells, largest 104.5 mm, mostly quite small. This was just a sample of the *Ondatra* piles upstream of the bridge, some of the shells fresh and others quite old. Eight shells of Lampsilis, looking similar to *Leptodea ochracea* (Delicate Mucket), old light eroded shells, largest 99.5 mm. Some are so light, and have such reduced teeth, that they appeared to be *Leptodea fragilis*. There were also 11 *Lampsilis radiata* (Eastern Lamp-mussel) mostly with *Lampsilis radiata siliquoidea* shape & periostracum, small light shells, largest 69 mm. An eroded 95 mm pair of *Alasmidonta marginata* (Elktoe) seemed to have grown very slowly, ca>40 yrs old. This was identified by Fred and F. Wayne Grimm on 17 May 2000, it appears in Schueler (1995) as *Lasmigona costata* (Fluted Shell).

On 30 July 1998 there was a striking lack of new piles of shells here, and the shells found may date to the 1995 piles: *Elliptio complanata* (6 small old pairs), *Lampsilis radiata* (Eastern Lamp-Mussel) (1 small old pair), and typical Tay *Lampsilis* (1 light pair, the freshest Unionid shell found).

In 2009 at the bridge the situation was much the same: *Elliptio complanata,* 6 alive (mean=71.17 (55 - 90) st. dev. =10.81) and 2 shells, 102 & 66 mm; *Lampsilis* (Lamp-Mussel) 4 shells males, 109 & 103mm, female 88 mm, and and old *Lampsilis radiata siliquoidea*-like 65.5 mm shell. There was also an unidentifiable deformed old 69.5 mm Unionid pair.

"Muskrat" shell pile: Fred went 100m SE, to rock ledges where shells were scattered along shore & in water. *Castor canadensis* (Beaver) were obviously present, with the edge of the shore heavily cut & trampled. Between here and the bridge there's a lodge on the bank, with brush freshly piled on the lodge, but no shells around it, and little trampling into the brush. *Ondatra zibethicus* (Muskrat) droppings were seen on the rock ledges. So this species is present here, though the shells collected have the character of Beaver predation, rather than shore piles associated with Muskrats.

As in previous collections *Elliptio complanata* (Eastern Elliptio) was the dominant species, 100 shells, 67 connected pairs, 4 reassembled, 26 valves, 3 fragments, largest 72.3 mm. No living mussels in the shell pile, but there were a few living *Elliptio* along the river, but these weren't picked up or measured. Otherwise, there were 15 *Lampsilis* (Lamp-Mussel) 9 pairs, 6 valves, largest 89 mm. These are smaller male shells, and larger females. Snails taken with the Unionids were 2 *Campeloma decisum* (Brown Mystery Snail), and 4 *Viviparus georgianus* (Banded Mystery Snail, specimens sent to Eva Pip, Sept 2009).

Crayfish: 30 July 1998 there were no *Orconectes* under several stones turned: "Certainly there aren't a lot of

Crayfish here, as the periphyton has an ungrazed appearance, but the piled stones under the bridge provide a multi-layer refuge."
In 2009 Chris saw about six "normal-looking crayfish" (=*Orconectes obscurus/ propinquus/ rusticus*), but if any were caught, they were among those that ate their labels before they were preserved.

Snails: On 13 October 1995 35 *Viviparus georgianus* (Banded Mystery Snail), largest 35 mm and 3 *Campeloma decisum* (Brown Mystery Snail), largest 27 mm, were taken incidently with the unionids, the shells broken as if bitten by *Ondatra*. On 30 July 1998 large algae-darkened *Viviparus georgianus* (Banded Mystery Snail) dotted the stones under the bridge. In 2009, around the bridge 9 *Viviparus georgianus* were taken, the largest 27 mm.

Herpetofauna: The expected shore-edge *Rana* were seen on the 13 October 1995, 30 July 1998, and 2009 visits: *Rana clamitans* (Green Frog, the commonest species), *Rana pipiens* (Leopard Frog, only a few, not seen in 1998), and *Rana catesbeiana* (Bull Frog). On 30 July 1998, a ca 80 cm adult *Nerodia sipedon* (Northern Water Snake) was on the bridge abutment, and in 2009 a large *Thamnophis sirtalis* (Common Garter Snake) was seen.

Tay River, Perth City Park. 44.89748N 76.25015W.

This site was visited only on 3 May 2001, TIME: 1159-1235. AIR TEMP: 29.5, sunny, windy. HABITAT: rocky river/urban park & residential, riffles & deep water below canal-weir, water 19.5 C. OBSERVER: Frederick W. Schueler, Aleta Karstad Schueler.

Mollusca: shell, dead, specimen. mixed shelly rubble from bottom of river. Just as we left I scooped up some bottom rubble from tributary branch here most are very old shells, dominated by Sphaeriids - the absence of *Bithynia* was in striking contrast to that species abundance in the Rideau River.

Unionids: These mostly came from an apparent predators' shell pile, mostly *Elliptio complanata* (Eastern Elliptio), these were abundant, 10 pairs, 3 valves, most small, largest 113.5 mm, fresher ones preferentially collected. A few seen alive. *Strophitus undulatus* (Squaw-Foot), hinge fragment of large shell, initially thought to be *Alasmidonta marginata* (Elktoe), but hinge morphology and posterior shape argued against this; *Lasmigona costata* (Fluted Shell) 1 deeply corrugated 93 mm fresh pair in riffle below weir. The most distinctive finding was *Lampsilis radiata* (Eastern Lamp-Mussel), 21 shells, elongate, largest 99 mm, with narrow dark rays few male-like shells, unlike any *Lampsilis* I've seen in the Tay above the dams.

Snails: *Viviparus georgianus* (Banded Mystery Snail) (Mollusca). few shell, adult, specimen. few shells and animals, not abundant here.

Crayfish: *Orconectes virilis* (Northern Crayfish), 2 adults found dead. inc. 1 38.6 mm Form II M , with abdominal flesh wasted away. Specimens not saved, and no stones turned to look for Crayfish.

Herpetofauna: *Nerodia sipedon* (Northern Water Snake) (herp). 1 adult, seen, active. ca 65 cm ad in shallow water among *Rana catesbeiana* (Bull Frog). These were medium-sized adults & small juveniles.

In mucky Maple leaf litter just upstream of a heavily bouldered walled bank, below house lawn and above deep water, a *Sternotherus odoratus* (Stinkpot) that seemed to be just at water's surface when disturbed, was grabbed by hand. Plastron length 81.3 mm; male by cloaca position, post-cloacal tail only 15 mm, not aggressive to handling, but not reclusive in the shell either.

T20, Tay R at Beckwith St bridge. 44.90112N 76.24610W

Visted on 13 August 2009, TIME: 1245-1326. AIR TEMP: 27, sunny, breezy. HABITAT: canal in town. OBSERVER: Frederick W. Schueler, Aleta Karstad Schueler, Orion Clark, Chris Stone, Nick Mulder.

The Beckwith Street Bridge is swung open and not used because of need for repairs. Very turbid in main channel. 1-2 cm spots of foam floating down stream, evenly sprinkled in centre of the stream. Waypoint lost, so reconstructed from Google Maps, and then from a waypoint taken on 24 October, 44.90115N 76.24602W.

Fred is collecting clam shells under the swung section of the de-commissioned wooden bridge, almost certainly a Muskrat shell pile. A lot of the "rocks" are slabs of concrete. He just turned a huge one, and is picking up a cluster of shells where it had been. Nick returns from downstream, saying "it's the same crap downstream" - which is taken to mean similar conditions.

Vegetation in the canal is algae-coated *Vallisneria*. There have only been a couple of boats going by - the second one raising a considerable slosh. The turbidity may be at least partly due to the wakes, because we can't see into the water along shore at all after it has passed.

No live Unionids found: perhaps they don't live in shallow water here because of the wakes of passing boats.

13h17 Suddenly we smell a perfume smell - Chris mentions it. Fred identifies it as Palmolive liquid detergent scent - Chris remembers later that this is a regular emanation of the Perth Soap Factory. 13h35 another pulse of detergent smell.

On 24 October the bottom and rocks were coated with short fluffy algae.

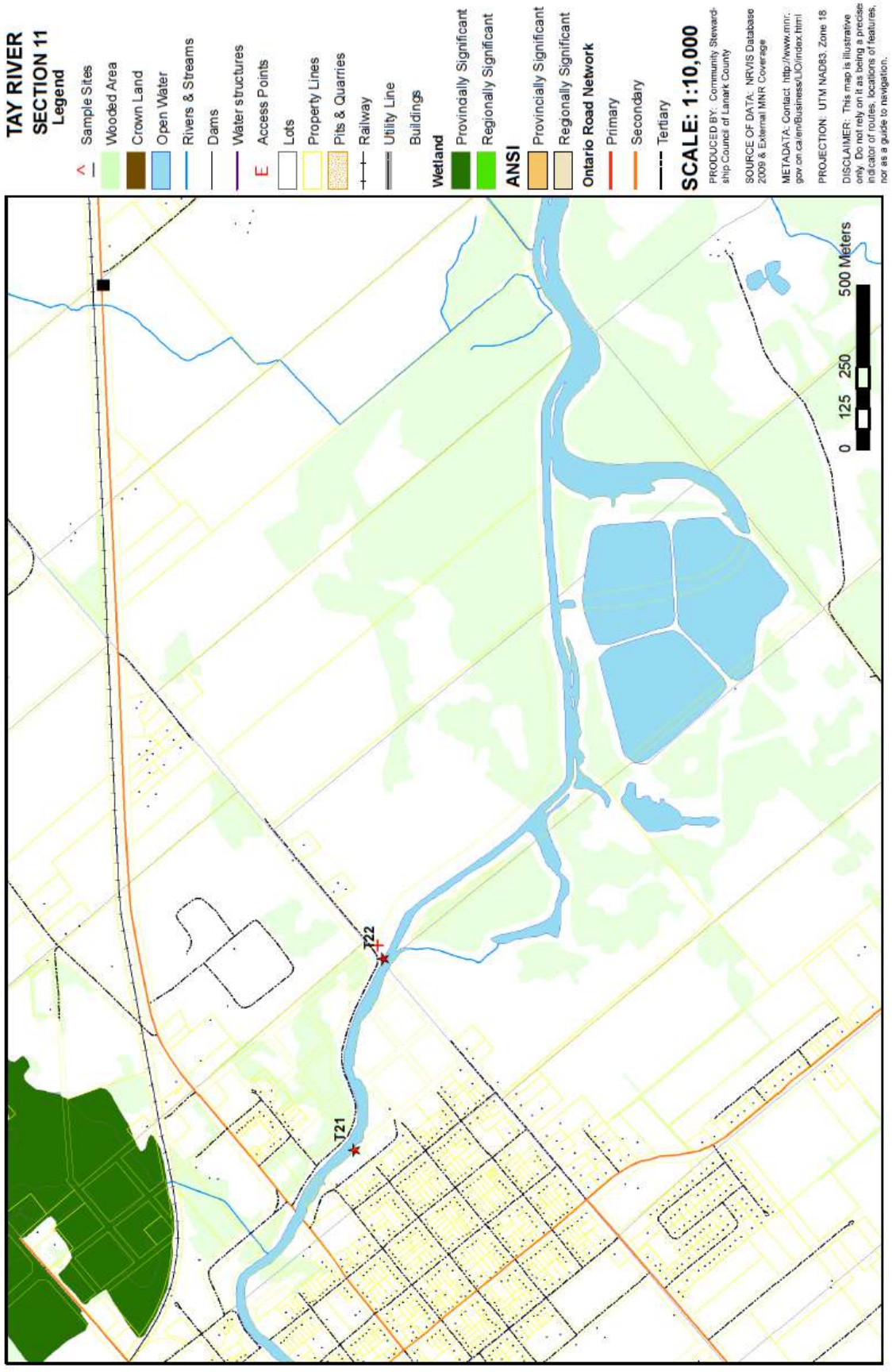
water chemistry: hydrolab. sample site just E of bridge on N shore. T-20 - Water temperature 27.24 C, pH 7.81, Total Dissolved solids 978 ppm, Conductivity 152.3 uS/cm, Alkalinity 95 ppm $CaCO_3$, Dissolved Oxygen 5.71 ppm, percent saturation Oxygen 72.5%

Unionids: Very few were found along the canal: 9 *Elliptio complanata* (Eastern Elliptio) shells, fairly fresh, largest 87 mm, the rest smaller, and 1 *Alasmidonta marginata* (Elktoe), a 94.5 mm fairly fresh pair with green rays & crisp crinkles.

Muskrat shell pile: From under the swung section of the de-commissioned wooden bridge, almost certainly a Muskrat shell pile. A lot of the "rocks" are slabs of concrete, and many of the shells were under the rocks. *Elliptio complanata* (Eastern Elliptio), 111 shells (77 connected pairs, 4 reassembled, 26 valves, 4 fragments), fairly fresh, largest 103.7 mm. *Lampsilis* (Lamp-Mussel) 13 shells, 11 pairs, 2 valves, fairly fresh, largest 104.4 mm. The largest a *Lampsilis cf cardium*, the rest small *Lampsilis cf siliquoidea*. Also a *Juglans cinerea* (Butternut) fruit, half of an old nutshell taken with the Unionids. On 24 October there were a few middling fresh shells of *Elliptio complanata,* but no sign of predation on this species here since our visit this August.

Snails: These were both taken in the shell pile: *Viviparus georgianus* (Banded Mystery Snail), 20.5 mm shell; *Helisoma trivolvus* (Larger Eastern Ramshorn), 14.2 mm immature shell.

Herpetofauna: *Rana catesbeiana* (Bull Frog) 1, ca 10 cm SVL(="4 inch"), "healthy looking" adult (Chris).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0 125 250 500 Meters
T21
T22

T21, Tay R at Last Duel Park. UTM 18TVE 21.9 722.2 44.89868N 76.23848W.

Previously visited on 23 July 1996, this year's visit on 13 August 2009, TIME: 1410-1435. AIR TEMP: 29, sunny, breezy. HABITAT: canal through lawnpark in town. OBSERVER: Aleta Karstad Schueler, Orion Clark, Chris Stone, Nick Mulder.

We approach the river from the mowed lawns of the park, beside a pumping station enclosed in a chain link fence. This bank is across from the straight bank along the "Tow Path" road. The Tay is a canal here, and we are sitting at the Cockburn St. Outflow, Chris says "the number one storm sewer outflow in Perth" - not one of the two that will be mitigated.

Nick says the water seems very warm here. Turbidity is high, but not as bad as the last place - about the same as at the Peter St. bridge. There is only *Valliseneria* here in the way of plants, and no emergent water plants due to the wakewash, except for a thin margin of Cattails in some spots along this bank, and a few Waterlilies. Not much other sign of life. There is a fair amount of bedrock outcropping, varying the water depth. There are areas of a few inches of muck depth, above rock or sand.
14h36 - Chris brought a live Zebra Mussel that he found attached to the underside of a rock. Also two Caddisfly cases, also from the undersides of rocks He says that there was a tremendous Caddisfly hatch at the Craig Street Bridge last night.

