KOONDROOK-PERRICOOTA FOREST WETLAND "HOTSPOTS" ASSESSMENT

Funded under the Living Murray Initiative

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

Striking a Balance

Western Murray
Land Improvement Group Inc.

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Report Title: Koondrook-Perricoota Forest – Wetland Hotspot Assessment

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We acknowledge the Barapa Barapa & Yorta Yorta people, Traditional Owners of Koondrook-Perricoota Forest and surrounding country. I thank them for their continuous generosity, support and friendship. My thanks and appreciation to members of the Moama & Deniliquin Local Aboriginal Land Councils for their constant backing and on-ground efforts. My gratitude to the staff and members of Western Murray Land Improvement Group for their commitment to the local environment and inclusion of the local community at all times.

Document History			
Version	Author(s)	Date	Reviewed by
Draft 1.0	John Conallin, Dan Hutton	June 2021	David Leslie (FCNSW)
Final 1.1	John Conallin, Dan Hutton		

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

Contents

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.

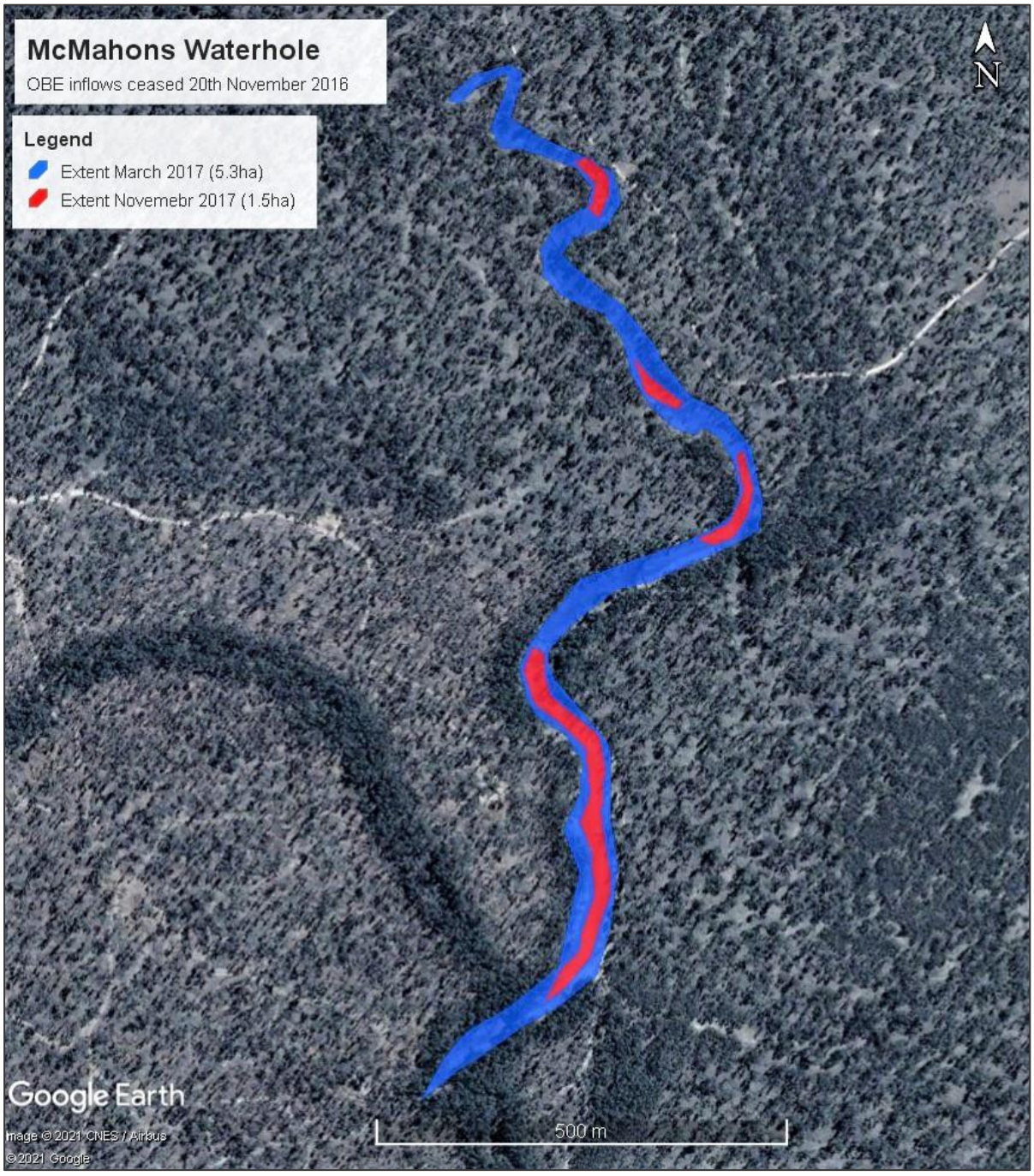

Figure 1: Map of McMahon's Waterhole

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.

