



**BELLINGEN
RIVERWATCH**
Our rivers, our future

VOLUNTEER MANUAL

WATER MONITORING MANUAL
FOR BELLINGEN RIVERWATCH VOLUNTEERS



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1st edition (2017) & 2nd edition (2018):

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3rd Edition (April 2019) edited by Amy Denshire, Bellingen Riverwatch Coordinator, OzGREEN,
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Cover photos:

Bellinger River Snapping (George's) Turtle, taken by Dr Ricky Spencer, University of Western Sydney
Gordonville Crossing, Gleniffer, taken by Sue Lennox, OzGREEN
Andy Core sampling at Spicketts Creek, taken by Sue Lennox, OzGREEN

Icons made by [Freepik](#) from www.flaticon.com

Thank you.

You make this program possible.

It is difficult to describe the extent of the concern our community felt for our river in 2015, when we lost an estimated 90% of our beautiful turtles in an approximate 6-week period. Bellingen Riverwatch has empowered our community to transform their concern into dedicated, constructive action. In turn, we have witnessed a positive change in our local community, which will ultimately contribute to a healthy river system.

The situation remains critical for the Bellinger River Snapping Turtle. The virus responsible for mass the turtle mortality event left predominantly juveniles in our river system. The NSW Office of Environment and Heritage is working hard with its partners to release turtles from the captive breeding program at Taronga Zoo back into the Bellinger River. This is in a trial phase while the Department of Primary Industries work on resolving questions about the virus that impacted the turtles.

Our partners would like to thank all of our wonderful volunteers for your dedication and hard work each and every month. Without you, this amazing program would not be possible.



IN PARTNERSHIP WITH
SAVING OUR SPECIES



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Online and phone support for any additional questions/training (where possible).

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From the Coordinator

Bellingen Riverwatch was created to provide consistent water quality data in the Bellinger and Kalang catchments following a virus outbreak that caused a mass mortality event of the critically endangered Bellinger River Snapping Turtle (BRST) in early 2015. A lack of water quality data was identified by scientists and community alike as a priority focus area.

The waterways of the Bellingen Shire are highly valued by the local community as they support many activities, such as recreation, irrigation and supplementary drinking water. There is therefore a strong community interest in monitoring and improving the water quality and riparian health.

Ongoing water quality data is important for monitoring the rivers' health, identifying priority areas for management actions and educating the community on how to reduce the impact they may be having on their environment.

In this Manual, you will find everything you need to know about the history of the project, what the data is telling us so far, as well as instructions on the monthly tests and data uploading.

Please write the testing dates in your diary (see [page 22](#)) and don't forget to contact me for replacement chemicals.

Thanks for all you do and happy testing!

Amy



Amy Denshire

Bellingen Riverwatch Coordinator, OzGREEN

I acknowledge the Gumbaynggirr people, the traditional custodians of the land I live, work, learn and play on. I pay my respect to all elders - past, present and future.



**BELLINGEN
RIVERWATCH**
Our rivers, our future

New to Bellingen Riverwatch?

Welcome! Thank you for becoming part of this wonderful citizen science program - we are always needing more trained volunteers to support our 25 sites being tested every month.

Below is a checklist for new volunteers:

Complete Volunteer Forms

When you join, you will be given a Volunteer form, Statement of Volunteer Duties form, and a Media Release form. The Statement of Duties form is needed to ensure you are covered by NSW OEH NPWS volunteer insurance. Please complete and sign forms and return to the Project Coordinator.

 Office of Environment & Heritage
NSW National Parks & Wildlife Service

Statement of Volunteer Duties

To be completed by OEH and signed off by volunteer (individual or group leader)

Project name Bellingen Riverwatch - Oz River, Our Future

Project aim Collect water quality data from 25 testing sites along the Bellingen river health. Data from project will support threatened species conservation actions, river management and Bellingen River Shelling Turtle recovery program.

Location

Volunteer job title Riverwatch Citizen Scientist

Volunteer project supervisor Name: Geetha Ortiz Phone: 02 9998 6009

Volunteer time requirement
Hours per week / months: 4.00 Days of week: 1 Start / finish times:

Volunteer duties
Volunteers will include recording of water quality data and assist with collection of macroinvertebrate assemblage data. Assist with data entry if required. Assist with data management and records management (if required). Hours to be worked to be negotiated with Project Coordinator. Details of tasks, responsibilities and when assistance is required.

Health and safety requirements

Report all hazards to the Volunteer Supervisor
Report all injuries or accidents to the Volunteer Supervisor
Follow all instructions given by the Volunteer Supervisor
Use and care for any equipment provided for health and safety purposes
Use and care for any personal protective equipment provided for health and safety purposes
Other

Training requirements
Water quality sampling techniques, safe use of water quality testing equipment, field safety, data entry into online portal

Dress requirements
Dress requirements
For office and lab based work closed shoes are preferable. For field based activities personal protective equipment include long-sleeved shirts, long trousers, walking boots, sun hat, insect repellent and sunscreen.

Equipment requirements
Equipment requirements
No specific equipment provided by OEH, and managed by NSW Waterwatch.

Other conditions (e.g. agreed reimbursement of costs)
Note: Volunteers do not engage in law enforcement activities.
Statement of understanding: I understand and will abide by the statement of Volunteer Duties, outlined above.

Volunteer's name _____ Date: / /

Volunteer's signature _____

Read WHS Requirements

All Bellingen Riverwatch participants are required to be aware of and understand WHS requirements of participating in this project, and follow the instructions provided through your training and in this manual (see [page 33](#)).

Sign up to a Volunteer Training Session

We conduct volunteer training sessions several times throughout the year. Sue Lennox, Bellingen Riverwatch Scientific Support and Co-Founder of OzGREEN, conducts the training. It usually takes two or more sessions before new volunteers feel comfortable with testing and are able to do it on their own. To find out about upcoming dates for training sessions, please contact the Project Coordinator.

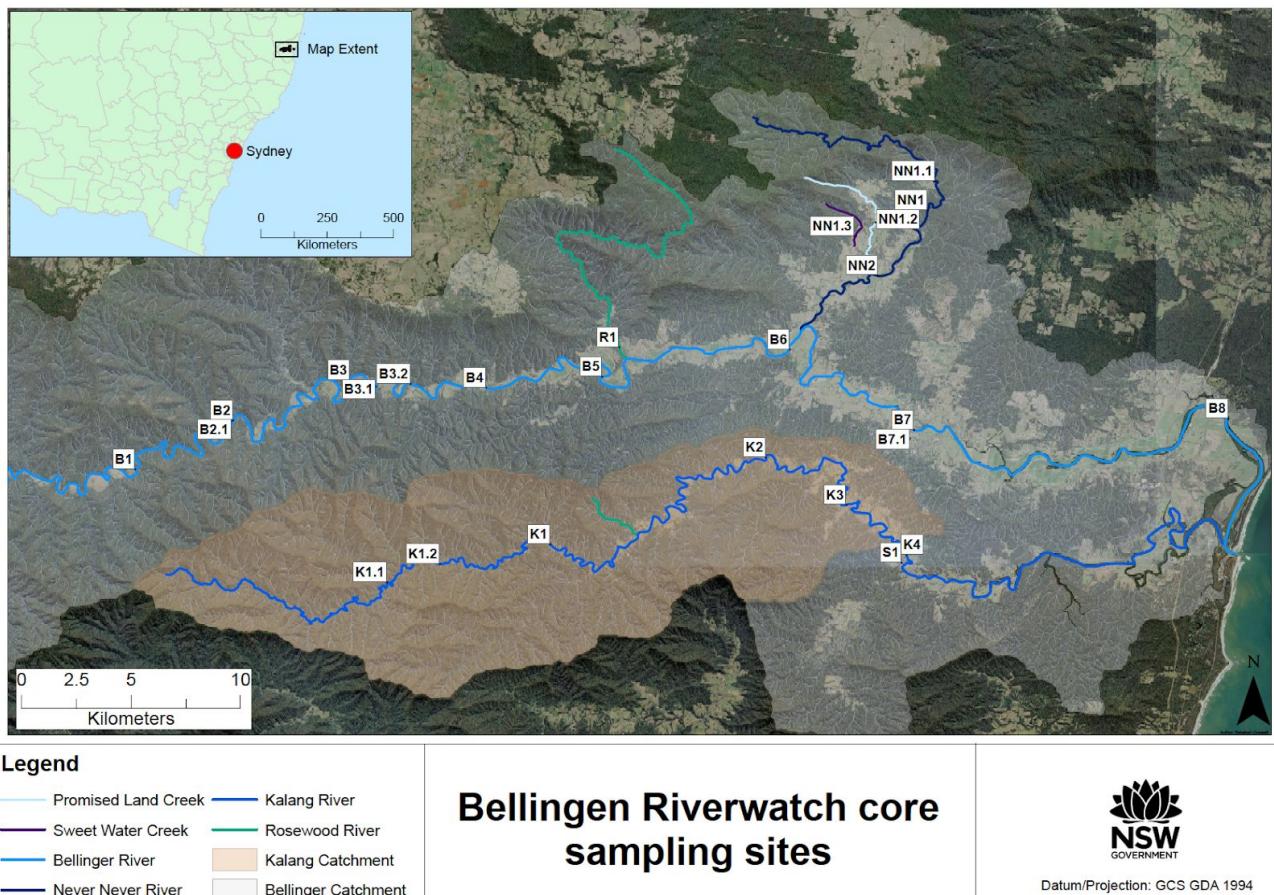
About Bellingen Riverwatch

Community scientists and the scientific community working together to support recovery actions for the Bellingen River Snapping Turtle.

Bellingen Riverwatch was born from the need to collect continuous water quality data to assist scientists involved in the recovery of the Critically Endangered Bellingen River Snapping Turtle (BRST) and inform management decisions.

Bellingen Riverwatch is an innovative citizen science program adopting a whole ecosystem approach. Through meaningful engagement of the community, volunteers collect long-term, scientifically rigorous data that is accessed by our eleven scientist partners nationally, to support recovery actions for this Critically Endangered turtle and other threatened species.

Bellingen Riverwatch engages 32 local community volunteers and 5 schools to collect monthly water quality data at 17 core sites and 8 additional sites every month across the Bellinger, Never Never, and Kalang Rivers.



Map 1: Bellingen Riverwatch Strategic Monitoring Sites

River health and water quality can change due to a wide range of factors, such as geology, rainfall, vegetation cover, gradient/steepleness and size of the catchment, human impacts through land use, natural disasters, climate, and much more.

To help build a picture of a catchments' health, ongoing and regular monitoring of water quality is required to build what's called 'baseline data' - a long-term picture of the conditions for that particular waterway.

This baseline information is important for river health and the future of the turtles, as the more we know about the river the better informed we are regarding what to do next.

Bellingen Riverwatch communicates its' data with key stakeholders to help build a picture of the aquatic and riverine health of the Bellinger and Kalang River catchments, help identify issues and impacts, aid decision making, guide research, and river health priorities. We also communicate our data with the community to raise awareness, improve community understanding about the environment and threatened species, and promote positive river health choices for community members, landholders, and tourists.

What We Test For

Bellingen Riverwatch Volunteers conduct site assessments, take site photos and test water samples for:

- Temperature (air and water);
- pH;
- Electrical Conductivity (Salinity);
- Turbidity;
- Available Phosphate; and
- Dissolved Oxygen.

This is complemented by Faecal Coliform testing by OzGREEN and bi-annual water quality testing by Scientists from the NSW Office of Environment and Heritage.

Our Story

The Bellinger River catchment is recognised as being one of the largest 'biodiversity hotspots' outside of the Daintree Rainforest World Heritage area with exceptionally high levels of endemism and one of the last remaining strongholds for a number of endangered species dependent on aquatic health, including the Giant Barred Frog (*Mixophyes iteratus*), Stuttering Frog (*Mixophyes balbus*), Green-thighed Frog (*Litoria brevipalmata*), Pouched Frog (*Assia darlingtoni*) and the critically endangered Bellinger River Snapping Turtle (*Myuchelys georgesi*). In addition to this, the catchment supports a number of listed Endangered Ecological Communities, including Lowland Rainforest.

There have long been identified problems in this catchment. The [Bellinger and Kalang River Eco Health Report Card \(2011\)](#), [Bellinger River Health Plan \(2010\)](#) and [Bellinger Riverwatch](#) data all point to elevated levels of available Phosphate and low Dissolved Oxygen levels, at several points in the catchment. Catchment health drives river health and marine health. Local rivers are the mainstay to the community; environmentally, socially and economically.

In 2015, Bellinger River Snapping Turtle (BRST) suffered a significant mortality event. Since the event, investigation has identified a virus (Bellinger River Virus or BRV), previously not known to science, as the agent most likely to be responsible for the mortality event.

An estimated 90% of the BRST population is believed to have died as a result of the virus in an approximate 6-week period. Infected turtles suffered blindness, internal organ necrosis and developed sudden inflammatory lesions.

Prior to this event, the population size for the species was estimated at 1600 – 4500 individuals. The current Bellinger River Turtle population is estimated to be between 200 and 300 individuals and predominantly juveniles.

The BRST is currently listed as Critically Endangered under the NSW *Biodiversity Conservation Act 2016* and the Commonwealth *Environment Protection and Biodiversity Conservation Act 1999*.



Photo: Rowan Simon



Photo: Office of Environment & Heritage



Photo: Taronga Zoo Sydney



Photo: Western Sydney University

The BRST is endemic to the Bellinger catchment, occupying approximately 55km of the Bellinger River. Main threats to this species are past disease associated with the Bellinger River Virus, predation by foxes, and poor water quality.

During the mortality event, thirty-five healthy BRST were removed from the river by the NSW Office of Environment and Heritage (OEH) and are now part of captive breeding programs at Taronga Zoo and Symbio Wildlife Park. It is hoped that the offspring from this program will be released back into the Bellinger River in future years.

To maximise the Bellingen River Snapping Turtle's persistence in the wild, it is important that the river's water quality is monitored consistently.

Preliminary testing by EPA did not detect any water pollution issues. However, a need to collect continuous, scientifically robust water quality data has been identified as a priority by the scientists involved in the recovery of the BRST, to help inform management decisions.

In late 2016, following a request from OzGREEN, the Office of Environment & Heritage (OEH) in association with Saving our Species program, started the motion to design a community driven citizen science project. It was quickly apparent that long-term monitoring was required, using a model that could sustain itself beyond individual funding cycles. To achieve this, it was important to work together collaboratively with the groups and agencies in the area and, leverage expertise and available resources.

In May 2017, OEH, in partnership with OzGREEN and assistance from NSW Waterwatch, set-up a citizen science project to facilitate the water quality testing process with the intention to maintain and/or improve the river's health. Eleven project partner organisations have come together to design and develop the program. All project partners contribute significantly through their unique expertise to the success of Bellingen Riverwatch.

There is a need for ongoing monitoring of river condition to support virus research and potential disease triggers. Data from Bellingen Riverwatch gives us an indication of overall river health. It can track trends over time, assist in prioritising sites for more

intensive sampling or riparian revegetation, contribute to research related to the BRST, or refine or inform other vital management actions to improve water quality.

Prior to Bellingen Riverwatch, there was a lack of consistent water quality data for the rivers in the Bellingen Shire NSW. The community is passionate about their rivers, but lacked the overall awareness about the threats impacting the rivers' health. Bellingen Riverwatch inspires community stewardship by directly involving them in collecting water quality data for their river. A sense of community ownership and concern for their river is important for ongoing river health.



Photo: Ricky Spencer

Our Partners

Bellingen Riverwatch is an initiative of OzGREEN and The NSW Office of Environment & Heritage in partnership with Bellingen Shire Council, NSW Waterwatch, Western Sydney University, Taronga Zoo Sydney, Bellinger Landcare, Earthwatch Institute, Eco Logical Australia, North Coast Local Land Services and Jaliigirr Biodiversity Alliance.

This project is unique. It is rare to find a project with this level of sustained community engagement, paired with such strong and consistent partner collaboration and focus.

The breadth of project partners reflects the importance placed on working together collaboratively with key stakeholders who have a role to play in catchment health and biodiversity. This partnership approach allows us to leverage the expertise and available resources of a strong group of organisations and individuals.



