WAGGA WAGGA 1:100 000 MAP SHEET, NEW SOUTH WALES

Xangyang Chen
CRC LEME, University of Canberra, Canberra, ACT 2601
Current address: 71 William Webb Drive, Canberra, ACT 2617
xiangyang_chen@hotmail.com

INTRODUCTION

The WAGGA WAGGA (8327) 1:100 000 map sheet covers an area of regolith and landforms that is typical of the southern Western Slopes, with the Riverine Plain to the west and the Great Dividing Range to the east. Within WAGGA WAGGA the elevation ranges from 180 m (ASL) in the relatively flat areas in the west and northwest, to above 300 m in the hilly areas of the east and southeast, with a few peaks rising above 500 m. The climate is warm temperate, with hot, dry summers and relatively wet winters. The average annual rainfall at Wagga Wagga is 550 mm. The bedrock of the region is composed of highly folded Ordovician metasediments, large Silurian granitic masses, and minor Devonian sandstones (Raymond, 1996).

LANDFORMS AND REGOLITH

The area comprises five main landscape divisions (Figure 1):

1. *Murrumbidgee flood plain*. Extensive, flat (<1% gradient) plain inundated by 1 in 50 year floods. The Murrumbidgee River enters the floodplain region from a valley in mountains of the Great Dividing Range about 10 km east of Wagga Wagga (Figure 1). Within the valley the river has formed terraces, particularly along its tributaries. Some of these are over 20 m high (McConnell, 1979). However, within the WAGGA WAGGA 1:100 000 map sheet study area, the river is characterised by aggradation, resulting in thick alluvial sequences without terraces. In a quarry (Figure 2), about 20 m of alluvial sediments are exposed below the floodplain surface. The uppermost 6 m of the alluvial succession comprises grey silty clay, which overlies gravel layers with sand lenses. A low dune of sand with red clay bands situated between the gravel and grey clay units has been dated as 4.5–3.5 Ka (Figure 2). There are also many dunes (or sand mounds) on the present floodplain, with some reaching up to 8–10 m in height. One of these was dated as >80 Ka (Figure 3). Dare-Edwards *et al*. (1996) found that the ages of these dunes appear to be clustered into 3 groups: 120–80 Ka, 60–50 Ka and ~19 Ka.

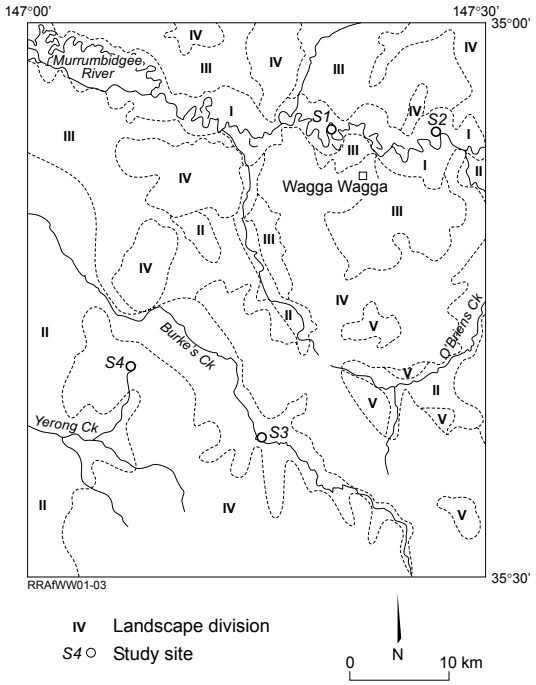

Figure 1. Five main landscape divisions within the WAGGA WAGGA 1:100 000 map sheet area. (I) Murrumbidgee floodplain, (II) alluvial plains of local streams, (III) undulating plains and rises, (IV) hilly areas, and (V) eroded plateau and piedmont plains.

