TRaCK
Tropical Rivers and Coastal Knowledge

Gooniyandi River Monitoring Report: 2009 – 2010

Marcus Finn, Pippa Featherston and the Bayulu-Gooniyandi Rangers

Australian Government
Department of Sustainability, Environment, Water, Population and Communities
National Water Commission
Fisheries Research and Development Corporation

CSIRO

TRaCK – *Research to support river and estuary management in northern Australia*

TRaCK brings together leading tropical river researchers and managers from Charles Darwin University, Griffith University, University of Western Australia, CSIRO, James Cook University, Australian National University, Geoscience Australia, Environmental Research Institute of the Supervising Scientist, Australian Institute of Marine Science, North Australia Indigenous Land and Sea Management Alliance, and the Governments of Queensland, Northern Territory and Western Australia.

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Tropical Rivers and Coastal Knowledge
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Introduction and Aims

Gooniyandi is the name of an Aboriginal language group from the Kimberley region in Western Australia. Gooniyandi traditional lands include country around the Fitzroy River, stretching from Margaret River to the Junction of Fitzroy River with Christmas Creek.

The Bayulu-Gooniyandi Rangers live in Bayulu, located approximately 15 kilometres out of Fitzroy Crossing. The group consists of 10 men, partially funded using Community Development and Employment Projects (CDEP) money. The country the Bayulu-Gooniyandi Rangers look after is from Fitzroy Crossing to its junction with Christmas Creek. Around 300 people from two language groups, Gooniyandi and Walmajarri, live in the Bayulu community.

The group would like to become full time rangers to look after their country, and keep an eye out for unwanted changes, such as weeds, and to provide management services. The group also feel they have an obligation to protect people (both local and visitors), and hope to be able to observe and assess people's behaviour, and where necessary modify it to care for their country.

> *Everybody welcome, but we need to make sure they do the right thing and don't get hurt* – Roneil Skeen, Bayulu-Gooniyandi Ranger.

The Bayulu-Gooniyandi Rangers participated in the monitoring program to demonstrate that they are capable of doing the work, and place them in a stronger position to obtain full-time funding when it becomes available.

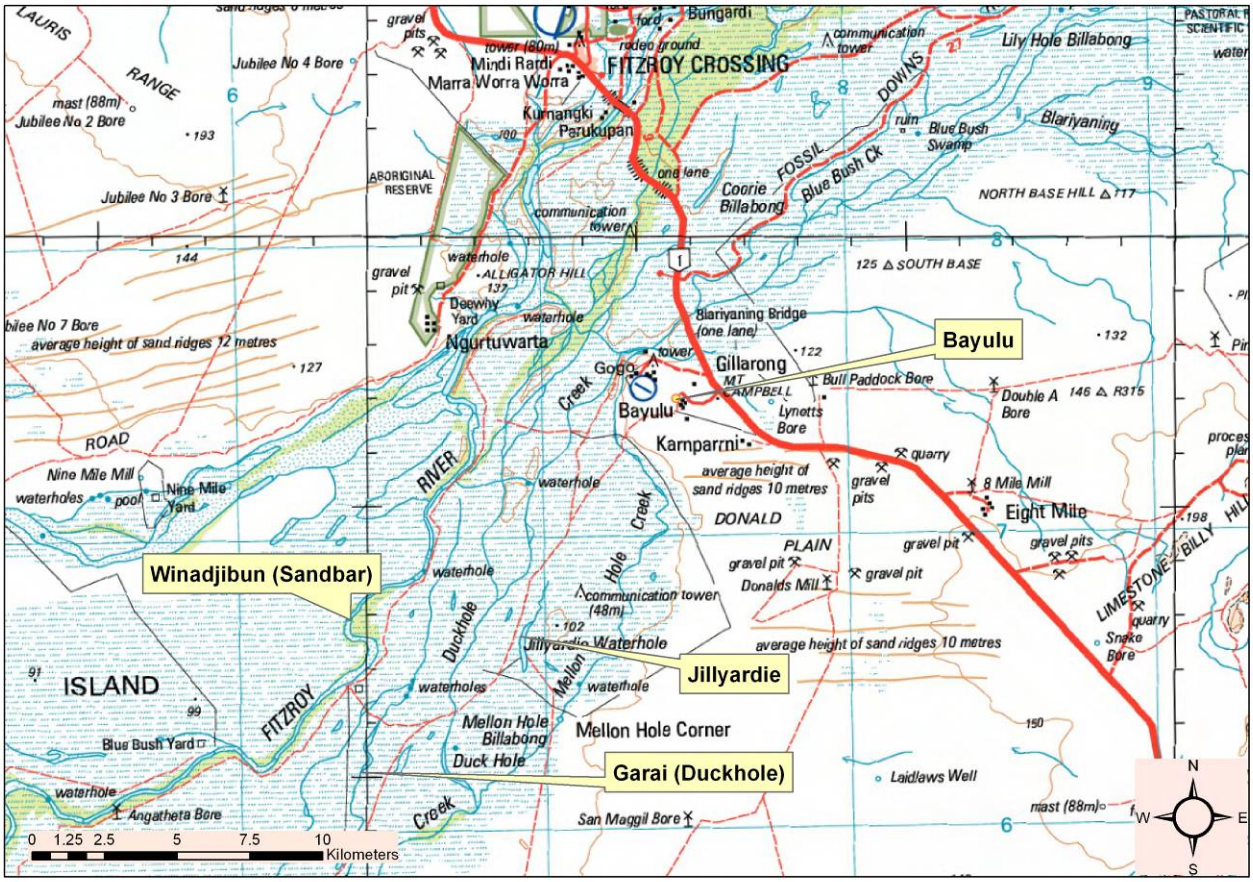
This report provides information on a year-long trial participatory monitoring program undertaken at river country sites significant to Gooniyandi people. The research was funded through TRaCK (Tropical Rivers and Coastal Knowledge Research Hub) and undertaken by CSIRO Ecosystem Sciences. A research agreement covering terms such as protection of religious knowledge, publication of information and payment for expertise, was negotiated with the Wagiman, the Northern Land Council and CSIRO at the commencement of the project in 2008.

