Ginninderra Catchment Group Inc.
Waterwatch and Catchment Health Indicators Program

MONITORING PLAN

SUMMARY

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Introduction

The Ginninderra Catchment Group has been undertaking water quality monitoring in the catchment since 1999, as part of a combined Waterwatch and Catchment Health Indicators Program. The program was initiated to develop a simple and practical method that community groups could use to:

- measure the health of their local catchment;
- monitor and evaluate the effectiveness of their on-ground projects;
- identify early warning signs of environmental problems; and
- measure trends in the condition of the natural resources in their catchment over time.

This Monitoring Plan summarises the reasons for monitoring, accepted protocol and procedures for participants to follow, and intended outcomes from our monitoring efforts.

The monitoring plan aims to provide participants and data users with a common vision for the monitoring program, and to ensure the quality of data collected, by exploring a number of key questions.

In order to obtain a more comprehensive picture of catchment health, program also uses data from a number of different sources to supplement the data collected by community volunteers. These include:
Rainfall Data - Provided by ECOWISE Environmental (Hydrology)
Land Information Data - Provided by various sources

Links with the Ginninderra Catchment Group Strategy
The Ginninderra Catchment Group Strategy (2000) outlines a number of goals that are relevant to the Monitoring Program:

Stormwater Quality
- Identify sources of sediment entering the creek;
- Identify source of litter entering the creek;
- Identify sources of 'other pollutants';

Environmental Restoration
- Identify and map stream and tributary banks that are actively being eroded;
- Regularly assess habitat / vegetation at identified sites, so as to focus revegetation projects;
- Establish regular wildlife monitoring in areas of the catchment that do not have regular data collected;

Invasive Flora and Fauna
- Develop a systematic habitat assessment;
- Monitor the impact of willow removal projects on the natural environment;
- Undertake regular macro-invertebrate snapshots.

Urban / Rural Planning and Development
- Use CHI to support consultation and communication with government agencies;
- Use CHI to support environmental best practice in planning and implementing developments.

Education and Awareness
- Educate students in the catchment about their local environment and how they can make a difference, through:
  - integrating Landcare and Waterwatch programs in local schools; and
  - regular macro-invertebrate snapshot monitoring in local schools.

- Raise awareness of the catchment community on local environmental issues.

Recruitment of Volunteers and Participation of Volunteers

- Develop formal training programs that help the Group to achieve its goals, while leaving participants with recognisable skills;

Monitoring and Evaluation

- Ensure coordination between Landcare and Waterwatch programs with regard to work plans, project plans and time frames;
- Integrate Waterwatch and CHI evaluation strategies into future Landcare projects;
- Establish the CHI Program to form the basis of the monitoring and evaluation processes for the Group;
- Analyse water quality data to identify problem areas and target on-ground activities;
- Monitor and evaluate the impact of projects undertaken by the Group and its members.

Question 1. Why are we monitoring?

AIMS: "To implement a community-run monitoring program that will allow the Ginninderra Catchment Group to:

1) Recognise significant short-term pollution events, and to identify the causes or sources of this pollution, so that the appropriate authority may be notified in a timely manner. Pollutants of particular relevance are those associated with:
   - stormwater runoff and erosion;
   - general litter and dumping of rubbish;
   - accidental spills or improper disposal of toxic substances.
2) Monitor and evaluate the impact of projects undertaken by the Group and its members.
3) Identify currently degraded areas in the Ginninderra Catchment, with respect to:
   - ecological issues;
   - catchment and stream health; and
   - public health and amenity issues.
4) Identify the sources or causes of long-term degradation in the Ginninderra Catchment, with respect to:
   - ecological issues;
   - catchment and stream health; and
   - public health and amenity issues.

Some Specific Monitoring Questions:

- What impact(s) has the willow removal project had on:
  - physical / chemical water quality, particularly dissolved oxygen and turbidity?
  - biodiversity - macro-invertebrates and available habitat?
- Where are the major sources of sediment in the catchment?
- Where are the major sources of litter in the catchment?
- Which areas in the catchment are most in need of weeding / erosion control / revegetation efforts?
- How effective are the on-ground works of the Ginninderra Catchment Group and member groups?

