

## ASSESSING THE PRESENT LAND STABILITY IN THE WESTERN TASMANIAN FOREST ESTATE IN RELATION TO RECENT AND ANCIENT HUMAN IMPACTS

Lynda Petherick, University of Queensland

### EXTENDED ABSTRACT

A Forest Practices Authority grant supported a study of late Holocene environments at two sites in western Tasmania, using pollen, sedimentological and charcoal analysis (Figure 1).

#### Rebecca Lagoon

A 90 cm sediment core was collected from Rebecca Lagoon in north-western Tasmania (near Arthur River) and underwent pollen, sedimentological (loss-on-ignition or minerogenic ash content analysis) and charcoal analysis.

The vegetation pattern throughout the record reflected an open sclerophyll forest dominated by eucalypts and *Melaleuca* throughout the late Holocene period (up to the last 2000 years) that the record is thought to cover (Figure 2). A classification analysis suggests that there are three clear vegetation zones. Zone RL 1 is dominated by eucalypts and *Melaleuca* forest/woodland and includes significant rainforest and sclerophyll herb values (particularly grasses and native *Rumex*). Aquatic values are relatively low and the lack of any exotic or introduced pollen suggests that this period reflects the pre-European environment. This zone has relatively high charcoal values that may reflect frequent burning associated with indigenous land-use and/or the underlying natural climate regimes (lightning strikes and drier climate). The next zone (RL 2) is also dominated by eucalypt/*Melaleuca* forest/woodlands, but there are some significant differences, including the decline in rainforest values and grass values and disappearance of native *Rumex*. Charcoal values are still relatively high, suggesting frequent burning, and the presence of exotic pollen [Asteraceae (Ligulifloreae)] at 35 cm reflects the arrival of European settlers at this site (~150 years ago). The increase in ash values during this period reflects increased erosion and this is probably associated with disturbance associated with European settlement (land clearance and the presence of cattle). The final zone (RL 3) fully reflects European settlement, with a decrease in forest representation reflecting land clearance; also present is exotic pollen [Asteraceae (Ligulifloreae) and *Pinus radiata*].

It is interesting to note that the most significant change occurred with the lower representation of *Melaleuca* and higher representation of *Leptospermum* and aquatic taxa. This alteration might reflect both land clearance in and around the lagoon and an alteration in the water table (to lower levels) that allowed the spread of *Leptospermum*, aquatic taxa (particularly sedges) and grasses. After a peak value in charcoal values at 18 cm, there is a significant decline, which might reflect the initial land clearance followed by the use of fire suppression as a management tool. Finally, ash content values decrease reflecting a return to wetter climates and/or a return to lower erosion rates.

## **Lake Selina**

A 70 cm sediment core was taken from a swamp that is located on the northern edge of Lake Selina. This core also underwent pollen, sedimentological and charcoal analysis. This record is thought to cover the last several hundred years (based on the pollen evidence) and provides some evidence of significant landscape alteration most likely associated with European settlement (Figure 3). A classification analysis has also been undertaken on this record and four zones have been identified. Zones LS A and LS B are both dominated by forest, generally eucalypt forest with a heath understorey but also with a significant representation of rainforest taxa. Both zones have high charcoal and ash content values possibly reflecting greater fire frequency and erosion, possibly associated with Aboriginal activity and/or drier climate regimes. The key differences between these two zones are a lower representation of rainforest in Zone LS B and a greater representation of aquatic taxa (particularly rushes) in Zone LS A, possibly reflecting drier environments in Zone LS B. The top sample of Zone LS B contains exotic taxa, reflecting European settlement in the region (probably around the late 19<sup>th</sup> century). The third zone, LS C reflects a significant alteration in the landscape, with a significant decline in forest representation and a dramatic increase in heath (Epacridaceae) and grass values. This is also accompanied with a significant increase in ash content values, increase in fern representation and a decline in charcoal values. These changes are most likely associated with European impacts, probably a combination of land clearance, the presence of cattle and an alteration in water tables. These alterations continue in the next zone, which could be best described as an open heath/sedgeland, with scattered native pine trees (*Callitris*) and the nearest forests (both eucalypt and rainforest) located on the surrounding hillsides. Charcoal values vary in this zone from low values at 20 cm to 12 cm depth, probably reflecting fire suppression management, which then increase in the top two samples possibly representing the use of controlled burning to reduce fuel loads, increase in natural fires associated with drought and/or logging occurring with the region.