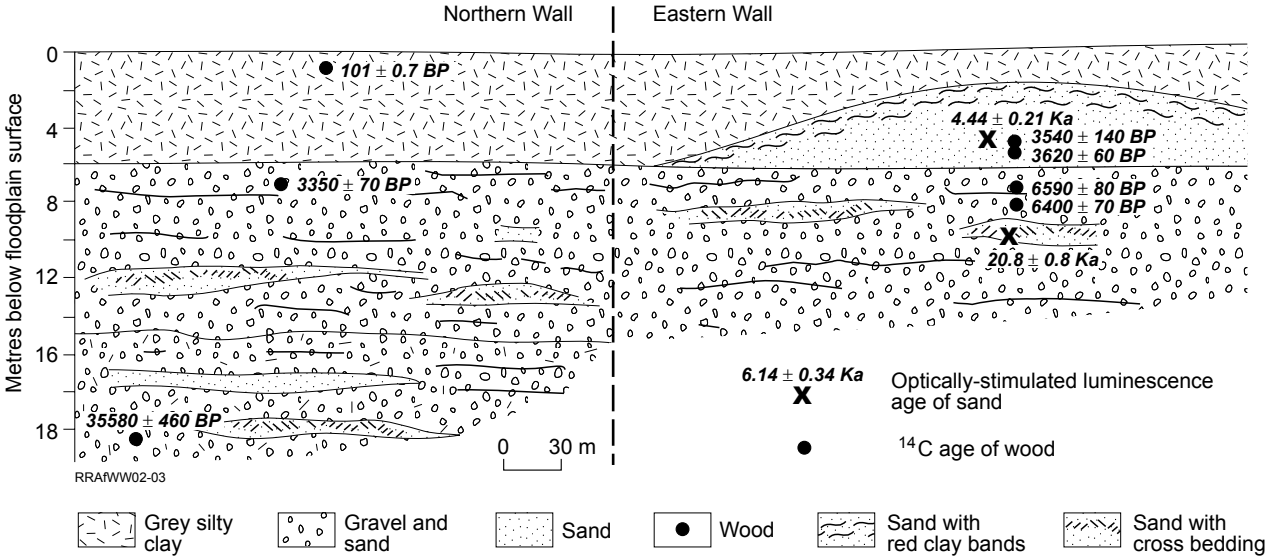

Figure 2. Sedimentary sequence of Murrumbidgee River floodplain at Site 1 (S1, Figure 1), showing a grey clay layer overlying thick sands and gravels. Positions of samples with ^{14}C or optically-stimulated luminescence ages are also shown. (from Chen *et al*., 2002)

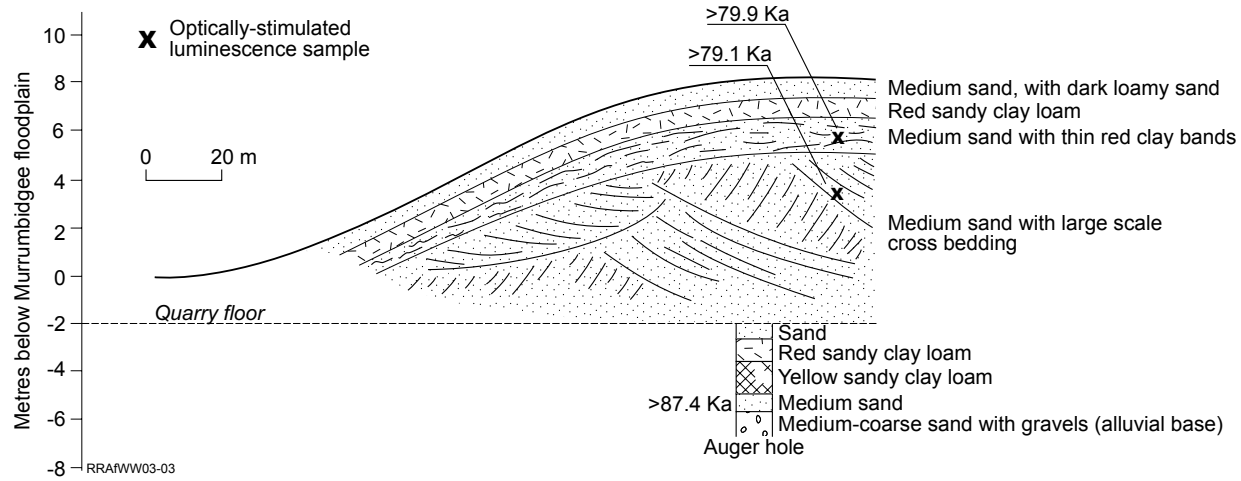

Figure 3. Sedimentary sequence in a dune (S2, Figure 1) on the Murrumbidgee River floodplain. The sequence below the quarry floor was proved by hand auger. (from Chen, 1997)