Question 2. Who will use our data?

Main User	Ginninderra Catchment Group
Secondary Users	Other ACT Waterwatch and Landcare Groups (Molonglo, SWAMP, Sullivan's Creek, Tuggeranong / Tharwa, Weston Creek)
	Teachers and Students (Primary, Secondary and Tertiary)
	ACT Government Agencies (Eg. Environment ACT, CUPP, ActewAGL / ECOWISE Environmental)
	Regional Government Agencies (Eg. Murray Darling Catchment Management Board, Upper Murrumbidgee Catchment Coordination Committee, Murray Darling Basin Commission, DLWC, EPA New South Wales)
	Other Groups and "general public" (Eg. Conservation Council)

Question 3. How will the data be used?

By Ginninderra Catchment Group:
- To direct Ginninderra Catchment Group members when planning on-ground restoration activities;
- To evaluate the effectiveness of on-ground activities by Ginninderra Catchment Group members;
- To alert government agencies and / or the public of potential pollution problems;
- To generate public awareness and increase understanding of water quality and catchment health issues; and
- To support lobbying efforts with respect to water quality and catchment health issues.

By Other Waterwatch and Landcare Groups in the ACT
- To compare the water quality and level of catchment health on a regional scale.

By Teachers and Students
- To increase understanding of water quality and catchment health issues; and
- To provide research opportunities for secondary and tertiary students.

By ACT and Regional Government Agencies:
- To provide alerts of significant pollution events; and
- To provide a model of a successful community-run Catchment Health Indicators Program.

Other groups
As needed, and if suitable.

Question 4. What will we monitor?

Indicator / Parameter	How will they fulfill our objectives?	Critical / background
pH	Identify unacceptable levels of acidity or alkalinity	Critical
Electrical Conductivity	Identify unacceptable levels of salinity	Critical
Turbidity	Identify unacceptable levels of sediment input; Identify unacceptable levels of erosion in the catchment.	Critical
Presence and Type of Rubbish	Identify unacceptable levels of rubbish along and in the creek;	Critical
Dissolved Oxygen	Identify occurrences of unacceptable D.O. levels.	Critical
Orthophosphates	Identify presence of excessive nutrient inputs into the creek.	Critical
Presence and Type of Algae	Give context to other WQ parameters (orthophosphates in particular) Identify occurrences of excessive or potentially toxic algae blooms.	Background Critical
Water Temperature	Give context to other WQ parameters	Background
Water Level	Give context to other WQ parameters	Background
Water Flow	Give context to other WQ parameters	Background
Weather	Give context to other WQ parameters	Background
Rainfall	Give context to other WQ parameters	Background
Macro-invertebrate Snapshots	Identify locations where conditions are unacceptable for diverse and abundant macro-invertebrate life.	Critical
Frogwatch	Identify frog habitats and maintain record of species present.	Critical
Riparian Vegetation Surveys	Identify locations where the quality of riparian vegetation requires attention.	Critical

Question 5. What data quality do we want?

The program requires a medium level of data confidence for the critical indicators of catchment health. Background indicators may be observed in a qualitative manner, to provide general a context for analysing the more critical indicators. As QA/QC procedures and protocols are developed and improved, we may aim for a high data confidence level, and to incorporate the needs of a broader range of users.

