Ginninderra Catchment Group Inc. - Waterwatch Program

HALF YEARLY WATER QUALITY AND CATCHMENT HEALTH REPORT

July - December 2003 SUMMARY

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INTRODUCTION

This report presents a summary of the data collected as part of the Ginninderra Catchment Group's Waterwatch and Catchment Health Indicators Program, during the period July through December 2003. Where applicable, the results from this period are compared with longer term data.

Measurement of these water quality and other parameters was undertaken using accepted methods. Quality Assurance / Quality Control training and procedures have been incorporated into this sampling program, in order to ensure that the data collected is of known quality.

Environmental Conditions in July to December 2003

July to December 2003 has seen a gradual increase in flow rates in the catchment, following the severe drought conditions experienced during 2002 - 2003. Areas of the creek that were previously reduced to a series of small pools are currently connected, and most upstream areas have small amounts of water flow.

Rainfall events were relatively small, with the maximum rainfall (approx. 40mm) recorded at the end of November. Highest flows were recorded during August, when rainfall reached a maximum level of 30 mm.

Increased water flow can benefit the health of the creek in a number of ways:

- Any pollutants that may be introduced to the stream are diluted and therefore have a smaller impact;
- Pollutants can also be flushed out during significant rainfall events;
- Water temperatures are stabilised (as opposed to increased temperatures accompanying very low flows);
- Areas of aquatic habitat are increased as isolated pools are reconnected.

These conditions have contributed to general improvements in water quality at many sites.

RESULTS

pH RESULTS

pH is a measure of the acidity or alkalinity of the water. Aquatic animals and plants are adapted to certain ranges of pH which, in the Ginninderra region, usually lies in the range 6.5 to 8.2. The median pH at most Waterwatch sites ranged between 6.5 to 8.0, which indicates a healthy stream environment.

In unhealthy waterbodies, pH levels can fluctuate dramatically over the 24-hour daily cycle. Such fluctuations will reduce the number of species normally present in the water. The Waterwatch Australia Technical Manual (2002) suggests that "changes of more than 0.5 pH units from the natural seasonal maximum or minimum in fresh water should be investigated". For this report, the median pH for July 2003 to December 2003 is compared with the long-term median pH for each site. Most sites showed no significant change, with 2 exceptions, MCW001 and STW007.

Dunlop Stormwater Pond 2 (STW007) showed a significant increase in median pH to 9.0, which is extremely alkaline. pH levels here fluctuated between 7.7 and 9.3, highlighting a particularly unstable environment. This instability is likely to be due to the large influx of sediment and associated nutrients as a result of land clearing in the vicinity of Kerrigan St (North Dunlop). High pH levels were also noted at this site between December 2002 to June 2003.

At Mackellar Wetland (MCW001), the median pH was 7.8, but fluctuated between 6.9 - 9.4. This fluctuation also indicates a highly unstable environment; the pond is similarly affected by recent land clearing for the new Mackellar estate.

The highly variable pH at both of these sites may be a result of photosynthetic activities of plants and algae. In environments where there are large nutrient inputs, excessive growth of aquatic plants can occur, causing pH levels to fluctuate significantly over the course of a day. Excessive growth of aquatic weeds and algae has been noted at both sites.

Yerrabi Pond also had relatively high pH levels (median of 8.1), but appears to be stable and the median is only

slightly higher than the ideal upper limit of 8.0 pH units, so this result is not regarded as being a major cause of concern.

ELECTRICAL CONDUCTIVITY RESULTS

NOTE: This report is using the conventional units for Electrical Conductivity (EC), µS/cm (micro Seimens per centimetre). In previous reports, EC has been given in ppm (parts per million). To convert from µS/cm to ppm, simply multiply by 0.64.

Most sites had median EC levels that were below 625 µS/cm, and were therefore rated as either 'Fair' or 'Good'. Only one site, Dunlop Stormwater Pond 1 (STW005) had a 'Very Good' EC rating, with a median value of 109 µS/cm.

The median EC at Kippax Creek (KIP001) was 720 µS/cm, which is considered 'Poor'. This shows a rise in median EC since the last reporting period. Severe erosion of the stream bank of Kippax Creek is likely to be contributing to this problem. During rainfall events, large amounts of fast-flowing water build up very quickly at this site, scouring the stream banks and contributing dissolved solids to the system. The ACT government is currently exploring "soft engineering" remediation options for this site.