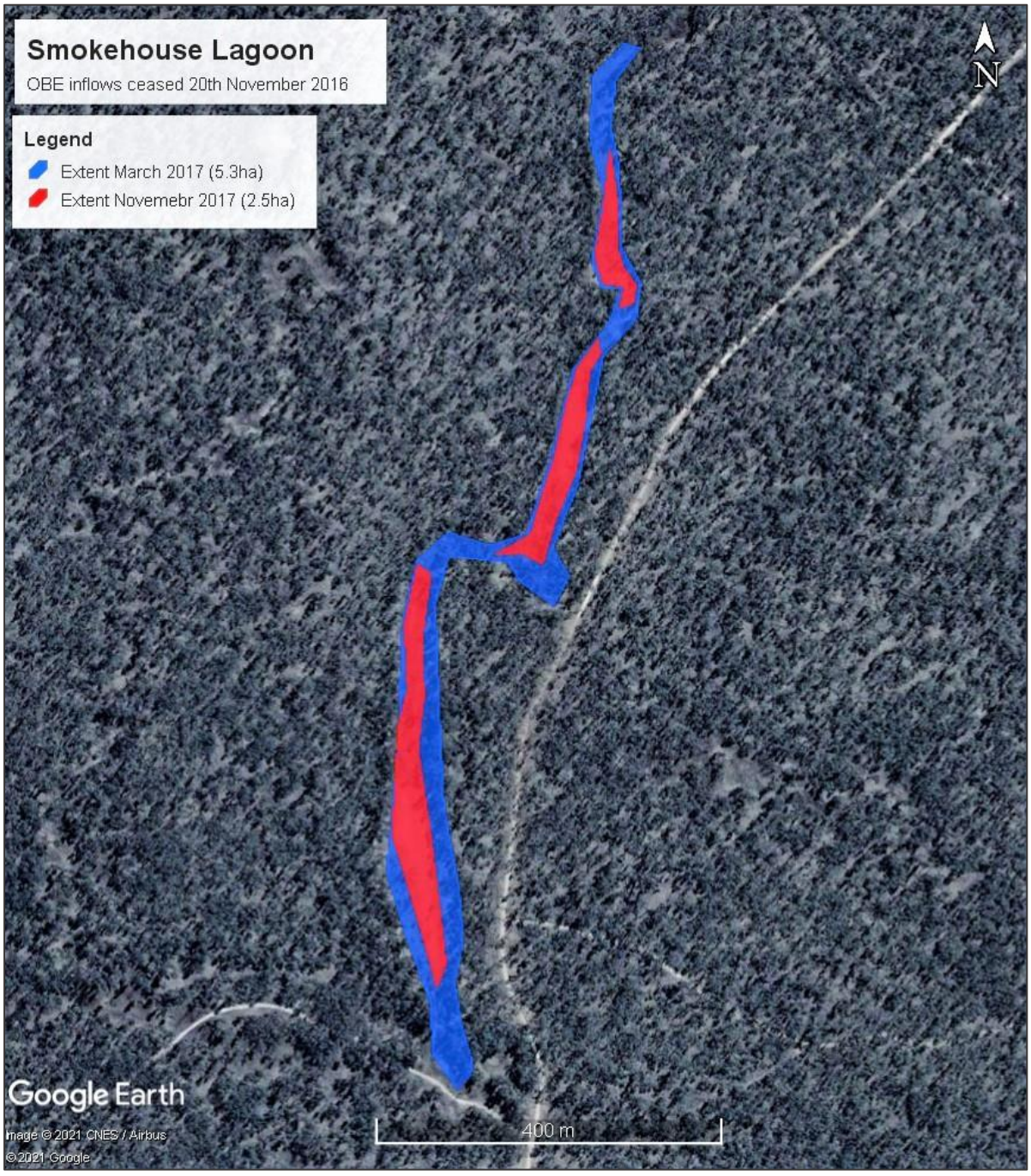

Figure 3: Map of Smokehouse Lagoon

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.