Parameter(s)	Completeness	Representativeness	Comparability
pH, EC, Turbidity, Orthophosphates, Presence and Type of Rubbish	At least 10 sampling events per year.	• Ensured by selection of sites and training. • Sampling must be undertaken during base flow (ie avoiding 24hrs after significant rainfall events).	Replicates taken at CHI sites within 2 - 3 days of each other, using standard procedures.
Dissolved Oxygen	At least 10 sampling events per year.	• Ensured by selection of sites and training. • Sampling must be undertaken during base flow (ie avoiding 24hrs after significant rainfall events). • Sample at specified time (early morning).	Replicates taken at CHI sites within 2 - 3 days of each other, using standard procedures.
Presence and Type of Algae and Temperature	Must be observed with any WQ or biological surveys.	Ensured by selection of sites and training	Replicates taken at CHI sites within 2 - 3 days of each other, using standard procedures.
Water Level and Water Flow	Must be observed with WQ surveys.	Ensured by selection of sites and training	Qualitative - not comparable between sites
Weather and Rainfall	Must be observed with WQ surveys.	-	Qualitative
Macro-invertebrates	Sample during abundant seasons - autumn and spring	ensured by selection of sites and training	Samples need to be taken from similar habitats (eg edge / riffle) for comparisons between sites to be made. Acknowledgement of rainfall and similar events also need to be made.
FrogWatch	Sample during calling seasons - autumn and spring	not representative - OK	not comparable - OK
Storm Event - Turbidity	Sample during storm events	Ensured by selection of sites and training.	Replicates taken at SAS sites during same storm events.

Parameter	Accuracy:Tolerable Error Range (TER)	precision	sensitivity of equipment	range of equipment
pH	Plus or minus 0.5 pH units (in the 5 - 9 range)	Mystery Sampling results within TER	0.1 pH units	0 - 14
Electrical Conductivity	Plus or minus 30% of the true value.	Mystery Sampling results within TER	10 ppm / uS/cm	0 - 1000 ppm
Dissolved Oxygen	Plus or minus 1 mg/L in the ranges 0-3 and 8-10 mg/L. Plus or minus 0.4 mg/L in the range of 5-7 mg/L.	Mystery Sampling results within TER	0.1 mg/L	0.0 - 12.5 mg/L
Turbidity	Plus or minus 15% of the true value.	Mystery Sampling results within TER	10 NTU	0 - >400 NTU
Orthophosphates	[Plus or minus 10% or the true value].... Arbitrary!	Mystery Sampling results within TER	0.02 - 0.1 ppm	0 - 3.0 ppm
Presence and Type of Rubbish	Qualitative OK	Qualitative OK	-	-
Presence and Type of Algae	Qualitative OK	Qualitative OK	-	-
Temperature	Plus or minus 2.0 degrees C	Mystery Sampling results within TER	0.5 degrees C	0 - 40 degrees C
Water level, Water Flow and Rainfall	Qualitative OK - supplement with ECOWISE data	Qualitative OK	-	-
Weather	Qualitative OK	Qualitative OK	-	-
Macroinvertebrates	90% identification success rate	?	-	-
FrogWatch	90% identification success rate	?	-	-

Question 6. What methods will we use?

Parameter	Sampling Method	Collecting Procedure	Sample Container
pH	pH meter or pH strips	Sample main current	plastic / glass
Electrical Conductivity	EC meter	Sample main current	plastic / glass
Dissolved Oxygen	azide modification of Winkler Method (with colorimeter)	Sample main current	glass
Turbidity	Turbidity Tube	Sample main current	plastic / glass
Orthophosphates	Orthophosphate	Sample main current	glass rinsed with 1:1 HNO_3
Presence and Type of Rubbish	Visual survey	Survey area bordered by 10 m length along creek and 1m onto side of each bank.	-
Presence and Type of Algae	Visual survey	Survey 10 m length along creek - whole of waterbody in this area	-
Temperature	Thermometer	Sample main current	-
Water level	Visual survey - relative at each site - back-up with ECOWISE data	Sample main current	-
Water Flow	Visual survey - relative at each site - back-up with ECOWISE data	Sample main current	-
Weather	General observation	General observation	-
Rainfall	General observation - backup with ECOWISE data	General observation	-
Macroinvertebrates	Snapshot Ratings	Sample specific habitat	plastic / glass
FrogWatch	ID of calls by tape recording	-	-

Question 7. Where will we monitor ?

** See separate catchment map **

Question 8. When and how often will we monitor?

