KOONDROOK-PERRICOOTA FOREST WETLAND "HOTSPOTS" ASSESSMENT



Funded under the Living Murray Initiative

Prepared by Western Murray Land Improvement Group for Forestry Corporation of NSW



Western Murray Land Improvement Group Inc. June 2021 John Conallin & Dan Hutton

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Front cover image: Smokehouse Lagoon at the peak of the 2016 natural flooding event (Hutton 2016)

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Introduction

Koondrook and Perricoota State Forests (the forest) are a 32,000ha forest on the northern bank of the Murray River, lying between the townships of Moama upstream and Barham downstream. Together with Gunbower Forest, the three forests form the Gunbower Koondrook-Perricoota Ramsar listed wetland site and The Living Murray Icon Site. The forest is managed by Forestry Corporation of NSW as a commercial forest.

River regulations have resulted in reductions in the frequency and duration of natural flooding events causing severe deterioration in the health and condition of wetland ecology within the forest. Construction of significant infrastructure including inflow and outflow regulators and a levee bank, was completed in 2103 to enable managed environmental delivery to inundate up 50% of the forest however; unresolved third-party impacts currently restrict the operational capabilities of the scheme.

Over the past five years investigations and reconstruction within the forest of seasonal residential patterns and economic activities of historical Aboriginal communities have been undertaken using archaeological, environmental, and hydrological information. The result is a picture of local Aboriginal people living in large groupings – villages like settlements – around specific water bodies. These lagoons and waterholes selected for settlement are adjacent to large wetlands, which historically were highly productive offering a wide variety, density and stability of food and other natural resources. It is reasonable to deduce these specific locations were ecological 'hotspots' and central to the community's cultural, social and economic structures. In identifying the preferred locations of the Aboriginal village like settlements, we present the case for modification of environmental water delivery from large area forest flooding to targeted smaller water bodies that form ecological "hot spots" throughout the forest landscape. (Pardoe Hutton 2020).

A pilot study of 24 locations across the forest was undertaken in 2020/21 to identify Aboriginal village like settlements and associated ecological "hot spots". The field surveys covered 1,255ha which represents approximately 4% of the whole forest. A total of 465 Aboriginal heritage sites were recorded. Preliminary examination and evaluation of the locations and data sets indicates 5 locations match the characteristics indicative of Aboriginal village like settlements and associated ecological "hot spots".

Background

The objective of this project was to conduct an assessment of current fish habitat quality and potential at identified key, pilot wetland locations within Koondrook-Perricoota Forest. This project forms Stage 1 of an interannual small-bodied fish habitat enhancement program, with the view for recommendations to be built upon in subsequent years through a strategic adaptive management approach.

Three locations were selected based on the following criteria;

- 1. The locations match the characteristics indicative of Aboriginal village settlements and associated ecological "hot spots"
- 2. Locations currently have the capacity to retain water for more than 12 months
- 3. Inundation is achievable with low flow rates and small volumes of water
- 4. Inundation is achievable with existing infrastructure
- 5. Inundation is achievable with minimal impacts to third-parties.

Methodology

Working from the data recorded during the pilot study of Cultural and Ecological "Hotspot" mapping, potential locations were selected for field assessment. A field assessment was then conducted and a number of variables measured at each selected wetland site. This included using a Fish Habitat Assessment template (Appendix A) for establishing baseline physical habitat conditions at each site, including pre-watering and post-watering needs for each site to support native fish populations.

Activities Schedule

All activities will be completed by 30th June 2021 and will include;

- 1. Review and evaluate relevant existing material
 - Collate existing relevant material
 - Review and evaluate relevant existing material.
- 2. KPF Community Visioning & Objectives Workshop
 - Develop and deliver workshop
 - Determine community's environmental/economic/social/cultural Objectives.
- 3. Field assessments
 - Selection of 3 pilot study locations based on 2020/21 IPP project recommendations.
 - Develop assessment process, protocols and field sheets
 - Determine field assessment team members
 - Provide appropriate assessment training
 - Conduct field assessments and record data
 - Selection of 3+ sites for prioritisation in Stage 2 habitat assessments.
- 4. Data Analysis
 - Collate recorded data
 - Analysis and evaluate data
 - Coalescence with other projects.
- 5. Community Presentation of Findings & Recommendation
 - Written presentation of findings and recommendations to the community.
- 6. Reporting
 - Full written scientific report including photographs, maps and data set
 - Written community summary of findings and recommendations, including cost Shortlisted sites for assessment in Stage 2.
 - Provide collated data set.