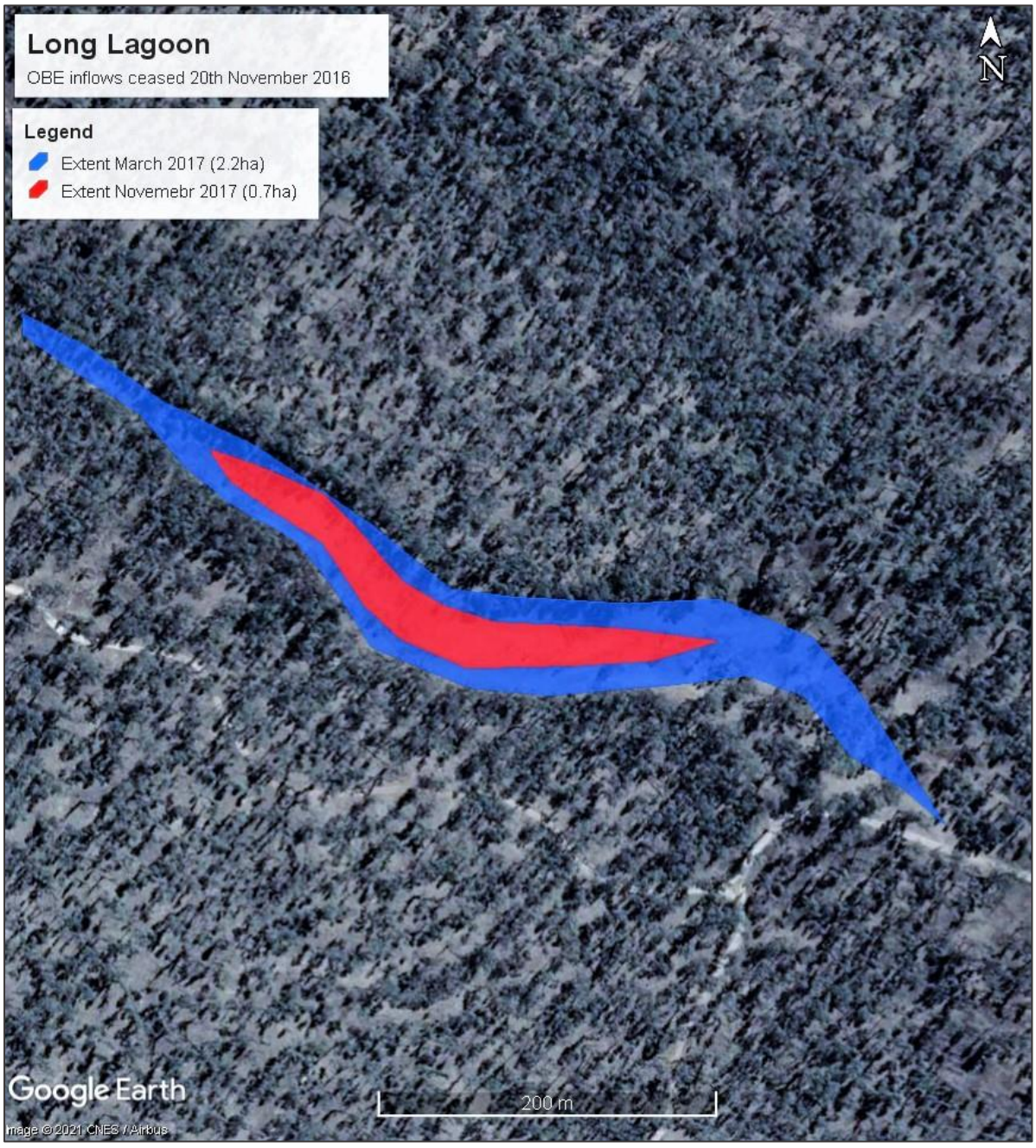

Figure 5: Map of Long Lagoon

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 Habitat Mapping Template								
Location/Site Details								
Site Location Name	**McMahons Waterhole**		Date	20/06/2021				
Reach	1							
WayPoint	H55	Easting	252860E	Northing	6049207N		GDA94	
Photos	~~1~~		2		~~3~~			
	~~4~~		~~5~~		~~6~~			
Description	Dry	~~wet~~						
Surface Area(m2,ha)	60,000	6	Wetted Depth		~~0-0.5~~	~~.5-1.0~~	~~1-1.5~~	1.5-2.0
Est Width (widest pt)	45m		Wetted Width (Now)		Dry			
Est Length (max)	1,750m		Min Start Season Depth					
Water Source	McMahons Creek		Min End Season Depth					
NATIVE VEGETATION								
NATIVE VEGETATION								
Canopy Health	~~Good~~	Poor	Dying	~~Regrowth~~				
Submergent- Most of the Plant structure below water								
Type/Species								
Cover	None	~~1--25~~	~~25--50~~	~~50--75~~	~~75--100~~			
Emergent Vegetation - Most of the plant structure out of the water an on bank								
Type/Species	Phragmites							
Cover	~~None~~	1--25	~~25--50~~	~~50--75~~	~~75--100~~			
Floating Vegetation - Surface area of wetland covered by floating vegetation								
Type/Species								
Cover	None	~~1--25~~	~~25--50~~	~~50--75~~	~~75--100~~			
Other Vegetation - Trees, acacias, salt bushes on banks								
Type/Species	Gum trees on banks, old man weed inchannel							
Cover	~~None~~	~~1--25~~	~~25--50~~	~~50--75~~	75--100			
Shading - How much of wetland shaded at midday								
Cover	~~None~~	1--25	~~25--50~~	~~50--75~~	~~75--100~~			
Instream Structure - LWD, undercut banks								
Presence	~~None~~	in-channel	banks	submerged	both			
Exotics	Deer							
			Grazing lease is available, no sign of damage					
Stock Access	Yes	~~No~~						
Ferals	Yes	~~No~~						
Type	Deer noticed							
Water Quality								
Clarity	Clear	Dark/Tannin	Turbid	Other				
Restoration Needs	Pre-water - Significant Log jams at exit points need removal, red gum suckers							
	Post Water - Revegetation and pest animal monitoring							
	Infested in stream with red gums, long way down from water entry point so							
Other comments	Possible to water with smaller volumes as high in system							
	Old stands of phragmites exist but very poor condition							