14h44 - A small inboard motor boat (about 14 footer) just passed, going at a clip of about 6-7 km/h, possibly the worst speed for wake size - it trailed a wake of at least 30 cm high, which almost sloshed to the top of the bank. Chris and Aleta were appalled.

water chemistry: hydrolab. sample site on N shore of canal at waypoint. T-21 - Water temperature 26.05 C, pH 7.81, Total Dissolved solids 997 ppm, Conductivity 155.7 u S/cm, Alkalinity 82 ppm $CaCO_3$, Dissolved Oxygen 5.45 ppm, percent saturation Oxygen 68.2%

Unionids: On 23 July 1996, 6 shells of *Elliptio complanata* (Eastern Elliptio), largest 74 mm, in water along the N bank of the canal here, with one old thin 80.5 mm inflated *Lampsilis* pair with sparse narrow rays. In 2009 we found only a few, 3 pairs, 1 fragment, of *Elliptio complanata,* largest 64.3 mm.

Muskrat shell pile: Fred went 0.2 km E of the site to a small island with a big *Salix nigra* (Black Willow) tree on island where he found a Muskrat "scrap-heap" and got 9 *Elliptio complanata* (Eastern Elliptio) shells, and saw 20 more. There was also *Lampsilis radiata silliquoidea* (Fat Mucket); a 59.5 mm female shell.

Crayfish: No Crayfish were seen at the site. At the little island, Fred saw one *Orconectes virilis* (Northern Crayfish), and one *Orconectes cf obscurus* both of which escaped capture under flat rocks.

Snails: At the site 1 25mm *Campeloma decisum* (Brown Mystery Snail), and at the shell pile 1 32 mm*Viviparus georgianus* (Banded Mystery Snail) were picked up, but there were no notes on abundance here.

Zebra Mussels: 1 adult, 25.5 mm, found attached to the underside of a rock.

Hereptofauna: None were seen in 2009, but on 23 July 1996 several big adult *Rana catesbeiana* (Bull Frog) were seen, as well as other *Rana* splashes seen but not identified.

Other taxa: 23 July 1996, *Ondatra zibethicus* (Muskrat) (Mammal). 1 adult, dead, seen. floating in canal, not fresh.

On 13 August 2009, 14h10-14h35, we heard *Chaetura pelagica* (Chimney Swift) overhead, but didn't see any.

T22, Tay R at Riverside Drive/Canalbank Road access point. 31C/16, UTM 18TVE 27.7 721.3 44.89797N 76.23108W.

One visit on 13 August 2009; TIME: 1500-1535. AIR TEMP: 28, sunny, breezy. HABITAT: rock & sand flowing canal with brushy shores. OBSERVER: Frederick W. Schueler, Aleta Karstad Schueler, Orion Clark, Chris Stone, Nick Mulder.

This is Canal Bank Road at the end of Riverside Road below Last Duel Park - we are downstream, and on the opposite bank from the last place.

Rocks have many of the little flat dark disk-algae on them, (about 1 cm) sail-like, or flap-like algae, PHOTO in the sun, out of the water, backlit. Pretty spectacular!

Fred mentions that all the duckweed we have been seeing today are *Spirodela*. The aquatic vegetation is much more diverse than the last place, and Aleta made up a plant press synoptic - Myriophyllum type, ruffly pondweed type, *Valliseria* with lovely tube-like flowers on long spiral stems, and a mossy weed from the rocks that is about 8 cm long and clotted with brown algae on all but its green growing tips - and the duckweed *Spirodela*. The opposite bank is grassy, with *Sparganium* along the water. An Oriole (*Icterus galbula*) makes its whistling peep call from one of the scattered Maples there.

15h15 Chris collected a large sample from a Muskrat pile in the water under a tree, containing *Elliptio* and *Lampsilis.*

water chemistry: hydrolab. sample site at S canal bank at waypoint. T-22 - Water temperature 26.91 C, pH 7.83, Total Dissolved solids 979 ppm, Conductivity 153.9 u S/cm, Alkalinity 102.5 ppm $CaCO_3$, Dissolved Oxygen 5.57 ppm, percent saturation Oxygen 71.2%

Unionids: *Elliptio complanata* (Eastern Elliptio) . 17/common shell, specimen. 6 pairs, 10 valves, 1 fragment, largest 114 mm. +1 fragment probably of another species. Shells scattered among rocks; larger ones very *Ligumia recta* -like in profile, and the only other species found along the canal was one old 111 mm *Ligumia recta* (Black Sand-Shell) shell.

Muskrat shell pile: This sample collected by Chris Stone, and sorted by Phillip Scott: *Elliptio complanata* (Eastern Elliptio),1 61 mm individual alive, 103 pairs, 20 valves, 9 fragments, largest 69 mm; *Lampsilis* (Lamp-Mussel) , 7 pairs, 3 valves, largest 95.5 mm; *Alasmidonta marginata* (Elktoe), a 78 mm pair.

Snails: *Goniobasis livescens* (Great Lakes Horn Snail) abundant snails on rocks in the shallow water by shore along road. Twenty-eight taken with Unionids & preserved dry. There are violent wakes here when boats pass - does this favour this species? A single *Viviparus georgianus* (Banded Mystery Snail) , 29.1 mm, was taken with Unionids in the Muskrat shell pile.

Crayfish: *Orconectes cf obscurus,*. 2 medium-size adults seen under cover.

Herpetofauna: *Nerodia sipedon* (Northern Water Snake) 2 adults seen: ca 50 cm adult swam from shore at 15h10, and a ca 70 cm TL swim across at 16h10.

Other taxa: a black flap-like alga common on rocks here. These are little flat dark disks, about 1 cm diameter, sail-like, or flap-like algae.

Hirudinea (Leech) 1 adult, from the Muskrat shell pile, taken with Unionids. Frozen & thawed before preservation in isopropyl.

T23, Perth Wildlife Reserve, Tay Marsh, 4.7 km ESE Perth. UTM 18TVE 56.3 713.3 44.89113N 76.19473W.

Matt Keevil and Fred Schuler made several visits to this site in October of 2007 (Schueler & Keevil, 2007). This year's visit was on 14 August 2009; TIME: 1018-1120. AIR TEMP: 27, sunny, Beaufort light air. HABITAT: grassy point in openwater/Typha marsh at mouth of old flowing slab-shores canal.

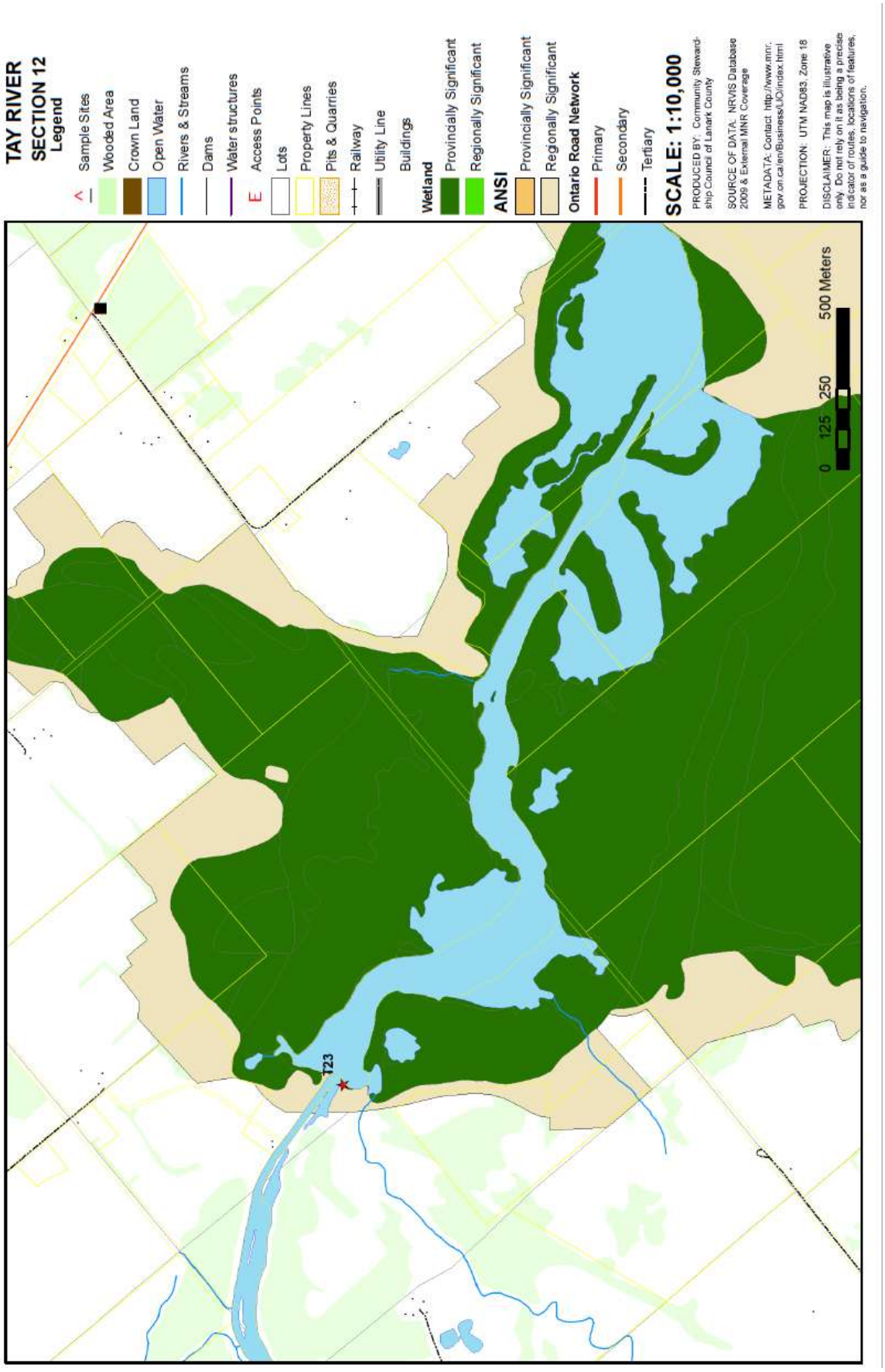
We began at the new 3 m observation platform, with signage emphasising Eels. Orion Clark, Nick Mulder, & Simon Lunn stayed on the mainland, while Fred went out to the nearby islet (some formerly functional feature of the Tay Canal) in search of concentrated Muskrat piles, which he didn't find. NO:Dreissena polymorpha seen here.

Land ownership is by the Crown/RVCA. Weather for the past 48 hr was seasonally normal temperatures seasonally normal moisture. The site was on a plain. The terrestrial vegetation was deciduous parkland (60% wooded). DOMINANT SPECIES:. Soft Maple, *Thuja occidentalis* (Eastern White Cedar), *Fraxinus* (Ash), understorey of *Rhamnus cathartica* (Common Buckthorn). Human impact on the site included old canal & wildlife restoration park.

Wetlands were permanent natural marsh. Dominant wetland plants were: *Typha* (Cattail), Duckweeds some *Nymphaea* (White Waterlily). Development stage of *Typha glauca* was mature seedheads. Water at the site was permanent canal/river, and open water of the Tay Marsh. Water level was high. The bottom was bedrock, boulders, slabs, & muck. Water quality was clear-cloudy. Spaces under rocks were clear of sediment. Water movement was slow. WIDTH: 100 m MAX. DEPTH: 1.5 m, in channel between mainland & islet, DEPTHS SAMPLED: 0-1 m.

Dominant aquatic plants were submerged *Vallisneria americana* (Water-celery), floating *Lemna minor* = *Wolffia* (Watermeal) = *Spirodela polyrhiza* (Larger Duckweed), in marsh, but only *Spirodela polyrhiza* (Larger Duckweed) in the canal. There was some *Nymphaea* (White Waterlily), & *Hydrocharis morsus-ranae* (European Frogbit), and 1 stand of *Butomus umbellatus* (Flowering-rush) on the downstream end of the islet. Capture was by hand & dipnet. Cover checked included flat rocks.

Water chemistry: hydrolab. sample site on canal side of mainland point. T-23 - Water temperature 25.74 C, pH 8.21, Total Dissolved solids 1119 ppm, Conductivity 174.8 u S/cm, Alkalinity 108 ppm $CaCO_3$, Dissolved Oxygen 4.49 ppm, percent saturation Oxygen 51.3%


TAY RIVER
SECTION 12
Legend
Sample Sites
Wooded Area
Crown Land
Open Water
Rivers & Streams
Dams
Water structures
Access Points
Lots
Property Lines
Pits & Quarries
Railway
Utility Line
Buildings
Wetland
Provincially Significant
Regionally Significant
ANSI
Provincially Significant
Regionally Significant
Ontario Road Network
Primary
Secondary
Tertiary
SCALE: 1:10,000
PRODUCED BY: Community Stewardship Council of Lanark County
SOURCE OF DATA: NRVIS Database 2009 & External MNR Coverage
METADATA: Contact http://www.mnr.gov.on.ca/en/Business/LIO/index.html
PROJECTION: UTM NAD83, Zone 18
DISCLAIMER: This map is illustrative only. Do not rely on it as being a precise indicator of routes, locations of features, nor as a guide to navigation.
T23
0 125 250 500 Meters

Unionids: *Elliptio complanata* (Eastern Elliptio), 18 shells, scattered along shores of islet; 12 pairs, ranging from fairly fresh to old, 6 old valves, largest 82 mm. *Pyganodon grandis* (Common Floater) 2 thin broken pairs, larger 100 mm.

On 16 October 2007, 3 *Elliptio complanata* (Eastern Elliptio) , 2 *Pyganodon grandis* (Common Floater), and a doubtfully identified *Strophitus undulatus* (Squaw-Foot) were picked up here.

Crayfish: *Orconectes cf obscurus,* 1 29 mm male taken, 2 small chelipeds found, very few under slabs along shore.

On 16 October 2007 Fred & Matt Keevil found 2 adult *Orconectes virilis* (Northern Crayfish), 1 *Orconectes propinquus*. and 5 drably coloured adult *Orconectes rusticus* (Rusty Crayfish) in Jebbs Creek on the other side of the point.

Snails: *Viviparus georgianus* (Banded Mystery Snail) was abundant, many on rocks everywhere in water, 16 taken. Only 1 *Goniobasis livescens* (Great Lakes Horn Snail), 19.5 mm, was noted. On 16 October 2007 in Jebbs Creek on the other side of the point, *Viviparus georgianus* was common adult, and 1 old shell of *Lymnaea stagnalis* (Great Pond Snail) was found.

Herpetofauna: *Rana pipiens* (Leopard Frog) (herp). 2 juveniles seen in grass on shore; *Hyla versicolor* (Tetraploid Gray Treefrog) about 5 bouts of calls throughout the visit; **Testudinata** (Turtle) a couple of predator-opened nest in disturbed ground near the new tower. An adult *Chelydra serpentina* (Snapping Turtle) was photographed in water, and an adult *Rana catesbeiana* (Bull Frog) ca 13 cm SVL, was seen on shore. In October 2007 Fred and Matt G. Keevil heard *Hyla versicolor* (Tetraploid Gray Treefrog) and *Pseudacris crucifer* (Spring Peeper) calling, and saw juvenile *Rana pipiens* (Leopard Frog) here.

T24, Tay R at Upper Beveridges Dam, 3.0 km WSW Port Elmsley. 31C/16, UTM 18TVE 85.8 705.3 44.88434N 76.15723W.

Visited on 14 August 2009, TIME: 1220-1342. AIR TEMP: 29, sunny, Beaufort moderate breeze. HABITAT: eutrophic flat bedrock river below canal dam, marshy/wooded shores. OBSERVER: Frederick W. Schueler, Aleta Karstad Schueler, Orion Clark, Chris Stone, Nick Mulder, G.Hendry, Simon Lunn.