Two sites had 'Very Poor' EC ratings, Yerrabi Pond (GIN003) and Wallaroo Rd (GOO007). Yerrabi Pond showed a dramatic increase in median EC (to 1252 µS/cm), compared to the overall median (830 µS/cm). Soil disturbances associated with the recent land clearing associated with the residential development of Forde may be responsible for this increase.

Consistent with data collected over the past 4 years, extremely high EC values were again observed at the Gooromon Ponds Creek site along Wallaroo Rd. EC levels have shown a slight decrease in the past 6 months, compared to the overall median from the past few years. This may be reflecting a degree of recovery from the severe drought conditions experienced last year. However, soil disturbances from stock access and erosion is still a significant problem at this site.

TURBIDITY RESULTS

Turbidity results varied considerably across the different sites in the catchment, and also at different times throughout the monitoring period. Although most sites had median turbidity values of <10 NTU, almost all sites showed turbidity 'peaks' ranging from 15 - 200 NTU. These spikes were not necessarily associated with significant rainfall events, but many were.

Sites with consistently high turbidity levels included Gungahlin Golf Course (GIN002), Mackellar Wetland (MCW001) and the upper reaches of Gooromon Ponds Creek (GOO001). At Gungahlin Golf Course, the turbidity was >30 NTU on 4 out of 7 sampling occasions, and reached a peak of 90 NTU in July, which was associated with a rainfall event. Sampling notes suggest that the high turbidity here is due to the action of water birds and their faeces in the site sampling pond.

At Mackellar Wetland, turbidity reached the extremely high reading of 100 - 200 NTU following a rainfall event in December. Peaks of 40 NTU were also recorded in July and August. These dramatic readings are associated with the current land disturbance for the development of the North Mackellar sub-division.

The site on the upper reaches of Gooromon Ponds Creek showed turbidity levels of at least 30 NTU on all but one sampling occasion. This is consistent with data collected over the past few years, and is likely to be related to bank erosion at the site, and stock access upstream of the site.

An improvement in median turbidity was apparent at Wallaroo Rd (GOO007), where turbidity was generally "Very Good', except for an extreme peak of 100 NTU associated with a large storm event in August. A similar pattern was present at the bottom end of Gooromon Ponds Creek, where there was a peak to 150 NTU, associated with the same storm event in August.

STORM EVENT MONITORING

Storm event monitoring has taken place at 3 sites during the current reporting period.

- **SAS710 - Macrossan St Footbridge, Macgregor.** Storm events were sampled on 2 occasions, 24 September and 21-23 November, reaching maximum turbidity readings of <10 NTU and 120 NTU, respectively. Charts from these clearly show the different levels of intensity of the 2 rainfall events, and the subsequent difference in levels of turbidity.
- **SAS721 - Ginninderra Creek at Macgregor PS Footbridge.** Turbidity readings were taken at SAS721 on 2 occasions, recording turbidity levels of 30 NTU on the 12-Jul-03 and 40 NTU on the 25-Oct-03.
- **SAS780 - Ginninderra Creek at Osburn Drive Road Bridge.** 3 rain events were sampled at this site over the past 6 months. The maximum recorded turbidity was 80 NTU on 2-Oct-03. During the other 2 rain events turbidity levels were not observed above 20 NTU.

DISSOLVED OXYGEN RESULTS

Dissolved Oxygen (DO) measurements have been taken at four sites. The median DO results for all of these sites were acceptable. However, it is important to note that the concentration of DO fluctuates daily, and the lowest levels occur overnight and early in the morning, so sampling may not have detected decreases in DO at these times.

The Waterwatch Australia Technical Manual states that, "A dissolved oxygen concentration of 2 mg/L will not support fish, and dissolved oxygen concentrations below 3 mg/L are stressful to most aquatic animals. At least 5 - 6 mg/L are required for fish growth and activity. Daytime concentrations of 6 mg/L are cause for concern as dissolved oxygen levels will decrease overnight." Here, it is useful to consider the number of times that dissolved oxygen levels are observed to be below 2 mg/L or below 6 mg/L.

For all 4 sites, DO levels were acceptable from about July through October, but then showed significantly low levels from September to December.

At Mackellar Wetland (MCW001), only 4 DO measurements were taken, which were all higher than 6 mg/L. On 2 sampling occasions in December 2003, turbidity levels were too high to take a DO reading.