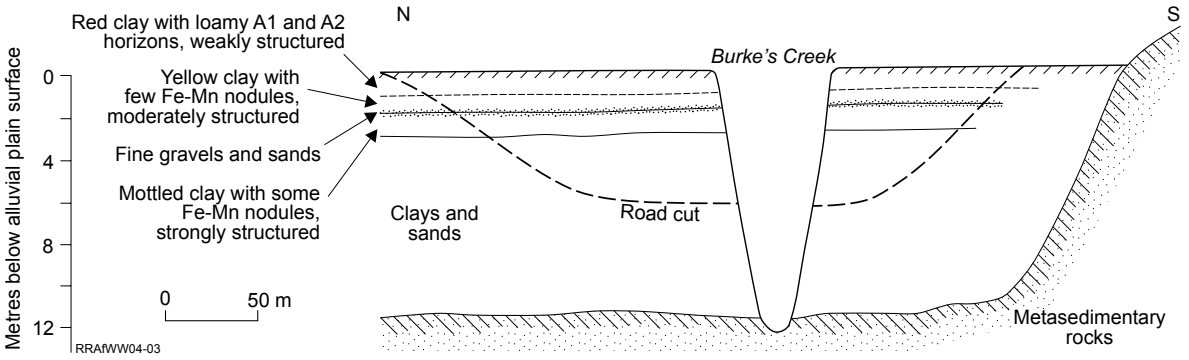

Figure 4. Transect of Burke's Creek at Mangoplah (S3, Figure 1), showing the deep channel incision and the consistent sediment sequence.

2. *Valley plains of tributaries*. Up to several kilometres wide and 1–2% in gradient. The alluvial sequences in this landscape division are 10–20 m thick and dominantly clayey, with few gravel beds. The top part is similar to the parna sequences covering undulating plains and rises (see below), although thin (1–5 cm) intercalated layers of sand and fine gravel are suggestive of an alluvial origin (Figure 4).

3. *Undulating plains and rises*. This landscape division comprises a continuous, broadly undulating (<3–5% gradient) mantle of clayey material, which is believed to be dominantly of aeolian origin (parna) (Beattie, 1970, 1972; Chen, 1997, 2001; Chen *et al*., 2002). The sequence consists of three separate parna units. From uppermost (youngest) to lowermost (oldest), these are: (1) Yarabee parna (50–80 cm thick), red (5YR or redder), clay loam to light–medium clay, weakly structured, non-calcareous; (2) Brucedale parna (100–150 cm thick), yellowish (10YR 5/4), medium to heavy clay, strongly structured, and containing small (<5 cm) carbonate nodules; and (3) Willis parna (100–150 cm thick), brownish grey (2.5Y 6/3) light to medium clay, strongly structured, and containing large (10–20 cm) carbonate nodules. The red sandy clay loam layer within the high dune shown in Figure 3 has been interpreted by Chen *et al*. (2002) to be equivalent to the Yarabee parna and to have been deposited principally during the last glacial period (25–16 Ka).

4. *Hilly areas*. Hill slopes and drainage depressions. In drainage depressions, sequences with 3 to 4 cycles of coarse and fine sediments are common. These have erosional contacts and soil features are common in the fine sediment layers (Figure 5).

5. *Eroded plateau and piedmont plains*. This landscape division consists of an undulating plateau between 400–450 m AHD and eroded piedmont plains occurring as parallel spurs and drainage lines sloping away from the high hills. The sediments in this landscape division are similar to the parna sequences described above. At some sites, particularly on the undulating plateau over granitic basement, the parna clay sequences are underlain by weathering profiles characterised by prominent red, grey and white colour mottles.