Habitat Assessment

Development of the fish habitat assessment will occur at the commencement of the program and will include recording the following location/site information;

- Dimensions of wetland
- Water retention capabilities
- Silt deposit
- Hydrological impediments
- Water quality risks
- Instream Habitat
- Wetland vegetation species
- Tree health
- Historically recorded wetland ecology
- Others to be determined.

McMahon's Waterhole

Location Description:

McMahon's Waterhole is located at the downstream end of McMahon's Creek with flows exiting to the north and feeding into the largest wetland area within KP forest known as Cumbungie Waterholes and Rookery. The waterhole is a relatively narrow, incised channel, approximately 1,750m long and running south/north. Large Aboriginal earth mounds situated adjacent to the lagoon are consistent with long-term, seasonal, residential occupation over several thousand years. Hydrological data indicates portions of the waterhole retain water for in excess of 12 months following flooding. It is reasonable to assume the lagoon would have retained permanent water pre-River regulations and the locality been a highly productive wetland. Large, fallen ringbarked trees have combined with historical logging debris moved during flooding to form a number of large log jams across the waterhole.

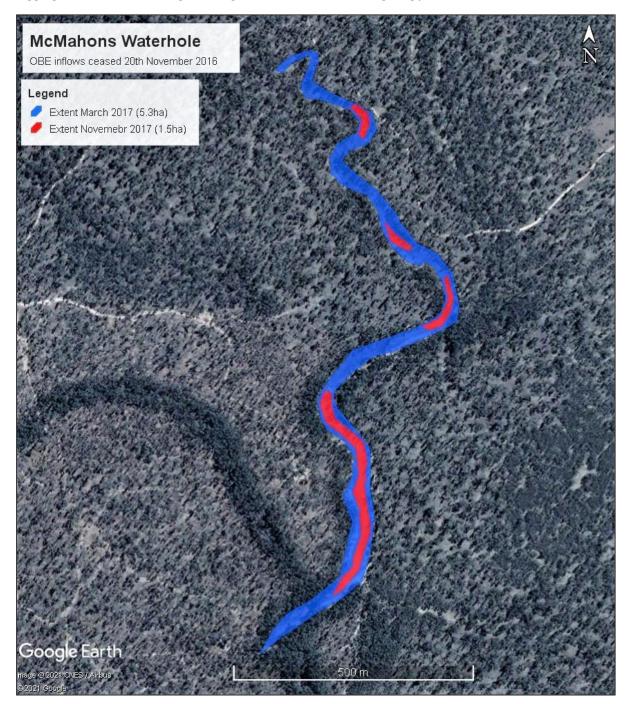


Figure 1: Map of McMahon's Waterhole

Characteristics

Location: H55 252860E 6049207N (GDA 94). Flood Source: McMahon's Creek. Distance from Offtake Regulator: 35km. Dimensions: Length: 1,750m. Width (max): 45m. Depth (max): 1.5m. Area of inundation: 5.31ha (4 months after 2016 OBE inflows ceased). Water Retention: 1.5ha (28%) (12 months after 2016 OBE inflows ceased).

Fish Habitat Potential (See appendix A for Templates)

Site large enough to possibly support permanent water and populations of native fish. However, currently dry and lacking in any type of submerged or emergent vegetation to support fish populations. Excess of LWD that is causing hydrology problems. Higher up the system that other wetlands so possibility to water more frequently to maintain extent.

Recommendations

Pre-Watering Needs

- Critical due to watering planned 2021
- Logjam and red gum sapling removal
- ACH site protection/rehabilitation
- Sediment depth tested
- Sediment cores for later analysis
- "Wetland Restoration" public signage.

Post-Watering Needs

- Wetland revegetation
- Pest animal & weed control.



Figure 2: one of the logjams within McMahons Waterhole

Smokehouse Lagoon

Location Description:

Smokehouse Lagoon is located on Smokehouse Creek and feed from flows exiting the Rookery and Cumbungie Waterholes. Flows exit the lagoon to the north into a large wetland area before flowing into Long Lagoon. The lagoon is an incised channel, approximately 1,350m long and running south/north. Large Aboriginal earth mounds situated adjacent to the lagoon are consistent with long-term, seasonal, residential occupation over several thousand years. Hydrological data indicates portions of the waterhole retain water for in excess of 12 months following flooding. It is reasonable to assume the lagoon would have retained permanent water pre-River regulations and the locality been a highly productive wetland. Large, fallen ringbarked trees have combined with historical logging debris moved during flooding to form a number of large log jams across the waterhole.