Site Description

This report looks at a small number of sites located on Gooniyandi river country. The Bayulu-Gooniyandi Rangers picked sites that were important to them and wanted to keep an eye on; they are frequently used and are in locations that allow a trial monitoring plan.

The relationship Gooniyandi people have with these sites is unique, and an integral part of their identity. Indicators (things to measure that can suggest changes are occurring) were chosen by the Bayulu-Gooniyandi Rangers during workshops coordinated by CSIRO scientists. Those indicators reflect the value of the sites, use, aspects of the sites (such as weeds) that they consider characteristic features, or the threats of concern to the Bayulu-Gooniyandi Rangers. Although the use of cultural indicators was discussed during workshops (particularly at a site with a strong cultural story), the Bayulu-Gooniyandi Rangers preferred to focus on physical indicators for monitoring and reporting purposes.

This report includes some information on the significance of these sites. However, Gooniyandi people wish to protect certain stories and knowledge and custodians have in these cases requested that the information revealed in a public report be limited. Readers of the report should therefore not assume that the information provided here represents a description of the full significance of these sites to Gooniyandi people.



Jillyardi

Jillyardi billabong is a permanent billabong that never dries up. The billabong is filled by floods; with larger floods making the whole floodplain surrounding the billabong go under water.

Jillyardi is of cultural and material significance. It is a significant story place, is included in a song cycle and traditional owners perform corroborees there. The traditional owners hold the story for *Jillyardi* and pass it on to their young people so they show respect and know the importance of this place. It is also an important fishing spot for the language group. It is a good spot for families and kids and people often go to *Jillyardi* for a picnic. It is a popular fishing spot early in the dry season when the creeks are still too flooded to get down to the Fitzroy River, or for groups that don't have a 4WD to get down to the river. It is a good place to go and catch Cherabin (*Macrobrachium rosenbergii*) and a hunting area for Goanna (*Varanus* spp.).

One of the main concerns of the old people is the station mob (and other white people) coming down to the billabong and doing whatever they want: drinking alcohol here and putting in boats when they are not allowed. People should not swim in the middle of *Jillyardi* either, in case they get harmed. A central concern is to make sure the place is used appropriately, particularly since harm can come to people who don't look after the place. An additional threat to the billabong was considered to be the risk of cattle damage to the banks, and cattle getting stuck in the mud and dying.

Garai (Duck Hole)

Garai, or Duckhole Creek, dries back to small waterhole in the dry season, but there is permanent water in some patches. Upstream, Blue Bush Creek and Two Mile Creek meet up when it floods and the water comes down through Bayulu Billabong, into Two Mile Creek and then into *Garai*. It then runs through here and into the Fitzroy River via another creek.

Garai is an important hunting and fishing place and a good spot for collecting bait on the way to the river. It is popular for fishing just after the wet season when the water is running, and when it is warm and the water is drying up, people drag nets through it.