We drove in through a gate opened for us by the Port Elmsley lock keeper and drove about a kilometre through woods along a track, with the big wetland on our left (south), and finally came to the dam. Land ownership is presumably by the Crown with private land all around. The locality is based on a waypoint at the spillway of the dam. The site was on a plain. Bedrock was limestone. Upland substrate was not assessed. The terrestrial vegetation was parkland (80% wooded). Human impact on the site included canal dam & picnic area. Site wetlands were extensive permanent riverine *Typha* (Cattail) marsh (above dam, not visited). Development stage of *Typha* (Cattail) was mature seedheads.

Water at the site was permanent canal-bypass river. Water level was very high, with weeds from recent flow on the E overflow spillway, and water flowing clearly over the W overflow spillway. The bottom was bedrock. Water quality was greenish/clear where calm, muddy-turbid above spillways & in current below dam. Spaces under rocks were clear of sediment (and of Crayfish). Water movement was fast below dam. WIDTH: 60 m below dam LENGTH SAMPLED: 300 m by FWS, 200 m by others MAX. DEPTH: 1 m DEPTHS SAMPLED: 0-1 m.

Dominant aquatic plants were submerged *Vallisneria americana* (Water-celery) in flower & massed filiamentous algae. *Lythrum salicaria* (Purple Loosestrife) here is pretty well hammered by *Gallerucella* Beetles; flower heads are multiple, and short. *Hydrocharis morsus-ranae* (European Frogbit) was common, in bloom, especially above the dam, with leaves intact. *Lemna trisulca* (Star Duckweed) was present, scattered, in backwater below dam on E side. We haven't seen masses of this species anywhere on the Tay.

Fred waded over to the W shore, under an optimal-looking Soft Maple, and found no shell piles, but just lots of *Castor* dragging, mud, and other sign. Others mostly waded in the deep water of the main stream with view boxes. Capture was by hand & dipnet. Cover checked included flat rocks.

water chemistry: hydrolab. sampling site just below dam on E shore. T-24 - Water temperature 26.76 C, pH 7.66, Total Dissolved solids 1154 ppm, Conductivity 180.1 u S/cm, Alkalinity 104 ppm $CaCO_3$, Dissolved Oxygen 5.9 ppm, percent saturation Oxygen 75%

Unionids: *Elliptio complanata* (Eastern Elliptio), very abundant, 22 alive (mean=65.91 mm (28 - 92) st. dev. =17.95), and 22 shells picked up , vastly more than this seen. Fred, standing in one place and reaching around in the mud on the W side of the river picked up 13 alive and 2 old pairs, 1 old valve, 17 fairly fresh pairs, largest 87.5 mm, a total of 20 shells handled. *Lampsilis* (Lamp-Mussel), 59 & 101 mm fresh pairs in the standing-in-one-place sample, others alive, 100 & 112 mm, and a 135 mm pair.

Muskrat shell pile: After not finding any predator shell piles on the west shore, Fred sampled 50 m of shore NE of the site, places that should have had Muskrat piles - gorgeous water edge Maple trees overhanging flat rocks, but no concentrations of shells, despite lots of Beaver sign, including chewed sticks in the sample, so the samples are all the shells seen along that shore.

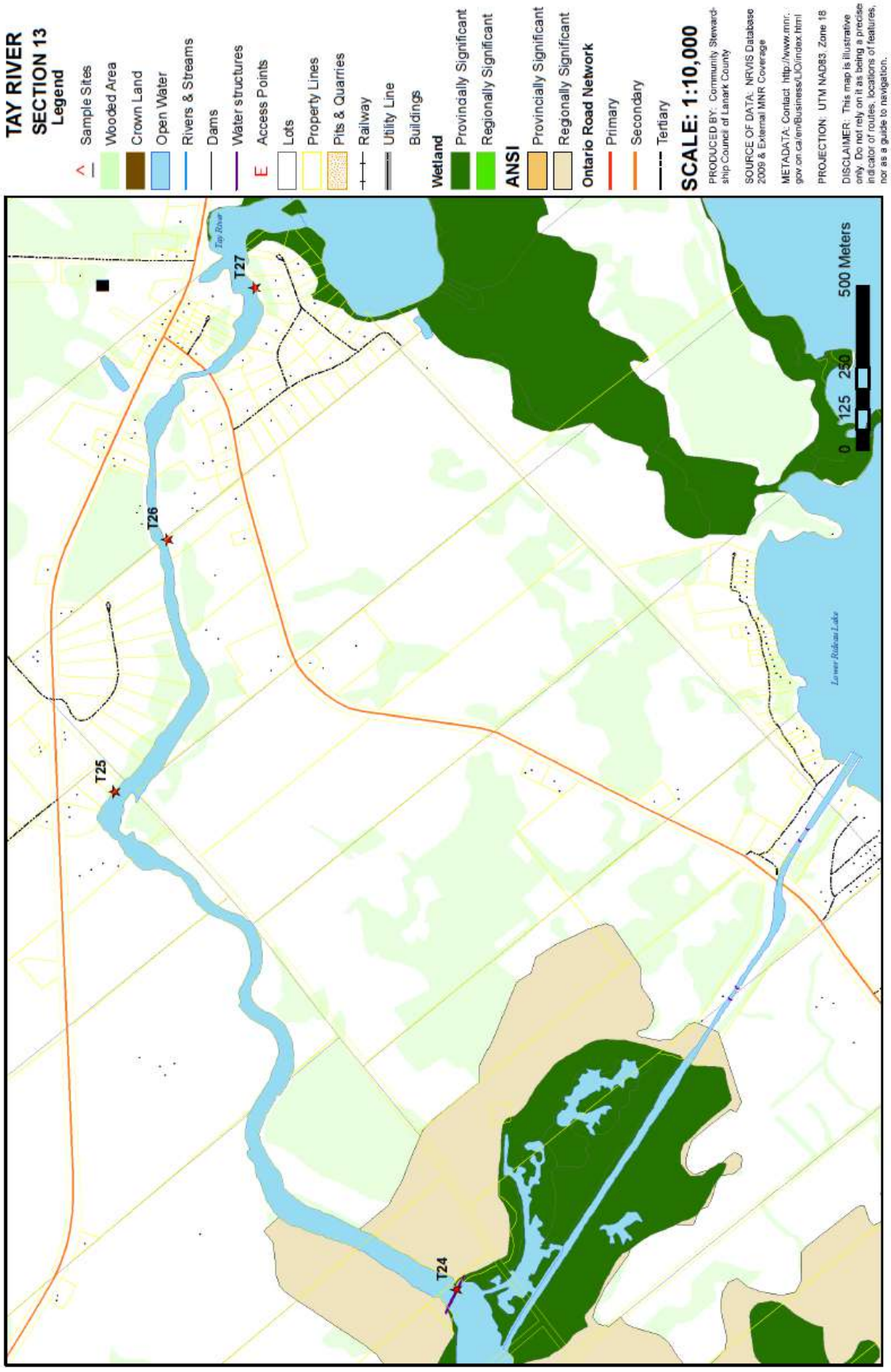
Most were *Elliptio complanata* (Eastern Elliptio), including 10 alive (mean=69.80 mm (60 - 85) st. dev. =7.59), taken incidentally with shells. There were 43 shells, 31 pairs, ranging about equally from fresh to old, but very few so old as to be perforated; ca 12 old fragments. Largest, 2 fresh pairs, 86.5 mm. *Lampsilis* was represented by an 87.5 mm female pair, an old perforate male pair, and a fragment. *Pyganodon grandis* (Common Floater), 113 mm pair, 3 smaller pairs, 2 fragments. *Viviparus georgianus* (Banded Mystery Snail), 11 mostly small shells mostly inside *Elliptio* pairs, largest 21.8 mm, most much smaller.

Zebra Mussels: 6+shells adults from various places on bedrock: n=6 mean=35.53 mm (30 - 41) st.dev.=3.79, the largest shells we've seen anywhere.

Crayfish: *Orconectes virilis* (Northern Crayfish), a large female, captured but died soon after in captivity. *Orconectes cf obscurus*, a minute carapace, and a 35 mm shell.

Snails: *Lymnaea stagnalis* (Great Pond Snail), 1 adult, alive on filiamentous algae near shore, 39.8 mm. *Viviparus georgianus* (Banded Mystery Snail), abundant in river below dam, 56 shells 10 alive, preserved, largest 24.7 mm. NO:Goniobasis noted here by Fred.

Herpetofauna: *Nerodia sipedon* (Northern Water Snake), 2 adults, seen, active. 70 cm on W shore, a metre-long adult in the long grass & Loosestrife next to the short backwater next to the concrete of the dam here. The many juvenile *Rana* (True Frog) seen were not identified to species by Fred.


TAY RIVER
SECTION 13
Legend
Sample Sites
Wooded Area
Crown Land
Open Water
Rivers & Streams
Dams
Water structures
Access Points
Lots
Property Lines
Pits & Quarries
Railway
Utility Line
Buildings
Wetland
Provincially Significant
Regionally Significant
ANSI
Provincially Significant
Regionally Significant
Ontario Road Network
Primary
Secondary
Tertiary
SCALE: 1:10,000
PRODUCED BY: Community Stewardship Council of Lanark County
SOURCE OF DATA: NRVIS Database 2009 & External MNR Coverage
METADATA: Contact http://www.mnr.gov.on.ca/en/Business/LIO/index.html
PROJECTION: UTM NAD83 Zone 18
DISCLAIMER: This map is illustrative only. Do not rely on it as being a precise indicator of routes, locations of features, nor as a guide to navigation.
T24
T25
T26
T27
Tay River
Lower Rideau Lake
0 125 250 500 Meters

Other taxa: Aleta waded out in response to a cry of "Pectinella!" - a giant bryozoan colony, *Pectinatella magnifica* (Blob Bryozoan) 2 30-cm colones in main turbid flow, 1 m depth, and photographed the colony through the viewing box. *Micropterus dolomieui* (Smallmouth Bass) were very common in river below dam. Note that this is both the most conspicuous big fish, and the only one we're keeping track of. *Castor canadensis* (Beaver) abundant sign all along shores, 3 short debarked branches from along shore retained as specimens.

Pandion haliaetus (Osprey), 2 adults, seen & heard overhead as we arrive.

T25, Tay R at #5317 Highway 43 (Bill Black's). 44.89390N 76.13824W.

Visited on 14 August 2009, TIME: 1125-1158. AIR TEMP: 28, sunny, breezy. HABITAT: shallow limestone bedrock river running past lawn. OBSERVER: Frederick W. Schueler, Aleta Karstad Schueler, Orion Clark, Chris Stone, Nick Mulder, Simon Lunn.

Lower branch of the Tay River, east of the dam, with solid limestone bedrock bottom as it sweeps past this lawn. When we arrived there was a large flock of *Branta canadensis* (Canada Geese) loafing in the riffles upstream, and there are still feathers floating downstream to us. There are lots of feathers on the mowed lawn - mowed right down to the bank. Aleta sits with computer under a medium-sized Silver Maple which overhangs the water. The bank here is only about 30 cm above the water, and undercut.

11h36:52 AM: Chris saw a large Snapping Turtle swimming in a small swampy bay on the opposite side of the river, downstream from this lawn.

No fish seen except fry, possibly small "minnows;" NO:Dreissena here. Caddis Fly larvae making cases with large sand grains.

11h56 Air temp:28 C, Soon after his arrival Fred caught one crayfish and saw another.

water chemistry: hydrolab. sampling site right at waypoint at Black's lawn. T-25 - Water temperature 27.8 C, pH 8.87, Total Dissolved solids 1147 ppm, Conductivity 178.7 u S/cm, Alkalinity 80.8 ppm $CaCO_3$, Dissolved Oxygen 7.25 ppm, percent saturation Oxygen 94.7%

Unionids: *Elliptio complanata* (Eastern Elliptio), appears very common here, though with the barren bottom all mussels are conspicuous. Forty taken alive (mean=71.45 mm (53 - 90) st. dev. =7.74), and 94 shells,69 connected pairs, 2 alive frozen, thawed & in isopropyl, 4 reassembled pairs, 16 valves, 3 fragments, some fresh, others very eroded and perforate.

Muskrat shell pile: A search for piles by Chris Stone turned up only 14 shells of *Elliptio complanata* (Eastern Elliptio), 4 pairs, 10 valves, largest 81 mm, all very fresh.

Snails: *Viviparus georgianus* (Banded Mystery Snail), 15 adults & shells, largest 29 mm, most alive, taken with Unionids.

Crayfish: *Orconectes cf obscurus;* Fred caught 1 slender 23 mm male & saw another individual in the last few minutes of the visit (he arrived late).

T26, Tay R at #202 Port Elmsley Rd (Susan Brandum's). 31C/16, UTM 18TVE 108.6 714.1 44.89255N 76.12848W.

Visited on 14 August 2009, TIME: 1400-1451. AIR TEMP: 29, sunny, Beaufort moderate breeze. HABITAT: shallow limestone bedrock/slab river through mixed woods & alvar-like barren flats. OBSERVER: Frederick W. Schueler, Aleta Karstad Schueler, Orion Clark, Chris Stone, Nick Mulder, George Hendry.

Land ownership is private (Susan Brandum). The site was on floodplain. Bedrock was exposed limestone. Upland substrate was bedrock over nearby areas. The terrestrial vegetation was parkland (40% wooded) and alvar-like barren flats. DOMINANT SPECIES: *Sedum acre* (Mossy Stonecrop) all over the limestone flats. Human impact on the site included lawn-chair recreation; the third of five mills at Port Elmsley was situated here, and remains of the dam can be seen upstream of the waypoint. There were no wetlands at the site, but *Pontederia* along some shores. Water at the site was permanent natural bedrock & slab-bed river. Water quality was clear. Spaces under rocks were very clear of sediment. Water movement was fast. Water level was high, but with streamside rocks exposed for the first time. NO:Eurycea under those that were turned (also no seepage along this shore). WIDTH: 25-30 m, LENGTH SAMPLED: 200 m, MAX. DEPTH: 50 cm, DEPTHS SAMPLED: 0-50 cm. Dominant aquatic plants were submerged black-disc algae. Otherwise rocks are bare. Capture was by hand & dipnet. Cover checked included flat rocks.

14:20: Nick brought in a Caddis fly larva, its tube made out of gravel, rather than sand. In cracks in the rock bottom, there are deposits of little Sphaerids, two individuals are 4 mm and 5.5 mm. "Not much muck on the bottom - clears up very fast"

The river is about 20 - 30 m wide here, with riffles most of the way. Just about 20 m upstream of the step-like ledges at the waypoint, with shade of Alder and Buckthorn, the riffles begin, and Fred and Chris waded and gunged in still-surfaced water.

14:35: Chris says NO:Dreissena seen. Fast-moving Small-mouth Bass. Not a great number of clams. Lifted many rocks, saw no Crayfish. Several Caddisflies under rocks. No Muskrat piles. Too much current.

