



Malak Malak River Monitoring Report: 2009 – 2010

Marcus Finn, Pippa Featherston and the Malak Malak Land Management Rangers



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



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Introduction and Aims

Malak Malak is the name of an Aboriginal language group from the Daly River catchment in the Northern Territory. The group largely resides in and near the Nauiyu Nambiyu community (approximately 250 kilometres from Darwin) in the Northern Territory, and has traditional river country around the middle reach of the Daly River. Malak Malak lands are bordered by the lands of the Kungarakany (north), Wagiman (south-east), Ngen'giwumirri (south), Marramaninjsji (southwest), and Maranunggu, Kewema and Tjerratj (west) language groups. Malak Malak country is looked after by the Malak Malak Land Management Rangers. The Ranger group comprises approximately 8 members. It is supported by funds from the Caring for Country Unit of the Northern Land Council.

The Malak Malak Land Management Rangers are heavily involved in the management of their lands. The men invest substantial time and effort on physical weed controls; particularly the spraying of *Mimosa pigra* from quad bikes, four wheel drive spray units, and from helicopters when conditions are favourable. The women rangers have, for a number of years, been trialling and undertaking biological control methods; using a beetle to assist the control of *Salvinia* in billabongs and breeding and releasing a *Mimosa*-eating moth. The women rangers developed and implemented this monitoring program.

This report provides information on a year-long participatory monitoring program trial undertaken at river country sites significant to Malak Malak people during 2010. The research was funded through TRaCK (Tropical Rivers and Coastal Knowledge Research Hub) and undertaken by CSIRO Ecosystem Sciences. The research was conducted in accordance with the TRaCK Indigenous Engagement Strategy.

The relationship Malak Malak 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 Malak Malak Rangers during workshops coordinated by CSIRO scientists. Those indicators reflect aspects of the sites that they consider characteristic features, or the threats of concern to the Malak Malak Rangers (such as weeds).

Three monitoring methods were trialled. Of these, permanent photo points were the most successful. The results in this report focus on the interpretation of the photos.

Although the use of cultural indicators was raised during workshops, the Malak Malak Rangers preferred to focus on physical indicators for monitoring and reporting purposes.

Site Description

This report looks at a small number of sites located on Malak Malak river country (Figure 1). The Malak Malak Rangers picked sites that were important to them, and wanted to keep an eye on; are frequently used, and are accessible to regular monitoring.

At times this report refers to the cultural significance of the selected sites. However, Malak Malak 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 Malak Malak people.



Figure 1: Location of monitoring sites and Woolianna community.

Perredeli – Nicholas Creek/No Fish Creek

Nicholas Creek floods through the wet and runs into the early dry season (emptying *Tyemalagan*). The creek then dries during the dry season (in July/August). During parts of the year the site could be classified as a temporary freshwater tidal system, as during the big king tides water backs up through the site. The creek is the same billabong/creek system as the Kilfoyle.

The Malak Malak consider *Perredeli* as a good place to visit. It is a particularly good location for children as it is open and they can easily walk around. It is a good place for fishing, especially in April, and for spearing large catfish (*Arius* spp.) and mullet (*Liza ordensis*). There are also Barramundi (*Lates calcarifer*), Bull Sharks (*Carcharhinus leucas*), and occasionally Sawfish (*Pristis microdon*) and Freshwater Whipray (*Himantura dalyensis*).

Perredeli is a place that is used sparingly. The Malak Malak people usually get a few fish out of here and then leave it until the following weekend. The other language groups from Nauiyu don't visit this site much, so it isn't as heavily harvested as other places. The existence of artefacts points to the historical use and occupation of this area. The Malak Malak believe the artefacts are still there but the cooch grass has grown over them.

The Malak Malak are concerned about the site and see feral and domestic animals, and tourists that sometimes come here (from the river in boats usually, but some people have driven in), as threats to the creek. Despite these pressures, they believe it is a pretty good place to come and use.

Parnngala

The hydrology of *Parnngala* has changed, as in the past it used to dry up. The last time it dried two years in a row was in the 1990's and dead turtles were seen everywhere because Feral Pigs (*Sus scrofa*) had dug them up. In more recent times, it has dried each year to a couple of small patches of water. *Parnngala* fills when the floodwater backs up from *Dinggirriyet* and *Perredeli*.

