Lower Gordon River erosion monitoring, Tasmanian Wilderness World Heritage Area

Report for the period May 2003 to February 2004

Tasmania

DEPARTMENT *of* PRIMARY INDUSTRIES, WATER *and* ENVIRONMENT
Resource Management and Conservation Division

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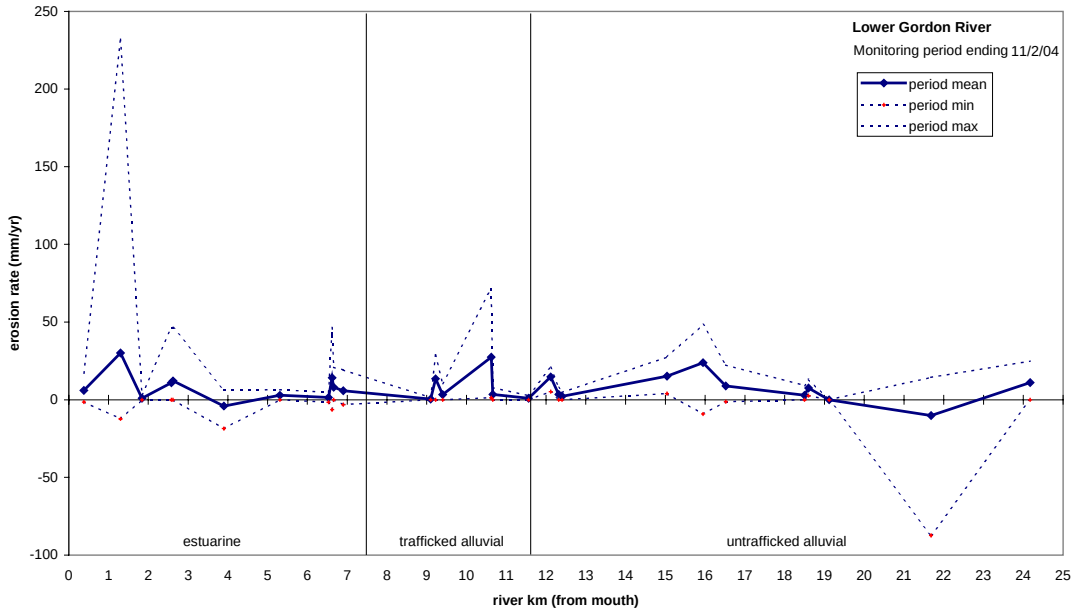

Figure one: Summary of lower Gordon River streambank erosion recorded during the period May 2003 to February 2004.

Introduction

The wakes from tourist cruise boats have caused erosion of the formerly stable to depositional banks of the lower Gordon River within the Tasmanian Wilderness World Heritage Area. Speed and access restrictions on the operation of commercial cruise vessels have considerably slowed, but not halted erosion of the now destabilised banks. This periodical report documents the erosion that occurred during the monitoring period May 2003 to February 2004. Data are presented here in summary form only. Requests for access to the full data set (some 15 Mb and including several other rivers) for scientific review or other non-commercial purpose shall be considered on a case by case basis. The next erosion monitoring is provisionally scheduled for late July 2004.

Erosion rate is determined by repeated measurement of erosion pins installed perpendicular to the bank face. Change in the exposed length of pins between measurements indicates the nett amount of erosion or

deposition that occurred during the monitoring period. Measurements are normalised and reported as a rate in mm/year, thus allowing comparison of monitoring periods of varying length. Any deposition is reported as negative erosion. Multiple pins are installed at each site and the mean rate of erosion at each site during the reporting period is presented in figure one.

On 21 December and 10 – 11 February 168 pins were measured at 29 sites, returning 145 erosion rates. Rates may not be returned if a pin is newly installed or has influenced local erosion (e.g. disturbed by floating debris). A brief geomorphological assessment was also conducted at each site to assist data interpretation. Additional sites on the Spence and Franklin Rivers and the Gordon above Franklin provide ancillary information. For a more comprehensive discussion of the nature and significance of bank erosion on the Gordon River and the monitoring and other investigative methods employed see the Lower Gordon River Recreation Zone Plan (1998) and references therein.

The nature of banks varies along the river, with three categories of erosion susceptible banks (estuarine, alluvial and levee) being recognised. The bank types form the basis of management zoning on the river and are discussed separately below.

Estuarine banks

Estuarine banks are the very low lying banks comprised of organic rich silt and minor sand that occur between the mouth of the river and First Gorge. Geomorphological evidence indicates that these banks were areas of deposition rather than erosion until relatively recently. Erosion measurements are likely to be an underestimate because the most actively erosional faces are generally undercut and therefore inaccessible.

