PROFILE OF A MONITOR: WATERWATCHING DAREBIN CREEK. ***Article by Waterwatch monitor Micheal Sephton and Banyule Council Waterwatch Coordinator Julia Vanderoord***

There has been a lot of Waterwatch action on the Darebin Creek lately. We have quite a few dedicated volunteers sampling the water quality, trying to get an accurate picture of the overall health of the Darebin Creek, especially for the aquatic life that lives there…or does anything actually live in the creek?. One Waterwatch volunteer water testing on the Darebin creek is Michael Sephton. Since December 2007 Michael has been monitoring (ie water testing) water quality to find out the answer to that questions and many others, at a number of sites on the Darebin Creek mostly on a monthly basis.

During this time a number of other Waterwatch monitors have joined him, namely Phillip Diver, Yuta Noguchi, Linda Odgers and Averil Hedley.

Michael began monitoring one site on Darebin Creek, a short distance upstream from the Darebin Rd Bridge, in Ivanhoe. In May 2008, Michael also begun monitoring an additional site on the Darebin Creek which is a large stormwater drain coming into the creek that brings in stormwater from the industrial estate and residential housing in Thornbury. This drain is upstream of the Darebin Rd Bridge site. In the past there have been pollution incidents in this spot, which has included litter and other liquid wastes. (refer to photos1 & 2) One of the infrastructure measures brought in to alleviate surface water pollution is a small pond on the banks of the Creek, so this is being monitored by Michael as well. The main aims of Michael's monitoring has been:

- to discover how much effect stormwater coming into Darebin Creek is having on the aquatic life, ie can anything live in the Creek,
- what pollution sources are coming into the creek at this point.
- The pond is being monitored to discover if any pollution is coming into this pond and how successful this pond is in keeping pollutants contained, out of the Creek.
- To report any pollution spills observed to the EPA (EPA have the power to prosecute any polluters)
- To report back to water managers on the types of common pollution tested and observed so that water managers can implement appropriate solutions to reduce these pollution events

To achieve these aims Michael has used a number of Waterwatch parameters including physical and chemical testing, habitat assessment, observations and aquatic macroinvertebrates sampling. (water bugs).

Photo 1 Stormwater drain Michael is monitoring on the Darebin Creek.

Photo 2. Litter is a big problem on the Darebin Creek, especially plastic bottles. Most of these enter via stormwater drains.

Both photos by David Ford

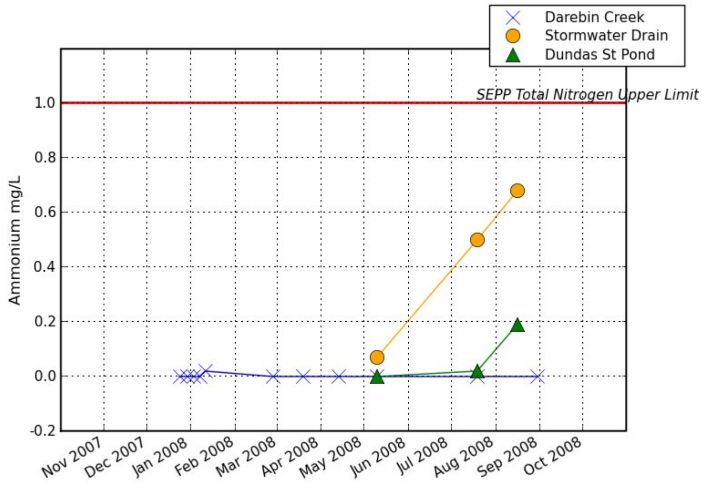
Physical and Chemical Indicators

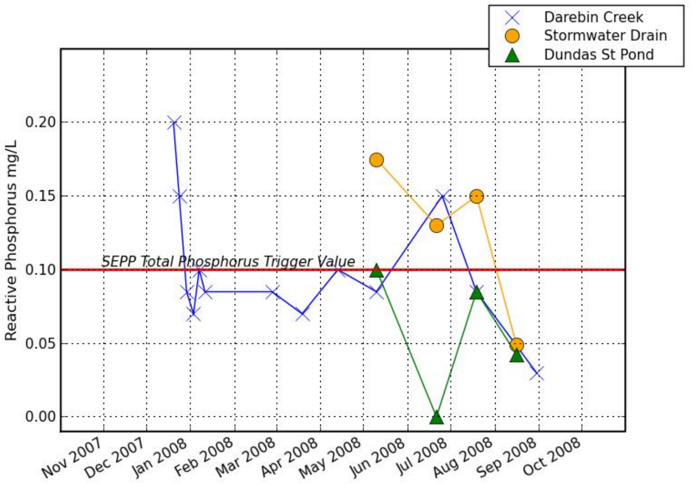
Waterwatch perform a number of water tests that can tell us a lot about ecological health. We choose these tests because:

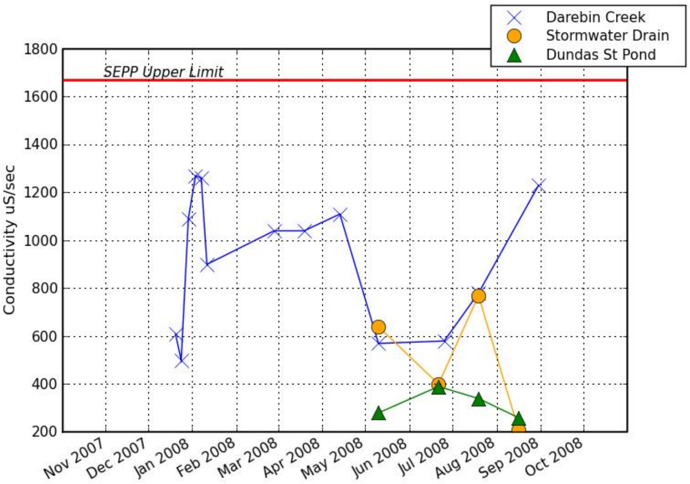
- they are easy to do,
- are inexpensive,
- can be done creek side to get an immediate result (no lab required)
- can give a guide to ecological health ,ie can this river sustain life, plants and animals?

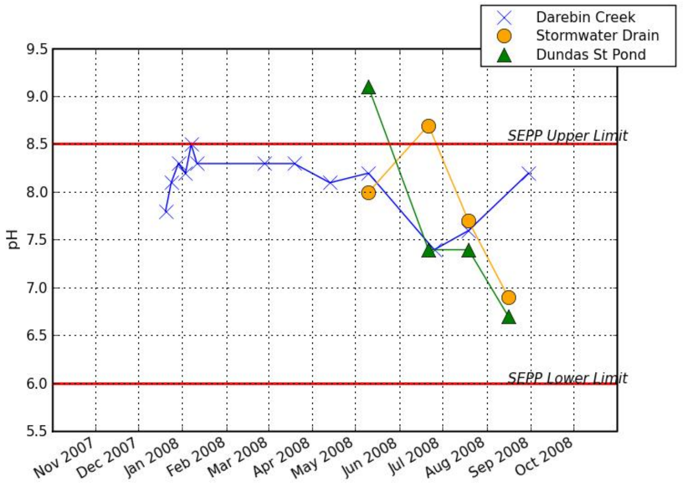
Once the tests are done the results are compared to a ratings table, or guidelines on ecological health. Over time (seasons and years) if our results continue to exceed these guidelines, action should be taken to discover what is causing the waterway to get these results, and of course to come up with a solution. Solutions include planting trees, installing litter traps, or raising awareness within the local community and/or landowners to stop the pollution they may be inadvertently causing.

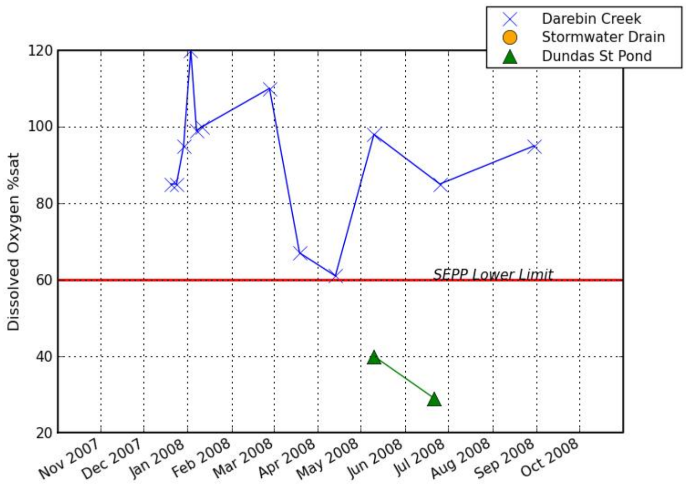
There are a few sets of guidelines that can be used, the main one we use for the Darebin Creek are the SEPP guidelines (State Environment Protection Policy). Developed by the EPA, SEPP guidelines are legally enforceable and regionally relevant. These ones used on the graphs below have been developed specifically for urban waterways in the Yarra Catchment, of which Darebin Creek is one. The red lines on the graphs represent SEPP, and if this line is crossed a number of times, this “triggers” a response to water managers and the community: the river is polluted, action should be taken to resolve this. The graphs below show clearly the physcehm tests Michael has performed at the 3 locations and where they have exceed SEPP. The tests are Turbidity (Cloudiness of water), pH, (acidity or alkalinity) Conductivity (salinity), Dissolved Oxygen,(quantity of oxygen present in water) Phosphate and Ammonium (nutrients) for the sites.