02:39:11 PM FWS came back from upstream, and said the Crayfish are small, and very adept at ducking down into the successive crevices of the piled slabs of rock. They don't get swept into the current and downstream, so he had a very low success rate for catching them.

water chemistry: hydrolab. sampling site on S shore at waypoint. T-26 - Water temperature 28.18 C, pH 8.9, Total Dissolved solids 1138 ppm, Conductivity 177.8 u S/cm, Alkalinity 118 ppm $CaCO_3$, Dissolved Oxygen 7.32 ppm, percent saturation Oxygen 96%

Unionids: Almost the only species here was *Elliptio complanata* (Eastern Elliptio), fairly densely throughout, where there are rocks, 21 alive (mean=67.43 mm (62 - 74) st. dev. =3.91), two of which (74.7 & 67.8 mm) have had such a hard life that they are short and hunched, and very eroded, symmetrically. We have preserved them in isopropyl. Above the site Fred saw ca 150 *Elliptio*, alive and dead, underneath rocks mostly, but didn't collect any of them, since he was focused on *Orconectes.* Shells were 5 highly perforate pairs & 1 valve, largest 83 mm, also a heavier fragment from *cf Lampsilis* in with the sample. *Lasmigona costata* (Fluted Shell) 1 alive, 110 mm.

Snails: *Viviparus georgianus* (Banded Mystery Snail) . 13+1 adult, shell, specimen. 8 shells, largest 27.8 mm, 5

alive, largest 25.5 mm, 30.5 mm in isopropyl. Living ones among the 13 preserved as shells. Sample includes Caddis cases and 2 Sphaeriids.

Crayfish: Orconectes cf obscurus, 5 taken under cover. from piled-rock riffle upstream of waypoint. males 21.2, 22.8, 23 mm; females 23.7, 23.5 mm (the second soft-shelled)

These were very adept at ducking down into the successive crevices of the piled slabs of rock. They don't get swept into the current and downstream, so there was a very low success rate for catching them.

Other taxa: *Pectinatella magnifica* (Blob Bryozoan) 1 colony on a *Vallisneria* blade, 290 mm long, 40 mm wide, tapering at both ends. The clusters of individual zooids are not packed together closely as on the earlier colonies at the dam, but more scattered, showing the clear jelly (found by Nick); numerous colonies up to 30 cm in diameter (Orion).

Micropterus dolomieui (Smallmouth Bass) common, fast-moving individuals noted (Chris); *Ardea herodias* (Great Blue Heron) 1 adult flying by; *Pandion haliaetus* (Osprey), 1 adult, seen & heard, flying by & chirping.

T27, Tay R at #116 Tayview Drive (George Hendry). 31C/16, UTM 18TVE 116.3 711.5 44.89026N 76.11874W.

This was our last station, 14 August 2009.TIME: 1530-1609. AIR TEMP: 29.5, sunny, breezy. HABITAT: slow marshy river with wooded/residential shores. OBSERVER: Frederick W. Schueler, Aleta Karstad Schueler, Orion Clark, Chris Stone, Nick Mulder, George Hendry.

This is George Hendry's backyard at the mouth of the Tay. Chris, who was diving with a snorkel, says bottom silt-covered bedrock, about 5 cm depth of silt. Water maximum depth about 2 metres. No sign of Zebra mussels. “Precious little else.” 20% plant covered, mostly *Vallisneria*, some *Elodea*. Lots of torn-up *Vallisneria* floating on surface. *Butomus umbellatus* (Flowering-rush) along the shores, in mostly submerged clumps. Chris found several *Elliptios* and a few scraps of *Elliptio* shells.

Fred waded downstream to a little island which is a remnant of the lock #1 on the original Tay Canal, which he thought might be the most likely place for a predator's shell pile, and for finding *Orconectes* under the many flat stones. There was no shell piles along the shores, and no *Orconectes* under many turned rocks.

As we were leaving, we saw the head of what may have been either a Painted Turtle or a Water Snake briefly emerge from the water about 4 m offshore.

water chemistry: hydrolab. sample site at dock. T-27 - Water temperature 28.94 C, pH 9.08, Total Dissolved solids 1148 ppm, Conductivity 179.1 u S/cm, Alkalinity 106 ppm $CaCO_3$, Dissolved Oxygen 6.92 ppm, percent saturation Oxygen 92.1%

Unionids: Only a few *Elliptio complanata* (Eastern Elliptio) taken around the site, 9 alive (mean=59.67 mm (51 - 69) st. dev. =5.75) and 9 shells 1 fresh-dead, 5 fairly fresh pairs, 2 fragments, 1 old 71.4 mm valve, the largest of the pairs 59.5 mm. Fred found 1 shell & 1 alive at the little island which is a remnant of lock #1 of the original Tay Canal.

Snails: *Viviparus georgianus* (Banded Mystery Snail), common, 2 alive taken incidentally with Elliptio, 17.8 & 19.7 mm.

Tay R at Hwy 43 Boat Launch, 0.4 km ESE Port Elmsley. UTM 18TVE 118.2 712.9 44.89160N 76.11635W.

We visited here on 14 August 2009, TIME: 1510-1523. AIR TEMP: 29, sunny, breezy. HABITAT: emergent-herb shore of marshy canal-river/residences. OBSERVER: Frederick W. Schueler, Aleta Karstad Schueler, Orion Clark, Chris Stone, Nick Mulder. The surface of the water here was covered with a bubbly scum of pale green algae, which was swept aside to find a single fresh floating *Campeloma decisum* (Brown Mystery Snail) shell, and to reveal NO:Unionidae.

Fred had previously found *Chrysemys picta* (Painted Turtle) and *Vulpes vulpes* (Red Fox) DOR here, heard *Hyla versicolor* (Tetraploid Gray Treefrog) & *Rana catesbeiana* (Bull Frog) calling, and saw alien *Iris pseudacorus* (Yellow Flag) in bloom at water's edge between canal & parking area.

3.2: Results: Water chemistry

Our water chemistry results are given in Table 1, and RVCA summer sampling in Table 2.

In comparison with the RVCA data, our conductivity is always somewhat lower, our pH is significantly lower above Perth, and quite a lot higher at Port Elmsley, and our alkalinity as $CaCO_3$, as explained in the Methods section, is about 1.5 times the RVCA's presumably better-controlled values. There will always be differences in such numbers produced by different protocols, but differences along the river in our results are presumably an accurate reflection of the real situation.

The geologic transition from Shield to Limestone plain is reflected in the increasing in pH and alkalinity downstream, as lime is taken up by the water. The accompanying increase in dissolved matter is reflected in the increase in conductivity.

As a rocky-bed stream in a rural environment, it's expected that the Tay would be well oxygenated, and that is what was found. If water was 100% saturated at 25°C, it would hold 8.3 mg/L and at 30°C- 7.5 mg/L. All sites have temperatures ranging from 22.07-28.94°C and hence will hold less than 9 mg/L , even if fully saturated. The sites where there was good aeration of the water by riffles had the highest saturation even at high temperatures, *i.e.* site T26, T2, between 6-7 mg/L of dissolved oxygen. In fact, only 8 sites had a saturation of 80%+ with respect to dissolved oxygen. Because we don't have numeric measures of gradient, we can't really say more than this about dissolved oxygen; a GIS (geographic information system) analysis would probably explain some of the variation on the basis of gradient, wetlands, and adjacent human settlement.

While “meso”-invertebrates weren't systematically sampled or identified in this survey, we[3] noted Animals that are regarded as biological evidence of good water quality at seven sites: Stonefly (Plecoptera) larvae at site T17 (73% saturation); various Caddisfly larvae at T12 (64%), T15 (73%), T21 (68%), T25 (94%), & T26 (98%), and a hellgrammite (Dobsonfly larva) at site T16 (76%).

3 some members of the party were not aware that these taxa were being tallied as potential evidence of water quality.

Effects of the town of Perth on Water Quality

There's no sudden break in our chemistry data at the town of Perth (stations T19-T21). The increased pH, total Dissolved Solids, conductivity, and Alkalinity beginning at T23 reflects the contribution of the sewage treatment plants at 44.893N, 76.208W, upstream of the Perth wildlife Area.

In their 2004 report, the Ontario Ministry of the Environment acknowledge that the benthic community in the outfall channel from the sewage treatment lagoons has been influenced by the long term discharge from the lagoons, and is characterized by the predominance of Oligochaetes and Chironomids. Both of these taxa are tolerant of nutrient enrichment and are common in areas of lesser water quality. The water quality and sediment (in the outfall channel the concentration of Total Organic Carbon and Total Kjeldahl Nitrogen were above the provincial Severe Effect Level Values) conditions in the embayment and outfall channel reflect a historical, cumulative impact from the lagoon discharge.

Christopher Stone writes:

The Tay, as it flows through Perth, is one of the greatest assets the town has. The Tay has contributed to the town's past development, is currently vital to the town's core and in the future, as the Rideau Canal heritage designation will bring more visitors to the area, the Tay has the potential to further enhance the visitor experience in Perth.

The Tay River in Perth can be the cleanest urban waterway in Ontario. This is not an unrealistic goal; the headwaters of the Tay are already in near pristine condition and improvements in agricultural practices and other measures are making more improvements. Source Water Protection initiatives will further improve the Tay as it enters Perth.

However, the water quality of the Tay decreases significantly once it starts its journey through the town. The first assault is the untreated backwash discharge from the Water Treatment Plant. Then follows more than thirty untreated storm water outlets into the river. The net result is that by the time the Tay leaves Perth it has one of the lowest water quality ratings.

It makes no economic sense that the Town should continue to view the Tay as an expedient, low-cost means of dumping untreated water treatment plant and storm water effluent. It appears that the Ontario Ministry of the Environment agrees as regards to WTP effluent.

Of recent concern is the Wilson Street reconstruction project. Currently, all the storm sewers from westward Drummond Street, southward Hwy 7 to Mary Street accumulate to dump unmitigated into the Tay through a culvert/ditch adjacent to the Stewart School, just downstream of the municipal water intake. Southward of Mary Street to the Tay itself all stormwater is dumped, unmitigated into the Tay through a culvert at Haggarts' Park. The Town was successful in receiving federal and provincial funding for the Wilson Street project based on a proposal that included treatment of storm water for this large drainage area. To date, even though the Town is celebrating completing the project under budget, the storm water treatment measures have not been implemented. (by e-mail, Thursday, February 10, 2011 5:43 PM)

Our survey took place during a time of no precipitation, so we couldn't have observed any direct effects of stormwater discharge. We briefly visited the discharge channel from the Water Treatment Plant (a "rocky/marshy Beaver-dammed water-treatment side channel in urban fringe," FWS 2009/198/h), and found one dead Crayfish; we didn't take water chemistry data or find any Unionid shells or living Crayfish.

Table 2: Water Chemistry data

SITE	Water °C	pH	T.D.S.- ppm	Conduct. uS/cm	Alkalinity as ppm $CaCO_3$	Dissolved Oxygen	Saturation % D.O.
T1	24.15°C	7.88	808	126.5	92	5.82	70.90%
T2	25.17°C	8.26	797	124.8	92	6.45	80.20%
T3	23.63°C	8.29	816	127.3	80	6.01	72.50%
C10	27.17°C	8.29	863	135.5	86	6.28	80.30%
T4	28.16°C	8.24	862	134.8	80	5.93	77.10%
T5	22.84°C	7.13	868	135.3	76	5.31	63.50%
T6	25.87°C	8.43	858	134.5	88	6.67	83.60%
T7	24.57°C	7.25	887	138.5	92	5.49	67.10%
T8	26.76°C	8.64	850	132.9	88	6.72	85.80%
T9	25.41°C	8.33	855	133.7	81	6.83	85.20%
T10	24.15°C	6.88	877	136.9	90	5.18	63.10%
T11	24.05°C	7.34	866	129.4	80	5.64	68.50%
T12	23.52°C	7.12	872	136.5	80	5.34	64.30%
T13	25.89°C	7.83	860	134.5	80	6.01	75.60%
T14	25.45°C	7.85	862	134.8	84	5.86	73.40%
T15	25.64°C	7.85	862	134.8	84	5.86	73.40%
T16	22.63°C	7.57	938	146.1	96	6.31	76.10%
T17	22.81°C	7.21	930	145.5	76	6.11	72.60%
T18	22.07°C	6.52	940	146.4	90	4.71	55.10%
T19	26.02°C	7.81	930	125.3	80.8	4.59	57.40%
T20	27.24°C	7.81	978	152.3	95	5.71	72.50%
T21	26.05°C	7.81	997	155.7	82	5.45	68.20%
T22	26.91°C	7.83	979	153.9	102.5	5.57	71.20%
T23	25.74°C	8.21	1119	174.8	108	4.49	51.30%
T24	26.76°C	7.66	1154	180.1	104	5.9	75.00%
T25	27.8°C	8.87	1147	178.7	80.8	7.25	94.70%
T26	28.18°C	8.9	1138	177.8	118	7.32	96.00%
T27	28.94°C	9.08	1148	179.1	106	6.92	92.10%

Table 3: Comparison of our and RVCA Water chemistry data

SITE	Ca mg/L	Alka.. mg/L $CaCO_3$	Conduct.uS/cm	pH
Above Perth:				
RVCA 16: 15 July	16.6	60	135	8.16
RVCA 16: 12 August	17.7	58	134	8.13
our station T1		92 ppm	126.5	7.88
RVCA 5: 15 July	21	74	170	8.29
RVCA 5: 12 August	19.8	65	151	8.17
our station T16		96 ppm	146.1	7.57
Below Perth:				
RVCA 19: 15 July	21	76	174	7.96
RVCA 19: 12 August	21	70	163	7.98
our station T20		95 ppm	152.3	7.81
RVCA 1: 15 July	22	79	184	8.09
RVCA 1: 12 August	23	76	185	8.09
our station T26		118 ppm	177.8	8.9

3.3: Results: Unionidae

Nine species of Unionid were found, *Elliptio complanata* (Eastern Elliptio) was the most abundant species, while the characteristic Tay *Lampsilis* (Lamp Mussel), was second most abundant. *Alasmidonta marginata* (Elktoe), *Lasmigona compressa* (Brook Lasmigona), *L. costata* (Fluted Shell), *Pyganodon grandis* (Common Floater), *Strophitus undulatus* (Squaw-Foot or Creeper), *Ligumia recta* (Black Sand-Shell), and *Lampsilis radiata siliquoidea* (Fat Mucket) were infrequent. Two species which are sporadically found in small streams in Eastern Ontario were not found: *Alasmidonta undulata* (Heavy-toothed Wedge Mussel) may require muddier habitats than we searched, while *Anodontoides ferussacianus* (Cylindrical Floater) may be restricted to tributary streams if it occurs in the Tay watershed. Appropriate host fish for Unionid larvae are known to be present in the Tay for each species (Appendix III).

In 1995 a paucity of Unionids was noticed at the mouth of the Tay at the Rideau River (and at the mouths of Kemptville Creek and Jock River, the other major Rideau River/Canal tributaries, Schueler 1996a). Our present sample of 30 river sites where *Elliptio* was found (not including the site at the mouth, in Port Elmsley sampled in 1995), the correlation between longitude and total *Elliptio* was only 0.2355 ($p=0.36$[4]), and even lower if only those taken alive or as shells were counted ($r=0.1103$, $p=0.56$). The correlation between *Elliptio* found and the number of other species of Unionids was only 0.0019, which rose only to 0.3384 ($p=0.07$) if the Muskrat pile and previously taken specimens were included. The one significant relationship was between the number of Unionid species at sites where *Elliptio* was found and longitude, which increased upstream ($r=-0.4345$, $p=0.01$).

Counts of species at sites (including species found before 2009) were lower in the lake (11 stations, mean= 1.55) vs the River (30 stations mean= 3.47; overall mean= 2.95 $t = +3.9$ $p=0.0004$, and similar p for the Mann-Witney U test).