REGOLITH AND LANDFORM EVOLUTION

The remanent plateau and eroded piedmont indicate uplift of the hilly areas in contrast with aggradation on the plains. Erosion has been predominant on most steep (>20–30%) hill slopes, but alternating episodes of erosion and deposition are indicated by the sedimentary sequences of drainage depressions in hilly areas (Figure 5). Aeolian dust deposits (parna) form continuous and

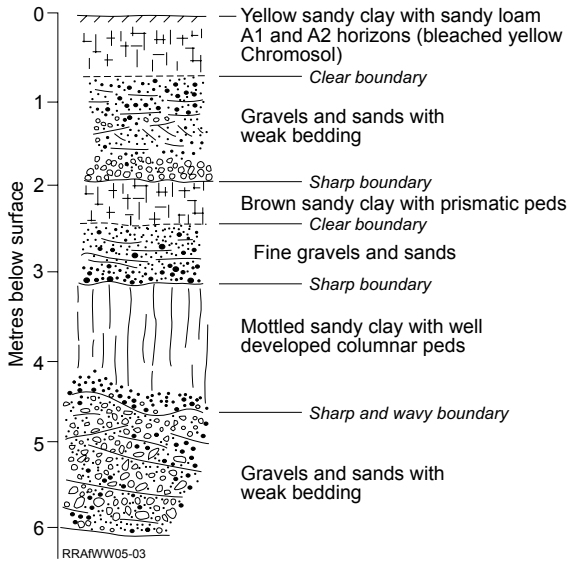

Figure 5. Sedimentary sequence exposed in a gully on the footslope of the hilly area (S4, Figure 1), showing 3 cycles of coarse/fine sediments, sharp, erosional boundaries, and pedal structures in the fine sediment layers.

relatively uniform clayey mantles in the undulating plains and rises, although they were probably reworked after deposition by the wind, slope-wash and soil creep. The youngest parna (Yarabee parna) was most likely deposited between 25–16 Ka, whereas the Brucedale and Willis parnas may have been deposited before 100 Ka (Chen *et al*., 2002).

The Murrumbidgee River has undergone several episodes of bed load deposition over at least the last 150 000 years, with the last episode ending at about 3 Ka, as indicated by the age of source-bordering dunes (Figure 2). Thereafter, the river changed to its present status with deposition of clayey sediment being dominant.

Periodic changes are evident in all of the above landscapes divisions. These are probably contemporaneous, although insufficient dating makes this difficult to establish.

REFERENCES

Beattie, J.A., 1970. Peculiar features of soil development in Parna deposits in the eastern Riverina, N.S.W. Australian Journal of Soil Research, 8: 145-156.

Beattie, J.A., 1972. Groundsurfaces of the Wagga Wagga Region, New South Wales. CSIRO, Melbourne. Soil Publication 28. 68 pp.

Chen, X.Y., 1997. Quaternary sedimentation, parna, landforms and soil landscapes of the Wagga Wagga 1:100,000 map sheet, southeastern Australia. Australian Journal of Soil Research, 35: 643-668.

Chen, X.Y., 2001. The red clay mantle in the Wagga Wagga region, New South Wales: evaluation of an aeolian dust deposit (Yarabee Parna) using methods of soil landscape mapping. Australian Journal of Soil Research, 39:61-80.

Chen, X.Y., Spooner, N.A., Olley, J.M. and Questiaux, D.G., 2002. Addition of aeolian dusts to soils in southeastern Australia: red silty clay trapped in source bordering dunes in Wagga Wagga Region. Catena, 47:1-27.

Dare-Edwards, A.J., Page, K.J., Owens, J., Chavang Klang, S. and Price, D., 1996. Source bordering dunes of the Wagga Wagga area, New South Wales: chronology and stratigraphy. Abstract of Australia and New Zealand Geomorphology Group 7th Meeting, James Cook University, Australia.

McConnell, A.D., 1979. A landscape history of the Wantabadgery area, NSW. Master Thesis, Australian National University, 139 pp. (Unpublished).

Raymond, O.L., 1996. Wagga Wagga 1:100 000 geology map. Australia Geological Survey Organisation (Geoscience Australia), Canberra.