

THE BIG FLOOD: WILL IT HAPPEN AGAIN?

A macrochannel evolution model

A Channel Evolution Model (CEM) provides process-based understanding of channel adjustment used to guide river restoration and rehabilitation

A macrochannel evolution model (mCEM) illustrates the processes operating within hydraulically variable SEQ trunk channel systems which are laterally stable and non-incising.

The mCEM demonstrates a self regulating cyclical process.

Stage I - contracting channel with banks primed for mass failure

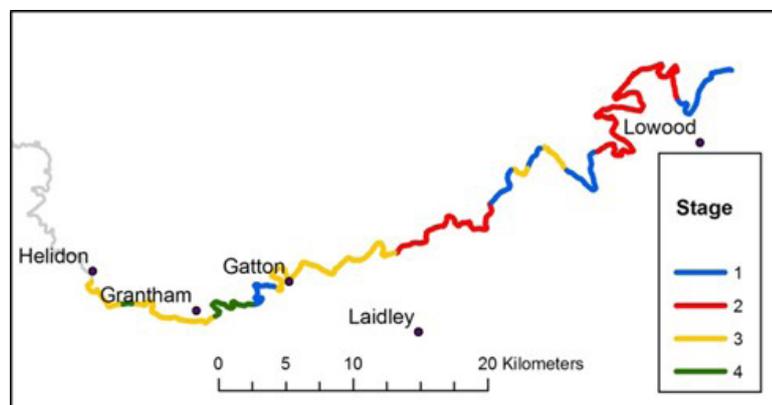
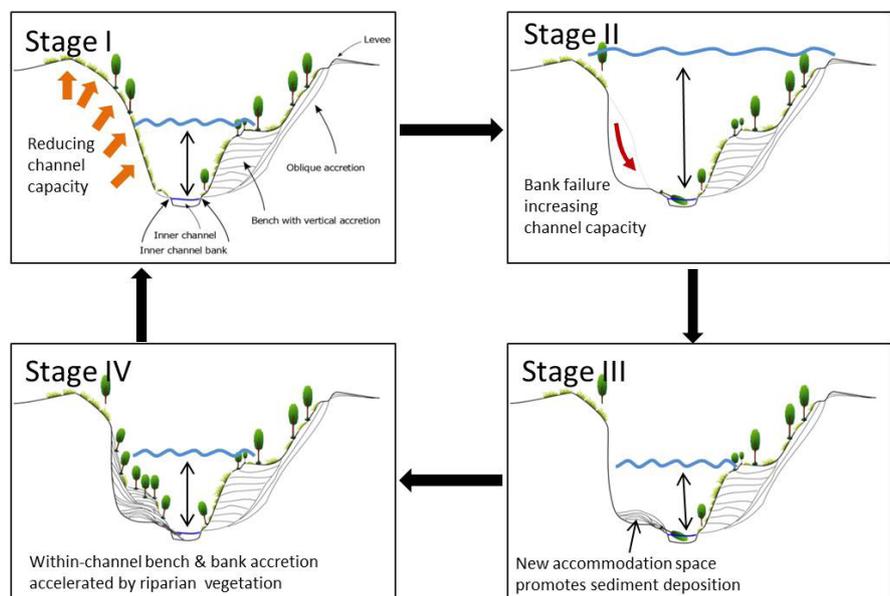
Stage II - rainfall and flood conditions trigger bank mass failure on primed banks until all primed banks reset

Stage III - sediment deposition in the new accommodation space

Stage IV - sediment deposition on banks and benches with increasing riparian vegetation enhancing sediment trapping and shear strength

Distribution of mCEM stages along Lockyer Creek following the 2013 flood

Stages 3 & 4 can be enhanced with bench and macrochannel bank vegetation management



FURTHER READING

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A channel evolution model for subtropical macrochannel systems



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ABSTRACT

A channel evolution model (CEM) represents stages of channel development in response to specific types of disturbance. In recent years, classic incised/disturbed CEMs have provided process-based understanding of channel adjustment and formed the cornerstone for river restoration and rehabilitation. While broadly applicable to alluvial systems in temperate and semi-arid regions, these models cannot be assumed to be universally applicable. Lockyer Creek in South East Queensland, Australia, has notable macrochannel morphology and is subject to high hydrological variability typical of many subtropical climates. The aim of this paper is to present a case study of channel adjustment and evolution in lower Lockyer Creek, to determine if existing CEMs adequately describe processes of channel adjustment and the associated trajectories of change typical of river systems in subtropical settings. Lockyer Creek has recently been subjected to a spate of flooding resulting in significant channel erosion. This offers an ideal opportunity to investigate the nature and rate of channel adjustment processes and place them in context of longer-term geomorphic adjustments in these systems. Specifically we address two questions. Firstly, do the classic incised/disturbed CEMs adequately represent the observed macrochannel adjustment? Secondly, if current CEMs are inadequate, what is the channel evolution model for these systems, of which lower Lockyer Creek is an example? Results show that these are non-incising systems where wet-flow bank mass failures (WBMFs) are the dominant process of channel adjustment. They occur within the channel bank top boundary resulting in no change to overall bank-top width. Furthermore, subsequent floods deposit sediment in the failure scars and failure headwalls generally do not retreat beyond channel bank-top. Channel adjustment has not followed the evolutionary stages for incised/disturbed channels and a new four stage macrochannel CEM is outlined for these subtropical systems. The proposed CEM illustrates a cyclical pattern of erosion by channel bank WBMF followed by re-aggradation, through deposition and oblique processes, contributing to bank rebuilding. This CEM provides sufficient information to determine the stage of macrochannel adjustment, enabling decisions to be made over whether intervention is required or will be successful.

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For more information about the project

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