Access Database

Tree Condition

To assess changes in the condition of woodland trees along river-floodplain and/or wetlandfloodplain gradients; a sub-sample of individual trees were surveyed based on increasing distances from either the river and/or wetland edges and then assigned to distance categories (note: where possible trees were selected to be within the monitoring plots) These distance categories varied within each site.

The sub-sample of trees (n = 45 per study location) were randomly selected within each riverfloodplain and/or wetland-floodplain distance category (Table 1) and tagged (using yellow cattle tags). Tree position was recorded using a handheld GPS (Garmin® GPSMap62s) so that the same trees could be monitored for the period of the weir pool raising. An assessment of tree crown condition was undertaken using the technique developed by Souter et al. (2008; 2010). This method takes into consideration: crown extent and density, bark form, epicormic growth and state, reproduction, crown growth, leaf die off and damage, and mistletoe (Souter et al. 2010). Therefore, condition and trajectory (whether condition is improving or declining) was assessed (Souter et al. 2008; 2010). The presence and location of any germinated Eucalyptus camaldulensis seedlings observed during the field surveys (if any) were also recorded (and marked with GPS).

Water Potential

Predawn water potential (Ψpredawn) measurements are used to indicate plant water status because Ψpredawn can vary between individuals and co-existing species, providing an index of the water extraction capacity of root systems (Aranda et al. 2000). Predawn shoot potentials, in particular, are useful as a consistent measure of soil moisture, based on the assumption that Ψpredawn is in equilibrium with the soil-water (Ψsoil) accessed by roots (Schulze and Hall 1982). In particular, Ψpredawn is not influenced by daytime transpiration, while daytime leaf water potential measurements depend strongly on transpiration as well as soil water status. Predawn water potentials are also independent of differences in rooting depth and soil water access and unlike volumetric soil moisture content, Ψpredawn is independent of soil texture (Zhou et al. 2016). Hence Ψpredawn is often compared with measurements of Ψsoil at different soil depths to infer where plants may be sourcing their water (Flanagan et al. 1992). Predawn water potential of the shoots (a shoot being approximately 5-10 leaves) were measured using a PMS Instrument Company Model 1000 Pressure Bomb (Oregon, USA) (Scholander et al. 1965) from the aforementioned sub-sample of 45 trees per study location; randomly selected within each river-floodplain and/or wetland-floodplain distance category (Table 1). Two shoots from each tree (n = 90) were collected before sunrise (Ψpredawn MPa) transferred to seal lock bags and processed within approximately ten minutes of sampling. Measurements were also conducted at midday (Ψmidday MPa) solar radiation (~11:00 to 13:30) to confirm that trees were actively transpiring (i.e. (Ψmidday (more negative) ≠ Ψpredawn (less negative) in actively transpiring trees).

Understorey

Within each wetland monitoring plot, three transects were established (Figure 4) perpendicular to the waterline (Figure 5). Note that a wetland monitoring plot could not be established at the Moorook site because an impenetrable stand of Phragmites australis was present, hence vegetation composition was very different to the sites at Big Toolunka Flat and Woolenook Bend. For Moorook, the wetland littoral vegetation surveys were therefore undertaken at the nearby Loch Luna wetland (34°13'51.19"S, 140°22'54.27"E) to monitor changes. Quadrats (1 x 15 m) were established on each transect at 0 cm (River Murray NPL), and then at 10 cm elevation intervals from +0.1 m to +0.6 m (inclusive), measured using a laser level, parallel to the shoreline or bank (Figure 5). Species abundance was measured by frequencies; where the quadrat was split into fifteen, 1 x 1 m cells and plants present in each cell recorded. Therefore, a species has a score of between 0 (not present) and 15 (present in each cell) for a quadrat. A cell with no live plants present was given a score of one for bare soil. This method has been used successfully for a number of vegetation monitoring projects in South Australia upstream of Wellington (Weedon and Nicol 2006; Weedon et al. 2007; Marsland et al. 2008; 2009; Gehrig et al. 2010; Nicol 2010; Nicol et al. 2010), at Markaranka (Marsland and Nicol 2009) and the Lindsay Mullaroo system and Hattah Lakes (C. Campbell pers. comm.) and are recommended standardised methods for obtaining vegetation data (Department of Environment, Water and Natural Resources 2012). Plants were identified to species (where possible) using keys in Jessop and Tolken (1986), Jessop et al. (2006), Cunningham et al. (1992), Dashorst and Jessop (1998), Sainty and Jacobs (1981; 2003), Prescott (1988) and Romanowski (1998). Nomenclature follows the Centre for Australian National Biodiversity Research and Council of Heads of Australasian Herbaria (2016). The presence and location of any germinated weed species observed during the field surveys (if any) were also recorded (and marked with GPS).

Trip Dates

Dates for the field components of the work

PIA

Canopy cover: Plant Area Index Changes in Plant Area Index (PAI) were also measured to assess changes in tree canopy within the monitoring plots. To determine changes in PAI, 16 digital hemispherical photopoints were established within the middle of each monitoring plot (Figure 4) to take photographs of the canopy cover each survey trip (Hale et al. 2013). PAI was determined from hemispherical photographs taken using a digital camera and fisheye lens with full 180° field of view. For each survey trip, the tripod and digital camera (CANON EOS 700D; Sigma 4.5 mm F2.8 circular fisheye lens adapter) was positioned at 1.3 m height and once levelled, three upward facing (i.e. lens pointing 90° to the horizontal plane) images were taken using the following settings: • AV mode • F-value = >9.0 • ISO = > 800 • Exposure/AEB: 0 (normal), +1 (overexposure) and -1 (underexposure) • Picture style: standard • RAW + JPEG file type

Excel Spreadsheet

Soil flux

To monitor changes in soil moisture parameters, soil core samples were collected within one manipulated weir pool only (namely Big Toolunka Flat, within Weir Pool 2) for each survey trip (before, during and after weir pool raising) (Appendix 4). Three transects were established (perpendicular to the waterline) and soil cores were sampled within the river and wetland monitoring plot only, at 5, 10, 20, 30, 60, 90, 120 and 150 m distances along each transect (n = 24 cores per river and wetland locations) (Appendix 4). The soil profile was sampled in 50 cm increments from the surface to the saturated zone or a maximum depth 3 m below ground level (therefore maximum of 6 samples per soil core) using mechanical push tube sampling (SPK Geodrill P/L). Soil samples (approximately 300-400 g) were placed into airtight containers and transported to SARDI, where the following analyses were conducted: total soil moisture (gravimetric water content; %), which is measured by oven drying samples at 80°C for three days (Klute 1986; Rayment and Higginson 1992), soil suction (or soil matric potential, Ψsoil MPa), which was determined using the filter paper technique (Greacen et al. 1989) and electrical conductivity and pH (1:5 soil water extract method) (Rayment and Higginson 1992) using a TPS water quality meter. Soil texture/type was also determined for soil samples (MacDonald et al. 1990) as clay soils tend to hold greater amounts of water, but water may be held too tightly within the soil matrix and therefore not readily available for uptake by plant roots (Hall et al. 2009). Soils with minimal clay content (e.g. sandy and loamy soils) hold less water, but water may be more readily available; furthermore they provide better structure for unrestricted root growth and adequate pore spaces for movement of air and water (Hall et al. 2009).