Type of Monitoring	Indicators	Sampling Frequency	Period of Sampling	Time of Day
Biological	Macroinvertebrates	Bi-annual	Autumn and Spring NOT within one week after heavy rain	na
	Frogwatch	Bi-annual	Autumn and Spring	Two hours after sunset.
	Riparian Vegetation	Annual	na	na
Baseline Water Quality	pH	Every three weeks.	During base flows (ie avoid 24hrs after heavy runoff)	na
	Electrical Conductivity	Every three weeks.	During base flows (ie avoid 24hrs after heavy runoff)	na
	Turbidity	Every three weeks.	During base flows (ie avoid 24hrs after heavy runoff)	na
	Presence and Type of Rubbish	Every three weeks.	na	na
Storm Event	Turbidity	Irregular	During storm events or substantial rain.	na
Extra baseline Water Quality	Dissolved Oxygen	Every three weeks	During base flows (ie avoid 24hrs after heavy runoff)	Early morning (dawn is best)
	Orthophosphates	Every three weeks	During base flows (ie avoid 24hrs after heavy runoff)	Early morning??? - check.
'Context' Indicators	Presence and Type of Algae	Every three weeks	At same time as Orthophosphate sampling	na
	Water Temperature	Every three weeks	At same time as Baseline data, macroinvertebrate and frogwatch sampling.	na
	Water Level, Water Flow, Weather, Rainfall	Every three weeks	At same time as baseline data sampling.	na

Question 9. Who will be involved and how?

Role	Responsibilities
Waterwatch Coordinator	• General coordination of Waterwatch and CHI Program • Communication between Waterwatch groups, individuals, school groups etc. • Liaison with government agencies; • Obtains funding; • Preparation and updating of Monitoring Plan; • Data Management; • Analysis of data; • Preparation and Communication of Yearly Report; • Development of QA/QC Procedures; • Undertake regular QA/QC Controls, as needed; • Check quality of data and carry out follow-up; • Carry out regular training of participants, as needed.
Participants	• Implementation of the Monitoring Plan; • Carry out surveys / sampling / analysis of data on-site; • Ensure that Waterwatch Coordinator is notified if unable to undertake regular monitoring. • Notify Waterwatch Coordinator if equipment appears faulty. • Alert appropriate people when severe pollution events are apparent

LOOKING AFTER EQUIPMENT

Equipment Type	Inspection Frequency	Type of Inspection	Calibration Frequency	Standard or Calibration Instrument Used
pH Meter	Before each use	Check that probe has been kept moist. If probe has dried out, soak in deionised water for 24 hrs prior to use.	Before each use	pH 7 buffer solution Check that solution is < 6 months old
pH Strips	Before each use	Visual	na	Check that papers are within use-by date
EC Meter	Before each use	Check that electrodes are free from build-up.	Before each use	TDScan10: 300 ppm TDScan20: 700 μS/cm Check that solution is < 6 months old.
Turbidity Tube	Before each use	Visual check of cleanliness of tube.	na	na
Dissolved Oxygen and Orthophosphate Equipment - DC1600	Before each use	Examine cuvettes for scratches. Check battery reliability Check date of reagents.	Before each use	Sample water (pre-treatment)
Thermometer	Before each use	Visual check for glass breakage / splits in 'mercury'	Every 6 months	Compare with approved thermometer
Macro-invertebrate nets	Before each use	Check for holes	na	na

Question 10. How will data be managed and reported?

- Original field data sheets will be collected from participants, via fax, post, email or direct delivery to the Ginninderra Catchment Group office, preferably within 2 weeks of sampling taking place.
- The Waterwatch Coordinator will check results sheets for completeness and outliers. Data will then be entered into Excel Spreadsheets (by date and by site), and into the Waterwatch Database.
- Original field data sheets will be stored, by date, in a lever arch file in the Ginninderra Catchment Group office.
- Records of Site Habitat Assessments and Site Details are also stored in the Ginninderra Catchment Group office. These files include site photographs.
- Photographic records of special events etc. are also maintained in a photo album in the Ginninderra Catchment Group office.