Comparing the River above Perth (20 stations mean= 3.80) vs the river in and below Perth (10 stations mean= 2.80), the overall mean is overall mean=3.47. Tests of the difference are ambiguous ($t = +1.7$, p (one-tail) = 0.05 (2-tail) = 0.10 Mann Whitney $U = 65.5$, $p = 0.0668$ (one-tail), $p2 = 0.1336$ (2-tail)). The one-tailed test ("are there fewer species below Perth?" rather than "is there a difference above or below Perth?") may be appropriate given previous speculations that pollution or the "mouth of the Rideau" effect might reduce the number of species downstream. However, given the nonrandom selection of sites, and the disparate effort expended at some stations, it's best to say that the data suggest such a decline, but that it's not established.

The best evidence of reduced downstream diversity may be the finding of only *Elliptio* and *Lampsilis* at T24, Upper Beveridges Dam, where the flat bedrock river, at the outflow of an impoundment, should have provided ideal conditions for Unionids, and were we made an extensive search of the whole width of the river.

Despite moderate levels of calcium, and above-neutral pH in August 2009 (mean=7.84, 6.36-9.08, st. dev.= 0.64) many Tay Unionids have most of their periostracum eroded away. This may be due to slow growth and long lifespans, or it may be due to lack of soft substrates for burrowing. In some sites, residual sawdust and barkchips from former lumber mills may provide less protection from erosion than mineral substrates would.

4 We express the association between variables by the Pearson product-moment correlation coefficient (r), and the strength of the association by the probability that it is due to chance (p).

The 1986 & 1987 Christie Lake Mussel Kills

On 23 July 1986 Mrs Dorothy Perry reported a "die-off of clams in the bay [of Christie Lake] where her cottage is located" to the Lakes Unit of the Ministry of the Environment. On 24 July "a large number of clams were found floating in Perry's bay... grabs of surface water in Perry's bay contained a large variety of detrital material, algae, macrophytes, and dead invertebrates. A shoreline cruise of the adjacent bays, Big Island and the southwest shores was performed. Floating clams were found over the whole lake particularly above areas of clean sandy substrate" (Hicks 1986).

Mortality recurred in 1987, and on 5 August of that year D.L. Galloway, Ministry of the Environment Recreational Lakes Evaluator, reported that:

"A field crew undertook an investigation of clam mortality on Christie Lake the week of July 13. A report of a reoccurrence of dying clams this year was phoned to the office by John Oliver earlier in the season. No dead or dying clams were observed by the field crew at the time of their visit... Mr. Oliver was notified by phone (225-9940) on August 4. He indicated that clams were dying by the thousands until (stop logs were removed at Bollingbrooke) and the water level in Christie Lake increased by 20 inches. This occurred a few days prior to our visit. Mr. Oliver attributed the turnaround in the clam mortality situation to increased flushing of Christie Lake" (Galloway 1987).

In 1991 Galloway writes to Peter M. Higgens that "I am pleased to learn by your letter that recolonization is proceeding, albeit slowly."

It's possible that water levels depressed below the suggested rule curve for several weeks could account for this massive mortality of Unionids, but the water level was much lower in 1985, and again lower in 1988, and in the winter of 1989, than in either 1986 or 1987, so from this perspective we're not able to understand why they died

and floated when they did. The increase in water level before the 1987 visit (from 154.2 m on 1 July to 154.46 m on 13 July), is visible in the data, but is 26 cm rather than 20 inches (51 cm; Parks Canada data, available from OC).

Unfortunately, no specimens of the dead clams were retained, though the fact that so many were "floating" suggests that the individuals seen dead were mostly *Pyganodon* "floaters." While *Elliptio* can survive low water levels better than other species, and *Pyganodon* is often very fast-growing, 22 years should have been sufficient for recolonization of the lake from the river, if the habitat in the lake was suitable for a diverse Unionid population.

Species Accounts

Elliptio complanata (Lightfoot 1786) Eastern Elliptio

This is the most widespread and abundant Unionid in eastern Ontario, and was vastly predominant in the samples along the Tay. The 36% found alive in random sampling will serve as a standard for the proportions found in other species. alive. It was also vastly predominant in Muskrat shell piles, the 1272 shells found in such piles making up 94% of all shells there.

In 30 river sites where this species was found, the correlation between the number found alive and as shells was only 0.3914, with a probability of 0.03, but there was no correlation between the number "found" (the sum of those alive and shells) with the number taken in Muskrat piles.

Table 4: *Elliptio complanata*	**Alive**	**Shells**	**Muskrat Piles**	**Previous**	**Total**
Tay R at Richies Farm, below Bolingbroke (T1)	16	3	0	0	19
Tay R at Davern Lane, 1.8 km NE Bolingbroke (T2)	14	8	0	0	22
Tay River above Deacon's Bridge, off Co Road 36 (T3)	9	18	24	0	51
Tay R/Co Road 36	0	0	0	3	3
Camp Opemikon, McManus Bay, 4.8 km ENE Bolingbroke				15	15
Christie Lake, near Station Bay, 3.6 km SW Big I (CSite02)	0	22	0	0	22
Long I, Christie Lake, 1.8 km WSW Big I (Shoal2)	13	21	0	0	34
Christie Lake, adjacent to Station Bay, 1.6 km NW Big I (CSite01)	0	5	0	0	5
Round I, Christie Lake, 1.2 km WNW Big I (Shoal1)	11	21	0	0	32
Christie Lake, Christie Lake Cottages & Marina, 1.1 km NNW Big I	0	11	0	0	11
Christie Lake, Boys & Girls Camp, 1.1 km SSW Big I (CSite05)	0	27	0	0	27
Christie Lake, Spring Bay, 0.1 km S centre of Big I (CSite09)	0	12	0	0	12
Christie Lake, near Ottawa Pt, 0.1 km S centre of Big I (CSite08)	0	6	0	0	6
Big I shoal, Christie Lake, 0.1 km NNE centre of Big I (Shoal3)	13	5	0	0	18
Christie Lake, across from McManus Point, 0.6 km SSE Big I (CSite)	0	12	0	0	12
Christie Lake, Alan Jordan's farm, 2.0 km ENE Big I (CSite07)	6	6	0	0	12
Tay River below Jordan's Bridge, 4.2 km SW Dewitt Corners (T4)	11	11	32	0	54
Tay R at #438 Althorpe Rd (Pauline Clark's) (T5)	30	34	182	0	246
Tay R/Co Road 6, Schoolhouse Bridge (T6)	49	30	81	30	190
Tay R at #2522 2nd Conc. Bathurst (Chris Stone's) (T7)	19	30	133	0	182
Tay R at 2nd Concession Bridge (T9)	80	45	72	4	201
Tay R at Bolger's farm (2nd Conc. Bathurst) (T8)	11	18	166	0	195
Tay R at Menzie-Munro Sideroad bridge (T10)	6	17	21	0	44
Tay R at Noonan Sideroad bridge (T11)	13	4	0	0	17
Tay R at Noonan Sideroad, Flat Rock Public Access (T12)	42	76	36	0	154
Tay R at #166 Leonard Sideroad (Nancy Wildgoose) (T13)	3	45	0	0	48
Tay R at Bowes Sideroad bridge (T14)	0	6	0	2	8
Tay River above OMYA water intake, 1.1 km SW Glen Tay (T15)	17	12	0	0	29
Tay River bridge/0.8 km SSE Glen Tay intersection	0	0	0	11	11
Tay R at #582 Glen Tay Sideroad (David Taylor) (T16)	0	11	124	0	135
Tay R at #177 Somerville Drive (Colin Stephenson's) (T17)	12	81	0	0	93
Tay R at #471 Christie Lake Rd (Ruth Craig's bridge) (T18)	37	0	0	0	37
Tay R at Peter St Bridge (T19)	6	2	100	185	293
Tay River, Perth City Park	0	0	0	13	13
Tay R at Beckwith St bridge (T20)	0	9	111	0	120
Tay R at Last Duel Park (T21)	0	4	29	6	39
Tay R at Riverside Drive/Canalbank Road access point (T22)	0	17	104	0	121
Perth Wildlife Reserve, Tay Marsh, 4.7 km ESE Perth (T23)	0	18	0	5	23
Tay R at Upper Beveridges Dam, 3.0 km WSW Port Elmsley (T24)	32	22	43	0	97
Tay R at #5317 Highway 43 (Bill Black's) (T25)	40	94	14	0	148
Tay R at #202 Port Elmsley Rd (Susan Brandum's) (T26)	21	155	0	0	176
Tay R at #116 Tayview Drive (George Hendry) (T27)	10	10	0	0	20
TOTALS	521	928	1272	274	2995

Alasmidonta marginata Say 1819 Elktoe

While this species is fairly common in southwestern Ontario, in Eastern Ontario it was known to be common only in the Mississippi River below Almonte where it is threatened by increasing Zebra Mussels (FWS, personal observations); only two shells had previously been found in the Tay, and only one in the entire Rideau River (Martel & Madill, in prep., *Rideau Biodiversity Study*).

In our survey we found them living in 4 locations and shells present in another 3 locations, all characterized by more or less flat bedrock bottom. The largest population (half of all living Unionids found there) was on the limestone flats above the OMYA water intake (T15), where the bare bedrock made up most of the bed of the river.

Table 5: - *Alasmidonta marginata*	**Alive**	**Shell**	**Muskrat Pile**	**Previous**	**TOTAL**
Tay R at Richies Farm, below Bolingbroke (T1)	0	1	0	0	1
Tay R at Noonan Sideroad bridge (T11)	1	0	0	0	1
Tay R at Noonan Sideroad, Flat Rock Public Access (T12)	4	5	3	0	12
Tay R at #166 Leonard Sideroad (Nancy Wildgoose) (T13)	1	1	0	0	2
Tay River above OMYA water intake, 1.1 km SW Glen Tay (T15)	7	5	0	0	12
Tay R at Peter St Bridge (T19)	0	0	0	1	1
Tay R at Beckwith St bridge (T20)	0	1	0	0	1
Tay R at Riverside Drive/Canalbank Road access point (T22)	0	0	1	0	1
TOTALS	13	13	4	1	31

Lasmigona compressa (Lea 1829) Brook Lasmigona

This is a brook and headwaters species that is rarely abundant in eastern Ontario. Despite the superficially brook-like character of much of the riverbed, We found only one shell & one alive, in the River above & below Christie Lake.

Table 6: ***Lasmigona compressa***	ALIVE	SHELL	TOTAL
Tay River above Deacon's Bridge, off Co Road 36 (T3)	1	0	1
Tay R at #177 Somerville Drive (Colin Stephenson's) (T17)	0	1	1
TOTALS	1	1	2

Lasmigona costata (Rafinesque 1820) Fluted Shell

Lasmigona costata is a big heavy species, often found on bare bedrock substrate. We found it sparingly all along the River. Seven of the 23 found were alive, but never more than one living individual at any station. In other some other drainages in eastern Ontario shells may show scarcely any of the posterior corrugations ('fluting') that give the species its English name, but Tay shells are usually boldly fluted, though they may be extensively eroded.

Table 7: - *Lasmigona costata*	ALIVE	SHELL	M_PILE	PREVIOUS	TOTAL
Tay R at Davern Lane, 1.8 km NE Bolingbroke (T2)	1	0	0	0	1
Tay River below Jordan's Bridge, 4.2 km SW Dewitt Corners (T4)	0	1	0	0	1
Tay R/Co Road 6, Schoolhouse Bridge (T6)	1	1	1	3	6
Tay R at #2522 2nd Conc. Bathurst (Chris Stone's) (T7)	1	0	0	0	1
Tay R at 2nd Concession Bridge (T9)	1	0	0	2	3
Tay R at Bolger's farm (2nd Conc. Bathurst) (T8)	1	4	0	0	5
Tay R at Noonan Sideroad bridge (T11)	1	0	0	0	1
Tay R at Noonan Sideroad, Flat Rock Public Access (T12)	0	6	0	0	6
Tay River above OMYA water intake, 1.1 km SW Glen Tay (T15)	0	1	0	0	1
Tay R at #582 Glen Tay Sideroad (David Taylor) (T16)	0	2	0	0	2
Tay River, Perth City Park	0	0	0	1	1
Tay R at #202 Port Elmsley Rd (Susan Brandum's) (T26)	1	0	0	0	1
TOTALS	7	15	1	6	29

Pyganodon grandis (Say) 1829 Common Floater

Pyganodon grandis is a thin-shelled species characteristic of lakes and brown-water habitats. It was found in 6 stations in Christie Lake, and at 10 all along the River. About a third of those found by searches were alive (11 of 31), and a equal number (12) in Muskrat shell piles. Most of the shells were too eroded away for the beak sculpture, on which detailed identification depends, to be visible.

Table 8: *Pyganodon grandis*	ALIVE	SHELL	M-PILE	PREVIOUS	TOTAL
Tay R at Davern Lane, 1.8 km NE Bolingbroke (T2)	2	4	0	0	6
Tay River above Deacon's Bridge, off Co Road 36 (T3)	2	1	0	0	3
Camp Opemikon, McManus Bay, 4.8 km ENE Bolingbroke				3	3
Long I, Christie Lake, 1.8 km WSW Big I (Shoal2)	3	6	0	0	9
Round I, Christie Lake, 1.2 km WNW Big I (Shoal1)	1	0	0	0	1
Christie Lake, Boys & Girls Camp, 1.1 km SSW Big I (CSite05)	0	2	0	0	2
Big I shoal, Christie Lake, 0.1 km NNE centre of Big I (Shoal3)	1	1	0	0	2
Tay River below Jordan's Bridge, 4.2 km SW Dewitt Corners (T4)	2	1	0	0	3
Tay R at #438 Althorpe Rd (Pauline Clark's) (T5)	0	0	5	0	5
Tay R/Co Road 6, Schoolhouse Bridge (T6)	0	0	1	2	3
Tay R at #2522 2nd Conc. Bathurst (Chris Stone's) (T7)	0	1	0	0	1
Tay R at 2nd Concession Bridge (T9)	0	1	0	0	1
Tay R at Bolger's farm (2nd Conc. Bathurst) (T8)	0	1	0	0	1
Perth Wildlife Reserve, Tay Marsh, 4.7 km ESE Perth (T23)	0	2	0	0	2
Tay R at Upper Beveridges Dam, 3.0 km WSW Port Elmsley (T24)	0	0	6	0	6
TOTALS	11	20	12	5	48

Strophitus undulatus (Say 1817) Squaw-Foot or Creeper

This species is is rarely abundant in Eastern Ontario, and then only in clayey bottoms which are not found in the Tay. Only 4 were found, two of them alive, in the August survey, though an equal number had been found along the river previously.

Table 9: *Strophitus undulatus*	Alive	Shell	Muskrat Pile	previous	TOTAL
Tay R at Davern Lane, 1.8 km NE Bolingbroke (T2)	2	0	0	0	2
Tay R/Co Road 6, Schoolhouse Bridge (T6)	0	0	1	0	1
Tay R at 2nd Concession Bridge (T9)	0	0	0	1	1
Tay R at Bolger's farm (2nd Conc. Bathurst) (T8)	0	0	1	0	1
Tay River, Perth City Park	0	0	0	1	1
Perth Wildlife Reserve, Tay Marsh, 4.7 km ESE Perth (T23)	0	0	0	2	2
TOTALS	2	0	2	4	8

Ligumia recta (Lamarck 1819) Black Sand-Shell

Ligumia recta grows to a greater length than any other local Unionid, but it is rarely abundant, and is often represented at sites only by long-dead shells. The August survey conformed to this pattern: only 13 shells were found, and 2 alive, at 7 sites along the river.