McMahons Waterhole – photo 1

McMahons Waterhole – photo 2

Smokehouse Lagoon (South)

Koondrook Perricoota Fish Habitat Mapping Template								
Location/Site Details								
Site Location Name	**Smokehouse Lagoon**		Date	20/06/2021				
Reach	**South**							
Waypoint	H55	Easting	250672E	Northing	6053656N		GDA94	
Photos	1		2		~~3~~			
	~~4~~		~~5~~		~~6~~			
Description	Dry	~~wet~~						
Surface Area(m2)	25,000		Wetted Depth		~~0-0.5~~	~~.5-1.0~~	~~1-1.5~~	1.5-2.0
Est Width (widest pt)	100m		Wetted Width (Now)		Dry			
Est Length (max)	500m		Min Start Season Depth					
Water Source	Myloc		Min End Season Depth					
NATIVE VEGETATION								
Canopy Health	~~Good~~	Poor	Dying	~~Regrowth~~				
Submergent- Most of the Plant structure below water								
Type/Species								
Cover	None	~~1--25~~	~~25--50~~	~~50--75~~	~~75--100~~			
Emergent Vegetation - Most of the plant structure out of the water an on bank								
Type/Species	Phragmites, in very poor condition							
Cover	~~None~~	1--25	~~25--50~~	~~50--75~~	~~75--100~~			
Floating Vegetation - Surface area of wetland covered by floating vegetation								
Type/Species								
Cover	None	~~1--25~~	~~25--50~~	~~50--75~~	~~75--100~~			
Other Vegetation - Trees, acacias, salt bushes on banks								
Type/Species	red gum trees on banks, old man weed							
Cover	~~None~~	~~1--25~~	~~25--50~~	~~50--75~~	75--100			
Shading - How much of wetland shaded at midday								
Cover	None	1--25	~~25--50~~	~~50--75~~	~~75--100~~			
Instream Structure - LWD, undercut banks								
Presence	~~None~~	in-channel	banks	submerged				
Exotics	No plants, but sign of deer							
Stock Access	Yes	~~No~~	Area is under grazing lease					
Ferals	Yes	~~No~~	Deer were sighted					
Type	deer							
Water Quality Clarity	~~Clear~~	~~Dark/Tannin~~	~~Turbid~~	~~Other~~	Dry			
Restoration Needs	Pre -	Pre-water - Significant Log jams at exit points need removal,						
	Post	Post Water - Revegetation and pest animal monitoring						
Other comments		A few instream red gums						
		Difficult to water with small volumes						
		Old stands of phragmites exist but very poor condition						

Smokehouse Lagoon – south Photo 1

Smokehouse Lagoon – south Photo 2

Smokehouse Lagoon (North)