Parnngala is a bush tucker spot. There is a lot of razor grass now, which never used to be there. In the dry season people would pick Lotus Lily (*Nelumbo nucifera*) seeds. As it got drier the Malak Malak would use the roots from the Lily. There is also another Lily (*Nymphaea violacea*) that people get from under the water. It can be wrapped and cleaned up in paperbark and then left in a big bag of paperbark to let them dry out. *Parnngala* is also a place where Long-necked Turtle (*Macrochelodina rugosa*) and Magpie Goose (*Anseranas semipalmata*) are found. Before they had guns, the Malak Malak used to throw sticks at the Magpie Geese from *Wirin*, the witchetty grub tree. .

At *Parnngala* Malak Malak are concerned about weeds such as Mimosa (*Mimosa pigra*) and razor grass. The Malak Malak recall the area as being an open plain. For example, 30 years ago one could drive around *Parnngala*. These days the vegetation is thick, and the pigs and buffalo have churned the edge up. The razor grass is also getting too thick and people have difficulty walking in there now. The increased density of razor grass is also crowding out the lilies.

***Tyemalagan* – Shark Swamp**

Tyemalagan consists of shallow water through the dry season, allowing people to wade across it. The swamp dries up every year in the late dry season and fills up with floodwater during the wet season when it backs up from *Perredeli*.

Tyemalagan is a good place for birds. Magpie Geese often fly here at night to rest and then during the day fly back to *Parngala* to feed. It is an important fishing spot. Sharks come into the billabong and can be caught when the water is shallow and hot. Turtles can be caught here too, mainly by digging them out of the mud rather than fishing for them. Sawfish are also sometimes found in *Tyemalagan*; although when people find them stuck they have been known to collect them and release them back in the river. It also used to be a stop-over place for people heading to Kilfoyle.

At *Tyemalagan*, the Malak Malak are concerned that stock and feral animal such as cattle, pigs, buffalo and horses are making a mess. They worry that *Tyemalagan* is not healthy anymore. There is often green slime here, when there used to be clear water. There also used to be grass right to the water's edge, but now there is extensive cattle pugging and pig digging. They are also concerned about the quality of the water. According to Malak Malak, you can't get water from *Tyemalagan* for a cup of tea or lunch anymore. The birds and animals have ruined the water quality, by coming to *Tyemalagan* in large numbers and making the water dirty. The Malak Malak Rangers have a photo of a person having a *bogy* (swim/wash) in *Tyemalagan* from years ago. The photo shows the water was a deep blue colour, now it is dirty.

***Tyin'kwereng* – Bamboo Creek**

Tyin'kwereng is a long winding creek that heads up towards Coppermine Creek. It is a temporary stream that stops running around early-mid dry season (approximately June); however there is some permanent water in pools along it. The Malak Malak think *Tyin'kwereng* is silting up and probably used to hold water in it for longer.

Tyin'kwereng has a lot of names along its length, the result of numerous significant sites. It is a main bait creek and people start fishing here around April or March, as they can't fish here during the height of the wet season. *Tyin'kwereng* used to be main camping site for Aboriginal people and the river used to be a lot deeper. Luggers/ships used to come right up the river as Woolianna (community) was the landing for a copper mine. One of the current Malak Malak Rangers was also born at *Tyin'kwereng*.

The Malak Malak people are worried about the mud and sedimentation at *Tyin'kwereng* and about erosion, particularly near the mouth. They also see people trying to drive in and camp on the bank and other recreational pressures as a concern.

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 Malak Malak Rangers, and represented those sites that were:

- Seen as being important to Malak Malak people 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 Malak Malak monitoring program, a few simple monitoring 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 equipment that might be expensive or hard to maintain. Of the methods trialled below, the photo-points proved the most successful.

Permanent photo points

Photos were taken from the same spot, looking in the same direction, on each of the sampling trips. Although it was not easy/possible to measure precisely whether things were getting better or worse (usually done with numbers or “quantitative” data), this method gave a visual reference of each site during each trip. By viewing the photos in a time series, it is possible to see changes.