The Bayulu-Gooniyandi Rangers consider the biggest concern and threat at *Garai* is the wide-spread cover of Noogoora Burr (*Xanthium occidentale*). They believe the Noogoora Burr ruins *Garai* as it grows too thick and has stopped people bringing family and kids to have dinner camp and camp on the bank. Damage caused by cattle and the high number of pigs is considered a threat to the site. Additionally, the monitoring group indicated that they considered the dragging of fishing nets to be a cause of water drying up at the site, and so was a threatening process. The mechanism for the dragging of nets causing the water to dry was not made clear by the monitoring group, and the use of drag nets to fish seemed to be sometimes considered appropriate.

Winadjibun (Sandbar)

Winadjibun on the Fitzroy River is a permanently flowing, main river channel. It has a big pool at the top end of the sandbar where people sometimes put in their boats.

Winadjibun is an important place to Gooniyandi people. It is a main camping spot, and a location for big meetings. It is a place where culture camps happen and a main place that old people will

bring young people to pass on information and stories. It is also an important fishing spot with good hunting on the other side. The young boys will often swim across to hunt Goanna on the other side and then bring them back into the main camp. Mainly people chase Barramundi (*Lates calcarifer*) at *Winadjibun*, but there are also the same species as in the billabong. It is a main place and a good training spot for young people who are brought down there to teach them how to hunt. Even the football boys come down and train on the sand sometimes.

The Bayulu-Gooniyandi Rangers see people leaving rubbish at *Winadjibun* as a major concern. Another is people gill-netting the upstream pool for Barramundi. They believe gill-netting is not the right way to do things and that people take too much when they do it this way. The final concern at *Winadjibun* is pigs and the damage they cause.

Methods

The participatory monitoring trial was conducted over a period of approximately 12 months. Site location, hydrology, significance, threats and indicators for the program were discussed during two planning workshops. Sites were chosen by the Bayulu-Gooniyandi monitoring group, and represented those sites that were:

- Seen as being important to the monitoring group for a range of reasons (including being good fishing locations, or having historical or cultural significance);
- Considered to have some level of threat associated with them; and
- Were relatively accessible for the purposes of monitoring, and could be visited as a group over a period of 1-2 days.

The first workshop focused on site selection and description, as well as describing the monitoring program, the support that would be supplied by researchers, and what researchers hoped to achieve. The second workshop focused on narrowing the list of sites down to a group that could be monitored within time and effort limits, selecting monitoring indicators to trial at the sites, and discussing some of the methods that could be used to measure the indicators. During this workshop, indigenous indicators were also discussed.

During the trial of the monitoring program, a few methods were tested. The methods were intended to be as straightforward as possible, easy to do in the same way for different people, and not require much equipment that might be expensive or hard to maintain. Although all of the methods below were trialled, the photo-points proved the most successful, and water quality gained a lot of interest, even if it was more complicated.

Permanent photo points

Photos were taken from the same spot, looking in the same direction, on each of the sampling trips. While this was not easily made into a number that tells whether things are getting better or worse ("quantitative" data), it gave a visual reference of each site during each trip.

Photos either taken along the ground either had the direction they were taken recorded, or more than one photo was taken to be "stitched" together using the Canon PhotoStitch program. A detailed method and datasheet of permanent photo points can be found in the methods document that accompanies this report.

Transects - Cattle disturbance and weeds

The aim of the transects was to get a repeatable measurement of the density (how thick they are) of cattle/pig damage along the banks, and weed infestations. To make sure the measurements could be repeated by different people and at different times, the length of the transect was set at 50 metres. Two people walked along the transect. The first person stopped at every meter, and called out whether cattle/pig damage or weeds were present at that spot. The second person recorded this on a data sheet. The technique is rapid, has low costs and equipment requirements, and training and application are straightforward. This is a slightly modified version of a "line intercept transect". Although it means percentage cover cannot be directly measured, it does allow relative changes (whether two places measured using our method are the same or different) to be assessed. The simplification of the method was considered to outweigh the need for absolute percentage cover measurements in our context. A detailed method and datasheet for the transect density can be found in the methods document that accompanies this report.

GPS walks - rubbish

The Bayulu-Gooniyandi Rangers indicated that rubbish being left at sites was one of the threats they wanted to monitor. Rubbish being left along riverbanks and at billabongs has also been noted as an issue by one of the managers of GoGo Station; the cattle lease on which the sites are located. The Rangers indicated they would like to clean the rubbish up as a part of the monitoring trial, but it was also necessary to measure the amount of rubbish. Early discussion on methods centred on weighing the rubbish, or counting the items. It was decided that locating each item of rubbish using a GPS unit whilst cleaning it up would give an indication of the amount of items, as well as where they were being left. Google Earth ™ images of rubbish distribution are shown in the results section.