Table 10: *Ligumia recta*	Alive	Shell	Muskrat Pile	previous	TOTAL
Tay R at Davern Lane, 1.8 km NE Bolingbroke (T2)	1	4	0	0	5
Tay River above Deacon's Bridge, off Co Road 36 (T3)	0	1	0	0	1
Tay R at 2nd Concession Bridge (T9)	1	2	1	0	4
Tay R at Bolger's farm (2nd Conc. Bathurst) (T8)	0	0	1	0	1
Tay R at #166 Leonard Sideroad (Nancy Wildgoose) (T13)	0	1	0	0	1
Tay R at Bowes Sideroad bridge (T14)	0	0	0	1	1
Tay R at #582 Glen Tay Sideroad (David Taylor) (T16)	0	0	1	0	1
Tay R at Riverside Drive/Canalbank Road access point (T22)	0	1	0	0	1
TOTALS	2	9	3	1	15

Lampsilis radiata siliquoidea (Barnes, 1823) Fatmucket

Lampsilis radiata siliquoidea / Canada: Ontario: Lanark County: Perth: island inTayR@LastDuelPark / 44.89852N 76.23621W / 13 Aug 2009 / Frederick W. Schueler field#: 2009/198/me

The two subspecies or species, *Lampsilis (r.) radiata* (eastern) and *L. (r.) siliquoidea* (western), meet or hybridize in eastern Ontario. Clarke (1981) maps eastern Ontario within the range of *Lampsilis r. radiata.* Schueler (1996a) concluded that populations in the lakes and big rivers were closer to *Lampsilis r. radiata*, while populations in smaller rivers were large and heavy and may well have been hybrids. Those in the Mississippi above Almonte, and in some lakes, are typical northern-Ontario *L. r. siliquoidea,* as were a few shells picked up along the Tay, and one photographed in Christie Lake. In abundance *Lampsilis radiata* usually comes right behind *Elliptio complanata*; but in the Tay that position is held by the Tay *Lampsilis*, of uncertain taxonomic status.

Table 11: ***Lampsilis r. siliquoidea***	Alive	Shell	Muskrat pile	previous	TOTAL
Camp Opemikon, McManus Bay, 4.8 km ENE Bolingbroke				1	1
Long I, Christie Lake, 1.8 km WSW Big I (Shoal2)	1	0	0	0	1
Tay River below Jordan's Bridge, 4.2 km SW Dewitt Corners (T4)	0	0	2	0	2
Tay R/Co Road 6, Schoolhouse Bridge (T6)	0	0	0	2	2
Tay R at Bolger's farm (2nd Conc. Bathurst) (T8)	0	1	0	0	1
Tay R at Peter St Bridge (T19)	0	1	0	12	13
Tay River, Perth City Park	0	0	0	21	21
Tay R at Last Duel Park (T21)	0	0	1	0	1
TOTALS	1	2	3	36	42

Tay *Lampsilis*

The bulk of the Lampsilis from the Tay are a light-shelled small-toothed form, which superficially resemble the Atlantic-drainage Tidewater Mucket *Leptodea (*or *Lampsilis* or *Ligumia) ochracea.* These are similar to *Lampsilis* in the Mississippi river below Almonte, and will require study to determine their taxonomic status.

Tay *Lampsilis* were the second most abundant species, found at 21 stations along the River downstream to Upper Beveridges Dam, about a quarter of those found were alive. However, this amounts to only 160 individuals, 5.3% as many as the 2995 recorded for the most-abundant *Elliptio complanata.*

Table 12: Tay *Lampsilis*	Alive	Shell	Muskrat Pile	Previous	TOTAL
Tay R at Richies Farm, below Bolingbroke (T1)	2	0	0	0	2
Tay R at Davern Lane, 1.8 km NE Bolingbroke (T2)	0	5	0	0	5
Tay River above Deacon's Bridge, off Co Road 36 (T3)	0	10	0	0	10
Tay River below Jordan's Bridge, 4.2 km SW Dewitt Corners (T4)	0	1	0	0	1
Tay R at #438 Althorpe Rd (Pauline Clark's) (T5)	0	0	2	0	2
Tay R/Co Road 6, Schoolhouse Bridge (T6)	0	1	5	0	6
Tay R at #2522 2nd Conc. Bathurst (Chris Stone's) (T7)	2	3	0	0	5
Tay R at 2nd Concession Bridge (T9)	0	0	1	2	3
Tay R at Bolger's farm (2nd Conc. Bathurst) (T8)	0	2	0	0	2
Tay R at Menzie-Munro Sideroad bridge (T10)	1	3	0	0	4
Tay R at Noonan Sideroad, Flat Rock Public Access (T12)	3	10	0	0	13
Tay R at #166 Leonard Sideroad (Nancy Wildgoose) (T13)	0	2	0	0	2
Tay R at Bowes Sideroad bridge (T14)	0	1	0	0	1
Tay River above OMYA water intake, 1.1 km SW Glen Tay (T15)	0	3	0	0	3
Tay River bridge/0.8 km SSE Glen Tay intersection	0	1	0	3	4
Tay R at #582 Glen Tay Sideroad (David Taylor) (T16)	9	8	12	0	29
Tay R at #177 Somerville Drive (Colin Stephenson's) (T17)	2	6	0	0	8
Tay R at Peter St Bridge (T19)	0	4	15	9	28
Tay R at Beckwith St bridge (T20)	0	0	13	0	13
Tay R at Last Duel Park (T21)	0	0	0	1	1
Tay R at Riverside Drive/Canalbank Road access point (T22)	0	0	10	0	10
Tay R at Upper Beveridges Dam, 3.0 km WSW Port Elmsley (T24)	0	5	3	0	8
TOTALS	19	65	61	15	160

3.4: Results: Zebra Mussels (*Dreissena polymorpha*)

The appearance of this species in Christie Lake provided the stimulus for the present study, so that the status of the macro-invertebrates could be documented before *Dreissena* has whatever effect on the fauna of watershed that its initial establishment will cause.

The SCUBA divers confirm (by the size of mussels seen) that the species has been present in Christie Lake for four or more years even though sampling for veliger larvae has been conducted since 1998 with only one positive sample in 2003 (normally 3 samples submitted to Ontario Hunters and Anglers Assoc for identification each year; *fide* Christie Lake Association Inc.). Many minute Zebra Mussels were found at various locations around the perimeter of Christie Lake by residents during the fall of 2008 when they were removing their swimming platforms, water lines and docks from the lake.

The August study reveals their presence at 6 sites (T4-T7 inclusive, T9 and T24). Prior to this study they were explicitly reported as not present at T19 (30 July 1998); Hanna Road Boat Launch (26 July 2001) as well as T23 (16 Oct 2007), though each collection of Unionids where *Dreissena* was not noted actually constitutes a negative record. The largest (41 mm) were found at Beveridge's Dam (T24); second largest and most numerous at the exit of the Tay from Christie Lake (T4).

Assuming that Zebra mussels established in Christie Lake around 2005, they have shown up only in the several kilometers to the bridge on the second concession in this time period, though the largest ones are found in the lower river (below an impoundment) at Beveridge's Dam (T24). Dispersal downstream by floating larvae (veligers) is rapid while dispersal upstream by attachment to boats occurs more slowly; lakes tend to be sources for veligers, and Christie Lake may take on that role in coming years, though the establishment of adult mussels is not an automatic consequence of the presence of larvae in a stream.

Cohen & Weinstein (2001) reviewed the Zebra Mussel's calcium threshold and the implications for the limits to its spread through North America. They conclude that the zebra mussel population is limited by availability of calcium, though there's no simple cut-off level, and different studies disagree on what the limit may be. A commonly cited ragnge of values is that at less than 12 mg/L the chance of establishment is very low, at 12-20 mg/L it is low, from 20-28 mg/L moderate, and above 28 mg/L it is high.

The local demonstration of these limits is the Ottawa River, where Zebra mussels are not established, despite the infusion of veliger larvae into the Ottawa from established abundant populations in the Mississippi, Rideau, and South Nation rivers. This shows that it's possible for a diverse Unionid fauna to persist at calcium levels too low for Zebra Mussel abundance, while, on the other hand, the situation in the upper Rideau shows that it's possible for the ecosystem-wrenching explosion of Zebra mussels to occur as long as a decade after they are first detected in a stream.

Water chemistry data collected in the survey found levels of calcium in the reaches upstream of Perth which are in the range in which *Dreissena* reproduction isn't certain (22-26 mg/L), while below Perth the levels are within the range that suggests successful reproduction (24-31 mg/L). These are similar to calcium levels in the Rideau River at sites where *Dreissena* became abundant only a decade after it was first noticed (Martel, *et al.,* 2006, Schueler & Martel 2009).

Table 13: *Dreissena polymorpha*	Zebras
Christie Lake, near Station Bay, 3.6 km SW Big I (CSite02)	5juv
Long I, Christie Lake, 1.8 km WSW Big I (Shoal2)	12juvs
Round I, Christie Lake, 1.2 km WNW Big I (Shoal1)	1shell,4juvs
Christie Lake, Spring Bay, 0.1 km S centre of Big I (CSite09)	3juv
Big I shoal, Christie Lake, 0.1 km NNE centre of Big I (Shoal3)	1juv
Tay River below Jordan's Bridge, 4.2 km SW Dewitt Corners (T4)	22
Tay R at #438 Althorpe Rd (Pauline Clark's) (T5)	3juvs
Tay R/Co Road 6, Schoolhouse Bridge (T6)	36
Tay R at #2522 2nd Conc. Bathurst (Chris Stone's) (T7)	5juv
Tay R at 2nd Concession Bridge (T9)	2
Tay R at Last Duel Park (T21)	1ad
Tay R at Upper Beveridges Dam, 3.0 km WSW Port Elmsley (T24)	6+shells

3.5: Results: Larger Aquatic Snails.

Aquatic snails were sampled irregularly, but the striking thing about them was the number of species that were not found or were rare. Three introduced species were not found. The first of these was ***Cipangopaludina chinensis,*** the enormous Oriental Mystery Snail which occurs in scattered locations in eastern Ontario (Clarke 1981, FWS, personal observation). ***Bythinia tentaculata,*** the filter-feeding European Faucet Snail, which lives in shallow water of large lakes, rivers, and canals, and prefers slowly moving, clean water in areas where aquatic plants are

abundant was also not seen. Before Zebra Mussels took over the Rideau River there were enormous populations of ***Bythinia*** there, with the shells frequently constituting a large fraction of the bottom sediments, so it was a bit of a surprise not to find them in the Tay. ***Radix auricularia,*** the European Ear Snail, which occurs in scattered locations in Ontario, including the Carp River (FWS, personal observation) was also not observed.

Pleuroceridae, or Horn Snails, are heavy high-spired shells with a non-calcified opercula. Ontario has two distinctive species of the multitude that occur south of the limits of glaciation. ***Goniobasis "Elimia" livescens*** is the dark rounded all-over-the-rocks Great Lakes Horn Snail of slow rocky rivers. In the Tay it was abundant at the Riverside Drive/ Canalbank Road access point (T22), but only a single individual was found elsewhere, at the nearby Perth Wildlife Reserve (T23).

Viviparidae, or Mystery Snails, have large rounded shells with non-calcified opercula. They are noteworthy for their wide diet: grazing on algae growing on any submerged surface, ingesting fine particulate detritus and its micro-organisms, filtering suspended matter from the water, and even feeding on carrion.

Viviparus georgianus / Canada: Ontario: Lanark County: Bathurst: T06,TayR/CoRd6, SchoolhouseBridge / 44.82386N 76.38878W / 11 Aug 2009 / Frederick W. Schueler, Aleta Karstad Schueler, Orion Clark, Macroinvertebrate Volunteers field#: 2009/191/ka

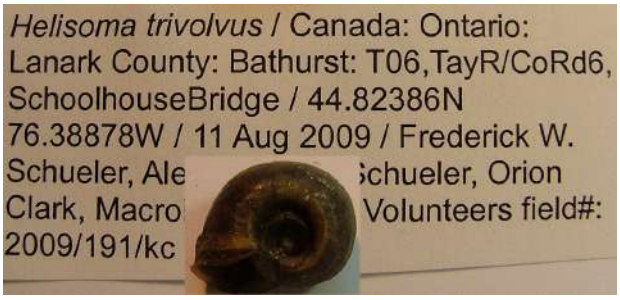
Viviparus "georgianus," the Banded Mystery Snail, is the thin-shelled, banded, inflated snail (25-35 mm high) whose shells accumulate in immense drifts on the shores of cottage lakes. The recently established Ontario populations have not yet been proven to be different from the European *V. viviparus,* but they appear to be markedly different from true *V. georgianus* of the southern USA, so their classification and origin is not certain. It was recorded at 29 stations, the most of any species of snail. As this is the only surface-active large snail that was widespread and abundant in the Tay and in Christie Lake, we can't speculate on which, if any, native species it may have displaced. Many of the specimens from the Tay survey have been sent to Eva Pip of The University of Winnipeg, who is part of a team that is studying the status of the species.

Campeloma decisum: Less common and heavier-shelled than *Viviparus georgianus*, this un-banded Mystery Snail lives buried in the soft mud or sand of slow lakes and rivers, and is most often seen as old shells. These are stout and smooth (30-40 mm high), and the early whorls at the top of the spire are often eroded away. In the August survey it was found as scattered shells all along the River, but was found abundantly only at Christie Lake Rd just below Ruth Craig's bridge (T18), where many living snails were scooped out of the in loose sandy bottom, with chunks of bark & Maple leaves. if this ideal habitat had been intensely sampled elsewhere, doubtless many more *Campeloma* would have been found.

Campeloma decisum / Canada: Ontario: Lanark County: T18,TayR at #471Christie LakeRd(RuthCraig's bridge) / 44.89344N 76.28865W / 10 Aug 2009 / Frederick W. Schueler, Aleta Karstad Schueler, Orion Clark, Emily Upham-Mills, A.Bouchilloux, Philip Scot field#: 2009/182/dja

The only Pond Snail that was found in the August survey was 3 individuals of *Lymnaea stagnalis,* the thin-shelled widely flared, needle-spired "Great Pond Snail." Two common Lymnaeid species were completely absent from the River & Lake: *Bulimnea megasoma* (Showy Pond Snail) had been found in an excavated shallow pond in the Perth Wildlife Reserve, but we have no records of *Stagnicola elodes*, the Common Pond Snail, and no records at all of *Physa* Tadpole Snails. This doesn't mean that these species are absent from the River and Lake, but does suggest that they're not particularly abundant.

Flat-coiled Planorbidae, or Rams-horn Snails, were also strangely rare. ***Helisoma campanulatum***, the Bell-mouth Rams-horn, which is abundant in many creeks and lakes, was found only at 6 sites, with a total of 8 specimens.