## **Summary**

Both records provide important information on the response of the western Tasmanian landscape to alterations in human management regimes and possible climate changes over the last few hundred to two thousand years. These changes can produce significant alterations in dominant ecosystems, as in the case of the Lake Selina record, or more subtle alterations as in the case of the Rebecca Lagoon core.

## **Further work**

Samples have been sent to the Australian Nuclear Science and Technology Organization (ANSTO) for radiocarbon dating. This data should be available in early February. At least two manuscripts are being produced at the moment for publication in peer-reviewed journals.

## **Conference presentations support by this grant**

Moss, P.T., Gehrels, R., Marx, S., Petherick, L.M., Green, S., Mackenzie, L. and Hammond, A. (2008). Late Holocene environments of Tasmania. Oral Presentation. *Australasian Quaternary Association Biennial Meeting*. Victor Harbor, South Australia, December 7-12, 2008, pp. 20.

Mackenzie, L.L., Moss, P.T., Petherick, L.M. and Marx, S. (2008). Late Holocene vegetation and environments of Lake Selina, western Tasmania. Poster. *Australasian Quaternary Association Biennial Meeting*. Victor Harbor, South Australia, December 7-12, 2008, pp. 17.

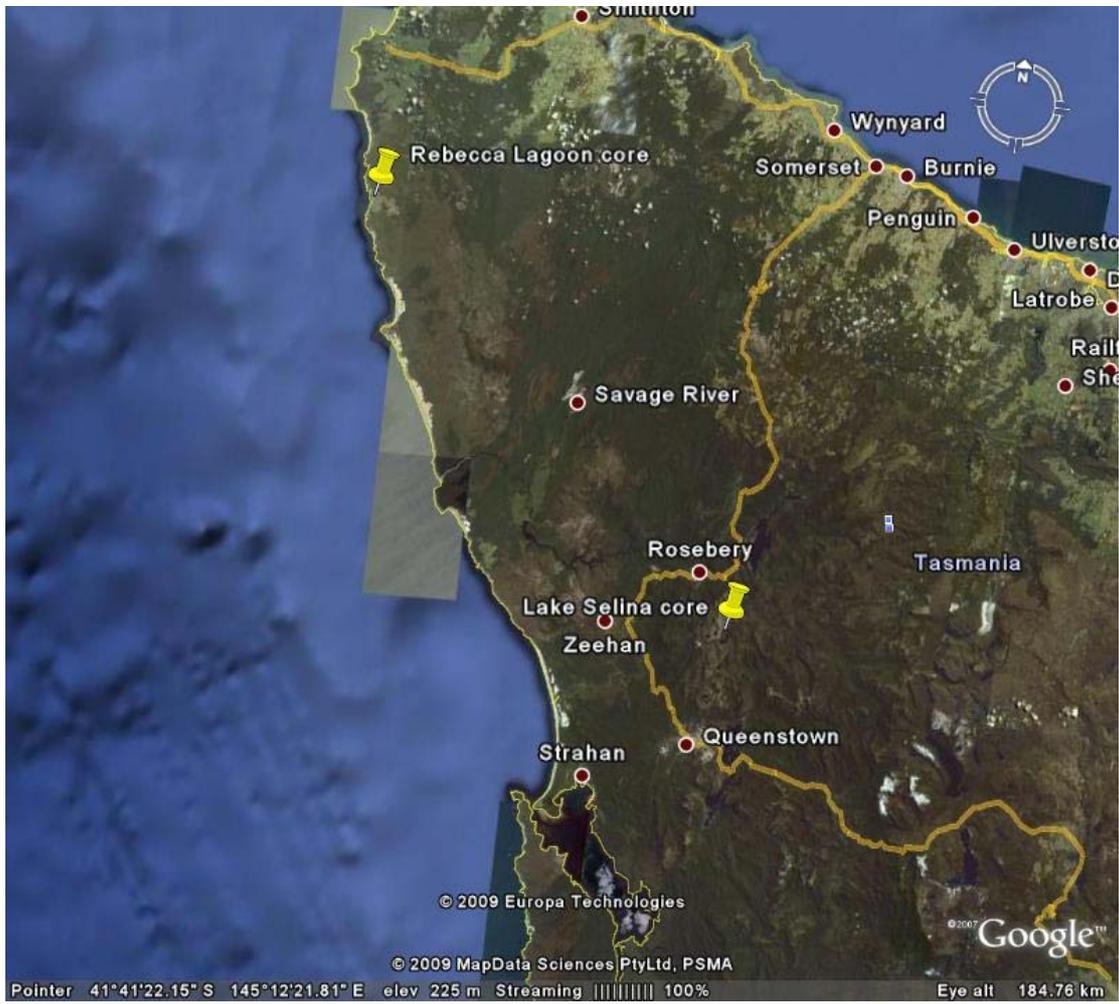


Figure 1. Site Locations

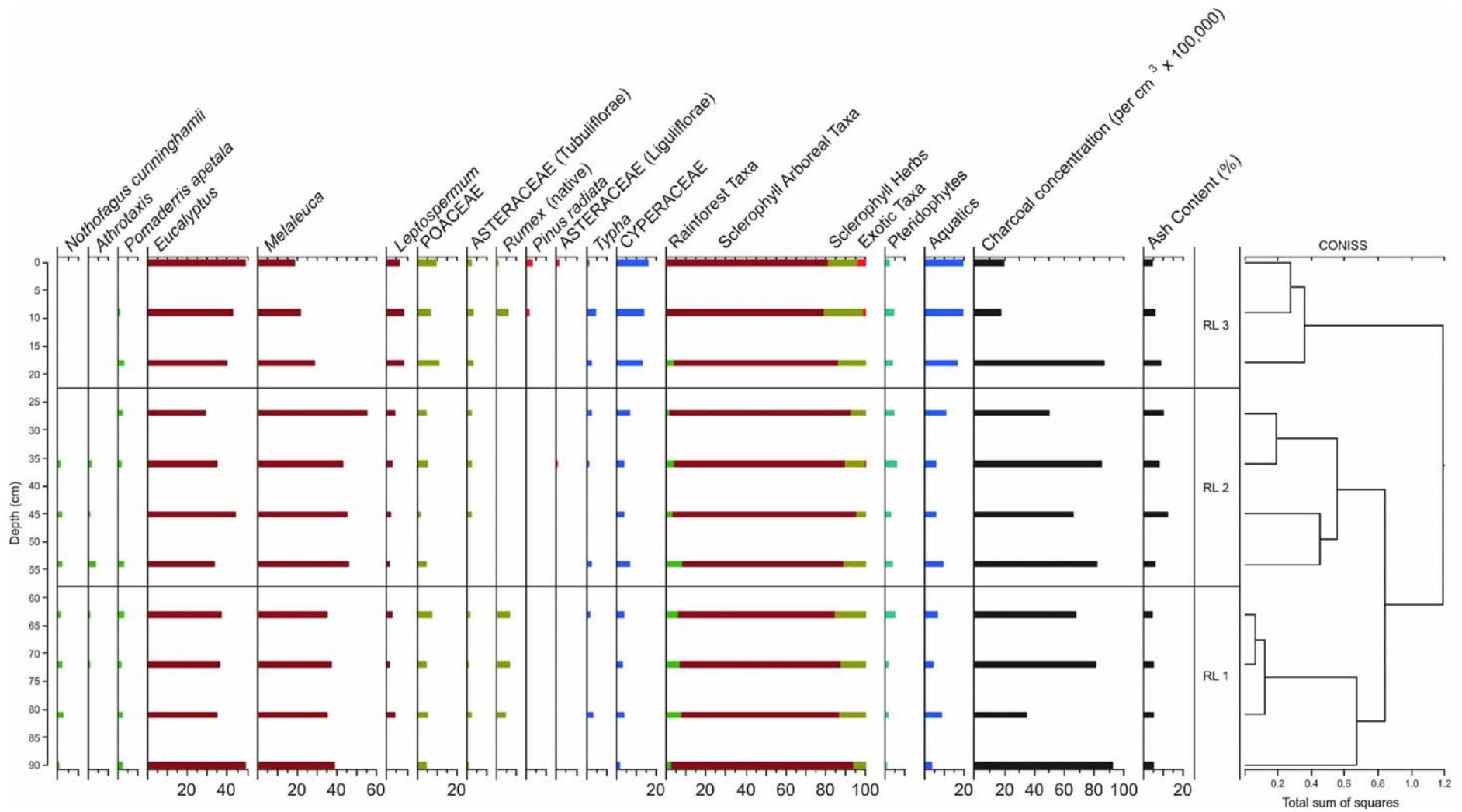


Figure 2. Rebecca Lagoon pollen record

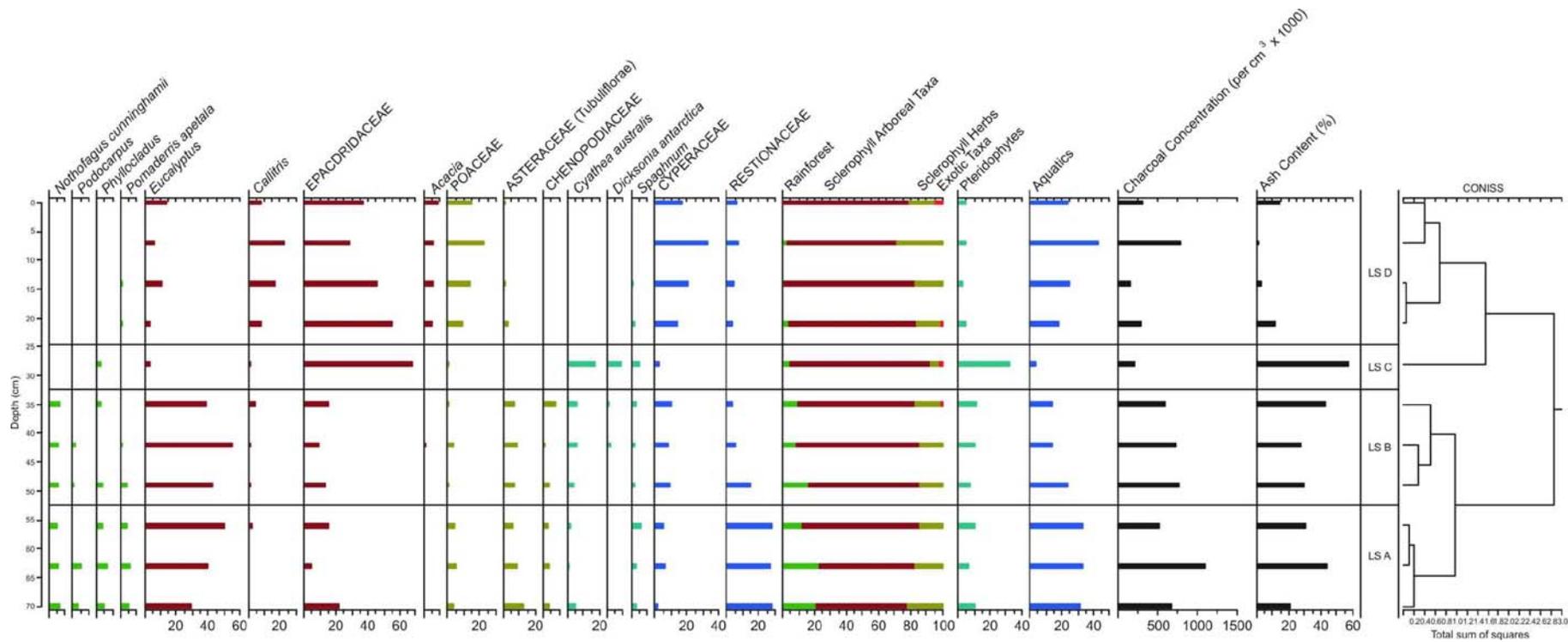


Figure 3. Lake Selina pollen record.