Water quality

Water quality was conducted using a LaMotte Water Quality Kit. Using the Smart 2 Colorimeter Operator's Manual by LaMotte and monitoring instructions generated with the Wagiman Ranger group from the Daly River. The Wagiman Rangers were involved in a similar trial monitoring program. Tests were conducted for:

- Dissolved oxygen (mg/L)
- Electrical conductivity (µS/cm)
- Nitrate (ppm)
- pH
- Phosphate (ppm)
- Temperature (˚C)
- Turbidity (RTU)

A copy of the Wagiman Water Quality Monitoring Instructions and datasheet can be found in the methods document that accompanies this report

Application of the scoring system

A scoring system for each site was applied by researchers at the completion of the monitoring. The score reflect the characteristic features of the sites, and the threats that rangers consider present at each of the sites. The characteristics scored are unique to each site: for example, a site where there was no concern about erosion does not have an "erosion" score.

The scoring system indicates the condition of the site, and has three levels in a "traffic light" style. The score given is based on the canvassed opinions of the rangers, given their prior knowledge of the site over a long period, and an interpretation of monitoring results by both the rangers and researchers.

- "Green" is "good". This feature is in good condition, and there appears no action needed;
- "Orange" is "bad". There is some concern about this feature. Some management action should be considered;
- "Red" is "ugly". There is strong concern about this impact at the site. Management action focussing on this feature should be considered a priority.

A total score is given for each of the sites. As the sites have different numbers of characteristic features being scored, score is divided by the total score possible at the site to give a percentage. This percentage score should not be used to score sites against one another in more than a general sense. It is intended to give only a broad indication of which sites should be considered a priority for management intervention, and should be considered along with a more general review of the available information on each site.

Results

Permanent photo points

Site name	Site code	GPS (WGS84)	Compass direction	Date taken	Information
Jillyardi	JP1	18˚22'23.2"S 125˚32'53.5"E	Stitch	16 November 2009 20 May 2010 9 August 2010 20 September 2010	Central part of *Jillyardi* Billabong
	JP2	18˚22'37.8"S 125˚32'52.7"E	Stitch	20 May 2010 9 August 2010 20 September 2010	Favourite fishing spot on *Jillyardi* Billabong
	JP3	18˚22'14.5"S 125˚32'57.7"E	Stitch	20 May 2010 9 August 2010 20 September 2010	Bayulu end of *Jillyardi* Billabong – includes weeds and cattle damage
Garai	GP1	18˚24'54.9"S 125˚31'30.9"E	Stitch	18 November 2010 10 August 2010 20 September 2010	*Garai* Creek
	GP2	18˚24'50.0"S 125˚31'28.4"E	Stitch	18 November 2010 10 August 2010 20 September 2010	*Garai* Creek
Winadjibun	SP1	18˚22'06.0"S 125˚29'43.8"E	Stitch	18 November 2009 9 August 2010 20 September 2010	Sandbar
	SP2	18˚22'05.3"S 125˚29'40.1"E	Stitch	18 November 2009 9 August 2010 20 September 2010	Sandbar - shade

Google Earth™ view of Jillyardi (dotted yellow lines show approximate direction of permanent photos. Transects were located along the water's edge at JP2 (heading north) and JP3 (heading south)