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In addition we would like to acknowledge the following organisations for their support in the program:



Why test the Bellinger & Kalang Rivers?

River health and water quality can change due to a wide range of factors, such as geology, rainfall, vegetation cover, gradient/steepleness and size of the catchment, human impacts through land use, natural disasters, climate, and much more. To help build a picture of a catchments' health, ongoing and regular monitoring of water quality is required to build baseline data - a picture of the conditions for that particular waterway. By gathering this data, it can contribute towards:

- building a picture of the aquatic and riverine health of the Bellinger and Kalang River catchments,
- helping researchers identify issues and/or impacts in both rivers,
- providing a photographic, scientific and anecdotal history of our waterways; and
- potentially providing information to facilitate research into the BRST (or George's Turtle) in the Bellinger catchment.

Data collected by Bellingen Riverwatch volunteers and schools will add to scientific data being collected by scientists involved in this project. Determining end-users (i.e. who's going to use the data) is essential to maximising the positive impact the project can have. The potential data end-users for Bellingen Riverwatch data are:

- *Bellingen Shire Council* – to help to contribute to the EcoHealth Report Card assessments for both rivers, which occurs in partnership with OEH for estuary monitoring, as well as ongoing assessment of river health that can help guide management decisions for on-ground projects.
- *OEH's Saving Our Species program scientists and aquatic ecologists* – to add to existing river health data for catchment health both locally and for statewide reporting, and inform BRST research.
- *Western Sydney University researchers, Taronga Zoo and Symbio Wildlife Park* – assist with research into the turtle and to replicate the condition of the river in the captive breeding program.

How was the program designed?

One of the identified knowledge gaps about the BRST virus outbreak, was whether or not water quality contributed to the event. Whilst some annual water quality testing was being completed in the Bellinger catchment, it was recognised that the frequency and consistency of the water quality testing needed to be increased to get a more accurate picture of water quality and catchment health in the Bellinger and Kalang Rivers – i.e. baseline condition data.

With already strong community interest for supporting both the health of the rivers and the freshwater turtle species, a **citizen science** project – [Bellingen Riverwatch – Our Rivers, Our Future](#), was designed, with the aim of collecting *scientifically rigorous long-term data* which can be used to inform management decisions and aid the recovery of the Bellinger River Snapping Turtle, as well as contributing to catchment health monitoring.

To ensure there was input from all partners, scientists and the community for a holistic approach to this citizen science project, the water testing program was developed so that:

- monthly water quality data would be collected by local residents and schools.
- every six months the OEH Scientific Division Aquatic Ecologists would conduct and complete testing
- Data reports communicated to partners and community on at least an annual basis

Water testing completed by both groups can be collated and compared to assess the water quality in the Bellinger and Kalang catchments over time, as some of their tests (or parameters) are the same. See Table 1 (next page) for a comparison between what the citizen scientists and the scientists are testing and how.

Table 1: Comparison of citizen scientist and OEH Scientist monitoring programs for Bellingen Riverwatch project.

Category	Local Residents & Schools	OEH Scientists
Water Quality tests	<ul style="list-style-type: none"> • Temperature • pH • Electrical Conductivity • Turbidity • Available Phosphate • Dissolved Oxygen 	<ul style="list-style-type: none"> • Temperature • pH • Electrical Conductivity • Turbidity • Phosphate – Available & Total (TP) • Nitrogen (TN, NOx, Ammonia) • Dissolved Oxygen • Total Suspended Solids
Additional items recorded	<ul style="list-style-type: none"> • Site photos – upstream, downstream, across stream (where possible) • Site observations of conditions on the day. 	<ul style="list-style-type: none"> • Site photos – upstream, downstream, across stream • Record physical habitat characteristics – in detail • Collect and identify aquatic macroinvertebrates (water bugs) from edge and riffle habitats.
Regularity	<ul style="list-style-type: none"> • Monthly – 2nd Tues & Wed of each month 	<ul style="list-style-type: none"> • Every 6 months
Equipment	<ul style="list-style-type: none"> • Waterwatch kits (see page 38) 	<ul style="list-style-type: none"> • Water quality multi-probe & other testing apparatus. • NATA accredited laboratory testing of nutrient samples.
Data storage – uploaded to...	<ul style="list-style-type: none"> • NSW Waterwatch database by volunteers (on Atlas of Living Australia portal) http://root.ala.org.au/bdrs-core/nswww/home.htm 	<ul style="list-style-type: none"> • OEH SEED database – by OEH Scientists • NSW Waterwatch database – by NSW Waterwatch

In addition to water quality testing, other long-term citizen science activities may be included in the future for monitoring riparian vegetation, reporting turtle sightings and evidence of turtle nests as well as water bug surveys (turtles rely on macroinvertebrates as their primary food source).

About the Turtle

The Bellinger River Snapping Turtle (*Myuchelys georgesi*) is a species of short-necked freshwater turtle in the family Chelidae and is iconic to the Bellinger River, NSW. Previously known as *Elseya georgesi*, the BRST was first observed by John Cann in 1971.

The BRST is currently listed as 'Critically Endangered' under the NSW Threatened Species Conservation Act 1995 and the Commonwealth Environment Protection and Biodiversity Conservation Act 1999.

Identification

BRST should not be confused with the non-native short-necked turtle *Emydura Macquarii* which also inhabits the Bellinger River. Distinctive features on BRST include a yellow stripe from the angle of the jaws, as well as distinct 'bar-bells' on the chin.

2015 Mortality Event

In February 2015, the BRST suffered a significant mortality event with a total of ~430 turtle deaths recorded (however, numbers are suggested to be much higher). It is believed that many of the dead turtles may have been washed away in a major flood event which occurred around the time of the mortality event. The infected turtles suffered blindness, internal organ necrosis and developed sudden inflammatory lesions. Affected turtles displayed symptoms of malnourishment and lethargy.

Since the mortality event a disease investigation has identified a virus (Bellinger River Virus or BRV), previously not known to science, as the agent most likely to be responsible.

Population

The current Bellinger River Turtle population is estimated to be between 200 and 300 individuals and predominantly juveniles.

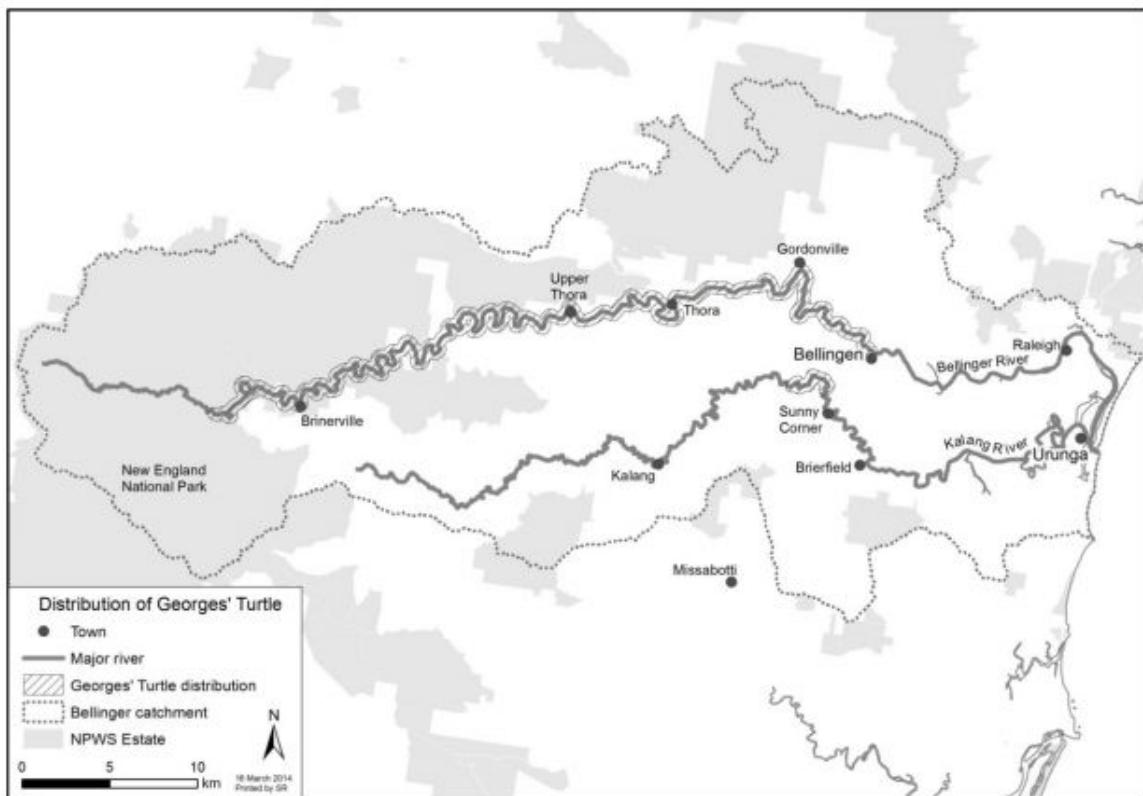
In 2005 the population was estimated between 3100-5900 individuals. After abnormal rainfall conditions and historically low river levels the population declined and in early 2015 (prior to the mortality event) was estimated between 1,600 – 4500 individuals.

To read more about the decline of the Bellinger River turtle see "The Conversation", with Ricky Spencer:

<https://theconversation.com/turtle-extinction-event-bodes-ill-for-our-waterways-38723>

Endemic to the Bellinger River

The Bellinger River Snapping Turtle is found in only one place on earth - a 55 kilometre stretch of the Bellinger River on the Mid North Coast of NSW. Bellinger River turtles prefer deep waterholes with rocky substrate and bedrock where they can camouflage. You can see the anticipated distribution in the image below.



*Photo: Distribution of Bellinger River Snapping Turtle
Photo Credit: Ian Roth- NSW, Department of Primary Industries*

Nesting Habits

BRST nests between October and December and lays one clutch of 10-25 eggs. Eggs are laid in excavations on the river banks. Turtles breed in sandy soil in open areas with lots of bush around (mosaic).

Diet

BRST feed on macroinvertebrates, terrestrial fruit and aquatic vegetation. They obtain a high proportion of their diet from benthic macro-invertebrate communities. As juveniles, they have strong leanings towards carnivorous diets, while as adults they are omnivorous, commonly consuming caddisfly larvae, pyralidae larvae (moth larvae), ribbon weed and algae. Turtle nesting sites can be found on river banks in areas of sand and fine gravel. Turtle nests are often at risk from fox and goanna predation.

Threats

The main threats to this species include predation by foxes, poor water quality, and the past virus outbreak. The macro invertebrates that this species like to eat (caddisfly larvae) require particularly high levels of oxygen.

Reporting Turtle Sightings and Nesting Sites or Fish Kills?

To report any turtle sightings, nesting sites or turtle health issues, please ring Enviroline on 6659 8200.

Turtles can be mapped using Turtle SAT: www.turtlesat.org.au/turtlesat

How to Use Turtle Sat:

<https://drive.google.com/file/d/0B2aFwaZEfKupaFdVRnhYNDZSJTJrSGFYSHhiUXMzTjNBbLVN/view>

To report a fish kill, please ring the Fisheries Watch Hotline on 1800 043 536.

Monitoring Sites

Bellinger Catchment Sites

Code	Site name	Core / Added	Latitude	Longitude	Map	Location Description
B1	Brinerville	Original Core	-30.4669	152.57861	map	Bellinger River, downstream of old Brinerville Farm, Brinerville (New England NP)
B2	Bellinger 2	Original Core	-30.4467 3000000 001	152.61882	map	Bellinger River at Cool Creek, Darkwood (in the main river)
B2.1	Cool Creek (tributary site)	Original Core	-30.4470 4903289 9784	152.61814896 502645	map	(tributary site) Upstream 10M from confluence with Bellinger River, Darkwood
B3	Richardsons Bridge	Original Core	-30.43015	152.66685	map	Bellinger River at Richardsons Bridge Crossing, Darkwood Road, Darkwood
B3.1	Tysons Bridge	Added Core	-30.4328 7	152.67762	map	Bellinger River, bridge upstream of Orama PS, Darkwood Rd
B3.2	Orama Public School	Added	-30.43171 6	152.691905	map	Bellinger River at Orama Public School, Darkwood
B4	Hobarts Bridge (near Chrysalis School)	Original Core	-30.4332 7	152.72290	map	Bellinger River at Hobarts Bridge, Darkwood Rd, near Chrysalis School, Thora
B5	Leans Bridge (near Thora Saw Mill)	Original Core	-30.4287 7	152.77063	map	Bellinger River at Leans Bridge (1 st bridge) up Darkwood Road, near Thora Saw Mill
B6	Gordonville Crossing	Original Core	-30.41767	152.84782	map	Bellinger River at Gordonville Crossing, Bellingen
B7	Lavenders Bridge	Original Core	-30.45071	152.89885	map	Bellinger River at Lavenders Bridge, Bellingen
B7.1	Caratti Creek	Added	-30.4542 04	152.897104	map	Caratti Creek, downstream of footbridge near tennis courts, Church St, Bellingen
B8	Repton Public School	Added	-30.446074	153.02818	map	Bellinger River, in front of Repton Public School, Repton
NN1.1	Crystal Creek	Added	-30.348336	152.907655	map	Never Never River - Upstream at Crystal Creek
NN1.2	Promised Land Creek	Added	-30.365392	152.883032	map	Never Never River catchment - Promised Land Creek, Glennifer
NN1.3	Sweet Water Creek	Added	-30.371165	152.874355	map	Never Never River - Sweet Water Creek, Glennifer
NN1	Tuckers Nob	Original Core	-30.3603 3	152.90439	map	Never Never River at Promised Land Road, Tuckers Nob
NN2	Arthur Keoghs Reserve	Original Core	-30.38719	152.88414	map	Never Never River at Arthur Keoghs Reserve, Promised Land Road, Gleniffer
R1	Rosewood 1	Original Core	-30.41669	152.77766	map	Rosewood River at bridge on Summervilles Road, Thora

Kalang Catchment Sites

Code	Site name	Core / Added	Latitude	Longitude	Map	Location Description
K1.1	Roses Creek	Added	-30.513294	152.682187	map	Kalang River catchment - Roses Creek, upper Kalang headwaters
K1.2	Wyembah Road	Added	-30.50574	152.703866	map	Kalang River - Corner of Wyembah Road & Kalang River Crossing
K1	Kalang Fire Trail	Original Core	-30.49768	152.74919	map	Kalang River at Ford at Kalang Fire Trail, off Kalang Road, Kalang
K2	Pearns Bridge	Original Core	-30.46203	152.83791	map	Kalang River at Pearn's Bridge, Kalang Road, Kalang
K3	Sunny Corner Road Bridge	Original Core	-30.48153	152.87105	map	Kalang River at Sunny Corner Road bridge, Bellingen
K4	Brierfield Bridge	Original Core	-30.50199	152.89571	map	Kalang River at Brierfield Bridge, Bowraville Road, Brierfield
S1	Spicketts 1	Original Core	-30.50528	152.89383	map	Spicketts Creek at Bowraville Road Bridge, Brierfield