Photos 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 – animal damage and plants

Transects are used to get a repeatable measurement of the density (how thick they are) of cattle/pig damage, weed infestations and plants like lilies. To make sure the measurements could be repeated by different people and at different times, the length of the transect was set at 50 m. 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 benefit of this simple method was considered to outweigh the need for absolute percentage cover measurements in our context. This method was only used once, as the women rangers are quite senior, and walking across a pig damaged, muddy billabong was physically very difficult (particularly in the November

“build up” heat). A detailed method and datasheet for the transect density can be found in the methods document that accompanies this report.

Catch information recording

If the site was listed as a good fishing or bush tucker site, particularly for things like fish and turtles, then catch recording may be useful. Although population counts for species like Long-necked Turtle and Barramundi can be labour intensive and quite hard, it can be easy to record information about what people catch.

This method records information on the size and weight of items that are caught. Although this will mean information will only be collected for what can be caught (i.e. you never get sizes and weights of tiny little barramundi 5cm long), it can show if the things being caught are changing in size over time. It could be important if there are no more big turtle being caught (maybe people are taking too many?) or if there are no small turtle being caught (maybe the number people are taking is OK, but there are no baby ones being hatched anymore). A detailed method and datasheet of catch information recording 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 and site-specific discussion

Permanent photo points

Site name	Site code	GPS	Compass direction	Date taken	Information
<i>Perredeli</i> (Nicholas Creek)	WP228	13°35'46.8"S 130°34'32.8"E	360° Stitch	6 August 2010	Nicholas Creek Camp Tree
					Nicholas Creek
<i>Parnngala</i>	PP1	13°39'03.3"S 130°35'39.8"E	Stitch	November 2009 6 August 2010 21 October 2010	Parnngala Billabong showing pig and cattle damage
	PP2	13°39'25.4"S 130°35'39.0"E	Stitch	November 2009 6 August 2010 21 October 2010	Parnngala Billabong near old camping location
<i>Tyemalagan</i> (Shark Swamp)	WP225	13°36'35.6"S 130°35'45.6"E	Stitch	6 August 2010 21 October 2010	Shark Swamp standing at water's edge
	WP226	13°36'36.0"S 130°35'45.2"E	Stitch	6 August 2010 21 October 2010	Shark Swamp showing water's edge

Site name	Site code	GPS	Compass direction	Date taken	Information
<i>Tyin'kewerang</i> (Bamboo Creek)	TP1	13°40'05.2"S 130°39'31.0"E	Stitch	6 August 2010 20 October 2010	Bank condition of the Daly River at its confluence with Bamboo Creek
	TP1-1	13°40'05.2"S 130°39'31.0"E	338°	November 2009 6 August 2010 20 October 2010	Bank erosion just downstream of confluence of Bamboo Creek and Daly River
	TP1-2	13°40'05.2"S 130°39'31.0"E	168°	November 2009 6 August 2010 20 October 2010	Bank condition just upstream of confluence of Bamboo Creek and Daly River
	TP2	13°40'10.6"S 130°39'34.6"E	350°	November 2009 6 August 2010 20 October 2010	Upstream side of road bridge across Bamboo Creek (Woolianna bank)
	TP3	13°40'09.5"S 130°39'34.2"E	120°	November 2009 6 August 2010 20 October 2010	Upstream side of road bridge across Bamboo Creek (Naiyu bank)
	TP4	13°40'09.5"S 130°39'34.3"E	Directly upstream	November 2009 6 August 2010 20 October 2010	Bamboo Creek upstream side of road bridge (from centre of bridge)
	TP5	13°40'09.6"S 130°39'34.1"E	Directly downstream	November 2009 6 August 2010 20 October 2010	Bamboo Creek downstream side of road bridge (from centre of bridge)

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



Perredeli (WP228a): August 2010



Perredeli (WP228b): August 2010



***Perredeli* (Nicholas Creek)**

Consecutive permanent photo-points were not taken at *Perredeli* due to its inaccessibility. The site is only accessible when the ground is completely dry during the dry season. Even then, the track into the site is very rough, and reaching the site can be time consuming. However, the photos are included in this report so they can be compared to any that may be taken in the future.

According to Malak Malak Rangers, *Perredeli* doesn't look very healthy any more. They believe it is under threat from cattle, buffalo and crocodiles. They remember the creek having cane grass along the banks in the past. The cane grass has now disappeared, probably due to cattle, pigs and horses.