Koondrook Perricoota Fish Habitat Mapping Template								
Location/Site								
Site Location Name	**Smokehouse 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 Depth		~~0-0.5~~	~~.5-1.0~~	~~1-1.5~~	1.5-2.0
Est Width (widest pt)	100m		Wetted Width (Now)					
Est Length (max)	1,000m		Min Start Season Depth					
Water Source	Myloc		Min End Season Depth					
NATIVE VEGETATION								
Canopy Health	~~Good~~	Poor	Dying	~~Regrowth~~				
Submergent- Most of the Plant structure below water								
Type/Species								
Cover	None	~~1-25~~	~~25-50~~	~~50-75~~	~~75-100~~			
Emergent Vegetation - Most of the plant structure out of the water an on bank								
Type/Species								
Cover	~~None~~	1--25	~~25--50~~	~~50--75~~	~~75--100~~			
Floating Vegetation - Surface area of wetland covered by floating vegetation								
Type/Species								
Cover	None	~~1-25~~	~~25-50~~	~~50-75~~	~~75-100~~			
Other Vegetation - Trees, acacias, salt bushes on banks								
Type/Species	Gum trees on bank, old man weed inchannel							
Cover	~~None~~	~~1--25~~	~~25--50~~	~~50--75~~	75--100			
Shading - How much of wetland shaded at midday								
Cover	~~None~~	1--25	~~25--50~~	~~50--75~~	~~75--100~~			
Instream Structure - LWD, undercut banks								
Presence	~~None~~	in-channel	banks	submerged				
Exotics	Deer							
Stock Access	Yes	~~No~~	Under grazing lease but no visible stock damage					
Ferals	Yes	~~No~~						
Type	Some deer noticed							
Water Quality								
Clarity	~~Clear~~	~~Dark/Tannin~~	~~Turbid~~	~~Other~~	Dry			
Restoration Needs	Pre-water - Significant Log jams at exit points need removal, red gum suckers Post Water - Revegetation and pest animal monitoring							
Other comments	Infested in stream with red gums, long way down from water entry point so difficult to water with small volumes Old stands of phragmites exist but very poor condition							

Smokehouse Lagoon – north photo 1

Smokehouse Lagoon – north photo 2

Long Lagoon

Koondrook Perricoota Fish Habitat Mapping Template

Location/Site Details

Site Location Name	**Long lagoon**		Date	20/06/2021				
Reach	1							
Waypoint	H55	Easting	249060E	Northing	6055602N	GDA94		
Photos	1		2		3			
	4		5		6			
Description	Dry	~~wet~~						
Surface Area (m2, Ha)	28,000	2.8	Wetted Depth		~~0-0.5~~	~~.5-1.0~~	~~1-1.5~~	1.5-2.0
Est Width (widest pt)	80m		Wetted Width (Now)		Dry			
Est Length (max)	400m		Min Start Season Depth					
Water Source	Smokehouse Creek		Min End Season Depth					

NATIVE VEGETATION

Canopy Health	~~Good~~	**Poor**	**Dying**	~~Regrowth~~	
Submergent- Most of the Plant structure below water					
Type/Species					
Cover	None	~~1--25~~	~~25--50~~	~~50--75~~	~~75--100~~
Emergent Vegetation - Most of the plant structure out of the water an on bank					
Type/Species	Phragmites				
Cover	None	1--25	~~25--50~~	~~50--75~~	~~75--100~~
Floating Vegetation - Surface area of wetland covered by floating vegetation					
Type/Species					
Cover	None	~~1--25~~	~~25--50~~	~~50--75~~	~~75--100~~
Other Vegetation - Trees, acacias, salt bushes on banks					
Type/Species	Redgums on banks, old man weed in bed				
Cover	None	~~1--25~~	~~25--50~~	~~50--75~~	75--100
Shading - How much of wetland shaded at midday					
Cover	None	1--25	~~25--50~~	~~50--75~~	~~75--100~~
Instream Structure - LWD, undercut banks					
Presence	~~None~~	**in-channel**	**banks**	**submerged**	
Exotics	No plants or animal damage visible				
Stock Access	Yes	~~No~~	Grazing lease is available but no sign of damage		
Ferals	Yes	~~No~~			
Type	Deer skat noticed				
Water Quality					
Clarity	~~Clear~~	~~Dark/Tannin~~	~~Turbid~~	~~Other~~	Dry
Restoration Needs	Pre-water - Log jams at exit points need removal, red gum suckers				
	Post Water - Revegetation and pest animal monitoring				
Other comments	Infested in stream with red gums, long way down from water entry point so difficult to water with small volumes				
	Old stands of phragmites exist but very poor condition				

Long Lagoon – photo 1

Long Lagoon – photo 2