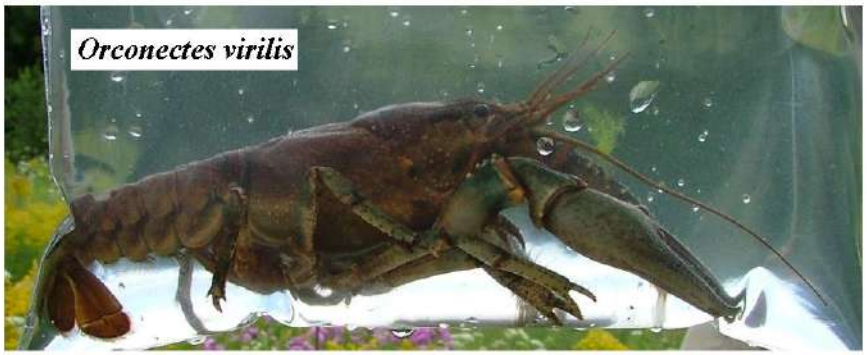
Helisoma trivolvus, the common large Rams-horn in southern Ontario, was slightly more common, with 11 specimens found at 9 sites.

Table 14: Snails	***Camp-eloma***	***Viviparus***	***Helisoma***	***Lymnea***	***Gonio-basis***
Tay R at Davern Lane, 1.8 km NE Bolingbroke (T2)		4			
Tay River above Deacon's Bridge, off Co Road 36 (T3)	11	23			
Christie Lake, near Station Bay, 3.6 km SW Big I (CSite02)		2shells			
Christie Lake, adj to Tay River Inlet, 2.6 km SW Big I (CSite04)		12shells	1 *H. tri.*		
Christie Lake, adj to Minnow Creek, 2.6 km SW Big I (CSite03)		7shells			
Christie Lake, adjacent to Station Bay, 1.6 km NW Big I (CSite01)		1alive			
Round I, Christie Lake, 1.2 km WNW Big I (Shoal1)		1shell			
Christie Lake, Christie Lake Cottages & Marina, 1.1 km NNW Big I		7shells			
Christie Lake, Boys & Girls Camp, 1.1 km SSW Big I (CSite05)		29shells	2 *H.camp.*		
Christie Lake, Spring Bay, 0.1 km S centre of Big I (CSite09)		16shells	1 *H. tri.*		
Christie Lake, near Ottawa Pt, 0.1 km S centre of Big I (CSite08)		10shells	2 *H.camp.*		
Christie Lake, across from McManus Point, 0.6 km SSE Big I (CSite		8shells			
Christie Lake, Alan Jordan's farm, 2.0 km ENE Big I (CSite07)		30shells			
Tay River below Jordan's Bridge, 4.2 km SW Dewitt Corners (T4)	1	16			
Tay R at #438 Althorpe Rd (Pauline Clark's) (T5)	1	19			
Tay R/Co Road 6, Schoolhouse Bridge (T6)	4	26	1 *H. tri.*, 1 *H.camp.*		
Tay R at #2522 2nd Conc. Bathurst (Chris Stone's) (T7)		20	1 *H. tri.*, 1 H.camp.	1alive	
Tay R at 2nd Concession Bridge (T9)	1	3			
Tay R at Bolger's farm (2nd Conc. Bathurst) (T8)		3(abun-dant)	1 *H.camp.*	1shell	
Tay R at Menzie-Munro Sideroad bridge (T10)	2	70	2 *H. tri.*		
Tay R at Noonan Sideroad bridge (T11)		11shells	1 *H. tri.*, 1 *H.camp.*		
Tay R at Noonan Sideroad, Flat Rock Public Access (T12)	5shells				
Tay River above OMYA water intake, 1.1 km SW Glen Tay (T15)	2				
Tay R at #582 Glen Tay Sideroad (David Taylor) (T16)	5		1 *H. tri.*		
Tay R at #177 Somerville Drive (Colin Stephenson's) (T17)	3shells				
Tay R at #471 Christie Lake Rd (Ruth Craig's bridge) (T18)	37alive		1 *H. tri.*		
Tay R at Peter St Bridge (T19)	2	13			
Tay River, Perth City Park		previous			
Tay R at Beckwith St bridge (T20)		1	1 *H. tri.*		
Tay R at Last Duel Park (T21)	1	1			
Tay R at Riverside Drive/Canalbank Road access point (T22)		1			28
Perth Wildlife Reserve, Tay Marsh, 4.7 km ESE Perth (T23)		16			1
Tay R at Upper Beveridges Dam, 3.0 km WSW Port Elmsley (T24)		77		1	
Tay R at #5317 Highway 43 (Bill Black's) (T25)		15			
Tay R at #116 Tayview Drive (George Hendry) (T27)		2			

3.6: Results: Crayfish

Schueler (2003) concluded that the "identity of Tay Crayfish, native or invasive, is uncertain," and the present survey bears this out. *Orconectes virilis*, the large native species, was found in seven out of 27 sites (26%) along the River, and had previously been found at another. The ambiguous Crayfish combined characteristics of *Orconectes propinquus*, a small, diurnally active native species, and the related invasive *Orconectes rusticus*, and *Orconectes obscurus,* as if a relatively stabilized hybrid swarm occupies the Tay. These *Orconectes "tayensis,"* as we called them, were nearly ubiquitous, being found at 23 sites (85%) along the River.

T07, Tay River at #2522 2nd Conc. Bathurst (Chris Stone's). (100m alg river), 44.82461N 76.37861W 11 August 2009. TIME: 1311-1430. AIR TEMP: 27C, cloudy, calm. HABITAT: broad shallow sand-bed river past lawn residence & swampy woods, with a lawn coming down towards the water and lots of Pickerel Weed, all along the far bank, a small amount of Purple Loosestrife behind, and White Water Lilies. 2009/186/r, Orconectes (Crayfish).



Unfortunately, there were problems in our procedures for handling Crayfish specimens, and some samples ate their labels, while others were inadequately preserved, and others lost after preservation. The remaining specimens have been deposited at the New Brunswick Museum, but will not be available for further study until they are curated there (January 2011).

Table 15: Crayfish	*O. virilis*	*O. "tayensis"*
Tay R at Richies Farm, below Bolingbroke (T1)		1cheliped
Tay R at Davern Lane, 1.8 km NE Bolingbroke (T2)		1juv
Tay River above Deacon's Bridge, off Co Road 36 (T3)		1ad
Tay River below Jordan's Bridge, 4.2 km SW Dewitt Corners (T4)	1ad	
Tay R/Co Road 6, Schoolhouse Bridge (T6)		present
Tay R at #2522 2nd Conc. Bathurst (Chris Stone's) (T7)	1 (photo)	3
Tay R at 2nd Concession Bridge (T9)		3
Tay R at Bolger's farm (2nd Conc. Bathurst) (T8)		4
Tay R at Menzie-Munro Sideroad bridge (T10)	2	several
Tay R at Noonan Sideroad bridge (T11)		3ad
Tay R at Noonan Sideroad, Flat Rock Public Access (T12)		7
Tay R at Bowes Sideroad bridge (T14)		3ad
Tay River above OMYA water intake, 1.1 km SW Glen Tay (T15)		2
Tay River bridge/0.8 km SSE Glen Tay intersection		prev
Tay R at #582 Glen Tay Sideroad (David Taylor) (T16)	1	1
Tay R at #177 Somerville Drive (Colin Stephenson's) (T17)	1	3
Tay R at Peter St Bridge (T19)		6
Tay River, Perth City Park	2 previous	
Tay R at Last Duel Park (T21)	1	1
Tay R at Riverside Drive/Canalbank Road access point (T22)		2
Perth Wildlife Reserve, Tay Marsh, 4.7 km ESE Perth (T23)		3
Tay R at Upper Beveridges Dam, 3.0 km WSW Port Elmsley (T24)	1	2
Tay R at #5317 Highway 43 (Bill Black's) (T25)		2
Tay R at #202 Port Elmsley Rd (Susan Brandum's) (T26)		5

3.7: Results: other invertebrate species[5]

At the Water Snake island below the Glen Tay bridge, one *Corydalus cornutus* (Dobsonfly) larva, or hellgrammite, was found under a large rock in the main current. This largest local Insect is only found infrequently, but the fact that with so many of us turning cover for a week only one was found suggests that the species is uncommon along the Tay.

The spectacular Blob Bryozoan (*Pectinatella magnifica*) was found in the lower river at Upper Beveridges Dam (T24) and Susan Brandum's (T26). The species is of erratic occurrence along the Rideau. *Pectinatella* is a member of the phylum Ectoprocta (Bryozoans, or Moss Animals), a group with a fossil record extending back to the upper Cambrian. While the majority of Bryozoans are marine, this class is found exclusively in freshwater. The photo illustrates the surface which is divided into rosettes, each with 12-18 zooids. Each zooid has whorls of delicate feeding tentacles swaying slowly in the water catching food. While many observations of plant and animal species were made at each site in the Tay, the presence of these "moss animals" was an exhilarating experience!

5 - The Mudpuppy (*Necturus maculosus*) is a conspicuous under-rock Vertebrate that has never been found in the Tay River. "There is nothing in the Ontario Herpetofaunal Summary or our data from Tay River or Bob's Lake, so I think it is safe to remark the lack of mudpuppies in that watershed." (John Urquhart, Staff Ecologist, Ontario Herp Atlas, 8 Feb 2011)

Section 4.0: CONCLUSIONS

We conclude that:

● The Tay supports a fauna of 9 Unionid mussel species, *Elliptio complanata* (Eastern Elliptio) the characteristic Tay *Lampsilis* (Lamp Mussel), *Alasmidonta marginata* (Elktoe), *Lasmigona compressa* (Brook Lasmigona), *L. costata* (Fluted Shell), *Pyganodon grandis* (Common Floater), *Strophitus undulatus* (Squaw-Foot or Creeper), *Ligumia recta* (Black Sand-Shell), and *Lampsilis radiata siliquoidea* (Fat Mucket). None of these were newly discovered by our survey, which suggests that previous sampling had adequately delineated the fauna. In 2009, we found all of these species alive, so we have not lost any mussel species due to the infestation of Zebra Mussels; appropriate host fish are known to be present in the Tay for all Unionid species found.

● the fauna of Christie Lake is less diverse than that of the River, with only 3 species of Unionids in samples from 13 sites: *Elliptio complanata* (Eastern Elliptio), *Pyganodon grandis* (Common Floater), and *Lampsilis radiata siliquoidea* (Fat Mucket).

● *Elliptio complanata* (Eastern Elliptio) makes up at least 90% of the Unionid fauna

● The second most abundant species is a *Lampsilis* superficially similar to *L. ochracea.*

● *Alasmidonta marginata* (Elktoe) is modestly common in places with a flat limestone bottom; its only known population in the Rideau drainage.

● eroded periostracum & low numbers of most species suggest that conditions are marginal for many Unionids.

● Zebra Mussels are present throughout the system; calcium levels above Perth are within the range where Zebra Mussels may or may not become dominant over the coming decade, while levels below Perth are higher, suggesting that there will be infestations similar to those present in the Rideau River.

● The Crayfish fauna is dominated by a form that appears to be a hybrid swarm among the native *Orconectes propinquus* and the introduced *O. rusticus*, and *O. obscurus*. The native *Orconectes virilis* does persist in the River

● This study confirms that through partnerships and volunteers, valuable information can be gathered that should educate as well as influence decision making processes in the future.

Projects suggested by this study include:

● Continued monitoring of Zebra Mussels.

● Surveys of tributaries such as Grant's Creek, of other lakes, and of Scotts Snye.

● Canoe surveys through wetlands & isolated reaches of the River.

● Resolution of the taxonomic status of the *Lampsilis* and of the Crayfish.

● Begin quantitative monitoring of Molluscs at selected stations..

● Be ready to salvage shells of Unionids that will be killed if Zebra Mussels become abundant.

● sample water chemistry in spring, fall, and winter to get a more complete picture of calcium and nutrient flow through the watershed.

Section 5.0: ACKNOWLEDGMENTS

Volunteers for the river sampling included Chris Stone, Nike Mulder, Emily Upham-Mills, Astrid Bouchilloux, Philip Scott , Lucy Welch, George Hendry, Alain Gauthier, Alida Lemieux, Drew Lampman, and Antony Powell. Jeff King, Geof Hall, Ralph Fish, & Jane Fish assisted with sampling Christie Lake in July.

River hats presented to the volunteers were provided by the Canadian River Management Society. Fred & Aleta Karstad thank the Damiano co-operative for providing accommodation during the survey.

Paul Hamilton and André Martel of the Canadian Museum of Nature provided advice and loans of equipment; Lanark Stewardship Council produced maps; and the Shell Environmental Foundation provided the bulk of the funding.

Aleta Karstad isn't in any of the photos, because she took almost all of them.

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Section 7.0: APPENDICES

APPENDIX I: FIELD RECORDS

see http://pinicola.ca/outings/tay_survey.htm for the field notes of this survey, and http://pinicola.ca/outings/tay_visits.htm for previous visits.

APPENDIX II: MUSSEL STUDY SITE LOCATIONS & MAP DESIGNATIONS.

DAY MON TIME	-	LOCATION[6]	-	LATITUDE LONGITUDE	
12 Aug 1420-1425	-	TayR@RichiesFarm,blwBolingbroke	-	44.76044 -76.51751	**T1**
12 Aug 1235-1330	-	***1-2*** TayR@DavernLane	-	44.77086 -76.50334	**T2**
12 Aug 1146-1425	-	***1-3*** TayR abvDeacon'sBridge,offCoRd36	-	44.77685 -76.49873	**T3**
23 June	-	ChristieL,adjacent toStationBay,1.3kmNW BigI	-	44.81301 -76.44183	**C1**
23 June	-	ChristieL,nrStationBay,1.6kmWNW BigI	-	44.81139 -76.44845	**C2**
23 June	-	ChristieL,adj to MinnowCreek,1.7kmWNW BigI	-	44.80733 -76.45231	**C3**
23 June	-	ChristieL,adj toTayRiver inlet,3.0kmWSW BigI	-	44.79240 -76.46583	**C4**
23 June	-	ChristieL,Boys&GirlsCamp,1.9kmWSW BigI	-	44.79590 -76.45202	**C5**
23 June	-	ChristieL,acr frMcManusPoint,2.1kmSW BigI	-	44.79076 -76.45067	**C6**
23 June	-	ChristieL,AlanJordan's farm,2.0kmNE BigI	-	44.81403 -76.41059	**C7**
23 June	-	ChristieL,nrOttawaPt,2.0kmNE BigI	-	44.81801 -76.41562	**C8**
23 June	-	ChristieL,SpringBay,1.7kmNNE BigI	-	44.81817 -76.42253	**C9**
23 June	-	ChristieL,ChristieL Cottages&Marina,1.2kmNNW BigI	-	44.81329 -76.43685	**C10**
25 July	-	RoundI,ChristieL,1.2kmWNW BigI	-	44.80747 -76.44565	**C11**
25 July	-	LongI,ChristieL,1.7kmWSW BigI	-	44.79964 -76.45196	**C12**
25 July	-	BigI shoal,ChristieL,0.2kmWNW neck ofBigI	-	44.80469 -76.43340	**C13**
13 Aug 0930-1056	-	***5-1*** TayR blwJordan's Bridge	-	44.82098 -76.40588	**T4**
12 Aug 0943-1038	-	***5-2*** TayR@#438AlthorpeRd(Pauline Clark)	-	44.82046 -76.39631	**T5**
11 Aug 1534-1627	-	***5-3*** TayR/CoRd6,SchoolhouseBridge	-	44.82386 -76.38878	**T6**
11 Aug 1311-1430	-	***5-4*** TayR@ #2522 2nd Conc.Bathurst(Chris Stone's)	-	44.82461 -76.37861	**T7**
12 Aug 1502-1604	-	***5A-1*** TayR@Bolger's farm (2nd Conc.Bathurst)	-	44.82644 -76.35945	**T8**
11 Aug 1441-1528	-	***5-5*** TayR@2nd Concession Bridge	-	44.82676 -76.37283	**T9**
11 Aug 1146-1243	-	***5A-2*** TayR@Menzie-Munro Sideroad bridge	-	44.83491 -76.35147	**T10**
11 Aug 1030-1144	-	***5A-3*** TayR@NoonanSideroad bridge	-	44.84245 -76.34000	**T11**
11 Aug 0920-1038	-	***5A-4*** TayR@NoonanSideroad,FlatRockPublicAccess	-	44.84110 -76.33556	**T12**
10 Aug 1633-1711	-	***6-1***TayR@#166LeonardSideroad(NancyWildgoose)	-	44.85400 -76.32317	**T13**
10 Aug 1519-1616	-	***6-2*** TayR@BowesSideroad bridge	-	44.86093 -76.31508	**T14**
10 Aug 1430-1508	-	***7-1***,TayR abv OMYA water intake	-	44.86863 -76.31229	**T15**
10 Aug 1215-1325	-	TayR@#582GlenTaySideroad(DavidTaylor)	-	44.87659 -76.30261	**T16**
10 Aug 1100-1120	-	***8-1*** TayR@#177 SomervilleDr(ColinStephenson)	-	44.88381 -76.29584	**T17**
10 Aug 0920-1045	-	***8-2*** TayR@#471ChristieLakeRd(RuthCraig's bridge)	-	44.89344 -76.28865	**T18**
13 Aug 1153-1243	-	***9-2*** TayR@PeterStBridge	-	44.89714 -76.25808	**T19**
13 Aug 1245-1326	-	***9-4*** TayR@Beckwith St bridge	-	44.89684 -76.25814	**T20**
13 Aug 1410-1435	-	TayR@LastDuelPark	-	44.89868 -76.23848	**T21**
13 Aug 1500-1535	-	***10-1*** TayR@RiversideDr/CanalbankRd access point	-	44.89797 -76.23108	**T22**
14 Aug 1018-1120	-	PerthWildlifeReserve,TayMarsh,4.7kmESE Perth	-	44.89113 -76.19473	**T23**
14 Aug 1220-1342	-	***12-1*** TayR@UpperBeveridgesDam	-	44.88434 -76.15723	**T24**
14 Aug 1145-1158	-	***12-2*** TayR@#5317 Hwy43(Bill Black)	-	44.89390 -76.13824	**T25**
14 Aug 1400-1451	-	***12-5*** TayR@#202 PortElmsleyRd(Susan Brandum's)	-	44.89255 -76.12848	**T26**
14 Aug 1530-1609	-	TayR@#116TayviewDrive(GeorgeHendry)	-	44.89026 -76.11874	**T27**