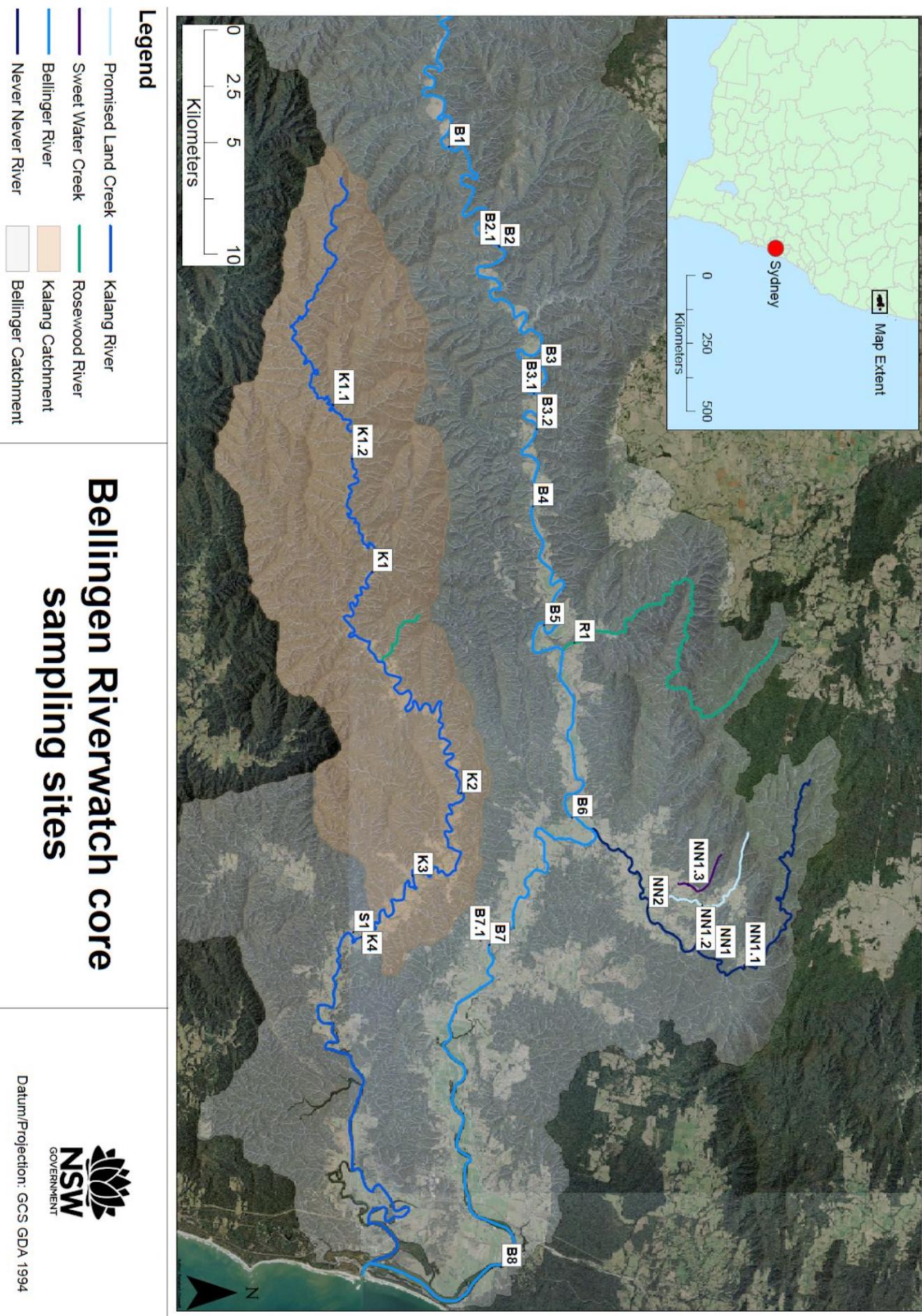
25 sites in total

How were the sites selected?

OEH Scientists first assessed where monitoring had been conducted in the past in the Bellinger and Kalang catchments by: OEH, Bellingen Shire Council, University of Western Sydney, University of New England, other NSW agencies, and OzGREEN's MyRiveR project. These locations helped to guide where Bellingen Riverwatch monitoring could take place.

Sites were selected where previous monitoring locations overlapped, as well as criteria to ensure that easy to find location (bridges, causeways, major landmarks), and where access was safe and easy for volunteers. You can see a map of the sampling locations in the map below.

Bellingen Riverwatch core sampling sites



Map 1: Riverwatch sampling sites

Testing Schedule

We test within a 48-hour period on the **2nd Tuesday and Wednesday of every month**.

Data must be **uploaded within 5 days of testing**.

We try to **test at the same time** for each site as this produces the most accurate results.

Why so often?

If citizen scientists (like you) would like councils, researchers and government organisations to be able to actively utilise the data, monthly data collection is the minimum requirement.

Important Note - Don't Test After Floods!

It is dangerous to enter waterways during flooding events events.

Do NOT carry out your testing after moderate & major flooding.

Wait approximately 2 weeks for the river to return to normal before going out again.

2019 & 2020 Testing Schedule

Bellingen Riverwatch testing MUST be carried out within a 48-hour period across both the Bellinger and Kalang catchments, and data uploaded within 5 days.

Write these dates in your diary! Reminder emails and sms will also be sent to volunteers to alert you that your monthly Bellingen Riverwatch testing is coming up.

If you are unable to complete testing on one of the dates below at your nominated site, please [contact the Project Coordinator](#) as soon as you can.

2019	Dates for Water Quality Testing	Data to be uploaded by
June	Tues 11th & Wed 12th	Mon 17th
July	Tues 9th & Wed 10th	Mon 15th
August	Tues 13th & Wed 14th	Mon 19th
September	Tues 10th & Wed 11th	Mon 16th
October	Tues 8th & Wed 9th	Mon 14th
November	Tues 12th & Wed 13th	Mon 18th
December	Tues 10th & Wed 11th	Mon 16th

2020	Dates for Water Quality Testing	Data to be uploaded by
January	Tues 14th & Wed 15th	Mon 20th
February	Tues 11th & Wed 12th	Mon 17th
March	Tues 10th & Wed 11th	Mon 16th
April	Tues 14th & Wed 15th	Mon 20th
May	Tues 12th & Wed 13th	Mon 18th
June	Tues 9th & Wed 10th	Mon 15th
July	Tues 14th & Wed 15th	Mon 20th
August	Tues 11th & Wed 12th	Mon 17th
September	Tues 8th & Wed 9th	Mon 14th
October	Tues 13th & Wed 14th	Mon 19th
November	Tues 10th & Wed 11th	Mon 16th
December	Tues 8th & Wed 9th	Mon 14th

Testing Times

You need to test within the two day period (second Tuesday and Wednesday of the month). Please try and be consistent with the time you choose as this is most helpful for the scientists.

There is a daily variance in oxygen with sunlight exposure - the oxygen levels drop away overnight and increase during the day. For this reason, it is important to be consistent with the time that you test each month.

We have assessed when each site has been tested historically (see [Appendix 1: Site Testing Times](#) (page 63)) and have outlined proposed testing time intervals for each site below.

Please note that the times listed below are a **guide only** - we understand that testing may be weather dependent or, as a volunteer, needs to fit in with your other commitments.

Proposed testing time intervals for each site:

B1	10.30am-11.30am
B2	11.30am-12.30pm
B2.1	11.30am-12.30pm (tested together with B2)
B3	9.00am-10am
B3.1	(site not yet added to the program)
B3.2	12.00pm-1.00pm
B4	9.30am-10.30am
B5	11.00am-12.00pm
B6	No suggested time
B7	1.00pm-2.00pm
B7.1	11.30am-12.30pm
B8	(site very recently added to the program)
R1	8.00am-9.00am
NN1.1	1.00pm-2.00pm
NN1.2	1.00pm-2.00pm
NN1.3	1.00pm-2.00pm
NN1	4.00pm-5.00pm
NN2	11.00am-12.00pm
K1.1	10.30am-11.30am
K1.2	11.30am-12.30pm
K1	1.00pm-2.00pm
K2	9.00am-10.00am
K3	9.00am-10.00am
K4	4.00pm-5.00pm
S1	4.00pm-5.00pm

The data so far

[Bellingen Riverwatch data](#) results supports the findings from the [Bellinger and Kalang River Eco Health Report Card \(2011\)](#) and the [Bellinger River Health Plan \(2010\)](#) (and tells us that there are elevated nutrient levels in the river, particularly phosphate, and low Dissolved Oxygen levels. Phosphorus is a naturally occurring nutrient that originates from plant and animal matter, and is applied as fertilizer to increase plant growth in agriculture. Dissolved oxygen is a measure of the availability of oxygen to aquatic life.

From Bellingen Riverwatch data to date, we can see elevated Available Phosphate levels presenting in the Upper Bellinger River, Upper Kalang River, Upper Never Never River and Rosewood River. Low Dissolved Oxygen levels are presenting at sites in the Upper Bellinger River, on the Rosewood River and Spicketts Creek, and at all of our testing sites on the Kalang River and Never Never River. In the 2011 Bellinger and Kalang River Eco Health Report Card, the Bellinger River received a B- mark, and the Kalang River received a C+ mark.

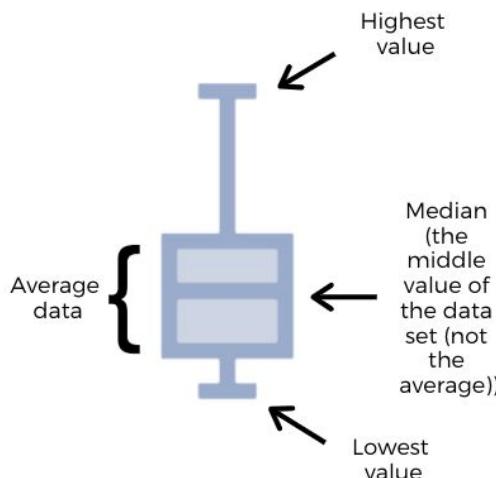
<http://aerlabcomau.ipage.com/wp-content/uploads/2015/12/Bellinger-Kalang-EcoHealth-Report-Card-2011.pdf>

When interpreting data, we have used the ANZECC Water Quality Guidelines (<http://www.waterquality.gov.au/guidelines/anz-fresh-marine>) for a healthy lowlands river system. The graphs below show the Dissolved Oxygen and Available Phosphates data across the Bellinger and Kalang catchments July 2017 to April 2019. A current data spreadsheet with our raw data to date is also available at www.ozgreen.org/br_data.

How to read our graphs

We have used a box and whisker plot to represent the complete data set from July 2017 to present. This plot style is commonly used to show key parameters regarding data sets. The maximum and minimum are represented via the whiskers, the upper and lower limits of the box indicates the upper and lower quartiles of the data and the line in the middle of the box shows the median. If you want to find out more about box plots please follow this link:

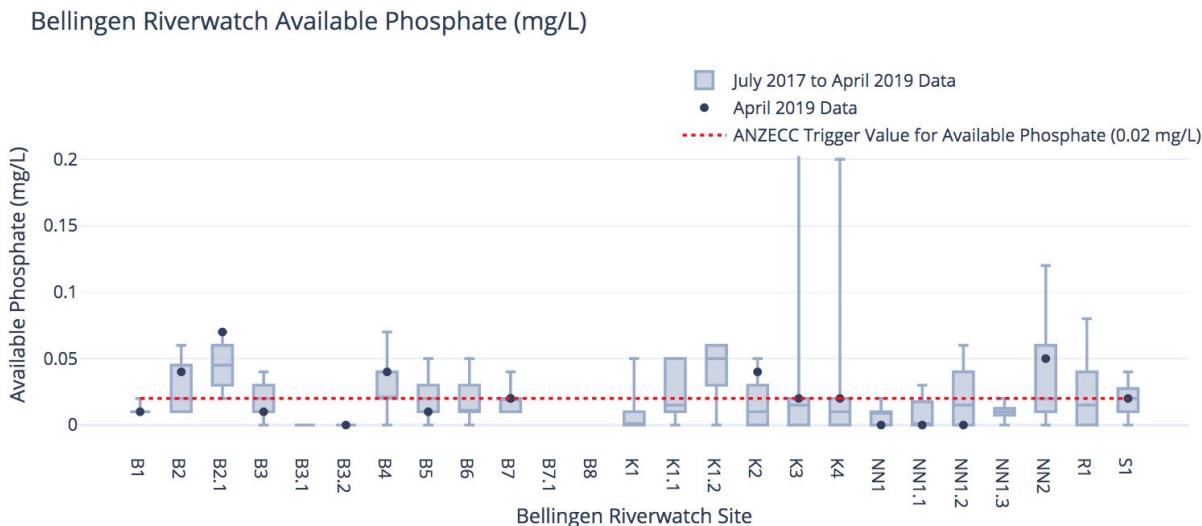
<https://www.wellbeingatschool.org.nz/information-sheet/understanding-and-interpreting-box-plots>



Available Phosphates

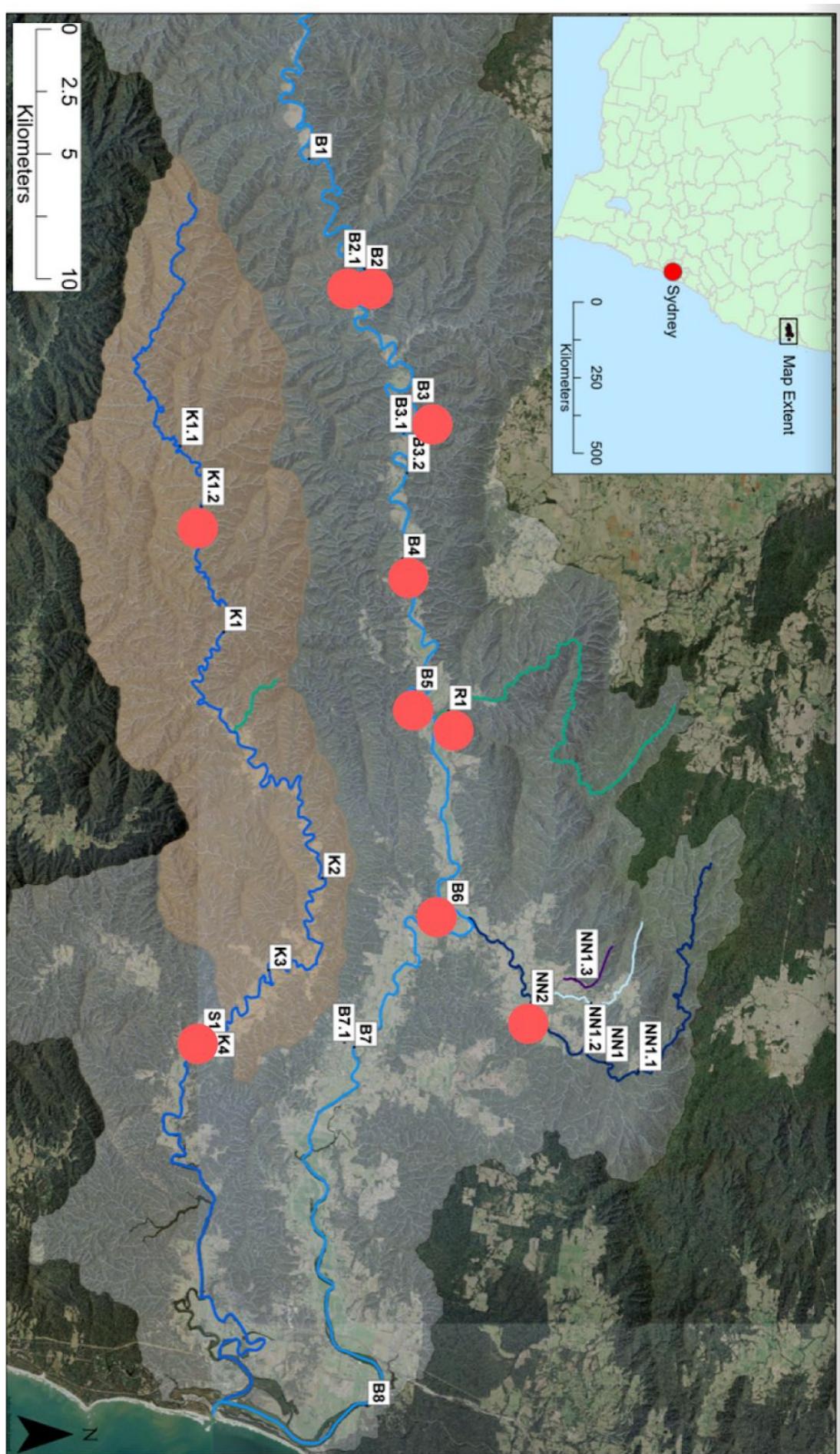
Phosphates are the essential plant and animal nutrient that occurs naturally in very low levels in Australian soils. The ANZECC Water Quality Trigger Values for Available Phosphates for moderately disturbed ecosystems for Lowland Rivers is 0.02mg/L.

The graph below shows the Available Phosphate data across the Bellinger River, Kalang River, Never Never River, Rosewood River and Spicketts Creek from July 2017 to April 2019. We can see from the graph below that sites that have median at or above Available Phosphate ANZECC guidelines for healthy waterway include B2, B2.1, B3, B4, B5, B6, K1.2, NN1.2, and R1.



To view this graph online, visit: https://plot.ly/~Bellingen_Riverwatch/47/

This can also be seen spatially on the map below.