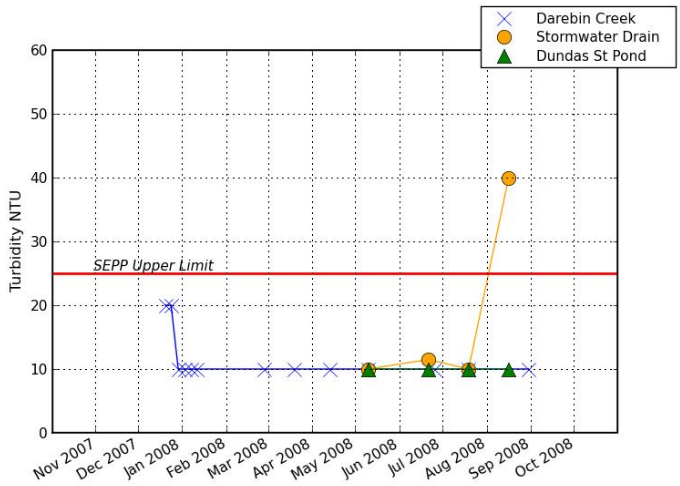












Graphs representing all physchem data collected from January 2007 to September 2008 on all 3 sites. M Sephton 2008.

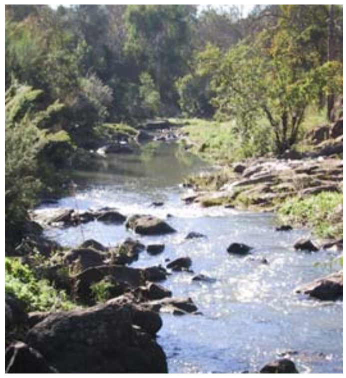
What do the results mean for Darebin Creek?

It is clear that turbidity measured in the stormwater drain has been higher than that measured in both Darebin Creek and the Pond. This means that when it rains water coming into the Creek via the stormwater drain is probably polluted with items such as oils, faecal matter, dust, cigarette butts and organic matter such as leaves. Indeed, the EPA has reported that these are some of the most common polluting sources from stormwater drains into Melbourne's rivers and creeks.

The graph of pH is interesting because unlike for Turbidity and Conductivity, the measured values for the Creek frequently go close to the upper reaches of healthy limit The pH of water is a measure of hydrogen ion concentration and indicates acidity and alkalinity of water. Measurement of pH is important for water quality as all aquatic animals and plants are adapted to specific pH ranges. The pH scale ranges from 0-14. The pH of freshwater usually falls between 6.5 to 8.2.
High pH levels during the sampling could be due to the time of the day sampled in the afternoon and sunny weather. The pH of water increases in warmer temperatures. If salinity is high, this can also increase the pH. Another factor is the geology of the Darebin Creek. Much of the catchment has balsiltic (larva) geology, which can naturally mean pH is higher (towards 8)

Looking at the graphs of Dissolved Oxygen (DO), it's clear that the Pond has much lower DO values, probably due to the fact that the water is relatively stagnant. The DO values measured at the Creek were mostly within the range of a healthy system. This is probably due to the water flowing over riffles (rocks in water) which oxygenates the water and provides great habitat for aquatic life such as stoneflies. (photo 3)

Photo 3. Riffles, like these on the Darebin Creek, help to provide oxygen to the water by the agitation of water over the rocks. Photo from DCMC.



Salinity is quite high, but not high enough to exceed SEPP upper limits. This is still a concern, to be ideal for most aquatic life, it would be best to be around 200. The wild fluctuations are probably due to rainfall events, when rain enters the creek the salt levels would decrease from being diluted.

The nutrients (reactive phosphorous and ammonium) are the biggest problems for all 3 sites.

Ammonium is a form of nitrogen. Other forms include nitrate and nitrate all able to be tested. Ammonium is the form we are most interested in measuring to discover the level of toxicity from Nitrogen derived sources. This includes the breakdown of animal wastes including dog faeces and other animal faeces, blood, abattoir waste, sewage. If undetected, the presence of ammonium results in bad smells and fish and other aquatic life deaths. Apart form the stormwater drain, the ammonium levels are normally low, but the stormwater drain is of a concern.