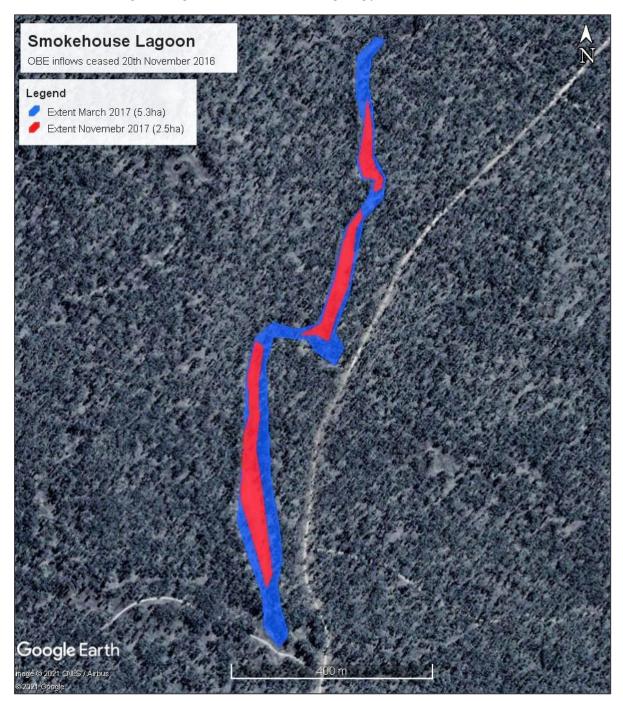


Figure 3: Map of Smokehouse Lagoon

Characteristics

Location: H55 250672E 6053656N (GDA94). Flood Source: Smokehouse Creek. Distance from Offtake Regulator: 40km. Dimensions: Length: 1,350m. Width (max): 70m. Depth (max): 1.8m Area of inundation: 5.34ha (4 months after 2016 OBE inflows ceased). Water Retention: 2.4ha (48%) (12 months after 2016 OBE inflows ceased).

Fish Habitat Potential (See appendix A for Templates) Smokehouse Lagoon (Reaches - South and North)

A large lagoon with a south and north lagoon which has good adequate size and depth to support native fish. However, it is currently dry and lacks any submerged or emergent vegetation. A small section of phragmites remains but is in poor condition. Woody debris is present in such abundance it is affecting hydrology and connection between the north and south reach as well as the exit. Sediment may be impacting the depths, but adequate depth is available for water retention over a 12-month period.

Recommendations

Pre-Watering Needs

- Not critical due to watering planned 2021
- Logjam and red gum sapling removal
- ACH site protection/rehabilitation
- Sediment depth tested
- Sediment cores for later analysis
- "Wetland Restoration" public signage.

Post-Watering Needs

- Wetland revegetation
- Pest animal & weed control.



Figure 4: one on the logjams within Smokehouse Lagoon

Long Lagoon

Location Description:

Long Lagoon is located downstream of Smokehouse Creek and feed from flows exiting the large wetland area to the south east. Flows exit the lagoon to the north west to eventually form Cow Creek and exit the forest. The lagoon is relatively wide with gentle sloping banks, approximately 1,350m long with flows running southeast/northwest. Large Aboriginal earth mounds situated adjacent to the lagoon are consistent with long-term, seasonal, residential occupation over several thousand years. Hydrological data indicates portions of the waterhole retain water for in excess of 12 months following flooding. It is reasonable to assume the lagoon would have retained permanent water pre-River regulations and the locality been a highly productive wetland. Large, fallen ringbarked trees have combined with historical logging debris moved during flooding to form a number of large log jams across the waterhole.