All estuarine bank pins were measured in December 2003 and not remeasured in February 2004. During the period May to December 2003 the rate of estuarine bank erosion recorded ranged from -19 mm/yr to 232 mm/yr, with a mean of 8 mm/yr, from 67 measurements at 11 sites. Nineteen pins recorded no change while 9 pins (at six sites) recorded deposition.

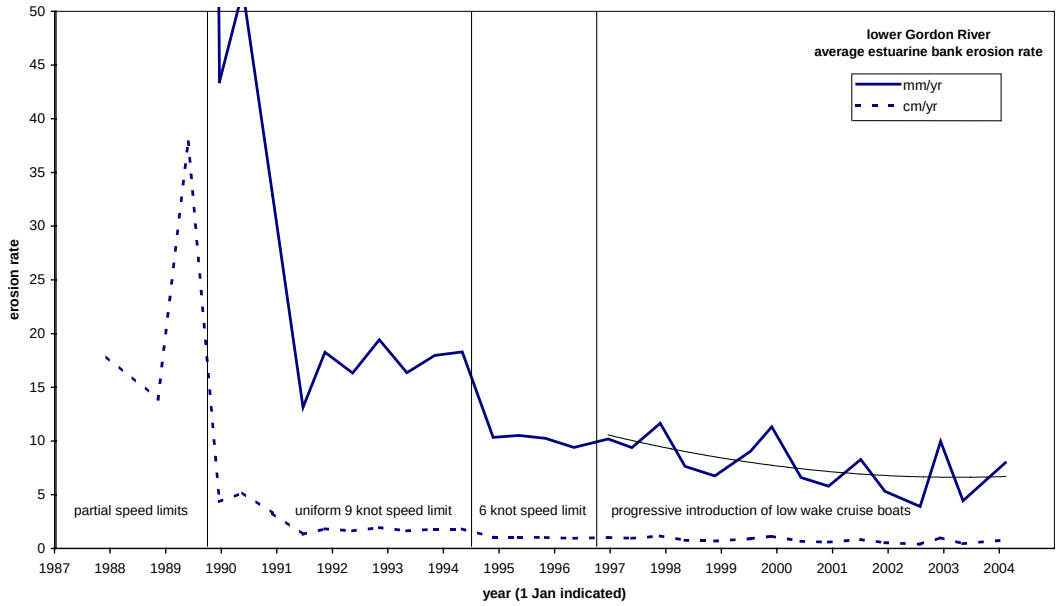

Figure 2: Mean rate of estuarine bank erosion through time. Some data is corrected for rust binding of mild steel pins, which were progressively replaced by stainless steel from May 1994 and have been excluded from the monitoring programme since December 2001. See report dated January 2001 for details of the correction, applied only to data from mild steel pins recorded during the changeover period. The fine smooth line shows the best fit trend of the data since the first introduction of multihulled cruise vessels.

With the first introduction of multihulled cruise vessels in the third quarter of 1996 a declining trend in the rate of estuarine bank erosion commenced. However that decline has now halted and over the past 18 months the rate has oscillated around a mean of approximately 7 mm/yr. At this stage it is impossible to predict from the monitoring data alone whether this represents a long term stabilisation of the erosion rate or an inflection before a period of rising rates. In any event, given the originally depositional nature of the estuarine banks it is clear that natural processes have not been restored. Observed and in places measured turbidity adjacent to

the banks following cruise vessel passage indicates that the management target of zero wake induced erosion (Lower Gordon River Recreation Zone Plan 1998) has not yet been achieved.

Alluvial banks

Alluvial banks consist of silt and fine sand and display a flat to subdued levee morphology with a crest typically about 1 m above mean water level. They occur in the floodplain areas between First Gorge and Eagle Creek, and also sporadically in Limekiln Reach. The alluvial banks upstream from Horseshoe Bend are not subject to the wake from commercial cruises and provide an experimental control for essentially similar banks in the zone of cruise operations. Since the banks, wind wave climate and the effect of hydrological variables in both trafficked and untrafficked zones are essentially similar, any difference in erosion rate may be attributed to the effects of wake waves from cruise traffic or some other local effect.

For the monitoring period May 2003 to February 2004 trafficked alluvial banks in zone 1 eroded at a rate ranging from 0 to 72 mm/yr, with a mean of 7 mm/yr from 26 measurements at 6 sites. No pins recorded deposition while nine recorded no change.