***Jillyardi* (JP1): November 2009**

***Jillyardi* (JP1): May 2010**

***Jillyardi* (JP1): August 2010**

***Jillyardi* (JP1): September 2010**

***Jillyardi* (JP2): May 2010**

***Jillyardi* (JP2): August 2010**

***Jillyardi* (JP2): September 2010**

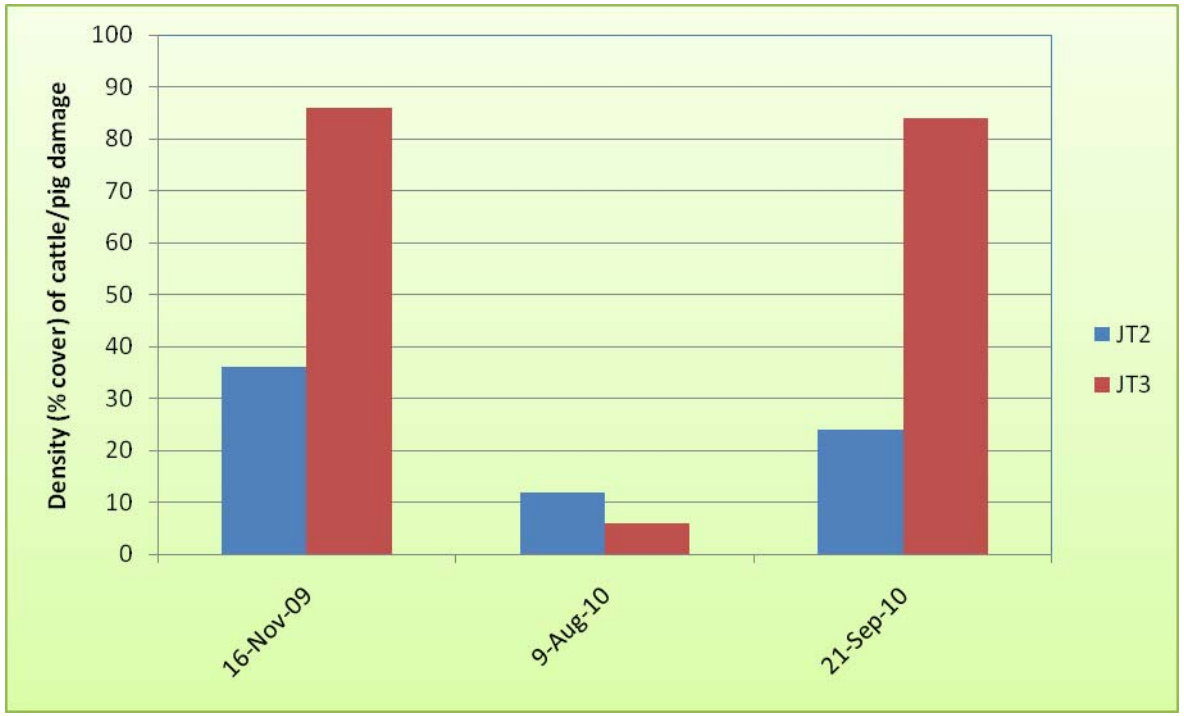
***Jillyardi* (JP3): May 2010**

***Jillyardi* (JP3): August 2010**

***Jillyardi* (JP3): September 2010**

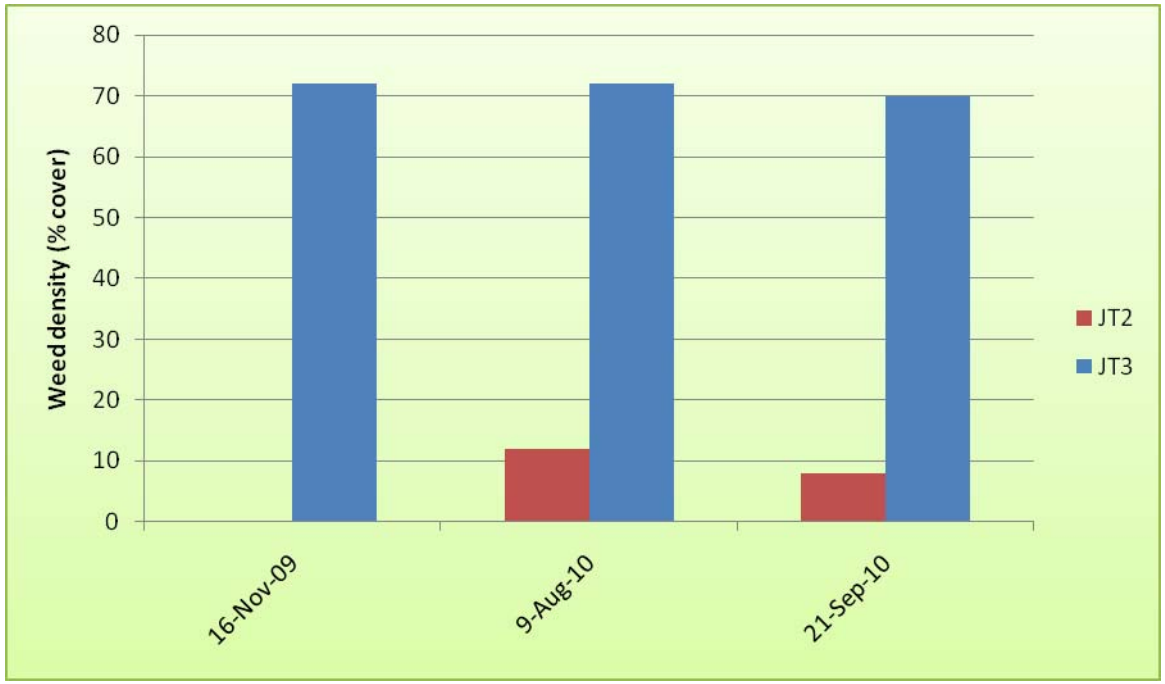
Cattle disturbance transects

Site	Site code	GPS at start	Compass direction	Dates taken	Raw counts	Calculated density (%)
Jillyardi	JT2	18˚22'37.8"S 125˚32'52.7"E	360˚	16 November 2009	18/50	36
				9 August 2010	6/50	12
				21 September 2010	12/50	24
	JT3	18˚22'14.5"S 125˚32'57.7"E	220˚	16 November 2009	43/50	86
				9 August 2010	3/50	6
				21 September 2010	42/50	84