Map 2: Sites that have median at or above Available Phosphate ANZECC guidelines for healthy waterways from Bellingen Riverwatch July 2017 to April 2019 data.

Frequent occurrence of results above 0.02mg/L could be harmful to aquatic ecosystems and increases the likelihood of impacts on waterways such as an abundance of algae and aquatic weeds which out-compete native plants; increased biochemical oxygen demand; reduced dissolved oxygen; reduced plant and animal diversity; blue-green algal blooms; and eutrophication.

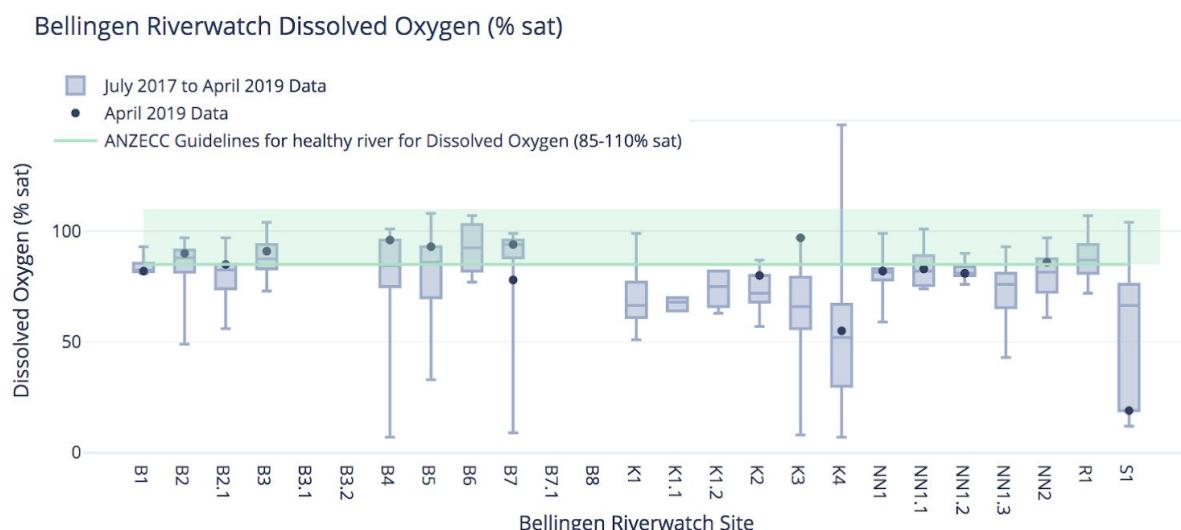
Possible causes of results outside these values include agricultural fertilisers, sewage, sediments from erosion, faeces from feedlots, dairies and pets, phosphate-based detergents, decaying plant material and industrial waste.

Scientists from the NSW Office of Environment and Heritage are carrying out a comprehensive bi-annual water quality and macroinvertebrate surveys (reports due early 2019) which will help identify the causes of elevated phosphate and nitrate levels.

Dissolved Oxygen

The ANZECC Water Quality Values for Dissolved Oxygen for moderately disturbed ecosystems for Lowland Rivers (less than 150m elevation) is between 85% and 110% saturation.

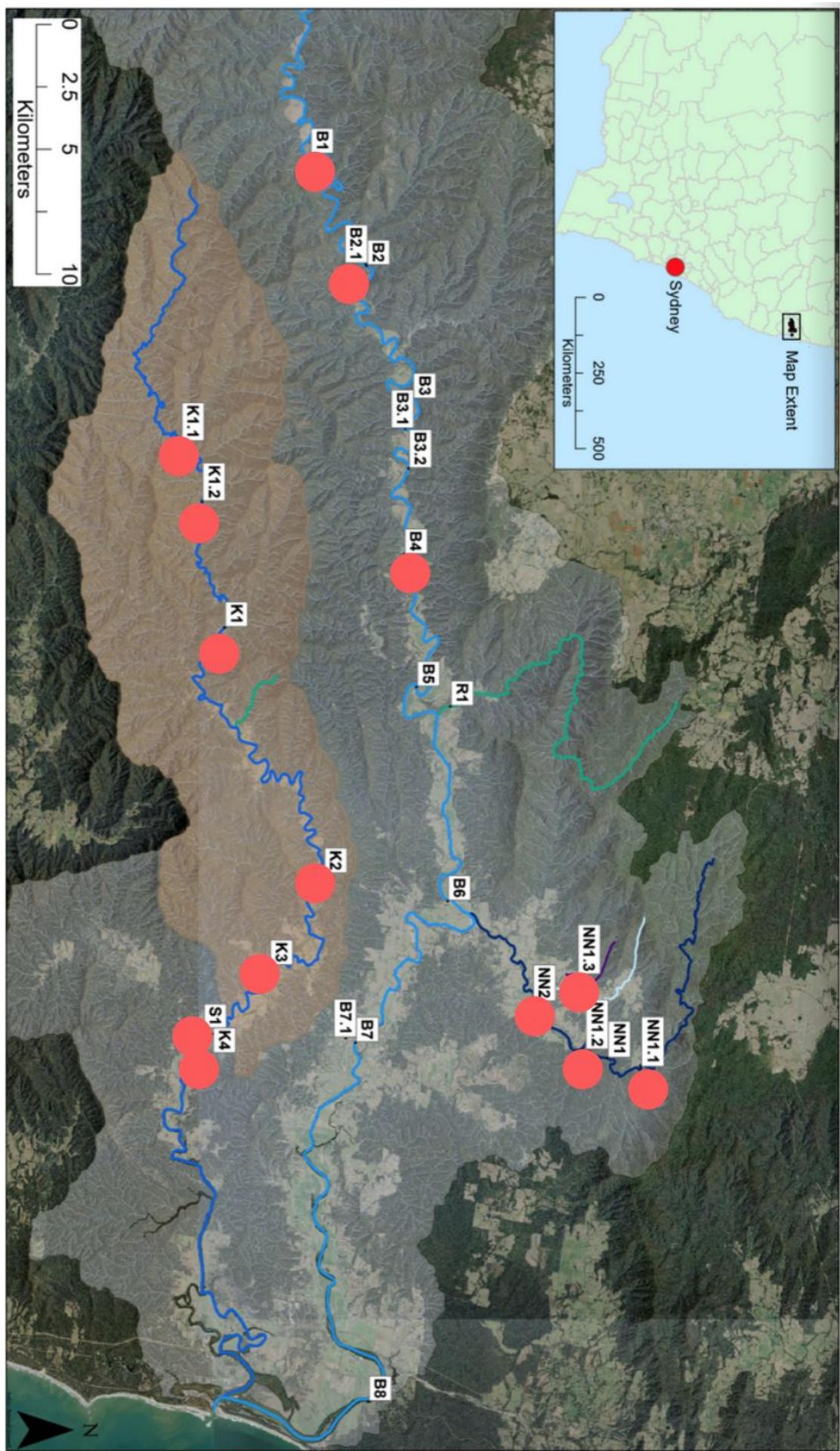
The graph below shows the Dissolved Oxygen data across the Bellinger River, Kalang River, Never Never River, Rosewood River and Spicketts Creek from July 2017 to April 2019.



To view this graph online, visit: https://plot.ly/~Bellingen_Riverwatch/49/

Sites that have median at or below Dissolved Oxygen ANZECC guidelines for healthy waterways include B1, B2.1, B4, B5, K1, K1.1, K1.2, K2, K3, K4, NN1, NN1.1, NN1.2, NN1.3, NN2, R1 and S1.

This can also be seen spatially on the map below.



Map 2: Sites that have median at or below Dissolved Oxygen ANZECC guidelines for healthy waterway from Bellingen Riverwatch July 2017 to April 2019 data.

Results outside the guidelines could be harmful to ecosystems. Anything below 85% is a threat to aquatic life and the macroinvertebrates that our turtles love to eat. Potential impacts outside ANZECC trigger values include lack of oxygen to support aquatic plant and animal life and fish kills.

Monitoring Dissolved Oxygen levels is very important as the Bellingen River Snapping Turtle (BRST) is able to supplement its oxygen uptake through cloacal (bum) breathing, reducing its need to come to the water surface to breathe. Possible causes of reduced oxygen levels in the river include low flow, stagnant water, organic waste and fertiliser run-off and algal growth. Micro-organisms use the oxygen as they break down the organic matter.

Subscribe to River Health News

We create monthly River Health Snapshots, reporting on Available Phosphate and Dissolved Oxygen data. We send these out through a newsletter - subscribe at <http://eepurl.com/dIFBdn>. You can also find data reports and the data spreadsheet at www.ozgreen.org/br_data.

ANZECC Freshwater Water Quality Guidelines & Ratings

These guidelines are based on ANZECC (Australian and New Zealand Environment Conservation Council Guidelines for Fresh and Marine Water Quality) 2000 and give a rough indication of what water quality monitoring results indicate about water quality.

Water Quality Parameter	<i>Unit</i>	Water Quality Ratings			
		Very good	Good	Fair	Poor
pH	pH units	-	6-8	-	< 6 and > 8
Conductivity**	µS/cm	< 300	300 - 500	500 - 800	> 800
Salinity**	ppm	< 200	200 - 350	350 - 500	> 500
Turbidity	NTU	< 7	7 - 10	10 - 30	> 30
Available phosphate as P	mg/L	< 0.02	0.02 - 0.05	0.05 - 0.15	> 0.15
Dissolved Oxygen saturation	%	80 - 90	90 - 100	60 - 80 and 100 - 110	< 60 and > 110
Suspended solids	mg/L	< 10	10 - 30	30 - 50	> 50
Faecal Coliform bacteria	CFU/100 mL	DRINKING WATER 0	PRIMARY CONTACT (swimming) < 150	SECONDARY CONTACT (boating & fishing) < 1000	NO CONTACT > 1000

Notes:

1. Water Quality Ratings above for ** Salinity and ** Conductivity are NOT applicable to estuarine ecosystems and are only applicable to freshwater ecosystems;
2. µS/cm = micro Siemens per centimeter; ppm = parts per million;
3. Conductivity = 5000 µS/cm = 5.00 mS/cm;
4. Salinity = 350 ppm = 0.35 ppt (ppt = parts per thousand)
5. Available Phosphate as P is calculated by dividing the Available Phosphate result by 3.06 to reach Phosphorus (P) result.

How Community Members can help

There are many things community members can do to maintain river health and support the recovery of the BRST.

1. Go before you Go

Go to the toilet before you leave home when visiting the river. The only public toilet on the Bellinger, Never Never and Kalang rivers is at Lavenders Bridge.

2. Keep a Clean Routine

Thorough cleaning of boats and equipment when moving from place to place on the Bellinger and between the Bellinger and other waterways reduces the risk of transporting the BRV virus. Wash down canoes with soapy water and dry thoroughly before re-use. Community members can also help minimise the risk of spreading the virus by swimming in only one location, or cleaning and drying swimming gear between visits.

- Request a copy of Code of Conduct for recreational use: Bellinger & Kalang Estuary from Bellingen Shire Council.
- Download [Keep a 'clean' routine: BRST mortality](https://www.bellingen.nsw.gov.au/sites/bellingen/files/public/images/documents/bellingen/Environment/Turtles/Keep-a-clean-routine-Bellinger-River-Snapping-Turtle-Mortality.pdf) (<https://www.bellingen.nsw.gov.au/sites/bellingen/files/public/images/documents/bellingen/Environment/Turtles/Keep-a-clean-routine-Bellinger-River-Snapping-Turtle-Mortality.pdf>)

3. Subscribe to our free Monthly River Health News

Each month, we send out a River Health newsletter, reporting on the parameters that are of particular importance to turtle recovery - Available Phosphates and Dissolved Oxygen. Sign up at <http://eepurl.com/dIFBdn>.

4. Report Turtle Sightings

Report turtle sightings using [Turtle SAT](https://www.turtlesat.org.au/turtlesat/) (<https://www.turtlesat.org.au/turtlesat/>).

Report nesting sights, and injured or deceased turtles to Office of Environment & Heritage Saving our Species team on (02) 6659 8200, 131 555 or Bellinger.turtle@environment.nsw.gov.au.

- [About the BRST](http://www.ozgreen.org/br_turtle) (http://www.ozgreen.org/br_turtle)
- [How to Use Turtle Sat](https://drive.google.com/file/d/0B2aFwaZEfKupaFdVRnhYNDZSJTJrSGFYSHhiUXMzTjNBbLVN/view) (<https://drive.google.com/file/d/0B2aFwaZEfKupaFdVRnhYNDZSJTJrSGFYSHhiUXMzTjNBbLVN/view>)
- [NSW Government Threatened Species App](https://www.environment.nsw.gov.au/threatenedSpeciesApp/) (<https://www.environment.nsw.gov.au/threatenedSpeciesApp/>)

5. Come to an Event

Bringing people together around river health is incredibly important for our future. [Our Upcoming Events](https://www.facebook.com/BellingenRiverwatch/events/) (<https://www.facebook.com/BellingenRiverwatch/events/>)

6. Volunteer with Us

We are always in need of more volunteers to support this program. Find out more at www.ozgreen.org/br_volunteer

How Landholders can help

We all live in the catchment. Landholders have an important role in maintaining river health and supporting the recovery of the Bellinger River Snapping Turtle. The main actions identified in the 2010 Bellinger River Health Plan (https://www.bellingen.nsw.gov.au/sites/bellingen/files/public/images/documents/bellingen/Environment/6386-Bellinger_River_Health_Plan.pdf) to improve river health are management of stock access to the river and fencing off the riparian zone, preventing fertiliser runoff and drains on farms.

1. Restore River Banks

Improving the condition of the riparian vegetation and stabilising riverbanks is important for maintaining water quality and habitat for aquatic animals in the Bellinger and Kalang rivers. Without action to protect and restore these areas, it is likely we will see a gradual decline in the health of our waterways through reduced water quality, the reduction or loss of riparian vegetation, and increased sediments washed into the river from eroding river banks which may negatively impact macroinvertebrates, native fish and seagrass habitat.

Native vegetation plays a vital role in river bank restoration. Whilst erosion and deposition of sediment are natural river processes, the accelerated rates of erosion seen today are the result of removal of native vegetation over time through land clearing, over-grazing and other development pressures. This in turn leads to the loss of productive land and valuable habitat and a negative impact on water quality and riverine habitat. The effect of accelerated erosion are especially significant during floods. Disturbance or destruction of river bank vegetation and weed invasion has also limited the ability of river banks to repair themselves through natural regeneration of vegetation between flood events.

In their current state, river banks need active assistance and management to maintain and improve their stability and resistance to erosion. Planting river banks with native species which are adapted to the pressures of this dynamic environment is a valuable way to ensure our river estuaries remain healthy.

The vegetation naturally occurring on estuarine river banks changes as the river water becomes less salty upstream. The Bellinger and Kalang estuaries have four vegetation zones characterised by particular groupings of plant species and their preferred location on the river bank. See the following for more info:

- Download [Bellinger River Estuary Revegetation Guide](https://www.bellingerlandcare.org.au/wp-content/uploads/Bellinger-River-Estuary-revegetation-guide.pdf) leaflet (<https://www.bellingerlandcare.org.au/wp-content/uploads/Bellinger-River-Estuary-revegetation-guide.pdf>)
- Download [Ecohealth: An aquatic ecosystem health check for the Bellinger and Kalang Rivers](#)

(<http://aerlabcomau.ipage.com/wp-content/uploads/2015/12/Bellinger-Kalang-EcoHealth-Report-Card-2011.pdf>)

- Download [Growing Lomandra from Seed, Bellinger Landcare](https://www.bellingen.nsw.gov.au/sites/bellingen/files/public/images/documents/bellingen/Environment/Coastline/Growing%20Lomandra%20From%20Seed_Apr2011.pdf) (https://www.bellingen.nsw.gov.au/sites/bellingen/files/public/images/documents/bellingen/Environment/Coastline/Growing%20Lomandra%20From%20Seed_Apr2011.pdf)

2. Best Practice Stock Management

Best practice for stock management should address the following aspects: Fencing, off-river, Stock watering points, Formed access points. Stock management is vital for riparian health to reduce:

- Damage to riparian vegetation from grazing and trampling, leaving banks exposed.
- Compaction of soil by hard hooves, subsequent erosion and degradation of the river structure.
- Pollution resulting from sediment washing into the water course from erosion sites.
- Stirring of sediment and damage to aquatic habitats caused by cattle loitering in streams.
- Pollution resulting from cattle defecation.
- Weed growth, through high nutrient loads from dung and disturbed riparian vegetation.
- Stock exposure to water borne parasites, disease and footrot.