6 - hyphenated designations before some location names are a prliminary system of numbering the stations, used in planning the survey.

Appendix III: Host fishes of Unionid mussels found in the Tay River

Fish species listed from the Tay in Esseltine (2002) are in bold. Host records are from Cummings, Kevin, & Tom Watters, Mussel/Host database, http://128.146.250.235/MusselHost/ - accessed 2009-2010. Note that most tests are from the US. Exotic species, and those not found in eastern Ontario, have been deleted.

Pyganodon grandis **(Giant floater): Rock Bass *Ambloplites rupestris,*** Central Stoneroller *Campostoma anomalum,* Goldfish *Carrasius auratus*, **Brook Stickleback *Culaea inconstans,*** Rainbow Darter, *Etheostoma caeruleum*, Johnny Darter, *Etheostoma nigrum*, **Banded killifish *Fundulus diaphanus*, Pumpkinseed *Lepomis gibbosus*, Bluegill *Lepomis macrochirus*, Striped Shiner, *Luxilus chrysocephalus*,** Common Shiner *Luxilus cornutus*, **Largemouth Bass *Micropterus salmoides,*** Round goby *Neogobius melanostomus,* Golden Shiner, *Notemigonus crysoleucus*, Blackchin Shiner, *Notropis heteroda*, **Blacknose Shiner *Notropis heterolepis*, Yellow perch *Perca flavescens,*** Bluntnose minnow, *Pimephales notatus*, White Crappie, *Pomoxis annularis*, Black Crappie, *Pomoxis nigromaculutus*, Blacknose Dace, *Rhinichthys atratulus*, **Creek Chub, *Semotilus atromaculatus.***

Alasmidonta marginata **(Elktoe): Rock Bass *Ambloplites rupestris,* White Sucker *Catostomus commersoni*,** Northern Hogsucker, *Hypentelium nigricans*, Shorthead Redhorse *Moxostoma macrolepidotum.*

Strophitus undulatus **(Squaw-foot or Creeper): Rock Bass, *Ambloplites rupestris*,** Black bullhead, *Ameiurus melas,* Spotfin Shiner, *Cyprinella spiloptera,* Rainbow Darter, *Etheostoma caeruleum*, Banded Darter, *Etheostoma zonale,* **Bluegill, *Lepomis macrochirus*, Largemouth Bass *Micropteris salmoides*,** River Chub, *Nocomis micropogon*, Sand Shiner, *Notropis stramineus* , Bluntnose Minnow, *Pimephales notatus*, Fathead Minnow, *Pimephales promelas*, White Crappie, *Pomoxis annularis,* **Longnose Dace, *Rhinichthys cataractae,* Walleye, *Sander vitreus,* Yellow Perch, *Perca flavescens.***

Lasmigona costata (Fluted Shell): Banded Darter, *Etheostoma zonale*, **Pumpkinseed, *Lepomis gibbosus*, Largemouth Bass, *Micropteris salmoides*, Longnose Dace *Rhinichthys cataractae*,** Northern Hogsucker, *Hypentelium nigricans*.

Lasmigona compressa **(Creek Heelsplitter):** Black Bullhead, *Ameiuris melas*, Yellow Bullhead, *Ameiuris natalis*, Slimy Sculpin, *Cottus cognatus*, **Brook Stickleback, *Culaea inconstans*,** Spotfin Shiner, *Cyprinella spiliptera*, **Bluegill, *Lepomis macrochirus*, Smallmouth Bass, *Micropteris dolomieu*, Emerald Shiner, *Notropis atherinoides*, Yellow Perch, *Perca flavescens*,** Black Crappie *Pomoxis nigromaculatus,* Flathead Catfish, *Pylodictis olivaris*, **Longnose Dace, *Rhinichthys cataractae*, Creek Chub, *Semotilus atromaculatus*.**

Elliptio complanata **(Eastern Elliptio): Banded killifish, *Fundulus diaphanus*, Pumpkinseed, *Lepomis gibbosus*, Bluegill, *Lepomis macrochirus*, Largemouth Bass, *Micropterus salmoides*, Yellow Perch, *Perca flavescens*,** White Crappie, *Pomoxis annularis.*

Lampsilis cardium **(Plain Pocketbook): Pumpkinseed, *Lepomis gibbosus*, Bluegill, *Lepomis macrochirus*, Largemouth Bass, *Micropterus salmoides*, *Smallmouth Bass, Micropterus dolomieu*,** Black Crappie, *Pomoxis nigromaculatus*, White Crappie, *Pomoxis annularis*, **Yellow Perch, *Perca flavescens*,** Sauger, *Sander canadensis*, **Walleye, *Sander vitreus.***

Lampsilis (radiata) siliquoidea **(Fatmucket): Bluegill, *Lepomis macrochirus*, Smallmouth Bass, *Micropteris dolomieu*, Largemouth Bass, *Micropteris salmoides*,** Sand Shiner, *Notropis stramineus*, Bluntnose Minnow, *Pimephales notatus*, Striped Shiner, *Luxilus chrysocephalus*.

Ligumia recta **(Black Sandshell): Rock Bass, *Ambloplites rupestris*, Largemouth Bass,**

***Micropteris salmoides*,** White Perch, *Morone americana*, **Yellow Perch, *Perca flavescens*.**
APPENDIX IV: text of: Schueler, Frederick W. 2003. ***lower Tay River field notes of Frederick W. Schueler: rare and unusual species.*** unpublished report circulated at Tay/OMYA water-taking meeting, Dec 2003. 1 p.

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lower Tay River field notes of Frederick W. Schueler: rare and unusual species

...assembled Dec 2003, Bishops Mills Natural History Centre, RR#2 Bishops Mills, Ontario, Canada K0G 1T0, (613) 258-3107 <bckcdb@istar.ca> http://pinicola.ca
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strange light-shelled freshwater mussels which are perhaps *Lampsilis ochracea*, which isn't otherwise known from Ontario, though there are old identifications of this population as this species.

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Lampsilis cf ochracea(?). 8 shell, prey of predator, Muskrat shell pile, specimen. **95/139/cfa**

Canada: Ontario: Lanark County: Perth: **Tay River at Perth Golf Club Road**. MAP:31C/16, UTM 18TVE 006 721. 44.89738N 76.25854W - 13 October 1995 TIME: 1630-1700. AIR TEMP: 22 ca, sunset, breezy

COLLECTED BY: **Frederick W. Schueler** 95/139/cfa - HABITAT: rocky stream through marsh, Elm/Oak golf/urban pkland; big piles along banks, old light eroded shells, largest 99.5 mm. Some are so light, and have such reduced teeth, that they appear to be *Leptodea fragilis*.

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Lampsilis cf ochracea(?). 3 shell, specimen. **96/169/cb**

Canada: Ontario: Lanark County: Bathurst: **Tay River bridge/.8 km SSE Glen Tay**. MAP:31C/16, UTM 18TUE 969.9 698.4. 44.87651N 76.30378W -
2 August 1996 TIME: 0844-0859. AIR TEMP: 16.7, overcast, calm

COLLECTED BY: **Frederick W. Schueler, Aleta Karstad Schueler** Field#: 96/169/cb - HABITAT: clear R, low weirs, lime.bedrock/sand bot., in village;
2 pairs, 1 valve, same light shells as in Perth(95/139/cfa).

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Lampsilis cf ochracea(?). 1 shell, specimen. **98/184/bi**

Canada: Ontario: Lanark County: Perth: **Tay R at Perth Golf Club Road**. MAP:31C/16, UTM 18TVE 006.3 720.9. 44.89726N 76.25812W - 30 July 1998 TIME: 1115-1146. AIR TEMP: 21 ca, overcast

COLLECTED BY: **Frederick W. Schueler** 98/184/bi - HABITAT: rocky stream through marsh, Elm/Oak golf/urban pkland ; light pair, freshest Unionid shell found. It looks like *Ondatra* is no longer catching clams here, and with overcast and high water level (though this may be regulated) there's no way of finding clams beyond the rocks piled around the bridge.

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Alasmidonta marginata - a freshwater mussel which is rare in eastern Ontario, and known from the Tay only on the basis of these two shells.

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Alasmidonta marginata. 1 shell, prey of predator, Muskrat shell pile, specimen.

Canada: Ontario: Lanark County: Perth: **Tay River at Perth Golf Club Road**. MAP:31C/16, UTM 18TVE 006 721. 44.89738N 76.25854W - 13 October 1995 TIME: 1630-1700. AIR TEMP: 22 ca, sunset, breezy

COLLECTED BY: **Frederick W. Schueler** 95/139/cg - HABITAT: rocky stream through marsh, Elm/Oak golf/urban pkland ; eroded 95 mm pair, grew very slowly, ca>40 yrs old. DET_BY:FWS,&FWG,17May2000

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Alasmidonta marginata. 1 shell, adult, prey of predator, Muskrat shell pile, specimen. **FWS/2001/May/002/aa**

Canada: Ontario: Lanark County: Perth: **Tay River, Perth City Park**. MAP:31C/16, UTM 18TVE 012.6 721. 44.89748N 76.25015W - 3 May 2001 TIME: 1159-1235. AIR TEMP: 29.5, sunny, windy

COLLECTED BY: **Frederick W. Schueler, Aleta Karstad Schueler** Field#: FWS/2001/May/002/aa - HABITAT: rocky river/urban park & residential, riffles & deep water blw canal-weir, water 19.5 C; hinge fragment of large shell.

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Stinkpot Turtles - nowhere abundant eastern Ontario

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Sternotherus odoratus (Stinkpot). 1 adult, male, active, captured, photo. **FWS/2001/May/002/h**

Canada: Ontario: Lanark County: Perth: **Tay River, Perth City Park**. MAP:31C/16, UTM 18TVE 012.6 721. 44.89748N 76.25015W - 3 May 2001 TIME: 1159-1235. AIR TEMP: 29.5, sunny, windy

COLLECTED BY: **Frederick W. Schueler, Aleta Karstad Schueler** Field#: FWS/2001/May/002/h - HABITAT: rocky river/urban park & residential, riffles & deep water blw canal-weir, water 19.5 C; at waters edge, PL 81.3 mm, leeches, plastral scutes eroded, in mucky *Acer platinoides* & other Acer leaf litter just upstream of heavily bouldered walled bank, below house lawn and abv deep water. It seemed to be just at water's surface when disturbed, grabbed by hand. Male by cloaca position, post-cloacal tail only 15mm, not aggressive to handling, but not reclusive in the shell either.

2 clusters of ca100 tiny Leeches at base of each hind leg (perhaps gradually falling off as we hold the Turtle out of water), and one larger (2cm contracted) gold&dark patterned Leech on shell.

Measurements: PL 81.3mm, CL: 166.8, max CW 72.8mm, PW ant of bridge 36.2, post of bridge 30.25mm, algae on carapace, plastron & bridge scutes eroded away to pink bone alg midline and sutures. AKS photos.

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identity of Tay Crayfish, native or invasive, is uncertain...

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Orconectes (Orconectes). 1 adult, shell, seen. **2001/140/bb**

Canada: Ontario: Lanark County: **Tay R/Co Road 36**. MAP:31C/16, UTM 18TUE 816.3 589.9. 44.77651N 76.49561W - 26 July 2001 TIME: 1551-1600. AIR TEMP: 22 ca, sunny, windy

COLLECTED BY: **Frederick W., Aleta Karstad, & Jennifer H. Schueler** Field#: 2001/140/bb - HABITAT: rocky brownwater river in *Typha* marsh; large ad, either *O.virilis* or *O.rusticus.*

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and upstream there's a population of the uncommon mussel...

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Ligumia recta. 1 shell, specimen. **98/185/cd**

Canada: Ontario: Lanark County: Bathurst: **Tay R/Bowles Side Rd, 1.9 km SSW Glen Tay**. MAP:31C/16, UTM 18TUE 960.8 681.4. 44.86107N 76.31503W - 30 July 1998 TIME: 1326-1408. AIR TEMP: 21 ca, overcast, light rain

COLLECTED BY: **Frederick W. Schueler** 98/185/cd - HABITAT: clear broken-rock river blw fallen dam/farm & woods; old eroded valve.

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Ligumia recta. 3 adult, shell, specimen. **98/187/ad**

Canada: Ontario: Lanark County: Bathurst: **Tay R/Con Road 2, 2.1 km SSW Dewitt Corners**. MAP:31C/16, UTM 18TUE 914.2 643.9. 44.82664N 76.37316W - 30 July 1998 TIME: 1451-1520. AIR TEMP: 21 ca, overcast

COLLECTED BY: **Frederick W. Schueler** 98/187/ad - HABITAT: clear sand/gravel/boulder bed river; 2 old pairs, lgr 136 mm, 1 larger alive.

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...how will water-taking influence these species?