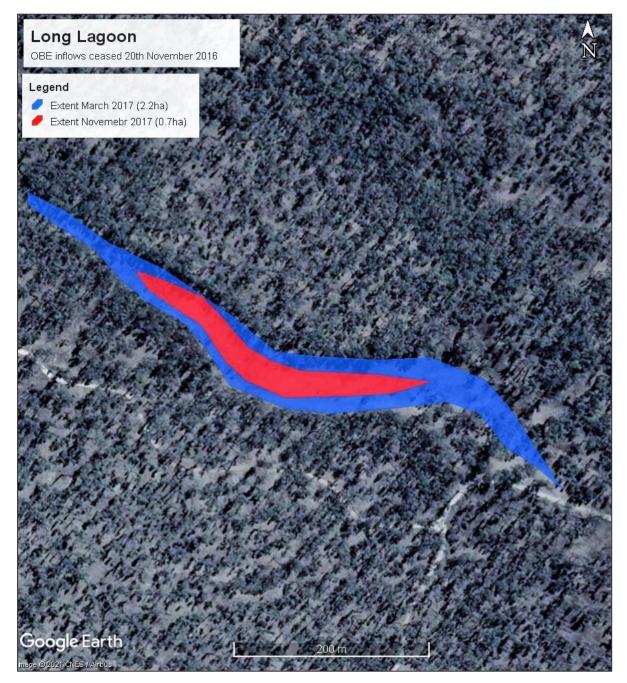


Figure 5: Map of Long Lagoon

Characteristics

Location: 55H 249060E 6055602N (GDA 94). Flood Source: Smokehouse Creek. Distance from Offtake Regulator: 43km. Dimensions: Length: 660m. Width (max): 55m. Depth (max): 1.4m. Area of inundation: 2.2ha (4 months after 2016 OBE inflows ceased). Water Retention: 0.7ha (31%) (12 months after 2016 OBE inflows ceased).

Fish Habitat Potential (See appendix A for Templates)

A long wide shallow lagoon with potential to support a permanent population of native fish. In centre of lagoon depth is adequate to maintain itself for over 12 months. However, currently dry and lacking in any submerged or emergent vegetation, except for one remnant patch of phragmites in poor condition. Depth may be impacted by sediment deposition. Infestation of redgum saplings in bed of lagoon.

Recommendations

Pre-Watering Needs

- Critical due to watering planned 2021
- Logjam and red gum sapling removal
- ACH site protection/rehabilitation
- Sediment depth tested
- Sediment cores for later analysis
- "Wetland Restoration" public signage.

Post-Watering Needs

- Wetland revegetation
- Pest animal & weed control.



Figure 6: one of the logjams within Long Lagoon

References

Pardoe, C. Hutton, D (2020): Aboriginal heritage as ecological proxy in south-eastern Australia: A Barapa wetland village, Australasian Journal of Environmental Management.

Appendix A: Wetland Fish Habitat Assessment Templates

McMahons Waterhole

Koondrook Perricoota Fish	h Habitat N	lapping Template	e						
Location/Site Details									
Site Location Name	McMah	ons Waterhole	Da	ate	20/06/2021				
Reach	1								
WayPoint	H55	Easting	25	52860E	Northing	6049207N		GDA94	
Photos	1		2			3			
	4		5			6			
Description	Dry	wet							
Surface Area(m2,ha)	60,000	6	5 W	etted De	pth	0-0.5	.5-1.0	1-1.5	1.5-2.0
Est Width (widest pt)	45m		W	etted Wi	dth (Now)	Dry			
Est Length (max)	1,750m		М	lin Start S	eason Depth				
Water Source	McMah	ons Creek	М	lin End Se	ason Depth				
NATIVE VEGETATION									
NATIVE VEGETATION									
Canopy Health	Good	Poor	Dy	ying	Regrowth				
Submergent- Most of the P	Plant struct	ure below water							
Type/Species									
Cover	None	125	25	550	5075	75100			
Emergent Vegetation - Mo	ost of the pl	ant structure out	of the	e water a	n on bank				
Type/Species	Phragmi	tes							
Cover	None	125	25	5 50	50-75	75 100			
Floating Vegetation - Surfa	ice area of	wetland covered	by flo	oating veg	getation				
Type/Species									
Cover	None	1 25	25	5 50	50-75	75 100			
Other Vegetation - Trees, a	acacias, sal	t bushes on banks	5						
Type/Species	Gum tre	es on banks, old i	man v	weed incl	nannel				
Cover	None	1 25	25	5 50	50-75	75100			
Shading - How much of we	etland shad	ed at midday							
Cover	None	125	25	550	5075	75100			
Instream Structure - LWD,	undercut b	anks							
Presence	None	in-channel	ba	anks	submerged	both			
Exotics	Deer		-						
Stock Access	Yes	No	Gr	razing lea	se is available,	no sign of dar	nage		
		-							
	Deer no								
-	Clear	Dark/Tannin	Tu	ırbid	Other				
						oval. red gur	n suckers		
		-				.erai, i cu gui			
		-			_	water entry	point so		
Other comments			-	-	-				
Submergent- Most of the P Type/Species Cover Emergent Vegetation - Mo Type/Species Cover Floating Vegetation - Surfa Type/Species Cover Other Vegetation - Trees, of Type/Species Cover Shading - How much of we Cover Instream Structure - LWD, of Presence	Plant structs None None Phragmi None ace area of the None Clear Yes Deer no Clear Pre-wat Post Wa Infested Possible	ure below water 125 ant structure out tes 125 wetland covered 1-25 t bushes on banks, old of 1-25 ed at midday 125 anks in-channel No No	25 of the 25 by flo 25 ; man v 25 ba 6r Gr Tu g jam n and ed gur naller	550 e water a 550 bating veg 550 anks razing lea urbid is at exit p l pest ani ms, long volumes	50-75 in on bank $50-75$ getation $50-75$ submerged ase is available, if other points need rem mal monitoring way down from as high in syste	75 100 75 100 75100 75100 both 0 hoo sign of dat 0 water entry 0	n suckers		