The photos show that there is no water in the creek during August 2010, although larger spring tides can back the water up through this part of the system. The ground around the site is open grassland, heavily grazed by cattle. Where the vehicle is parked is a camp site, and the photo of the creek itself shows some young Noogoora Burr (*Xanthium occidentale*) plants growing. Feral pigs were observed leaving the site when we arrived during another trip, but there is no obvious feral pig damage as seen at other sites.

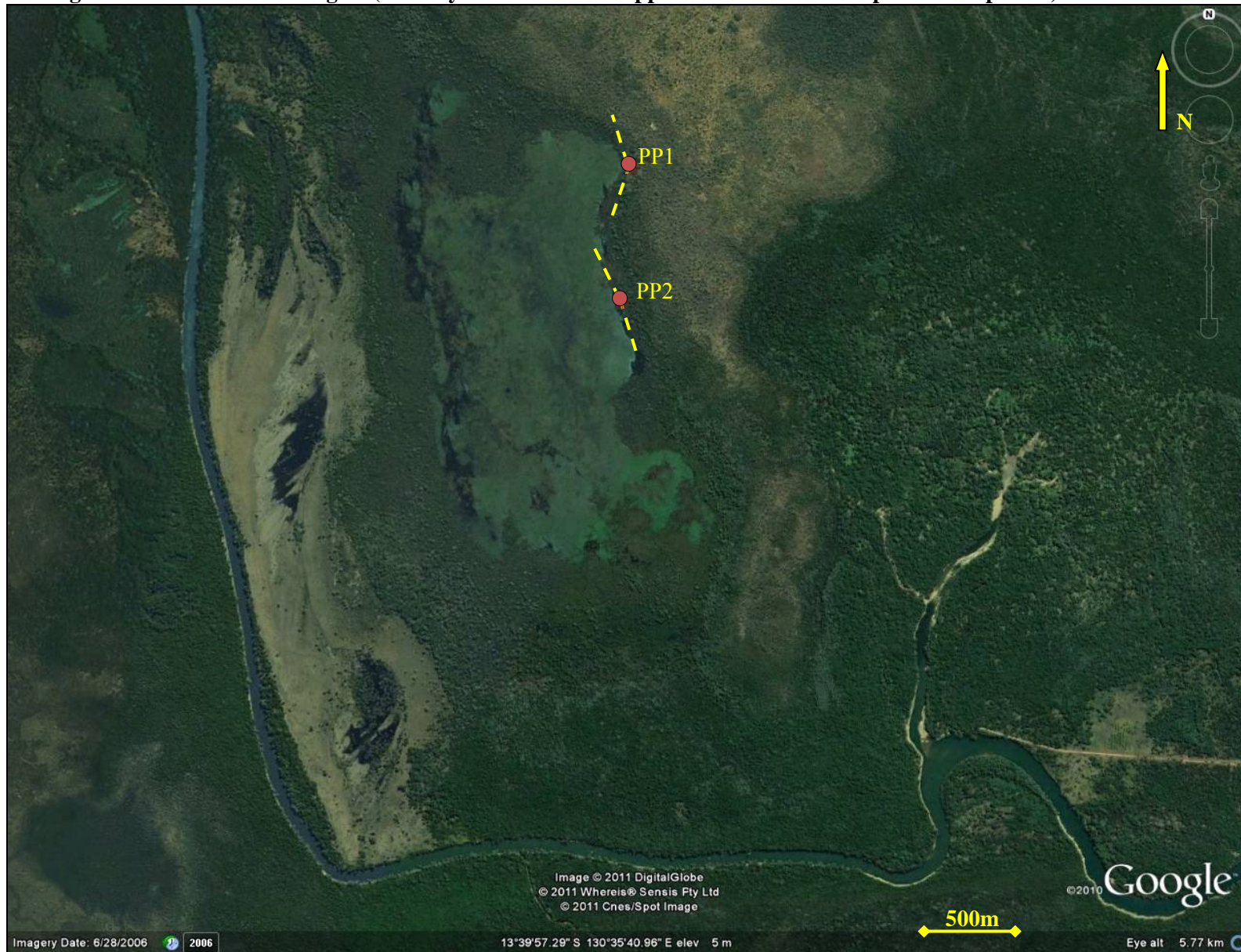
The Rangers preferred management intervention for *Perredeli* includes getting rid of Mimosa, and stopping buffalo and cattle damaging the creek and its banks. This is a good place to look after for the children, as it is a place they can learn how to fish so they don't tangle their lines down at the river.