Download [Bellinger River System Landholder Booklet: Best Practice for a Healthy River](https://www.bellingerlandcare.org.au/wp-content/uploads/BRSLandholdersBooklet_PRI_NT_sm.pdf) (https://www.bellingerlandcare.org.au/wp-content/uploads/BRSLandholdersBooklet_PRI_NT_sm.pdf) or request a copy of the booklet from Bellingen Shire Council.

3. Best Practice Fox Management

Turtle nest predation by foxes is a major threat to the BRST. Feral dogs and cats have been known to target stock and can pose a threat to native animal populations, they can also be carriers of disease. To enquire about the times and locations of baiting courses, contact Mick Elliott of the Grafton Agriculture Department on 0408 352 174 or michael.elliott@lls.nsw.gov.au.

4. Best Practice OSMS Management

On-site Sewage Management Systems (OSMS) are the treatment systems that collect wastewater from the home for the treatment and discharge into composting or septic system located within the property of unsewered areas of the shire. By maintaining best practice OSMS management, river landholders can contribute significantly to keeping our rivers healthy. For more info see:

- [Council & Landholder Responsibilities](https://www.bellingen.nsw.gov.au/environment-waste/environmental-health/on-site-sewage-management-system-osms-program) (<https://www.bellingen.nsw.gov.au/environment-waste/environmental-health/on-site-sewage-management-system-osms-program>)
- [Septic Safe Guide](https://www.bellingen.nsw.gov.au/environment-waste/environmental-health/on-site-sewage-management-system-osms-program/septic-safe) (<https://www.bellingen.nsw.gov.au/environment-waste/environmental-health/on-site-sewage-management-system-osms-program/septic-safe>)

First Aid & WHS

First Aid Kit

Your first aid kit contains: Lyclear Cream, Bandaids, Snake Bandage, Betadine pads, Tweezers, Cotton pads.



Take a Buddy or Inform Someone of your Trip

- Always call or text someone where you are going, and provide a departure & arrival back time, so if something happens and you don't return on time, they can send for help.
- Where possible, work in pairs on the water's edge - one person collects the water sample, while their buddy holds on to their clothing at the back or their belt – whichever way the person collecting prefers. This helps the person collecting the water to reach further away from the water's edge without fear of losing balance or falling in.



Traffic & Road Safety

- Ensure you park in a safe position, and leave lights flashing whilst parked there.
- Wear your high visibility vest during sampling to highlight to nearby motorists you are there.
- Stay aware of other traffic – no phone calls or listening to music whilst there!

Use Traffic Bollards (if you sample near a road or bridge)

- If sampling near a road or bridge, park your car somewhere safe, put your vests on, put your traffic bollards out on the bridge at either end (off to the side of the road) and then conduct your sampling. Take your water sample & photos as quick as possible, then move off the bridge.
- See [page 35](#) for sites requiring traffic bollards (also listed in the Site Guide).



Wear Gumboots or Covered Shoes

Wear gumboots or covered shoes that you are happy to get wet. This prevents against standing on a bullrout, bits of glass or a wire.

Protect Yourself from the Sun

Always wear personal protective clothing when out in the field (boots, long pants, long sleeves, shoes & hat).

Wear Gloves

- So you don't contaminate yourself with polluted water or with chemicals used for testing.
- So you don't contaminate the samples water.
- BE CAREFUL – gloves are very slippery when wet.
- If a glove tears put it in the solid waste bag and get a new one.
- Leave the gloves on the whole time you are at the creek.
- BUT make sure you take the gloves off and wash your hands prior to eating or touching your skin.



Wear Safety Glasses

- Wear safety glasses at all times when you are handling the chemicals so that your eyes are protected from any chemicals which may flick or spray into your eyes.



Solid Waste Container

- Place all used gloves used paper towels, empty reagent packaging and any other rubbish from the testing into your solid waste container to stop any toxic chemical leaking (Senior Tests only).
- Leave the site cleaner and tidier than when you found it – pick up and transport out any rubbish you can from the site.



Liquid Waste Container

- Hold all test bottles over the liquid waste container while adding the liquid and powder reagents.
- Pour rinse water into liquid waste container after each piece of used equipment has been rinsed with distilled water.
- Do not put solid waste into the liquid waste container.
- Do not concentrate the liquid waste.
- To dispose of liquid waste dilute it with twice the volume of tap water and then flush it down the toilet. In this diluted form, the combination of chemicals in the liquid waste is harmless.
- If you have a septic system, further dilute the liquid to flush down the toilet. If you're concerned about the septic system, just flush ½ cup of yoghurt down the toilet at the same time.



Tick Bites

- **Freeze don't squeeze!** Ticks can be dangerous for causing allergy and serious disease. **Kill the tick where it is and remove it later.**
- Apply a pea sized blob of Lyclear Cream (in your first aid kit) directly onto each tick without rubbing it in.
- Leave for at least one hour.
- Scrape the cream and the dead tick off as if shaving. If all the parts of the dead tick don't come out, use tweezers to extract the rest.
- If the tick is close to the eyes or genitals don't attempt to remove it yourself but seek medical assistance.
- If you are experiencing any allergic reactions or symptoms, even minor ones, you should immediately seek medical help.
- **Do not** try to scratch or pull it out with your fingernails while it is alive (kill it with Lyclear first!). Also, don't scratch something you can't see if there's any chance it might be a tick.
- **Do not** try to burn it with a match or lighter.
- **Do not** apply any substance to it other than Lyclear Cream.



DO NOT Test After Floods

- **DO NOT** carry out your testing after moderate & major flooding. Wait approximately 2 weeks for the river to return to normal before going out again.



Snake Bites

- Beware of snakes, particularly in the warmer months. Bang the sample pole at the extension handle end on the ground as you walk along to create noise & vibrations to scare snakes away.
- If bitten by snake, follow the instructions below:



Snake bite



IN A MEDICAL EMERGENCY CALL TRIPLE ZERO (000) FOR AN AMBULANCE.

DRSABCD Danger ▶ Response ▶ Send for help ▶ Airway ▶ Breathing ▶ CPR ▶ Defibrillation

The DRSABCD Action Plan is the first step when providing first aid. Use this to assess the immediate situation.

All known or suspected snake bites must be treated as potentially life-threatening, and medical aid should be sought urgently.

WARNING

Do not wash venom off the skin or clothes because it may assist identification.

SIGNS AND SYMPTOMS

Signs of a snake bite are not always visible and, in some cases, the patient may not have felt anything. Symptoms may not appear for an hour or more after the person has been bitten.

Depending on the type of snake, signs and symptoms may include some or all of the following:

- immediate or delayed pain at the bite site
- swelling, bruising or local bleeding
- bite marks (usually on a limb) that may vary from obvious puncture wounds to scratches that may be almost invisible
- swollen and tender glands in the groin or armpit of the bitten limb
- faintness, dizziness
- nausea and vomiting
- headache
- abdominal pain
- oozing of blood from the bite site or gums
- double or blurred vision
- drooping eyelids
- difficulty in speaking or swallowing
- limb weakness or paralysis
- difficulty in breathing
- occasionally, initial collapse or confusion followed by partial or complete recovery.

WHAT TO DO

- 1 Follow DRSABCD.
- 2 Call triple zero (000) for an ambulance.
- 3 Lie the patient down and ask them to keep still. Reassure the patient.
- 4 If on a limb, apply an elasticised roller bandage (10–15 cm wide) over the bite site as soon as possible. Apply a further elasticised roller bandage (10–15 cm wide), starting just above the fingers or toes and moving upwards on the bitten limb as far as can be reached.
- Use clothing or other material if an elasticised roller bandage is not available.
- Apply the bandage as tightly as possible to the limb.
- 5 Immobilise the bandaged limb using splints.
- 6 Keep the patient lying down and completely still (immobilised).
- 7 Write down the time of the bite and when the bandage was applied. If possible, mark the location of the bite site (if known) on the skin with a pen, or photograph the site.
- 8 Stay with the patient until medical aid arrives.



Chemical First Aid Information

Senior DC1500 Waterwatch Kits contain the following chemicals, please see below for first aid information for using these chemicals. For full safety information on each chemical, see full Material Safety Data Sheets (MSDS) at www.lamotte.com.

Safety equipment including eye glasses and gloves MUST be worn.

All use of chemicals MUST occur over the liquid waste container.

<p>Manganous Sulfate Solution (LaMotte Product Code: 4167)</p> <p>Eye Contact: Immediately flush with water for 15 minutes. Consult a physician.</p> <p>Skin Contact: Immediately flush with water for 15 minutes while removing affected clothing. Consult physician.</p> <p>Ingestion: Induce vomiting immediately. Consult a physician.</p> <p>Inhalation: N/A</p>	<p>Starch Indicator Solution (LaMotte Product Code: 4170)</p> <p>Eye Contact: Flush with water.</p> <p>Skin Contact: Flush with water.</p> <p>Ingestion: Solution is acidic (pH3) and may irritate stomach if large amount is swallowed. Drink water or milk. Consult physician.</p> <p>Inhalation: N/A</p>
<p>Sulfuric Acid 1:1 (LaMotte Product Code: 6141)</p> <p>Eye Contact: Immediately flush with water for 15 minutes. Call a doctor immediately.</p> <p>Skin Contact: Immediately flush with water for 15 minutes while removing affected clothing. Get medical attention if skin appears to be severely irritated or burned.</p> <p>Ingestion: Do not induce vomiting. Rinse mouth, drink plenty of water. Get medical attention immediately!</p> <p>Inhalation: Remove to fresh air. Give artificial respiration if not breathing. If breathing is difficult, give oxygen.</p>	<p>Phosphate Acid Reagent (LaMotte Product Code: V-6282)</p> <p>Eye Contact: Immediately flush with water for 15 minutes. Get prompt medical attention.</p> <p>Skin Contact: Immediately flush with water for 15 minutes while removing affected clothing. Consult a physician.</p> <p>Ingestion: Do not induce vomiting. Rinse mouth. Drink plenty of water. Call a doctor immediately.</p> <p>Inhalation: Remove to fresh air. If breathing is difficult, give oxygen.</p>
<p>Alkaline Potassium Iodide (LaMotte Product Code: 7166)</p> <p>Eye Contact: Immediately flush with water for 15 minutes. Get medical attention immediately.</p> <p>Skin Contact: Immediately flush with water while removing affected clothing and rinse skin thoroughly for 15 minutes. Consult physician.</p> <p>Ingestion: Do not induce vomiting. Rinse mouth, drink plenty of water and call a doctor immediately.</p> <p>Inhalation: Remove to fresh air.</p>	<p>Phosphate Reducing Reagent (LaMotte Product Code: V-6283)</p> <p>Eye Contact: Flush with water for 15 minutes.</p> <p>Skin Contact: Rinse skin. Wash with soap and water.</p> <p>Ingestion: Rinse out mouth. Drink plenty of water.</p> <p>Inhalation: Remove to fresh air.</p>

**13 11 26 - POISONS INFORMATION CENTRE
CALL FROM ANYWHERE IN AUSTRALIA 24 HOURS A DAY**

Sites requiring traffic bollards

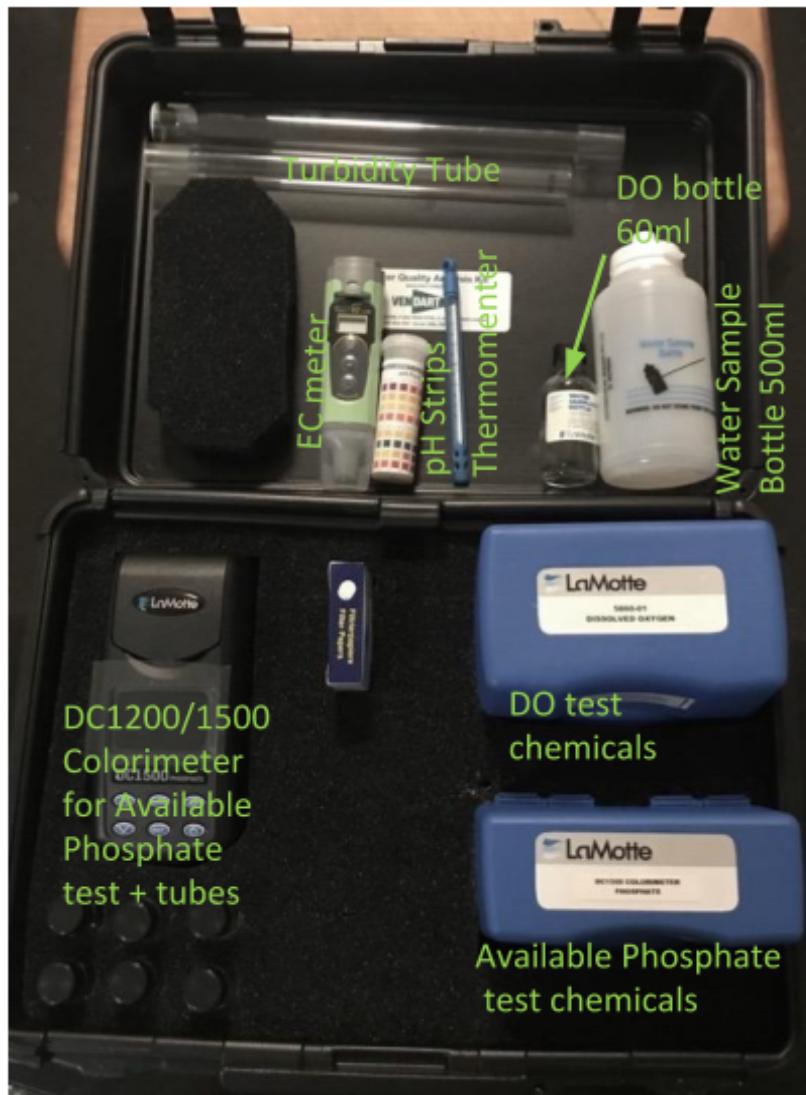
If sampling near a road or bridge, it is important to use the traffic bollards provided to conduct your sampling. The sites requiring traffic bollards are shown below:

Code	Site name	No. of Bollards	Map	Location Description
B3	Richardsons Bridge	2 bollards	map	Bellinger River at Richardsons Bridge Crossing, Darkwood Road, Darkwood
B4	Hobarts Bridge (near Chrysalis School)	2 bollards	map	Bellinger River at Hobarts Bridge, Darkwood Rd, near Chrysalis School, Thora
B5	Leans Bridge (near Thora Saw Mill)	1 bollard	map	Bellinger River at Leans Bridge (1 st bridge) up Darkwood Road, near Thora Saw Mill
R1	Rosewood 1	2 bollards	map	Rosewood River at bridge on Summervilles Road, Thora
K2	Pearns Bridge	2 bollards	map	Kalang River at Pearn's Bridge, Kalang Road, Kalang
K4	Brierfield Bridge	2 bollards	map	Kalang River at Brierfield Bridge, Bowraville Road, Brierfield

What to do in case of a Safety Incident?

1. **Apply or seek first aid** (see [page 33](#) for first aid relating to chemicals)
2. **Call 000** Notify emergency services (i.e. Fire Service, Police, Ambulance)
3. **Record as much detail as possible on an Incident Form**
Record the time, date, location, any witnesses and description of the incident. Include details of type of medical attention received.
4. **Report the incident** to one of the [Bellingen Riverwatch contacts \(see page 5\)](#) as soon as possible.
5. If you received medical treatment for your injuries, please ensure you **keep all receipts**.

Water Quality Testing Equipment



NSW Waterwatch has standardised sets of equipment and procedures that are used by all registered Waterwatch groups in NSW.

Waterwatch kits will be 'on-loan' to Bellingen Riverwatch participants until such time as the project is completed, or if the kit is not being regularly used (i.e. data not uploaded).