McMahons Waterhole – photo 1



McMahons Waterhole – photo 2

Smokehouse Lagoon (South)

Koondrook Perricoota F	ish Habitat	Mapping Templa	ite					
Location/Site Details								
Site Location Name	<u>Smokeh</u>	ouse Lagoon	Date	20/06/2021				
Reach	<u>South</u>							
Waypoint	H55	Easting	250672E	Northing	6053656N		GDA94	
Photos	1		2		3			
	4		5		6			
Description	Dry	wet						
Surface Area(m2)	25,000		Wetted De	epth	0-0.5	.5-1.0	1-1.5	1.5-2.0
Est Width (widest pt)	100m		Wetted W	idth (Now)	Dry			
Est Length (max)	500m		Min Start S	Season Depth				
Water Source	Myloc		Min End S	eason Depth				
NATIVE VEGETATION								
Canopy Health	Good	Poor	Dying	Regrowth				
Submergent- Most of th	e Plant struc	ture below wate	r					
Type/Species								
Cover	None	1-25	25 50	50-75	75 100			
Emergent Vegetation - I	Most of the p	olant structure ou	It of the water	an on bank				
Type/Species	Phragmi	tes, in very poor	condition					
Cover	None	125	25 50	50-75	75 100			
Floating Vegetation - Su	rface area of	f wetland covere	d by floating v	egetation				
Type/Species								
Cover	None	1_25	25 50	50-75	75 100			
Other Vegetation - Tree	s, acacias, sa	lt bushes on ban	ks					
Type/Species	red gum	trees on banks,	old man weed					
Cover	None	1-25	25 50	50 75	75100			
Shading - How much of	wetland sha	ded at midday						
Cover	None	125	2550	5075	75100			
Instream Structure - LW	D, undercut	banks						
Presence	None	in-channel	banks	submerged				
Exotics	No plant	s, but sign of dee	er					
Stock Access	Yes	No		der grazing lease				
Ferals	Yes	No	Deer were	sighted				
Туре	deer							
Water Quality								
Clarity	Clear	Dark/Tannin	Turbid	Other	Dry			
Restoration Needs	Pre -	Pre-water - Sig	nificant Log ja	ms at exit points	need removal,	,		
	Post	Post Water - R	evegetation a	nd pest animal mo	onitoring			
Other comments		A few instrean	n red gums					
		Difficult to wa	ter with small	volumes				
		Old stands of p	ohragmites exi	st but very poor o	condition			



Smokehouse Lagoon – south Photo 1



Smokehouse Lagoon – south Photo 2

Smokehouse Lagoon (North)