A Score

- Cattle/Animal damage:	2/3	●
- Water quality/colour:	3/3	●
- Bank erosion/condition:	2/3	●
- Weeds:	2/3	●

<u>Total</u>	<u>9/12 (75%)</u>
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A Google Earth™ view of Parnngala (dotted yellow lines show approximate direction of permanent photos)



Parnngala (PP1): November 2009



Parnngala (PP1): August 2010



Parnngala (PP1): October 2010



Parnngala (PP2): November 2009



Parnngala (PP2): August 2010



Parnngala (PP2): October 2010



Parnngala

The permanent photo points at *Parnngala* show the dramatic seasonal changes that occur over the space of a year. Photos taken in November 2009 show little water and evidence of prior pig damage, especially at site PP1. After the wet season, Lotus Lilies (*N. nucifera*) regrow in *Parnngala* (seen in August 2010). At this time the density of lilies is very high.

As the water recedes during the dry season, the edges are dug up by feral pigs (seen in October 2010). By October 2010 the lilies are disappearing from the edges of the billabongs, possibly as a result of being dug up by feral pigs. There were still lilies present in the middle of *Parnngala* where the water was deeper.

The Rangers say the billabong used to be clearer, and fill up with water right to top. They have also noticed changes in the trees growing at the edge of *Parnngala*, which are denser and make access to the billabong problematic.

The Rangers suggest that the majority of changes seen at *Parnngala* are the result of feral animals. The permanent photos taken in August and October 2010 suggest how many lilies the pigs eat and push over by the end of the dry season. The Rangers say that because the pigs and buffalo push the ground into mounds and holes, they now see the lilies growing in sideways directions instead of straight up and wonder if it is affecting the health of the plant. It is also believed that the cattle and other animals urinating in the water burns the lilies and make them grow haphazardly. The Rangers also note that the lilies shown in these permanent photos are shorter than in other years and should be longer, although an explanation was not given.

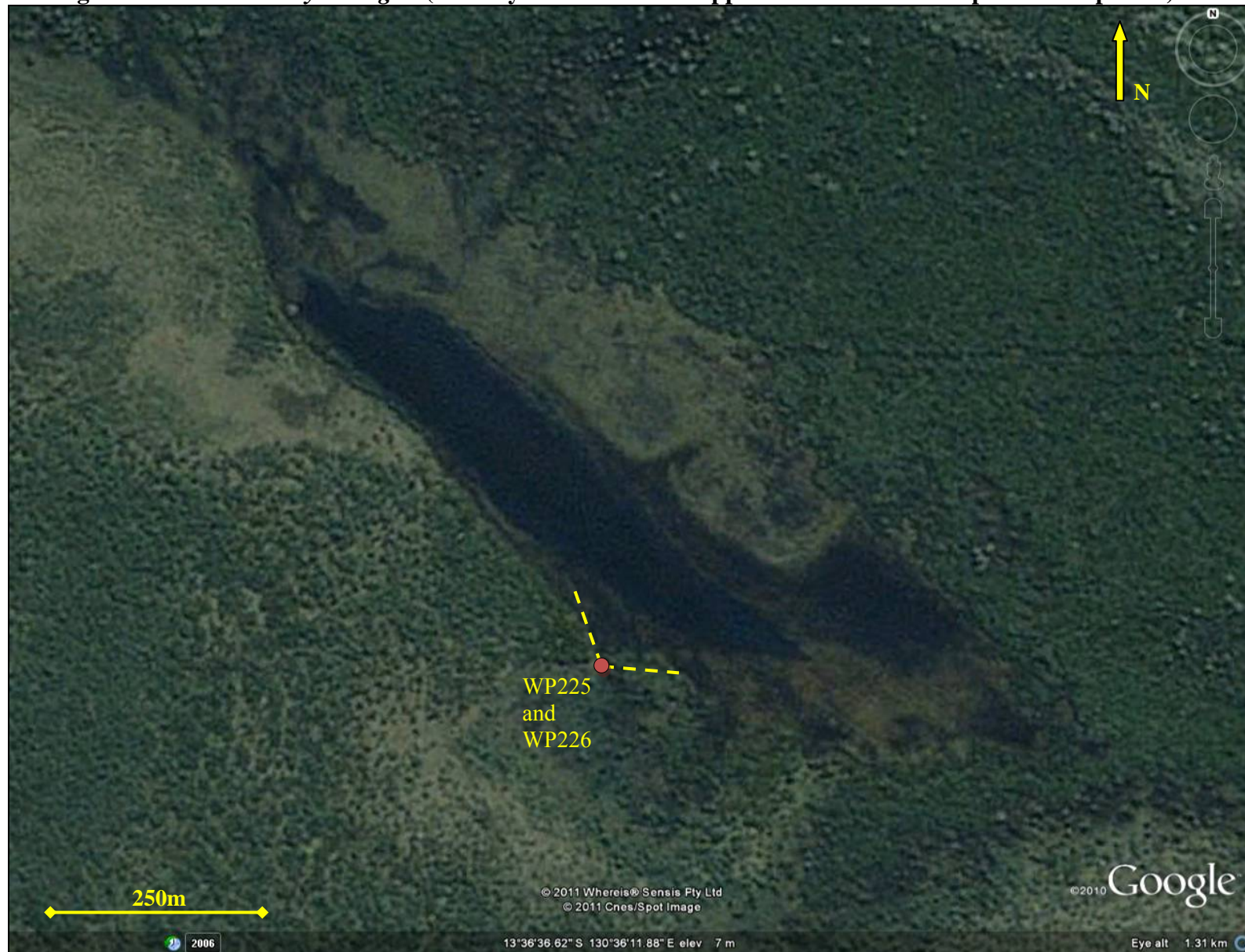
TRaCK research in waterholes on the Mitchell River floodplain supports these observations of seasonal impacts of feral pigs and cattle. The impacts of cattle and pigs increase over the dry season as the waterholes recede and more introduced animals congregate around them. Vegetation becomes trampled, the edges become muddy and the water becomes more turbid. In years when the waterholes dry up completely, turtle shells are found as the pigs dig them up too. Observations from the Mitchell River floodplain suggest that the impacts of cattle and pigs are much greater in smaller and more shallow waterholes, and that the wet season floods are important for these waterholes by providing an opportunity to recover from cattle and pigs impacts.