Weeds

Site	Site code	GPS at start	Compass direction	Date taken	Raw counts	Calculated density (%)
Jillyardi	JT2	18˚22'37.8"S 125˚32'52.7"E	360˚	16 November 2009	0/50	0
				9 August 2010	6/05	12
				21 September 2010	4/50	8
	JT3	18˚22'14.5"S 125˚32'57.7"E	220˚	16 November 2009	36/50	72
				9 August 2010	36/50 (1/50 Noogoora burr)	72 (2% Noogoora burr)
				21 September 2010	35/50	70



Water quality

Site	Site code	Date taken	Dissolved oxygen (mg/L)	Electrical conductivity (µS/cm)	Nitrate (ppm)	Phosphate (ppm)	Temperature (˚C)	pH	Turbidity (RTU)	Comments
Jillyardi	JT1	20 May 2010	6.3	150	0.01	0.10	28	7	15	Near middle billabong in deeper water. Sample taken about 1300.
		10 August 2010	7.1	140	0.01	0.56	-	7	13	Sample taken about 0914.
		21 September 2010	6.5	150	0.3	0.19	-	7	12	Sample taken abut 0950.
	JT3	20 May 2010	5.6	150	0.12	0.06	30	7	18	Shallow end towards the community. Sample taken about 1500.

Jillyardi

The photos from the *Jillyardi* permanent photo points show a good water level throughout the year, and some changes in water colour. These colour changes are believed to be caused by movement of the rainbow serpent spirit that lives in *Jillyardi*. The slightly lower water level and milky colour seen in pictures from November 2009 and late 2010 are due to the spirit travelling to other places, when he returns the water goes blue again. The changes in water colour seen throughout the photos did not surprise or concern the Gooniyandi people interviewed. TRaCK research conducted elsewhere across northern Australia, especially in the Mitchell River catchment, also showed that water quality parameters could be highly variable between seasons.

Water quality measurements at *Jillyardi* showed nothing to indicate concern. The green algae present in May 2010 at JP1 and JP2 is also a normal occurrence that the Bayulu-Gooniyandi Rangers says happens every year. Over the years they have observed the algae return and disappear again and believe it's a normal thing that people don't worry about. The photos over the span of a year also show how aquatic plants grow back after the wet season. Other TRaCK research looking at floodplain waterholes on the Fitzroy floodplain, as well as in other catchments across northern Australia such as the Daly and Mitchell floodplains, also indicate that aquatic algae are common at the end of the wet season and early dry season. There is strong evidence that this algae is a very important food resource for fish in these rivers: fish consume this algae at the end of the wet season and have a burst in growth which seems to support them through the following dry season.

Other concerns of the Bayulu-Gooniyandi Rangers are people poisoning or shooting the freshwater crocodiles. A dead freshwater crocodile can be seen at JP1 in May 2010. The Rangers suggested that poison meat (for pigs or wild dogs) had been laid too close to *Jillyardi*, and that this had killed the crocodile. There were also spent .44 magnum shell casings nearby; a calibre reportedly not in common use amongst Bayulu community members. The Rangers also considered that boats on the billabong posed a substantial risk, although there was no evidence that this happened during the trial monitoring program. It is believed the rainbow serpent doesn't like people putting boats onto *Jillyardi*, and those who disobey this rule will get the feeling of restlessness and may be in danger of getting hurt.

The photos taken at JP3 show the billabong getting drier towards the end of the dry season, although this is normal. The Bayulu-Gooniyandi Rangers explain that by September 2010 cattle and pelicans have made the water dirty at the northern end of the billabong (JP3). Currently, the Rangers are not concerned about the cattle and weeds present at the site, even though the weeds are relatively thick in this area.

The Bayulu-Gooniyandi Rangers consider a management action for *Jillyardi* could include building a fence to stop the cattle accessing the billabong. They hope getting a trough for the cattle or finding permanent water somewhere else could allow a compromise to be reached with the station owners. One of the TRaCK research projects investigated appropriate methods for monitoring river health. This project found that while cattle disturbance appears to be a common impact on waterholes and rivers across northern Australia, there are very few places of "no impact" which could be used to compare impacts. Therefore, preventing cattle access to a waterhole is likely to provide a good opportunity to measure the impacts of cattle, particularly around these floodplain waterholes.