Phosphorus is found naturally in both surface water and groundwater at low concentrations. It is naturally derived from the weathering of rocks and the decomposition of organic material, but it can also enter water bodies in runoff or discharges – soil and fertiliser particles can carry phosphorus, and sewage is also rich in phosphorus. High concentration of phosphorus in water bodies is often the result of human activities (Water quality monitoring manual, March 2004). Apart form the pond the Creek and drain have exceeded SEPP a number of times, which is a concern.

Macroinvertebrate Sampling

What are macro invertebrates?

Aquatic macro-invertebrates (such as snails, mites, bugs, beetles, dragonflies, freshwater crayfish and worms) are very useful indicators in biological monitoring. They are animals without a backbone, visible to the naked eye and are commonly found in rivers and steams

Why are macro invertebrates monitored?

The biological characteristics involve monitoring Macro-invertebrates to indicate the health of the river. Environmental changes on the river ecosystem, such as effects of pollution and surrounding land, have a major impact on aquatic animal
The presence or absence of specific species provides

information about water quality. Generally sites with good quality water have a high level of species diversity

They are a diverse group of animals and live in different habitats suitable to their living conditions. In order to survive, macro-invertebrates need specific ranges of environmental conditions such as nutrients, right temperature, enough oxygen levels, pH and salinity. Changes in water quality can therefore affect macro-invertebrates by decreasing the numbers of different types of macro-invertebrates and increasing those species which are more tolerant. The tolerant macroinvertebrate species or those can survive under polluted conditions usually increase in number because of the absence of other species, which normally compete with them for food.

Very sensitive animals:	are only likely to be found in streams with good water quality.
Sensitive animals:	are usually only found in streams with good or medium water quality.
Medium tolerant animals:	can be found in streams with good or medium water quality but are less likely to be found in those of poor quality.
Tolerant animals:	can be found across a range of water quality in streams, but can live in poor-quality water.
Very tolerant animals:	can be found in water of poor to good quality, but are usually the most abundant group in streams with poor water quality.

Table 1. Sensitivity levels of macro invertebrates

Macroinvertebrates are identified to an Order/Class/Phylum level, each being assigned a “BugScore”. Bug scores range from 1-8, with the orders of macroinvertebrates most sensitive to pollution being assigned scores close to or equal to 8, and those tolerant to pollution; scores close to 1. The total abundance of all macroinvertebrates found is then converted to an “abundance category” (table 2.) These two values are then plotted on the Stream Condition Chart (table 2), giving the stream condition.
So far Michael has collected samples of macroinvertebrates on three occasions at the Creek site, table2 shows results.

Name of Bug	**Bug Score**	**Abundance**		
		31 December 2007	5 May 2008	19 July 2008
Caddisfly nymph	7	70	50	15
Damselfly nymph	6	25	18	1
Dragonfly nymph	6	0	8	0
Water Boatman	4	0	45	1
Snails	3	0	4	10
Aquatic Beetles	3	0	1	1
Round Worms	3	1	2	10
Leech	3	3	0	1
Bloodworms	1	43	0	0
Total Abundance		142	128	53
Total Bug Score		20	32	27
Stream Condition		Fair	Fair	Poor

Table 2. Results from macroinvertebrate sampling in the Darebin Creek

Although the results show fair/poor stream condition, partly this reason is to do with the time of month the samples were taken- the best time to sample is autumn and spring, when bugs are breeding and temperatures in stream are optimum. Nevertheless the stream condition ratings provide an interesting point of reference.

This results also shows that due to habitat loss and poor physchem results for some parameters, the creek in unable to support a huge diversity an population of aquatic life. As bugs are a food source for many animals such as platypus, fish and frogs this effects the rest of the food chain and thus the Darebin Creek ecosystem.

Often Michael has accidently caught mosquito fish in their net, and on one occasion, what seemed to be a very small eel (~7 cm long).

What do the results show overall?

Briefly the results show that while some tests are generally ok for aquatic life, some are showing there needs to be improvement. Some solutions, many of which are actively being carried out by various groups (Darebin & Banyule Council, Friends of Darebin Creek and Darebin Creek Management Committee to name a few) include habitat restoration (adding riffles, aquatic and bank vegetation and removal of weeds), education of residents and businesses that may have stormwater pollution from their properties, maintenance of drains and pipes connected to the Creek, and adding treatment systems such as litter traps and wetlands (best option as not only do they treat water, they slow it down and create habitat) Obviously this monitoring is another action that should be continued to monitor if these solutions are working.

For More Information

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