During the same period untrafficked alluvial bank erosion rates in zone 2 ranged from -9 to 48 mm/yr with a mean of 8 mm/yr from 49 measurements at 11 sites. Three pins recorded deposition (at three sites), 10 recorded no change.

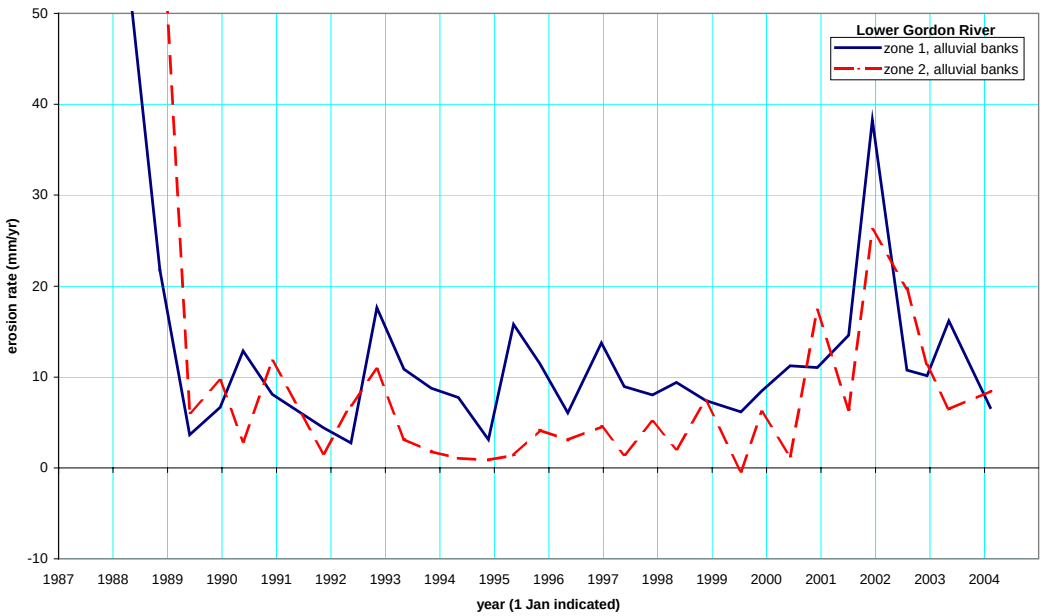

Figure 3 Mean rate of alluvial bank erosion as a function of time.

The difference in mean erosion rate between trafficked and untrafficked banks through time is shown in figure three. In general this difference has been reduced since mid 1998, which is attributed to progressive replacement of the older monohull cruise vessels with relatively low wake catamaran designs. The difference is usually expressed as a percentage of the total erosion of trafficked banks, ie:

$$\frac{\text{(trafficked rate - untrafficked rate)}}{\text{trafficked rate}} \times 100$$

The result for the most recent monitoring period was -27%, the negative sign indicating a lower alluvial bank erosion rate in zone one than in zone two. That result is statistically significant using the standard test of a non-parametric sign-based analysis of medians. While these results suggests that no erosion in zone 1 could be attributed to the wake from cruise vessels, the unusually high erosion rate in zone 2 in recent years, particularly in the vicinity of Expectation Reach, makes conclusive comparisons difficult. If the 3 anomalous Expectation Reach sites are excluded from the analyses zone one alluvial bank erosion becomes 13% greater than that at the remaining 8 alluvial bank sites in zone two and the two zones become indistinguishable by the analysis of medians. As yet there are not direct indications of the cause of the Expectation Reach anomaly.

increased monitoring frequency

Levee banks

Sandy levee banks occur along the meandering 10 kilometre reach from near Sir John Falls downstream to Lake Fidler. These are part of a landform assemblage of outstanding geoconservation significance at a global level. All sandy banks are very susceptible to wake wave erosion and have been rapidly eroded in the past, with erosion rates in excess of 1 m/yr having been recorded and total retreat of up to 10 m estimated. Commercial cruise operations were excluded from levee bank reaches in 1989 and the rate of erosion consequently slowed dramatically.

In the 14 years since removal of large wave wake from the wave climate the eroded levee banks have developed a reasonable cover of primary colonisers and juvenile rainforest species. These have increased bank stability, although minor slope adjustments continue to occur, especially on subvertical scarps. It is likely that these oversteepened faces will take many decades to fully restabilise, which will be dependant upon the maturation of slow growing canopy species and re-establishment of the protective interlocked root mat.

Due to the present slow rate of change levee bank pins are now only measured occasionally, most recently in May 2003. No new data has been acquired for this monitoring period.