Koondrook Perricoota	Fish Habitat N	Vapping Templat	e					
Location/Site								
Site Location Name	Smokehous	e Lagoon	Date	20/06/2021				
Reach	North							
Waypoint	H55	Easting	250672E	Northing	6053656N	GDA94		
Photos	1		2		3			
	4		5		6			
Description	Dry	wet						
Surface Area (m2,ha)	50,000	5	Wetted Dep	th	0 0.5	.5 1.0	1 1.5	1.5-2.0
Est Width (widest pt)	100m		Wetted Wid	th (Now)				
Est Length (max)	1,000m		Min Start Se	ason Depth				
Water Source	Myloc		Min End Sea	son Depth				
NATIVE VEGETATION								
Canopy Health	Good	Poor	Dying	Regrowth				
Submergent- Most of th	he Plant struct	ture below						
water								
Type/Species								
Cover	None	1 25	25 50	50-75	75 100			
Emergent Vegetation -	Most of the p	lant structure out	t of the water a	n on bank				
Type/Species								
Cover	None	125	2550	5075	75100			
Floating Vegetation - Su vegetation	urrace area or	wetland covered	by hoating					
Type/Species								
Cover	None	1 25	25 50	50-75	75 100			
Other Vegetation - Tree		-			/0 100			
Type/Species		on bank, old man		_				
Cover	None	125	2550	5075	75100			
Shading - How much of		-						
Cover	None	125	2550	5075	75100			
Instream Structure - LW		-						
Presence	None	in-channel	banks	submerged				
Exotics	Deer							
Stock Access	Yes	No	Under grazir	ng lease but no vis	ible stock dam	age		
Ferals	Yes	No	0.000			-0-		
Туре	Some deer							
Water Quality								
Clarity	Clear	Dark/Tannin	Turbid	Other	Dry			
,	Pre-water -	Significant Log ja	ms at exit poin	ts need removal,	red gum sucke	rs		
Restoration Needs								
		- Revegetation a	•	-				
		stream with red g	gums, long way	down from wate	r entry point			
Other commerts	SO difficult to y	Nator with and I	(olumos					
Other comments		water with small v		rcondition				
	Old stands (of phragmites exi	st but very poc	or condition				



Smokehouse Lagoon – north photo 1



Smokehouse Lagoon – north photo 2

Long Lagoon

Koondrook Perricoota Fish	Habitat Mar	ping Template						
Location/Site Details		1.0.0.000						
Site Location Name	Long lage	oon	Date	20/06/2021				
Reach	1			-,,				
Waypoint	H55	Easting	249060E	Northing	6055602N	GDA94		
Photos	1	0	2	0	3			
	4		5		6			
Description	Dry	wet	0		C C			
Surface Area (m2, Ha)	28,000	2.8	Wetted De	pth	0-0.5	.5-1.0	1-1.5	1.5-2.0
Est Width (widest pt)	80m		Wetted Wi	•	Dry			
Est Length (max)	400m			eason Depth	,			
Water Source		ouse Creek		eason Depth				
NATIVE VEGETATION								
Canopy Health	Good	Poor	Dying	Regrowth				
Submergent- Most of the P			- /8					
Type/Species								
Cover	None	1 25	25 50	50-75	75 100			
		*	00					
Emergent Vegetation - Mo	st of the plan	t structure out of ti	he water an o	n bank				
Type/Species	Phragmit							
Cover	None	125	2550	5075	75100			
Floating Vegetation - Surfa	ce area of we	tland covered by f	loating vegeta	ation				
Type/Species			0 0					
Cover	None	125	2550	5075	75100			
Other Vegetation - Trees, a	icacias, salt b	ushes on banks						
Type/Species	Redgums	on banks, old mar	n weed in bed	ł				
Cover	None	125	2550	5075	75100			
Shading - How much of we	tland shaded	at midday						
Cover	None	125	25 50	50-75	75 100			
Instream Structure - LWD,	undercut ban	ks						
Presence	None	in-channel	banks	submerged				
Exotics	No plants	s or animal damage	e visible					
Stock Access	Yes	No	Grazing lea	ise is available but n	o sign of dam	age		
Ferals	Yes	No						
Туре	Deer skat	t noticed						
Water Quality								
Clarity	Clear	Dark/Tannin	Turbid	Other	Dry			
Destaustice Nee 1	D				velve a-			
Restoration Needs				removal, red gum su	lickers			
Other comments		er - Revegetation a		_				
Other comments				vay down from wate	r entry point	50		
		o water with small		oor condition				
	Ju stand	ls of phragmites ex	kist but very p					



Long Lagoon – photo 1



Long Lagoon – photo 2