The Bayulu-Gooniyandi Rangers would also like signage put up at various locations around *Jillyardi* to inform and teach people how to use the billabong correctly. A draft of the sign has already been put together and is waiting for funding and a small amount of initial on-ground support. At the moment the weeds at *Jillyardi* are not a concern to the Bayulu-Gooniyandi Rangers

although they will continue to keep a close eye on the billabong in case a management action is required in the future.

Score

- *Water level:*	3/3	●
- *Apparent visitor behaviour:*	2/3	●
- *Cattle/Pig damage:*	2/3	●
- *Water quality/colour:*	3/3	●
- *Weeds:*	2/3	●
- *Total*	12/15 (80%)	

Google Earth™ view of Garai (dotted yellow lines show approximate direction of permanent photos)

***Garai* (GP1): November 2009**

***Garai* (GP1): August 2010**

***Garai* (GP1): September 2010**

***Garai* (GP2): November 2009**

***Garai* (GP2): August 2010**

***Garai* (GP2): September 2010**

Water quality

Site	Site code	Date taken	Dissolved oxygen (mg/L)	Electrical conductivity (µS/cm)	Nitrate (ppm)	Phosphate (ppm)	Temperature (˚C)	pH	Turbidity (RTU)	Comments
Garai (Duck Hole Creek)	GP1	10 August 2010	6.0	100	5.2	0.45	-	6	836	Sample taken about 1034. The high turbidity at *Garai* made use of the water quality kit problematic. The high value for nitrate and phosphate may be a false reading.
		21 September 2010	Turbidity to high	130	To dirty to test	13.2	-	6	800	Sample taken about 1115.

Garai (Duck Hole Creek)

At *Garai* one of the biggest concerns of the Bayulu-Gooniyandi Rangers is Noogoora Burr, which can be seen along the banks at both GP1 and GP2. The photos show that the Noogoora Burr dies back later in the dry season and during or after the wet season re-establishes itself on the banks. At both permanent photo points the Noogoora Burr is lower down the banks, which is a good thing according to the Bayulu-Gooniyandi Rangers, and it looks like the cattle have knocked some of it down. The Rangers suggest that as the 2009-2010 flood was of a smaller magnitude than 2008-2009, the water deposited Noogoora Burr seeds further down the bank, reducing the amount of Noogoora Burr growing along the top of the bank where people camp.

Although water quality monitoring showed extremely high levels of turbidity in *Garai*, the Bayulu-Gooniyandi Rangers believe the water shown in the photos is satisfactory. They explain how the water goes clean after the wet season flood and then the wind makes it dirty, before the site dries in preparation for the next flood season. Other TRaCK research in similar waterholes on the Mitchell River floodplain also show that water quality, particularly turbidity, can vary greatly between the late wet season after the floods and the late dry season. These patterns were observed in waterholes where there was no impact from cattle or pigs, suggesting the water quality in floodplain waterholes can be highly variable.

It is when the flood pushes the water through that it's good enough to drink, when the flood stops it is still acceptable to drink but then when it gets lower it gets too dirty to drink. Observations of researchers matched the description provided by the monitoring group. As the water level declined at *Garai* during the dry season turbidity increased. The sediment at the site was very fine, and the turbidity appeared to increase in relation to wind and wave action. Although it is difficult to make a definitive assessment of the causes of high turbidity without experimental manipulation of the site, *Garai* appears to be a naturally turbid waterhole. Water quality was given a high score to reflect the belief of the monitoring group that this was a natural feature of the site.

The GP2 August 2010 photo shows multiple cattle paths down the other side of the creek bank, which the Rangers suggested was normal and not of concern for *Garai*. The Rangers did express the opinion that the cattle tracks may encourage erosion, but *Garai* appeared to be considered an acceptable watering point for stock. According to the Bayulu-Gooniyandi Rangers there also used to be many more pigs in this area than was the case during the trial monitoring program.

The major concern of the Bayulu-Gooniyandi Rangers at *Garai* is the Noogoora Burr. Currently they are unsure how to manage the weed and would like to be trained in its removal. They would then like to generate a management action for its exclusion. The Bayulu-Gooniyandi Rangers would like the future condition of *Garai* to include at least a small area free of Noogoora Burr that can be used for camping and day trips.