You will be trained in use of the kit, care for equipment, Workplace Health & Safety (WHS), and information on each of the testing parameters: temperature, pH, electrical conductivity, turbidity, available phosphate and dissolved oxygen (DO).

Kit Care Tips

- Don't leave the kit in the sun or a hot car.
- Kits are very expensive - don't leave the kit unattended in public.
- Put stuff back as you go!
- Keep your kit full - [contact the Project Coordinator \(see page 5\)](#) for replacements/refills.

Water Quality Testing Results Sheet - Senior Kit

Name/s: _____

Sampler Group Name: Bellinger Riverwatch **Survey Date:** _____

Number in Sampler Group: _____ **Survey Time:** _____

No. of Volunteers Testing: _____ **Survey Duration:** _____

Location: _____

Rainfall in last 7 days: Heavy / Moderate / Light / Nil

Rainfall (mm) (optional): _____

Water level or flow: Low / Medium / High / Flood / No flow / Dry/isolated pool

Site Observations

Flow: _____

Weather conditions: _____

Visible pollution: _____

Wildlife present: _____

Odour: _____

Algae: _____

Water Quality Measurements

Air Temperature: _____ °C **Dissolved Oxygen:** _____ mg/L

Water Temperature: _____ °C **Dissolved Oxygen*:** _____ % sat

pH: _____ pH units

Electrical Conductivity: _____ µS/cm (*Dissolved Oxygen (% sat) is automatically

Turbidity: _____ NTUs calculated when you upload data)

Available Phosphate: _____ mg/L

Did you calibrate your EC meter? Yes / No

Water Testing Notes/Issues:

When was the last rainfall? within 24 hours / 1-7 days / more than 7 days

Need any replacements for your kit? _____

Other Notes: _____

Site Photos Taken Upstream Across Downstream

Upload (within 5 days) Data Site Photos

<https://root.ala.org.au/bdrs-core/nswww/home.htm>



**BELLINGEN
RIVERWATCH**
Our rivers, our future

Testing Checklists

Before you set off

- Am I sampling on the correct date?** – we test on the **2nd Tuesday or Wednesday of each month.**

(See [Testing Schedule](#) page 22)

- Am I sampling within the suggested timeframe?**

If possible, please try to sample at the same time of day each month (see [Site Testing Times](#) (page 38) for proposed testing time intervals for each site). Please note this is **guide only**.

- Do I have everything I need in the car?**

- Clear Box (make sure your calico bag with First Aid Kit is in the clear box)
- Black Box
- Pole with adaptor
- Bollards (if necessary)
- Bucket & rope (if necessary)
- Gumboots or covered shoes
- Hat / long-sleeved shirt / sunscreen
- Sunglasses
- Camera or smartphone

- Have I told someone where I'm going?**

What to take to the water's edge

- Sample pole with (500ml) sample bottle attached**

- Bucket & rope** (where applicable)

- Bollard/s & sign/s** (where applicable)

- Calico bag with:**

- First Aid kit
- Thermometer
- Dissolved oxygen (60ml) glass bottle
- Clipboard, results sheet and pen
- Camera or phone to take site photos

What to do at the water's edge

Remember to do **6 THINGS** at the water's edge::

1. **Observe your site** ([see Site Observations](#), page 42)
2. **Air temperature** ([see Air Temperature](#), page 47)
3. **Water temperature** ([see Water Temperature](#), page 47)
4. **Sample in 500ml bottle** ([see How to collect a surface water sample](#), page 45)
5. **Sample in 60ml bottle** ([see How to collect a dissolved oxygen sample](#), page 46)
6. **Take site photos** ([see Site Photos](#), page 43)

Water Testing 9-Step Summary

Listed below is a summary of the water testing steps to be completed each month:

1. Fix the Dissolved Oxygen.	See page 53
<p>Note - This is the only step that needs to be done at the river. The rest can be done at home later if you transport your samples in an esky, put them in the fridge at home/work and then bring them up to room temperature to test. (This is because the phosphate levels change with temperature (by putting it in the fridge it stops the phosphate levels from changing).</p>	
2. Complete your pH Test (with pH strips)	See page 48
3. Check your EC meter with the standard, and then complete your Electrical Conductivity Test (calibrate only if necessary).	See page 49
4. Complete your Available Phosphate test, using your DC1200/1500 colorimeter & chemical blue box marked Phosphate.	See page 51
5. Complete Dissolved Oxygen test via Winkler Titration Method (chemicals are in the blue box marked Dissolved Oxygen).	See page 53
6. Complete Turbidity test with turbidity tube.	See page 55
7. Pack up. Empty out remaining sample water & ensure all equipment has been washed and cleaned with distilled/deionized water, and put away in the correct place in the kit & box.	
8. Contact the Project Coordinator if you need any replacement chemicals .	See page 5
9. Upload your data to the NSW Waterwatch database via https://root.ala.org.au/bdrs-core/nswwww/home.htm with the Login: a. Username: BellingenRiverwatch b. Password: P@ssw0rd	See page 57
10. Upload your site photos taken upstream, downstream, and across (where possible) to Google Drive folder (link will be emailed to all volunteers & schools to access).	See page 61

Water Testing Instructions

The following instructions have been written by Ingrid Berthold, EnviroComm Connections Pty Ltd, representing NSW Waterwatch.

Site Observations

First of all, on the [result sheet](#) (page 39), you are asked to record observations of what conditions are like on the day of sampling. This information helps to add context to the water quality testing results.

You should describe and record information about what you see, hear, feel and smell at your river/stream location during your sampling visit. Examples of observations to include are:

- **Are there any wildlife present today?** – Saw ducks, turtles, fish, wading birds, wallabies; heard birds calling...
- **What's the weather conditions today?** – Clear, sunny, overcast, raining, hot, warm, cold, windy, humid...
- **What does the water look like today?** – Clear, dirty or turbid, coloured, muddy...
- **Does the water smell at all today?** – No odour, earthy odour, noxious sulfur odour...
- **What is the flow like today?** - Flood, fast, medium, slow, dry isolated pools, no flow.
- **Is there any algae present?** - No algae, some algae on rocks, thick filamentous algae, blue-green algae present (looks like green paint & smells)...

When approaching your site, try to BE QUIET so as to maximise your chance of seeing any wildlife there...

(however, when you are approaching the river, bang the sample pole at the extension handle end on the ground as you walk along to create noise and vibrations to scare snakes away).

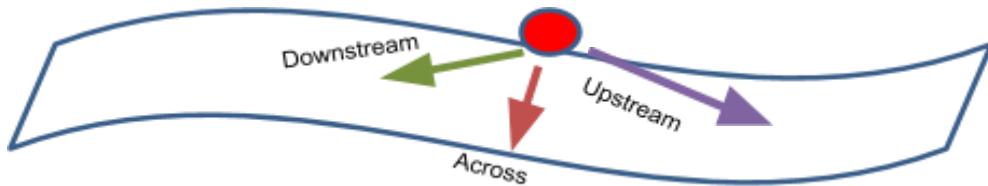
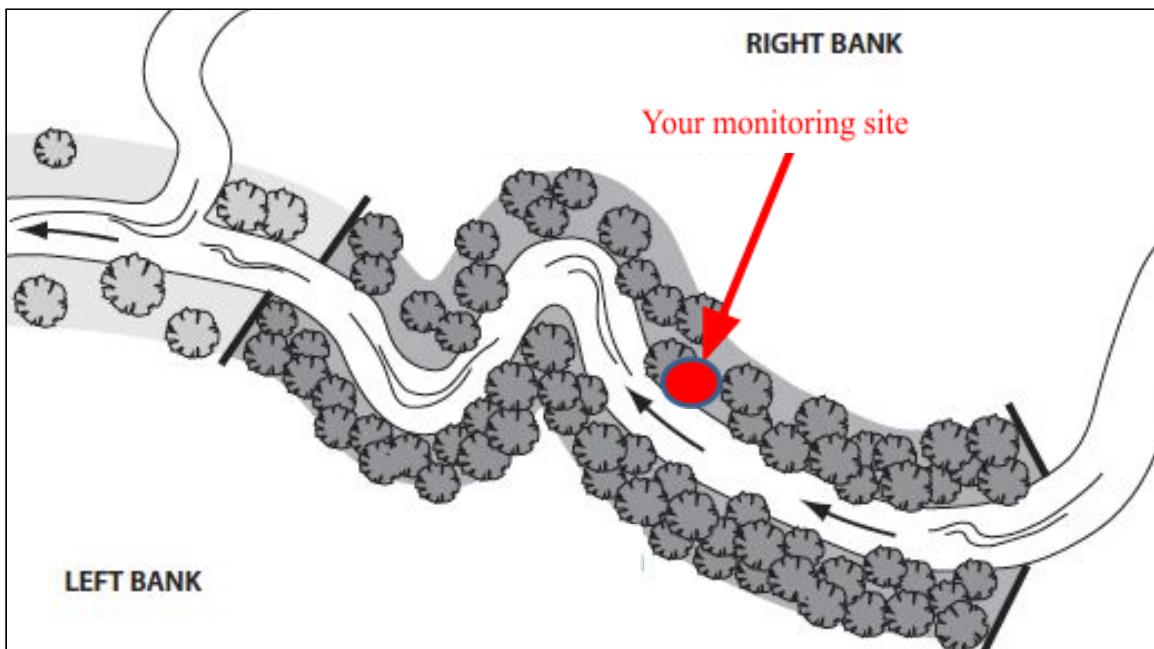
Site Photos

Taking Site Photos - Upstream, Downstream & Across

As well as collecting their monthly water quality sample, please use your digital devices (either camera, smartphone or iPad) to take photos of what conditions are like on the day at your site.

Most sites are located at bridges, so pick a spot around the centre of the bridge, or just next to it, to take your upstream or downstream photographs.

Remember to return to the same spot each time!



For upstream and downstream photos, aim your camera to the centre of the stream to take your photo.

Across photos should take the view directly across from where you sample – including river & opposite bank in view.

For example: Kalang River – Kalang 2



Upstream



Across



Downstream

Site Photo Tips

1. Match your frame with the original ones – look for a key feature in the landscape upstream, downstream & across. Refer to previous photos taken at your site – we need to replicate them!

If you're photographing off a bridge, you may not be able to take a photo 'across'. But if you have access next to the river, take an extra photo and upload it with the 'Across' at the end of the file name.

How to Collect a Surface Water Sample

Equipment: Long arm sample pole, snap adaptor and 500ml sample bottle

CAUTION: Never carry or lift the pole above your head, as touching power lines could cause electrocution.

IMPORTANT: Collect the water from the pool, rather than the rapids and face the bottle upstream.

- **Work with a buddy where possible**
- **Ensure you are standing on a stable, level surface away from the edge of the bank**
- **Collect your rinse sample downstream of your collection site.**
- **To prevent stirring up the sediment, tip the rinse water onto the bank.**

1. To loosen the extension handle of the long arm sample pole, turn to the left. Extend the pole, with the sample bottle in place. Make sure the pole is not too long and difficult to handle. Twist handle to the right to lock the pole into place.
2. Turn the bottle face down over the water and fully submerge the bottle.
3. Once the bottle is fully submerged, turn it upwards and allow it to fill.
4. Bring the sample in and tip it onto the bank. Repeat this to rinse the bottle twice.
5. Using the same collection methodology a third time, collect your sample to test.
6. Close the extension pole and twist right to lock in. Take sample bottle out of the snap adaptor. Continue with temperature test.



How to collect a Dissolved Oxygen Sample

for the Modified Winkler Titration Method (glass bottle)

Equipment: 60ml glass sample bottle

NOTE : The black lids have an inverted plastic cone inside which stops air bubbles being trapped within the water sample (this would distort the DO result by adding more oxygen).

1. Take the water sample at the same time and same place each testing day.
2. There may be two glass sample bottles in the Dissolved Oxygen Kit box. The larger 'bottle-shaped' one is to be used when doing the titration method. The smaller 'glass tube' is to be used for the colorimetric method.
3. Do not collect sample water below a waterfall as the higher level of oxygen will not be representative of the waterbody.

4. Do not collect sample water from stagnant pools or backwaters as this water will have a lower level of dissolved oxygen.
5. Collect the sample water from a flowing section of the water body (if possible) as far away from the bank as you can safely reach with the aid of your buddy.

6. Rinse the appropriate ('glass bottle' or 'glass tube') DO bottle with 'creek' water before collecting the water sample in it.
7. To avoid surface scum entering the bottle remove the lid from the sample bottle only when the bottle is below the surface.
8. Turn the bottle on its side and lower it into the water until the surface of the water reaches your wrists.
9. When the bottle is below the surface slowly unscrew the lid allowing the water to enter.

10. Turn the bottle vertically the right way up while it is below the surface to allow it to completely fill and release all trapped air.
11. Recap the bottle while underwater.
12. Remove the bottle from the water and invert the bottle to check that no bubbles have been trapped inside
13. When the DO bottle is filled take a water temperature reading at the same time and place.

Test 1: Air Temperature

Equipment : Thermometer

NOTE: Ensure the thermometer is completely dry before taking the air temperature.

1. Hold the thermometer at waist height by the top of the thermometer in the shade of your body.
2. Wait for at least one minute before reading the thermometer.
3. Ask another person to check the result.
4. Record your result.

Test 2: Water Temperature

Equipment : Thermometer

NOTE: Make sure you keep the thermometer in the water while taking the water temperature reading, otherwise the result is inaccurate.

1. You should take the temperature from the actual waterway as close as possible to where you took the sample. If you can't reach the water then test water in the sample bottle immediately after taking the sample.
2. Lower the base of the thermometer into the water and hold for one minute. Read the thermometer while it is still in the water and when the reading stabilises.
3. Ask another person to check the result.
4. Rinse the thermometer with distilled water to remove any contaminants, dry and place back into the kit.
5. Record your result. Return to a safe location to test your sample.



Test 3: pH

Equipment: MN pH strips (tube with coloured squares), small container, distilled water

1. You can either test your pH in a small container or the sample bottle. Ensure there is enough water to cover the 4 coloured squares on the pH strip.
2. Take one pH strip, being careful not to touch the coloured squares.
3. Place the coloured squares in the water and leave in for 5 minutes.
4. Take the strip out of the water. The colours will have changed depending on the acidity or alkalinity of the sample water.
5. Hold the box in your left hand, making sure the numbers are up the right way, and the strip in your right hand.
6. Run the strip up and down the box until you match the colours of the strip to the colour chart on the side of the pH strip container.
7. The pH will be the closest match to ALL colours. You may estimate between the two colours in 0.5 increments.
8. Pass the strip to others to verify, and record your result.
9. Empty the contents of the small container. Rinse the small container with distilled water and put the strip aside to dispose of later – it can only be used once!



Helpful Hint : Look to the green square to match the pH.

Test 4. Electrical Conductivity (EC)

Equipment: Electrical Conductivity Meter (low range), specimen container, distilled water.

4(a). Check to see if your EC Meter Needs Calibrating

First check to see if your meter needs calibrating by dipping the electrodes into the conductivity standard and swirling. If the meter reads the same as the standard it does not need calibrating.

NOTE : Be sure to use the correct calibration solution!

Low meter = 500 μ S/cm standard;

High meter = 12.9 μ S/cm standard.

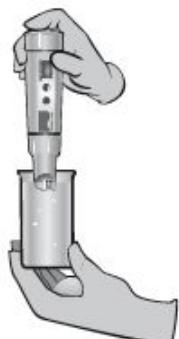
**IMPORTANT : Discard the calibration solution after use.
Never return it to the container.**

1. Pour enough 500 μ S/cm calibration solution into clean beaker to cover probes (a depth of approx 3cm or 30mL in your small beaker).
2. Take bottom cap off the EC meter and turn on (by pressing 'on/off' button).
3. Dip the probes into the calibration solution and swirl the container, meter and solution.
4. Wait several seconds until the number stabilises.
 - a. If the reading matches your calibration solution, rinse off the meter and go to [4\(c\). Electrical Conductivity with an ECscan Meter](#) (page 50)
 - b. If the reading does not match your calibration solution, go to [4\(b\). Calibrating your EC Meter](#) below.