MANAGING POLLUTION INCIDENT DATA

When a severe pollution incident is identified, immediately contact either:

- the Environment ACT Helpline (business hours only): 6207 9777
- After Hours Hotline: 132 281
- these numbers are printed on the field data sheets for easy reference.
- Severe pollution incidents include:
  - large oil spills;
  - paint in the stream;
  - unusual colour change in the water;
  - fish kills;
  - kills of any animals;
  - large change in pH;
  - odours, an unusual appearance, fumes;
  - dumping of waste.

For unusual water quality results (ie. more than plus or minus 20% of 3-year median):

- Check calibration of the meter (if applicable), procedure and reagents used, and resample.
- If the original result is confirmed, record the result, and contact the Waterwatch Coordinator, on 6278 3309 (BH).
- Relevant authorities / land managers will then be informed of the incident. If appropriate, field checks and analysis of the cause / source of the pollution incident can then be undertaken.
- For small, regular incidents of this kind, keep a record of the time and day that it occurs for about a month and, if possible, try to identify the source. [take sample?]

INTERPRETING THE DATA

The Waterwatch Coordinator will:

- Develop findings: findings are observations about the data. For example:
  - Rating the data according to the CHI ratings system;
  - Identifying which sites exceeded standards and when.
- Develop Interpretations: to explain why the data looks the way it does, and from which conclusions can be drawn.
- Develop Recommendations: recommendations describe what action should be taken and what further information should be gathered.

Question 11. How will we ensure that our information is credible?

Parameter	Equipment and Method	Quality Control Checks	Quality Control Sample Frequency
pH	pH meter	Cleaning and Calibration of meters	before every use
		Mystery Solution testing	every 6 months
	pH strips	Check paper not out of date	before every use
		Mystery Solution testing	every 6 months
Electrical Conductivity	EC meter	Cleaning and Calibration of meters	before every use
		Mystery Solution testing	every 6 months
Turbidity	Waterwatch Turbidity Tube	Visual Check for cleanliness	before every use
		Mystery Solution Testing	every 6 months
Presence and Type of Rubbish	Visual Survey	na (Qualitative OK)	na
Dissolved Oxygen	Colorimeter	Mystery Solution testing	every 6 months
Orthophosphates	Colorimeter	Mystery Solution testing	every 6 months
Presence and Type of Algae	Visual Survey	na (Qualitative OK)	na
Water Temperature	Thermometer	Visual Check for breaks in “mercury”	before every use
		Check for accuracy against office thermometer	every 6 months
Water Level	Qualitative measure	na Qualitative OK	na
Water Flow	Qualitative measure	Backed-up by readings from guaging stations	na
Weather	Qualitative measure	na Qualitative OK	na
Rainfall	Qualitative measure	Backed-up by readings from ECOWISE	na
Macroinvertebrates	Habitat Sampling	Training to ensure homogenity of habitat samples and correct sampling technique	every 12 months
	Visual Identification	Check against reference collection	10% of samples
Frogwatch	Tape recording	Check with calling times and Env ACT WRM	every 6 months

ANALYSIS OF DATA QUALITY

The accuracy of the data collected will be determined every 6 months at community workshops, by comparing results of mystery sampling testing with the Tolerable Error Range for each parameter. Data that does not comply with the specified TER will be rejected for use in catchment health calculations. This data will be identified (‘tagged’ in the records), retained, and used only to support the rest of the data.
The comparability, completeness and representativeness of data sets will be assessed at 6 monthly intervals by the Waterwatch Coordinator.

Data will be checked by the Waterwatch Coordinator for errors in recording on data sheets and keyboard mistakes. Unusual data results will be followed up by checking sampling and testing procedures, equipment functionality, and/or re-testing the water as soon as possible. Explanations for unusual data will be sought by exploring comments on data sheets, unusual conditions, relevant data from other sites, and inquiries to relevant authorities. The quality of data collected will be analysed on a 12-monthly basis, in order to determine inclusion or otherwise in the annual catchment health report. Data that do not meet data quality requirements will be excluded from calculations used to determine catchment health (ie calculations of medians for ratings etc). Data that is excluded from these calculations may be used to provide context for the more robust results.