Score

- *Water level:*	3/3	●
- *Cattle/Pig damage:*	3/3	●
- *Water quality/colour:*	3/3	●
- *Weeds:*	1/3	● Noogoora Burr is a substantial problem
- *Total*	10/12 (83%)	

Google Earth™ view of Winadjibun (dotted yellow lines show approximate direction of permanent photos)

***Winadjibun* (SP1): November 2009**

***Winadjibun* (SP1): August 2010**

***Winadjibun* (SP1): September 2010**

***Winadjibun* (SP2): November 2009**

***Winadjibun* (SP2): August 2010**

***Winadjibun* (SP2): September 2010**

Rubbish/Campfire

Location of the rubbish as counted at Winadjibun (Sandbar).

The cluster of marks represents the GPS coordinates of individual items of rubbish. During each recording period, rubbish was cleaned up as the coordinates were taking. So, each colour mark represents "new" rubbish; or rubbish that had been left behind since the last time the Rangers cleaned Winadjibun.

No effort was made to count and clean rubbish from the entire site as shown on this Google Earth™ image. The focus of recording and cleaning rubbish was on the main camping and fishing site at Winadjibun.

The GPS coordinates for rubbish at Winadjibun show that leaving rubbish behind was a continuing problem throughout the monitoring trial.

The number of marks on each of the Google Earth™ images on the left reflect the number of items of rubbish (and so, density/intensity of the rubbish).

*On 18th November 2009, **46** items of rubbish were counted and collected.*

*On 9th August 2010, **31** items of rubbish were counted and collected.*

*On 21st September 2010, **51** items of rubbish were counted and collected.*

Water quality

Site	Site code	Date taken	Dissolved oxygen (mg/L)	Electrical conductivity (µS/cm)	Nitrate (ppm)	Phosphate (ppm)	Temperature (˚C)	pH	Turbidity (RTU)	Comments
Winadjibun (Sandbar)	SP1	10 August 2010	6.6	190	0.35	0.01	-	6	4	Sample taken about 1234.
		21 September 2010	5.9	200	0.08	0.64	-	7	12	Sample taken about 1250.

Winadjibun (Sandbar)

At *Winadjibun* prior to the monitoring program starting in 2009 the sandbar was all sand and no rocks according to the Bayulu-Gooniyandi Rangers. They believe that over time the wet season floods have pushed or washed some of the sand out and exposed or deposited more rocks.

The photos taken at SP1 show little, if any, Noogoora Burr present in November 2009. However, it can be seen in the 2010 photos. At this photo site the Bayulu-Gooniyandi Rangers believe Noogoora Burr is becoming a problem.

According to the Bayulu-Gooniyandi Rangers, the photos of SP2 show a dry site due to little rain. During and after the flood the water runs along the both sides of the trees shown in the middle of the photo. The rangers recall *Pandanus aquaticus* used to line the river bank at SP2 and are not sure what event made them disappear. The Rangers believe people littering is currently the main problem at this site.

The Bayulu-Gooniyandi Rangers are happy about the current condition of *Winadjibun* and believe there are not any substantial issues beyond the constant littering of the site. Suggested management actions include placing a sign and temporary rubbish bin at the site. A sign for *Winadjibun* has already been drafted and is waiting for funding and a small amount of initial on-ground support. The Bayulu-Gooniyandi Rangers would also like to be able to provide rubbish bins at *Winadjibun* during big meetings and culture camps and coordinate their removal after the event to insure the site is kept clean.

Score

- *Water level:*	3/3	●
- *Cattle/Pig damage:*	3/3	●
- *Water quality/colour:*	3/3	●
- *Weeds:*	2/3	●
- *Rubbish:*	1/3	● Ongoing issue
- *Total*	12/15 (80%)	

Conclusion

During the course of the monitoring trial, the use of Indigenous cultural indicators was discussed. Given that some of the sites have substantial cultural significance, and the interpretation of changes at sites was often phrased in terms of spiritual beliefs, it was suggested that indicators of cultural health could be applied. The Bayulu-Gooniyandi Rangers decided not to adopt this approach. To the CSIRO scientists coordinating the program, it appeared as if there was some discomfort about the level of detail that would be required about cultural stories and knowledge if cultural indicators of healthy river country were used. However, the causes of physical changes observed were often described by drawing on Gooniyandi explanations; allowing the rangers to place impacts in context while controlling the level of cultural information communicated during monitoring.

The Bayulu-Gooniyandi rangers express a desire to be directly involved in looking after their traditional lands. They would like to be able to measure and monitor the changes at sites important to their language group. The group would also like to have the capacity to design and implement management action plans for their country and set up a funded ranger program. As with many Indigenous land management groups that are not fully funded or supported by external partners, the Gooniyandi Rangers express a desire to be involved in a formal, fully-funded ranger program where money is set aside for capacity building within the community.

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Tropical Rivers and Coastal Knowledge