4(b). Calibrating your EC Meter

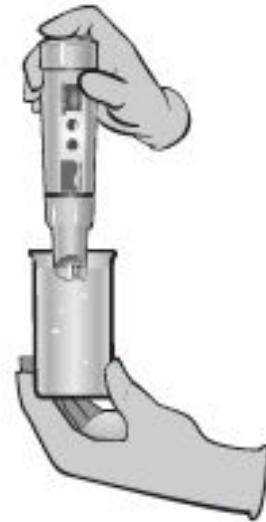
1. Press the CAL button to put into calibrate mode & the numbers on the screen will flash. Quickly then use the HOLD/ENT button to scroll up & around to come back 500.
2. Then, wait 3 seconds without pressing any buttons; the display will flash 3 times then shows 'Ent'. The meter is now calibrated. Note: If it doesn't read 500 on the screen after calibrating, repeat the process from Step 5.



- Take the meter out of the solution, rinse probes with distilled water.
- You can now continue on with your EC test on sample water, or turn off & put away if you'll use it later for testing. The meter is now calibrated.

4(c). Electrical Conductivity with an ECScan Meter

- Rinse out a specimen container with sample water at least twice, or test straight from the sample bottle.
- Pour sample water into the specimen container to a depth of about 3 cm.
- Remove the cap from the meter and turn it on. Wait until a 0 appears.
- Dip the meter into the container so that the probes are covered. Only immerse the probes of the meter in the water. Do not rest the probes on the base of the container as this will give an inaccurate reading.
- Hold the meter in the sample water and swirl gently, so that the sample water, container and meter move. Allow time for the number value to display and stabilise on one reading. If the reading doesn't stabilise, record the result as the number that was displayed most frequently.
- Read the result from the meter screen.
- Identify the unit of measurement that the meter is reading ($\mu\text{S}/\text{cm}$ or mS/m).
- Note: If the reading reads 'Or' this means over range – contact your Coordinator to find out how to do a dilution with distilled water.**
- Pass to others to verify the result.
- Rinse the probes in distilled water. Do not wipe the probes of the meter – blow on the probes or allow to dry in the air.
- Replace the cap on the meter. Turn the meter off and record your result.



Rain water is around $200\mu\text{S}/\text{cm}$. Humans can taste it easily at $800\mu\text{S}/\text{cm}$. In estuarine environments, salinity varies significantly depending on tidal influences and amount of freshwater entering the system. Ocean water is approximately $65\ 000\mu\text{S}/\text{cm}$.

Test 5: Available Phosphate with DC1500 colorimeter

Equipment: DC1500 colorimeter, Phosphate Low Range Box, 60ml syringe, filter and filter holder, colorimeter tube, safety glasses, gloves, distilled water, paper towel and liquid waste container

NOTE: All Bellingen Riverwatch kits have DC1500 colorimeters

SAFETY

Gloves and goggles must be worn. Do not conduct tests over your lap. All tests must be performed over the waste container.

CHEMICALS

Phosphate Acid Reagent and Phosphate Reducing Reagent are considered hazardous substances. **EXTREME CAUTION MUST BE TAKEN!**

Notes:

- If the filter clogs, replace it with a new filter and continue.
- The colorimeter may appear to switch off but it will have only defaulted to energy saving mode.
- Carefully wipe colorimeter tubes clean and dry before inserting into the DC1200/DC1500 colorimeter chamber
- If there is sufficient sample water left in your sample bottle, start from step 3.

1. Shake the sample bottle.
2. Draw some water into the 60ml syringe and rinse.
3. Using the 60ml syringe draw up 40ml of sample water.
4. Place a 0.45 micron filter paper in the filter holder and attach to the syringe. Gently expel a small amount of water through the filter.
5. Holding the filter and syringe over the colorimeter tube (no dot on lid), rinse the colorimeter tube twice with filtered sample water. Fill to 10ml line with filtered sample water.
6. Repeat Step 5, by adding 10ml to line in colorimeter tube with blue dot on the lid. You should now have two colorimeter tubes filled with filtered sample water to 10ml line.
7. Cap and wipe the both colorimeter tubes dry.
8. In one of the tubes (with blue dot on lid), use 1.0mL syringe to add 1.0mL of Phosphate Acid Reagent to the colorimeter tube. Cap and invert to mix.

Available Phosphate DC1500 test – Cont'd

9. Then, use the 0.1g spoon to add one level spoon of Phosphate Reducing Reagent to the colorimeter tube. Cap and shake until powder dissolves. Wipe tube dry.

10. Wait 5 minutes for full colour development. Solution will turn blue if phosphates are present.

Scanning the Blank

Note - The bottles with blue dots are for the blanks (the samples with no chemicals/reagents added).

11. Insert the tube which has not had chemicals added to it (no dot on lid) into the colorimeter chamber, being sure to align the index (vertical) line with the arrow on the meter.

12. Close the lid. We now blank or zero the DC1500 with filtered sample water.

13. Push and hold the Power (bottom right) button to turn the meter on.



14. Press ENTER to select the Testing Menu.

15. Scroll to and select 081 Phosphate LR from menu.

16. Close the lid. Press ENTER to select Scan Blank. Then remove the colorimeter tube.

Scanning the Treated Water Sample

17. Insert the tube which has chemicals added to it (blue dot on lid) into the colorimeter chamber, being sure to align the index (vertical) line with the arrow on the meter

18. Push the ENTER button to select Scan Sample.

19. Record results as ppm of Available Phosphate. Record this number as ____ mg/L. (ppm and mg/L are equivalent measurements)

20. Remove tube from colorimeter and pour contents into liquid waste container.

21. Remove filter from filter holder and dispose.

22. Rinse all equipment with distilled water and dry.

23. Press and hold Power button to turn the colorimeter off.

24. Empty contents of waste container down the toilet.



*Remember to always
wipe & dry the
colorimeter tube, and
close the lid.*

Test 6. Dissolved Oxygen by Winkler Titration Method

Equipment: Glass DO sampling bottle, DO titration box, safety glasses, gloves, distilled water, paper towel and liquid waste container

SAFETY

Gloves and goggles must be worn. Do not conduct tests over your lap. All tests must be performed over the waste container.

CHEMICALS

- Reagent No. 1. Manganese Sulfate - can irritate eyes and skin
- Reagent No. 2. Alkaline Potassium Iodide Azide - can cause severe burns and is poisonous if swallowed.
- Reagent No. 3. Sulfuric Acid - will cause severe burns, ingestion may be fatal and inhalation can cause coughing and chest problems.

The 8 drops of each chemical need to be added by holding chemical container upside down vertically.

Note: If you cannot test your DO sample straight away, fix the sample by following Steps 1-7. This fixes the amount of DO in the bottle. Sample can then be tested at a later time, continuing on with procedures as listed.

1. Collect the water sample in the 60ml glass bottle (see [How to Collect a Dissolved Oxygen Sample \(page 46\)](#))
2. Remove lid from glass DO sampling bottle.
3. Add 8 drops Reagent No. 1 (Manganese Sulfate)
4. Add 8 drops Reagent No. 2 (Alkaline Potassium Iodide Azide)
5. Recap the glass sample bottle and invert several times.
6. Stand bottle for precipitate to fall below shoulder of bottle.
7. Add 8 drops Reagent No. 3 (Sulfuric Acid).
8. Recap and invert bottle until precipitate dissolves. If precipitate does not dissolve after 5 minutes, leave the precipitate to fall below the shoulder of the bottle.
9. Fill the small glass vial to the 20mL white line with yellow/golden solution.
10. Put 1mL green syringe from the DO box into the top of the Sodium Thiosulfate bottle. Invert bottle and syringe.

11. Draw 1mL of this liquid. If there is a bubble, depress plunger and repeat. Re-invert bottle and remove 1mL syringe.
12. Insert syringe in hole in cap of glass vial. Add one drop at a time. Swirl solution vigorously after each drop.
13. When solution turns pale yellow, add 8 drops of Starch- yellow solution will turn deep blue when starch is added.
14. Continue adding drops of Sodium Thiosulfate and swirling each time. Stop when the solution becomes clear.
15. Read off TOTAL amount of Sodium Thiosulfate USED - this is equivalent to the mg/L of Dissolved Oxygen in the water.
16. Record mg/L (It is not necessary to calculate the % sat as this calculated automatically when uploading data to the NSW Waterwatch online database*.) However, if you would like to calculate this manually as well, please find instructions at [Appendix 2 \(page 67\)](#).
17. Empty all chemicals into liquid waste container.
18. Wash and dry all equipment used and replace in the DO Titration Box.
19. Empty contents of the waste container down the toilet.
20. Rinse files and syringes for phosphate and DO test in **deionised/demineralised water**. Rinse sample bottle with **tap water**.

**When uploading your data to the NSW Waterwatch online database, it will automatically convert your water temperature and mg/L of DO (from titration test) to produce a % saturation result. However, you can manually calculate % saturation of Dissolved Oxygen - this step is optional (see [Appendix 2](#), page 67).*

Test 7: Turbidity

Equipment: Turbidity tube

NOTES:

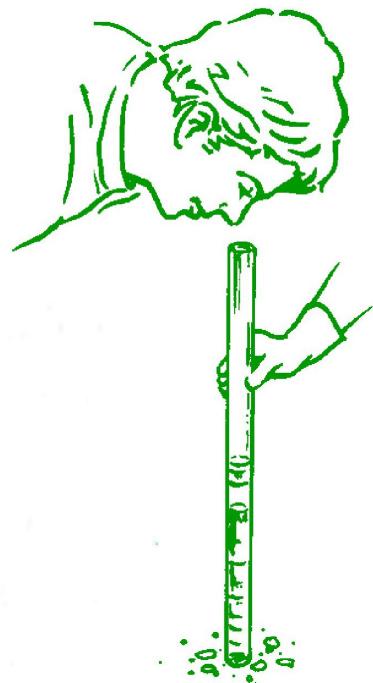
The test must be conducted in the shade of your body. Put your back to the sun and the tube should be in the shadow.

When looking into the tube, the top of the turbidity tube should be at least 15cm from your eye for safety and quality assurance.

Ensure you shake the bottle to disperse any sediment that has settled before beginning this test.

DO NOT estimate between the lines.

1. Assemble the turbidity tube by sliding the two pieces together.
2. Shake the water sample in the sample bottle.
3. Pour a little bit of water into the tube. Holding the tube vertically, look down into the tube. You may need to wait for the water to stop swirling to see if lines can be observed clearly. If you can still see them clearly, continue pouring a little at a time.
4. Stop pouring when the three distinct black lines at the bottom of the tube cannot be seen clearly. Ask another person to verify your result.
5. Measure the turbidity by recording the last marked point on the tube **below** the level of the water. **DO NOT ESTIMATE BETWEEN THE LINES.**
6. If you can still see the lines when the water has reached the top of the tube, record the result as 7 NTUs (means the result was <10NTUs).
7. Record your result. Rinse the tube and sample bottles **with tap water** and place back in the kit.



Volunteer FAQ

Can I take my kids with me to do testing?

Yes depending on the site and the age and personality of the children. Many of our volunteers take their children testing with them. However, some sites are close to roads which make could make it dangerous with small children.

If you are consistently testing your site with children, please forward feedback on this to the Project Coordinator as we would like to add this information into the next site guide reprint.

Can you test in the rain?

Yes, definitely. However, DO NOT TEST IN FLOODS.

I'm having trouble with one of my tests.

Contact Sue Lennox, Bellingen Riverwatch Scientific Support, on 0408027995 to troubleshoot testing questions. Sue often goes out to test alongside our volunteers if they are having trouble with their tests.

There are also training videos available at www.youtube.com/user/NSWWaterwatch.

We hold several Volunteer Training sessions throughout the year - [contact the Project Coordinator](#) for details (see page 5).

All water testing procedures, informative resources, as well as instructions and links to 'how to' videos can be accessed by the NSW Waterwatch website at www.nswwaterwatch.org.au

Will my results vary?

The phosphate levels can vary a lot, especially after rain are likely to see an increase. Dissolved oxygen levels vary with temperature and time of day, thus the importance of trying to test at approximately the same time each month.

How do I know if there has been rainfall recently and how much?

You can find out rainfall data at the BOM website (www.bom.gov.au) or at Willy Weather website (www.willyweather.com.au).

Where do I dispose of the solid and liquid wastes?

Take solid and liquid wastes home. Pour liquid wastes on a patch of bare earth, well away from the river.

What tests do I need to complete?

Standard monthly tests are Temperature (air and water), pH, Electrical Conductivity (Salinity), Turbidity, Available Phosphate, and Dissolved Oxygen. We also ask that you take and upload site photos each month.

See additional monitoring section for more information about how you can be involved!

Uploading Instructions

Uploading Data to the NSW Waterwatch Database

IMPORTANT : Use Google Chrome or Safari to ensure you can view the new ALA Database format correctly.

**Watch training video on uploading your data at
<https://www.youtube.com/watch?v=tfhM9BoPsn8>**

STEP 1: Log onto the NSW Waterwatch database via the Atlas Of Living Australia at: <https://root.ala.org.au/bdrs-core/nswww/home.htm>

STEP 2: Click on **ADD RECORDS**, then click on **SIGN IN**.

Add this page to your FAVOURITES on your internet browser, so you can come back easily.

waterwatch
NEW SOUTH WALES
Communities Caring for Catchments

HOME FIELD GUIDE ADD RECORDS VIEW RECORDS RESOURCES CONTACT US HELP SIGN IN

NSW WaterWatch - Communities Caring for Catchments

NSW Waterwatch is a school and community based water quality monitoring program, which promotes environmental awareness and action through involvement. Primary schools, high schools, community groups, landholders and other community volunteers can participate in the Waterwatch program. The data they collect is used as an indicator of total catchment health.

What can you do in this site?

- Identify a species
- Send your survey data
- See your own records and what other people have submitted

Communities monitoring catchment health

Latest Statistics

Number of users 723
Total number of records 20545
Number of species recorded 31

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STEP 3: Then enter your Username and Password (P@ssw0rd), and click **Sign In** *PLEASE NOTE - USERNAMES & PASSWORDS ARE CASE SENSITIVE!

NSW Waterwatch Sign in

Welcome to the NSW Waterwatch Data Recording System.

If you already have a Username and Password, please sign in below.
If you don't currently have access to this site and are interested in becoming a Waterwatcher, p can get involved.

Please enter your username Please enter your password

[Forgot your password?](#)

Note: this site is best viewed in [Google Chrome](#).

Username: BellingenRiverwatch
Password: P@ssw0rd

Note: If you forget your password, click on the link at the bottom, which will ask you for an email address for your reset password to be sent to.

STEP 4: Go to **ADD RECORDS**, and click on the **Water Quality Data – North Coast** option for your region.

The screenshot shows the NSW WaterWatch homepage. At the top, there's a navigation bar with links for HOME, FIELD GUIDE, ADD RECORDS, VIEW RECORDS, RESOURCES, CONTACT US, HELP, and SETTINGS. A red arrow points to the 'ADD RECORDS' link, which is highlighted with a blue background. Below the navigation bar, there's a sub-menu with the text 'Water Quality Data - North Coast'. The main content area has a title 'NSW WaterWatch - Communities Caring for Catchments'. On the left, there's a brief description of what NSW WaterWatch is. In the center, there's a section titled 'What can you do in this site?' and on the right, there's a section titled 'Communities monitoring catchment health' with a small image of a plant.

STEP 5: Click in the **SAMPLE GROUP NAME** field box, and find you Waterwatch Group Name in the list & select it. *You can type the first letter of your Group name in to find it faster!*

The screenshot shows a form titled 'Water Quality Data - North Coast'. Under the heading 'General information & Participants', there are several input fields: 'Sampler group name *' (with a dropdown menu showing a list of groups, where 'Bellingen Riverwatch' is selected and highlighted in blue), 'Number in sampler group', 'No. of volunteers testing', 'Location' (with a map), and 'Survey Date *' (with a date input field containing '16 Jun 2017'), 'Survey Time *' (with a time input field containing '21:31'), and 'Survey duration (hrs)' (with a dropdown menu). There is also a scroll bar on the right side of the form.

STEP 6: Fill in boxes for:

- Number in sampling group (No. of volunteers/people in your group)
- No. of volunteers testing
- Survey Date & Survey Time – time & date of sampling/monitoring
- Survey duration (hrs) – how long it took to do sampling & testing.

STEP 7: Next, click in the **LOCATION** box (at left end), and find your site and click to select.