Just downstream of Lake Ginninderra (GIN009), DO levels were acceptable on sampling dates in September to early November 2003, but were then below 6mg/L on late November and early December sampling dates. An extremely low DO level was then recorded in early January 2004, at a level of 0.4 mg/L. This reading is of cause for concern, as it is well below the level stated above for supporting aquatic life.

DO levels at Latham (GIN020) were below 6 mg/L on two occasions, during December 2003 and January 2004; and at Kippax Creek (KIP001), levels were below 6 mg/L during November 2003 and January 2004.

There may be a number of causes of these lowered DO levels. Rainfall events during August, October and November may have washed a variety of pollutants into the creek, following extended periods of low flows during the first half of 2003. Nutrient pollution and subsequent excessive growth of aquatic plants can cause dramatic fluctuations in daily DO levels, resulting in higher maximum and lower minimum values. In addition, inputs of organic materials can also degrade DO levels, as the organic matter uses up oxygen as it degrades. Ortho-phosphorus results for GIN009 are consistently acceptable, but there is evidence of large amounts of aquatic plant growth at this site.

ORTHO-PHOSPHORUS RESULTS

Ortho-phosphorus is an indicator of the nutrients present in the waterway that are available for aquatic organisms and plants. While nutrients are an important natural component of a healthy ecosystem, excess amounts can result in the growth of nuisance plants species such as algae. This can smother aquatic life and deplete overnight dissolved oxygen levels.

The Ortho-phosphorus (P) results for Mackellar Wetland are extremely high, with a maximum recorded P concentration of 0.26 ppm. This reading was associated with a significant rain event in December, when large amounts of sediments and associated nutrients were washed into and caught in the pond. This is a result of the large amounts of bare soil caused by current residential development of the North Mackellar Estate. Other, less severe, but high readings were recorded here in August and September.

Ortho-phosphorus concentrations at Ginninderra Creek (GIN009), Ginninderra Drive (GIN020) and Kippax Creek (KIP001) are generally satisfactory. However, these sites show 'peaks' of P concentration when levels are greater than 0.04 mg/L. At GIN020, this peak occurred on 1 out of 8 sampling occasions, and at KIP001 they occurred on 4 out of 8 occasions. At GIN009, P levels were consistently below 0.04 mg/L.

PRESENCE OF RUBBISH

Rubbish was observed at all sites that were monitored, with the exception of Yerrabi Pond (GIN003) and Gungahlin Pond (GUN001).

The largest amounts of rubbish were observed at the Giralang GPT (STW001) and John Knight Park (GIN010). At both of these sites over 100 items of rubbish were observed over the reporting period. Sites with more than 20 items of rubbish found include: Kippax Creek (KIP001), Wallaroo Rd (GOO007), and 2 Latham Sites (GIN020 & GIN024). The highest frequency of rubbish was observed at three of these sites: STW001, GIN010 and GIN024.

The breakdown of the type of rubbish present shows that over half (57%) was plastic, followed by 18% paper. Cigarette butts, aluminium cans, glass, green waste and building waste also made up significant components of the rubbish.

PRESENCE OF ALGAE

The presence of excessive amounts of algae can indicate nutrient enrichment of a waterway. Sites where algal growth was observed for greater than 50% of sampling dates are concentrated in Gungahlin and in the middle reaches of Ginninderra Creek , downstream of (and including) Lake Ginninderra. Sites along Gooromon Ponds Creek and at the lower end of Ginninderra Creek showed the presence of algae less often than other sites.

FROGWATCH RESULTS

Detailed results from our Frogwatch surveys are included in the "ACT 2003 National Water Week Community Frogwatch Census Report", available from the Ginninderra Catchment Group office, 6278 3309.

A total of 8 frog species were observed during October 2003 in the Ginninderra Catchment. There were 2 Frogwatch sites where no calls were heard. At the same time last year, only 5 species were observed.

Since our last spring Frogwatch surveys (2002), participant numbers have increased dramatically to include 50 Frogwatch sites in the Ginninderra catchment. In part, this accounts for the significant increase in both the diversity and abundance of frogs observed this spring. However, these results also show a return to the 'usual' number of species present in the Ginninderra catchment, as observed during 2001 and 2000 Frogwatch surveys, when 8 species were present. A low number of species (5) were recorded last year, when the catchment and surrounding region was experiencing a particularly prolonged dry period.