The management interventions the Rangers would like to see at *Parnngala* include preventing the access of cattle, buffalo and pigs and continuing the control of Mimosa.

A Score

-	<i>Water level:</i>	3/3	●	Extensive pig digging removing vegetation and disturbing soil
-	<i>Cattle/Pig damage:</i>	1/3	●	
-	<i>Vegetation health:</i>	1/3	●	
-	<i>Soil condition:</i>	1/3	●	
-	<i>Weeds:</i>	2/3	●	
<u><i>Total</i></u>		<u>8/15 (53%)</u>		

A Google Earth™ view of *Tyemalagan* (dotted yellow lines show approximate direction of permanent photos)



Tyemalagan (WP225): August 2010



Tyemalagan (WP225): October 2010 (photo taken from slightly different point)



Tyemalagan (WP226): August 2010



Tyemalagan (WP226): October 2010 (photo taken from slightly different point)



***Tyemalagan* (Shark Swamp)**

Permanent photo-points were taken at *Tyemalagan* in August and October 2010. Ground cover increased, and canopy cover of bank-side trees thickened at both photo points during the three months between captures.

The Rangers believe *Tyemalagan* is silting up and are quite concerned. They recall *Tyemalagan* having Lotus Lilies in the past, something that no longer happens due to cattle, pigs and buffalo. Water quality appears to be poor. The water goes green through the dry season, and is often dirty. It used to be clear and blue. The Rangers suggest this is as a result of cattle and pigs, and also the large number of water birds that mess the water up.

The Rangers suggest the fencing of cattle from *Tyemalagan* may be a first step in management intervention for the area. They have asked the near-by station owner to muster the cattle and keep them inside the neighbouring property. The Rangers would also like to continue to work on the control and removal of Mimosa.