If you need help with selecting the correct site, please contact your Coordinator.

Water Quality Data - North Coast

General information & Participants

Sampler group name *	Bellingen Riverwatch	Survey Date *	16 Jun 2017
Number in sampler group	1	Survey Time	21:31
No. of volunteers testing	1	Survey duration (hrs)	1
Location	Bellinger 1 - Bellinger River, downstream of old Brinerville Farm, Brinerville (New England NP)		



When you select the Location, the map will zoom to your site, and the longitude and latitude will autofill.

- If your site marker (orange circle) is slightly off where it should be, contact your Coordinator to correct it.
- Click on the left-hand side of the dropdown box to show all sites, and type letter your site name begins will to be taken to that section of the list (e.g click B for Bellinger).

Water Quality Data - North Coast

General information & Participants

Sampler group name *	Absalom Reserve at convergence of 2 drains, Port Macquarie
Number in sampler group	Anna Bay detention pond- Gan Gan Rd Opposite Anna Bay Public School, Anna Bay
No. of volunteers testing	Bangalay Reserve A, at Rushcutters Way, access at Second Foot Bridge, Port Macquarie

Location

Bellinger 1 - Bellinger River, downstream of old Brinerville Farm, Brinerville (New England NP)

Bellinger 2 - Bellinger River at Cool Creek, Darkwood

Bellinger 3 - Bellinger River at Richardsons Bridge Crossing, Darkwood

Bellinger 4 - Bellinger River, Darkwood Road, near Chrysalis Steiner School, Thora

Bellinger 5 - Bellinger River at 1st bridge on Darkwood Road, near Thora Saw Mill

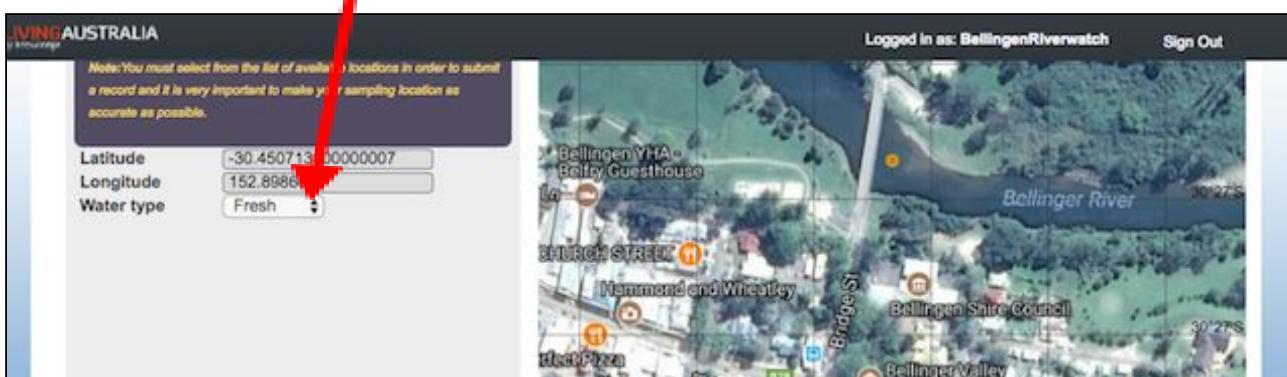
Bellinger 6 - Bellinger River at Gordonville Crossing, Bellingen

Bellinger 7 - Bellinger River at Lavenders Bridge, Bellingen (township)

Site Location



STEP 8: Use the drop down menu to the left side of the map, to select FRESH or ESTUARINE.



STEP 8: Fill in the boxes with information (data & observations) from your result sheet with the sample/survey information.

Environmental Information at the Time of Sampling

Rainfall in last 7 days: Light
Rainfall (mm) (optional):
Water level or flow: Medium
Rate of Flow (optional):
Site observations: River flowing, clear water with some turbidity below bridge. Weather clear & sunny. Some ducks paddling around. No odour or discolouration of water. Water sampled from stairs behind Council.

Water Quality Measurements

Air Temperature (deg C): 20	Dissolved Oxygen (mg/L): 8.6
Water Temperature (deg C): 15	Dissolved Oxygen (% sat): 85
pH (pH units): 7	Faecal Coliforms (CFU/100mL):
Electrical Conductivity ($\mu\text{S}/\text{cm}$): 250	E. coli (CFU/100mL):
Turbidity (NTUs): 7	Total Phosphate (mg/L):
Available Phosphate (mg/L): 0.05	Nitrates (mg/L as N):

Did you calibrate your EC meter?

Water Testing Notes/Issues:

Buttons: Submit and Add Another | Submit

NOTES:

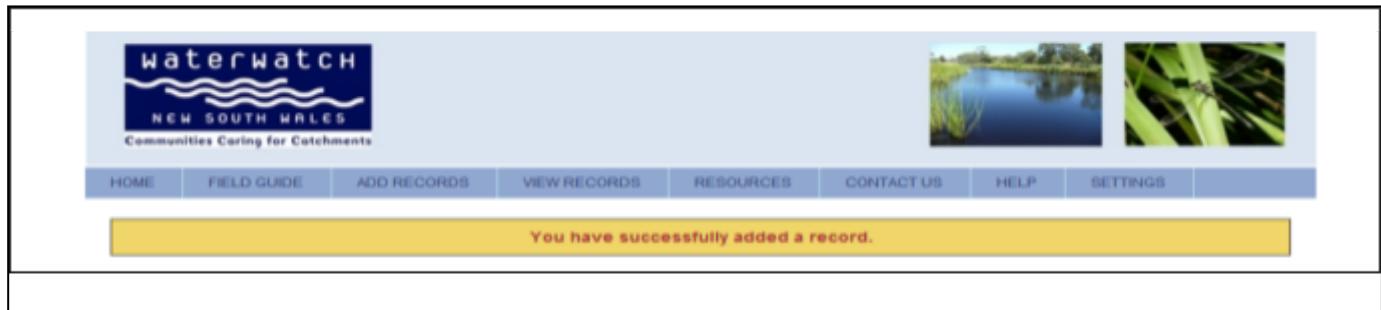
- Remember to only enter numbers into the **Water Quality Measurements** boxes for the tests that you have completed. Leave the others blank – do not enter zero!
- When entering data make sure you have if you're entering a decimal <1, you must put a zero before decimal point & 2nd digit.
- **Dissolved Oxygen % saturation is auto calculated** at this stage when you've entered temperature & DO mg/L. Write the % on your result sheet if you wish.

STEP 9: Click **SUBMIT**.

If you have more results to add, then click **SUBMIT and ADD ANOTHER**.

STEP 10: You'll then be taken to a screen, confirming you have **UPLOADED SUCCESSFULLY!**

NOTE: If you wish to edit anything, click on the UNLOCK FORM FOR EDITING lock, and edit & re-submit.

**STEP 11:** Then, you can **SIGN OUT** if you have completed your data uploads.**Having trouble uploading your data?**

Find the instructions for uploading your data on page [__](#) or watch the training video at <https://www.youtube.com/watch?v=tfhM9BoPsn8>.

Uploading Site Photos to Google Drive

Google Drive folders have been set up for each group/participant to upload their monthly photos to for the project. Simply take your photos, rename them for your site, and upload. Please follow the site naming protocol of: **Year-Month-Site Number – view** (e.g. 2017-08 – Bellinger 1 – upstream).

Having trouble uploading your site photos?

If you are having trouble, our Project Coordinator can upload them for you - simply email your photos to riverwatch@ozgreen.org.au

Can't see the Google Drive Site Photos folder?

Contact the Project Coordinator on riverwatch@ozgreen.org.au to share the Google Drive folder shared with you.

Additional Monitoring

Riparian Monitoring and Revegetation

We are beginning to explore riparian monitoring for Bellingen Riverwatch. There will be training sessions run in 2019/2020 and more information to follow. If you would like to know more about this please contact the Bellingen Riverwatch Coordinator.

National Waterbug Blitz Monitoring (Optional)

The National Waterbug Blitz was Australia's first nationwide waterway monitoring event in Spring 2018. Australians are encouraged to become 'citizen scientists' and investigate how healthy their local waterways and wetlands are, simply by exploring and identifying what waterbugs they contain. Anyone can participate!

You can have a go at doing [Waterbug Blitz](#) anytime yourself - you just need a net, large white tray, ice cube trays, spoons & pipettes and the app. This equipment is available for hire for Bellingen Riverwatch volunteers - contact the Project Coordinator (see page 5). See <https://www.waterbugblitz.org.au/> for more info.

You can download the Waterbug app anytime to start using it for identification of waterbugs. Check out the [NSW Waterwatch how-to-video on Youtube](#) (<https://www.youtube.com/watch?v=wzjAMOwp9sl&t=42s>). The sweep net sample technique is slightly different but will give you a start. You can also view existing results sheets and other information about the method at <http://www.thewaterbug.net/ALT.html>. There may be another Waterbug Blitz training session in 2019, pending funding.

Further questions

For further questions, please contact Ingrid Garland from NSW Waterwatch on ingrid@envirocommconnections.com.au or the Bellingen Riverwatch coordinator.

Don't forget to ask some of the volunteers that attended the training to show you through the steps if you want some extra help.

Appendix 1 : Site Testing Times

	B1	B2	B2.1	B3	B3.1	B3.2
Jul 17						
Aug 17		1.15pm		11.10am		
Sep 17		11.28am		1.29pm		12.03pm
Oct 17	1.20pm	11.30am		10.05am		12.00pm, 12.15pm
Nov 17	9.35am	2.00pm		11.55am		12.01pm
Dec 17	10.30am	1.30pm		3.00pm		12.00pm, 12.00pm
Jan 18	11.40am	9.34am	9.31am	11.30am		12.30pm
Feb 18	12.45pm	8.00am	8.46am	10.08am		12.00pm
Mar 18		8.00am	8.30am	9.15am		3.05pm, 12.00pm
Apr 18	12.30pm	12.30pm	1.00pm	12.00pm		12.00pm
May 18		7.40am	8.26am	9.33am		12.00pm
Jun 18						12.00pm
Jul 18		12.10pm	12.20pm	11.30am		12.00pm
Aug 18		10.00am				12.00pm
Sep 18						12.00pm
Oct 18	12.00pm					12.03pm
Nov 18	10.36am	4.00pm	4.00pm	11.38am		12.00pm
Dec 18	10.26am	11.00am	11.00am	9.09am		
Jan 19		5.00pm	5.00pm	9.46am		
Feb 19	10.23am					11.30am, 12.00pm

	B4	B5	B6	B7	B7.1	B8
Jul 17				12.00pm, 8.30am, 9.45am, 12.56pm	11.39am, 1.30pm, 1.08pm	
Aug 17		9.00am	5.01pm	11.30am, 2.00pm	12.30pm, 3.08pm	
Sep 17	10.00am	12.00pm	4.20pm	2.00pm	11.34am	
Oct 17	9.00am		5.18pm			
Nov 17	1.31pm	9.19am	3.00pm	5.22pm	4.15pm	
Dec 17	10.00am	11.00am	3.49pm	1.50pm		
Jan 18			4.45pm	12.53pm		
Feb 18	9.30am	11.05am	3.56pm	1.15pm		
Mar 18	9.30am		3.57pm	9.52am		
Apr 18	9.30am	11.00am	10.00am	1.40pm		
May 18	4.10pm					
Jun 18		1.20pm	3.59pm			
Jul 18	11.00am	10.30am	12.41pm			
Aug 18	12.22pm	11.55am	11.00am			
Sep 18	12.26pm	11.48pm	9.30am			
Oct 18	9.30am	9.40am	12.00pm			
Nov 18	11.41am	9.30am	4.00pm	1.30pm		
Dec 18	10.13am	11.04am	11.20am			
Jan 19	8.35am	11.00am	10.00am, 10.30am	9.00am		
Feb 19		9.45am	2.00pm			

	R1	NN1.1	NN1.2	NN1.3	NN1	NN2
Jul 17						
Aug 17	4.07pm				3.55pm	5.00pm
Sep 17	3.02pm				12.15pm	5.30pm
Oct 17					5.45pm	6.10pm
Nov 17		4.55pm	1.00pm	1.15pm	8.37pm	5.10pm
Dec 17	2.00pm	7.50am	8.25am	5.10pm		6.30pm
Jan 18					5.02pm	5.40pm
Feb 18					6.14pm	5.41pm
Mar 18						
Apr 18		9.00am			5.04pm	11.05am
May 18		11.55am	4.48pm	4.33pm	11.35am	11.15am
Jun 18		12.25pm	1.35pm	2.45pm	12.50pm	1.10pm
Jul 18	10.00am				5.20pm	4.55pm
Aug 18		4.37pm			5.09pm	3.42pm
Sep 18		11.58am	7.37am		11.35am	11.15am
Oct 18	11.25am		1.45pm	8.32am	12.00am	
Nov 18	8.00am					
Dec 18	8.00am	6.50am			4.50pm	3.30pm
Jan 19	8.00am	5.50pm			5.21pm, 10.15am	11.30am
Feb 19	8.00am		4.38pm		4.20pm	11.00am

	K1.1	K1.2	K1	K2	K3	K4	S1
Jul 17							
Aug 17			1.00pm	12.36pm	09.20am	2.10pm	4.15pm
Sep 17	9.40am	11.30am	2.50pm	9.30am	10.15am	3.57pm	4.50pm
Oct 17				8.40am	10.30am	3.45pm	4.10pm
Nov 17	11.00am	1.00pm	4.30pm	3.45pm	2.20pm	11.30am	6.00pm
Dec 17	11.09am	12.20pm	3.30pm	12.06pm	9.00am	4.20pm	
Jan 18	10.40am	12.20pm	2.20pm	8.40am	9.15am	11.46am	12.12pm
Feb 18	10.40am	1.00pm	2.00pm	9.15am	10.30am	8.40am	4.25pm
Mar 18	10.30am	11.45am	11.00am	8.58am	8.20am	2.35pm	10.20am
Apr 18				6.30am	6.02am	4.30pm	5.15pm
May 18				7.00am	10.40am	4.10pm	
Jun 18	11.15am	11.56am		9.15am	9.45am	4.05pm	
Jul 18				9.10am	9.50am	8.38pm	
Aug 18				9.25am	9.45am	5.10pm	
Sep 18				9.40am	10.20am	4.40pm	
Oct 18				8.35am	8.20am	2.40pm	
Nov 18				2.15pm	2.50pm	4.50am	5.00pm
Dec 18				12.15pm / 12.00pm	11.45am	5.38am	
Jan 19			1.00pm	4.25pm	3.50pm	4.45pm	3.00pm
Feb 19				11.00am	2.23pm	12.25pm	

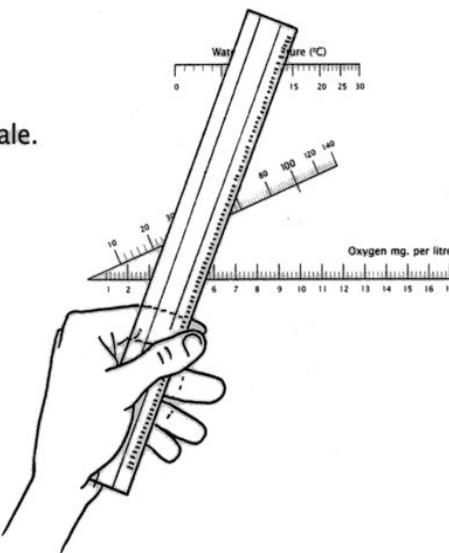
Appendix 2: Manually Calculating % Saturation of Dissolved Oxygen

NOTE: This step is optional. When uploading your data to the NSW Waterwatch online database, it will automatically convert your water temperature and mg/L of DO (from titration test) to produce a % saturation result.

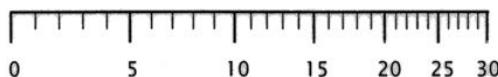
However, to manually calculate % saturation, follow the steps below:

Calculation of results

- 1 Plot temperature on upper scale.
- 2 Plot oxygen concentration on lower scale.
- 3 Hold a ruler between the two points.
- 4 The point where the ruler crosses the middle scale is the % saturation.
- 5 Record this result on your test results worksheet.



Water temperature (°C)



Oxygen mg. per litre