Frogwatch Results Autumn 2003

Species marked with (*) indicate those species which were NOT observed in spring 2002.

Scientific Name	Common Name	Number of Sites Where Observed
Crinia signifera	Common Eastern	46
Crinia parinsignifera	Plains Froglet	38
Limnodynastes tasmaniensis	Spotted Grass Frog	34
Limnodynastes dumerillii	Eastern Banjo Frog	23
Uperoleia laevigata *	Smooth Toadlet	18
Litoria peronii *	Peron's Tree Frog	16
Litoria verreauxii	Whistling Tree Frog	6
*Limnodynastes peronii**	Brown-Striped Frog	5

MACRO-INVERTEBRATE SNAPSHOT RESULTS

Three macro-invertebrate snapshots were undertaken in Ginninderra during spring 2003.

For all three of these results, the SIGNAL system suggested high salinity or nutrient values. At these sites, problems associated with elevated nutrient values are more likely than high salinity. Unfortunately measurements of nutrients are not currently monitored at these sites.

At Giralang Pond, results for spring 2003 show an increase in the number of bug types found, compared to spring 2002, when only 5 bug types were apparent. Comparable data is not available for the other two sites.

SUMMARY, CONCLUSIONS AND RECOMMENDATIONS

SUMMARY OF RESULTS

The summarised water quality results for each site and subcatchment ranged from 'Fair' to 'Very Good'. This reflects a general improvement in water quality, associated with a reprieve from the severe drought that was experienced during 2002 - 2003. Other indicators such as the diversity of frog species, diversity of bug types have also shown some improvement over the past 6 months.

The water quality results at Yerrabi Pond (GIN003) and Dunlop Pond 2 (STW007) have indicated an overall degradation in the last 6 months. This is likely to be related to the current development of new residential suburbs in these areas (Forde and North Dunlop, respectively).

CONCLUSIONS

- The development of new suburbs involves large-scale land disturbance, vegetation clearance and the exposure of large areas of bare soil. Such development is currently occurring in north Gungahlin, north Dunlop and in the North Mackellar areas. Water quality sites situated downstream of these developments are all showing symptoms of this disturbance, such as elevated Electrical Conductivity levels, extreme fluctuations in pH, high turbidity, or high Ortho-phosphorus concentrations, despite the recent small increase in flow levels.
- Nutrient levels are often too high and Dissolved Oxygen levels are regularly below acceptable standards at key monitoring sites. The analysis of aquatic macro-invertebrate populations also indicate a nutrient-rich environment.
- The erosion of stream banks is an important issue along the Gooromon Ponds Creek tributary (related to stock access) and along Kippax Creek (related to high water velocity).
- Rubbish is a problem along most of the creek line, particularly in urban areas. John Knight Park (GIN010) and Giralang GPT (STW001) are 2 sites where amounts of rubbish are especially high.
- The number of frog species present in the catchment is similar to results from previous years.

RECOMMENDATIONS

Further Monitoring

- Expansion of the monitoring program to include the measurement of Ortho-phosphates and Dissolved Oxygen at more sites than at present is desirable, as it will provide more information relevant the survival of aquatic organisms. This will be particularly useful at sites where macro-invertebrate sampling is undertaken. Funds from a recent Envirofund grant application will soon be available to provide equipment for this.
- A standardised measure of the amount of algae present at each site is necessary to be able to undertake a more meaningful analysis of algal growth (and indirectly DO and Ortho-phosphorus results).
- Storm Event Sampling - Greater coordination of sampling between sites is needed, to be able to compare turbidity levels at different places. This will help to identify areas where erosion abatement is most needed. It is also recommended that extra SAS sites be established in areas likely to be contributing the highest sediment loads, that is, in North Gungahlin, West Belconnen and North Mackellar, where land clearing, construction and residential development are currently occurring.
- Inclusion of wildlife monitoring (for example of bird, vegetation and fish species) is desirable, in order to broaden the scope of our monitoring program into the wider catchment.

Community Engagement

- Initiate relationship with land managers in the Gooromon Ponds Creek catchment, with a view to preventing stock from accessing the creek corridor.
- Take action to prevent escape of sediments from areas undergoing clearing and construction work. This may include establishing a relationship with builders associations and pressuring government agencies to enforce the proper management of building sites.
- Continue involvement in consultation process for rehabilitation of Kippax Creek's erosion problems.