A Score

-	<i>Water level:</i>	3/3	●	Clear decline in living memory
-	<i>Cattle/Pig damage:</i>	2/3	●	
-	<i>Water quality/colour:</i>	1/3	●	
-	<i>Vegetation health:</i>	3/3	●	
-	<i>Weeds:</i>	3/3	●	
<u><i>Total</i></u>		<u>12/15 (80%)</u>		

A Google Earth™ view of *Tyin'kwereng* (dotted yellow lines show approximate direction of permanent photos)



A Google Earth™ view of *Tyin'kwereng* (solid yellow lines show approximate direction of permanent photos)



Tyin'kwereng (TP1): August 2010



Tyin'kwereng (TP1): October 2010



Tyin'kwereng (TP1-1): November 2009



Tyin'kwereng (TP1-1): August 2010



Tyin'kwereng (TP1-1): October 2010



Tyin'kwereng (TP1-2): November 2009



Tyin'kwereng (TP1-2): August 2010



Tyin'kwereng (TP1-2): October 2010



Tyin'kwereng (TP2): November 2009



Tyin'kwereng (TP2): August 2010



Tyin'kwereng (TP2): October 2010



***Tyin'kwereng* (TP3): November 2009**



***Tyin'kwereng* (TP3): August 2010**



***Tyin'kwereng* (TP3): October 2010**



Tyin'kwereng (TP4): November 2009



Tyin'kwereng (TP4): August 2010



Tyin'kwereng (TP4): October 2010



Tyin'kwereng (TP5): November 2009



Tyin'kwereng (TP5): August 2010



Tyin'kwereng (TP5): October 2010



***Tyin'kewereng* (Bamboo Creek)**

Changes observed at Bamboo Creek have been of concern to Malak Malak people for many years.

Six permanent photo points were established at *Tyin'kewereng* to monitor bank condition, erosion (especially near the mouth), and sedimentation. Permanent photo points TP1, TP1-1 and TP1-2 focus on the mouth of Bamboo Creek where it joins the Daly River, while TP2, TP3, TP4 and TP5 capture Bamboo Creek from the Woolianna Road bridge.

Photos taken from TP1 and stitched together suggest a small increase in water level between August and October 2010, probably as a result of rainfall slightly before the October sampling trip. Photos from TP2, TP3, TP4 and TP5 also suggest there was a flush of water down the creek and river between August and October 2010. Vegetation and sediment has been removed from the bed of the creek between these dates, and a shrub has been washed out of the centre of the photo of TP2. The photos also show some die-back (or washing away) of Noogoora Burr between August and October.

TP1 shows a substantial bank slump downstream of the creek mouth. This area of bank slump is very near a place where Malak Malak people used to camp. Over the year of permanent photos at this location, the area of erosion did not appear to get larger or change in any way. This period of time included a wet season, where water levels were at the top of the bank and there were substantial erosive forces.

Photos were taken at TP1-1, TP1-2, TP2, TP3, TP4 and TP5 in November 2009, August 2010 and October 2010. So, these locations are shown over the course of a year. Almost all photos points (TP1-2, TP2, TP3, TP4 and TP5) show the cycle of Noogoora Burr growth. The first photos in November 2009 show little obvious Noogoora Burr. Subsequent photos during August 2010 show extensive stands of dry Noogoora Burr, suggesting that the plant has regrown and gone to seed between these times. Few plants are still present in November 2010. However, photo points TP2 and TP4 suggest that grasses providing close ground cover do not grow well under stands of Noogoora Burr. This would suggest that Noogoora Burr may promote the erosion of banks (by out-competing low grasses, but dying back prior to the wet season and exposing the soil), although more specific work is required for confirmation.

The Rangers are concerned that the mud that helps hold the banks together is washing into the river, leaving just sand and gravel and making the banks unstable. The Rangers used the colour of the dirt in the photographs to indicate whether the soils were good. Light brown dirt suggests the soil is very powdery, and is capable of being washed away. Darker brown soil suggests the presence of black soil or clays that stabilise the bank and make them more resistant to erosion. TRaCK research on the lower Daly River suggests there has been considerable erosion of riverbanks due to large wet season flows over the last 20-30 years. These large flows are likely due to the wetter-than-average wet seasons over this period rather than any changes in land-use upstream. However, this increased erosion has led to more sediments being moved throughout the lower Daly River which could also be contributing to observed changes in floodplain waterholes as sediments are moved onto the floodplain during floods.

Present in some of the photos, and downstream of the creek mouth, there is a registered sacred site (Blue-tongue Dreaming). There are some smooth rocks near-by where the Blue-tongue Lizard walked down the bank, smoothing the place out. The Rangers say that the Blue-tongue dreaming place never changes like the rest of the river, even when the floods go through, because it is a sacred site.

The Rangers have already started management intervention for *Tyin'kewereng*. They would like to keep cars and caravans away from the river bank to prevent further erosion and have the area blocked off. They are also managing Noogoora Burr at times by poisoning.

Score

-	<i>Water level:</i>	3/3	●
-	<i>Water quality/colour:</i>	3/3	●
-	<i>Sedimentation/erosion:</i>	2/3	●
-	<i>Soil condition</i>	2/3	●
-	<i>Weeds:</i>	2/3	●

<u>Total</u>	<u>12/15 (80%)</u>
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Conclusion

Of the monitoring methods employed during this program, permanent photo points appeared to work the best and were considered a useful tool by the group. Transects to measure the density of plants and feral animal damage in billabongs were only used once due to their time consuming and physically difficult nature. Similar (although less quantitative) information could be derived from photos, and so this became the focal method of measuring chosen indicators. Some measurement of traditional harvest was taken opportunistically (see Appendix 1). Although discussed as a method of measuring the size and health of “bush tucker” (and keeping track of this over time), harvest activities (such as fishing and hunting) were not undertaken as a part of the monitoring program.

The discussion of the condition of each site is largely informed by the permanent photos. The “traffic light” summary includes a percentage mark. This percentage supplies a broad indication of the relative condition of each site, providing ideas for where to begin management interventions. Of the four sites considered during this monitoring trial, *Perredeli*, *Tyemalagan*, and *Tyin’kewereng* all has a similar score (75-80 per cent). *Parnngala* however, had a much lower score of 53 per cent as a result of the extensive feral pig damage to the site. Overall, our monitoring suggests that management priorities for each site should be:

- *Perredeli*: cattle access to creek banks;
- *Parnngala*: feral pigs;
- *Tyemalagan*: water quality (cattle, pigs, birds); and
- *Tyin’kewereng*: erosion (possibly related to Noogoora Burr)

Ultimately, the method that worked was the use of permanent photo points. The following quote provides some indication of people’s thoughts on the method, and highlights the reason they continue to devote valuable time to land management programs.

The photos are really good, because we can see and think about what’s happening to that place. I’m worried for that place...Been looking at them photos, and feel sorry for that land.

– Biddy Lindsey, Malak Malak Land Management Ranger.

Appendix

Catch information recording

Site: Elizabeth Downs (not a monitoring site).

Date	Species	How was it caught?	Length (in cm)	Weight in (Kg)				Does the species look...?				How was it shared?
				Weight	Bag?	What kind?	Total weight	Healthy/fat	Normal	Skinny/sick	Why?	
8 Nov 2009	Long-necked Turtle	Stick in mud	20.0	1.30	√	Green bag 0.08 Kg	1.22		√	√	Not all that fat	Caught on weekend and alive out the back in an old freezer until it is cooked
8 Nov 2009	Long-necked Turtle	Stick in mud	29.2	3.61	√	Green bag 0.08 Kg	3.53		√	√	Not all that fat	Caught on weekend and being kept alive in old freezer until they are eaten
8 Nov 2009	Long-necked Turtle	Stick in mud	30.5	3.55	√	Green bag 0.08 Kg	3.47			√	Not very fat	Caught on weekend and being kept alive until it can be eaten
8 Nov 2009	Long-necked Turtle	Stick in mud	29.5	3.96	√	Green bag 0.08 Kg	3.88		√	√	Not all that fat	Caught on weekend and is being kept alive until eaten
8 Nov 2009	Long-necked Turtle	Stick in mud	20.5	1.33	√	Green bag 0.08 Kg	1.25		√	√	Not all that fat	Caught on weekend and being kept alive in old freezer out the back.
8 Nov 2009	Long-necked Turtle	Stick in mud	29.0	3.54	√	Green bag 0.08 Kg	3.46		√	√	Not that fat	Caught on weekend and being kept out back in old freezer to be used
8 Nov 2009	Long-necked Turtle	Stick in mud	23.2	1.71	√	Green bag 0.08 Kg	1.63		√	√	Not too fat	Caught on weekend and being kept alive until they can be eaten
8 Nov 2009	Long-necked Turtle	Stick in mud	28.5	3.29	√	Green bag 0.08 Kg	3.21		√	√	Not too fat	Caught on weekend and being kept alive until can be eaten



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