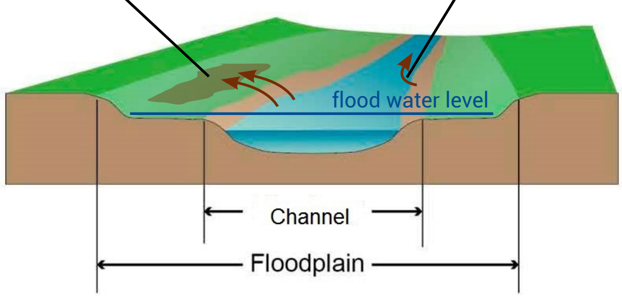
THE BIG FLOOD: WILL IT HAPPEN AGAIN?

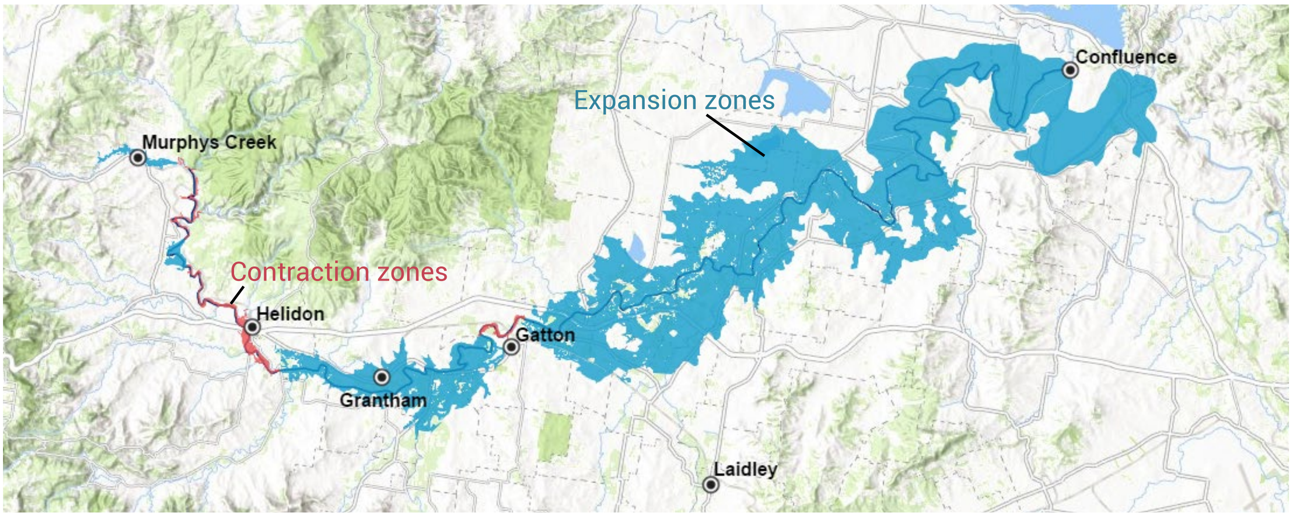
Where does sediment go in floods?

- Sediment can be stored for many years in channel bars and benches.
- Sediment can be stored on floodplains for thousands of years.
- Not all eroded sediment enters the waterways.
- Not all sediment in the waterway is delivered to the end of the catchment, in fact allowing flood water onto floodplains decreases sediment delivery to the end of the catchment.

Contraction zones on the Lockyer Creek are reaches where floodwaters are confined to the channel. Expansion zones are where floodwaters can flow out over floodplains, although how often this occurs depends on flood height.

Flood height and water flow can be reduced by increasing the amount of vegetation within the channel. By allowing water to flow out onto the floodplains, connectivity of the floodplains and the sediment storage of the catchment would increase.





FURTHER READING

Croke, J., Fryirs, K., Thompson, C. 2013. Channel-floodplain connectivity during an extreme flood event: Implications for sediment erosion, deposition, and delivery, Earth Surface Processes and Landforms 38 (12): 1444-1456

Thompson, C., Croke, J. and Fryirs, K. 2015. The disconnected sediment conveyor belt: Patterns of longitudinal and lateral erosion and deposition during a catastrophic flood in the Lockyer Valley, southeast Queensland, Australia. Rivers Research and Application. DOI: 10.1002/rra.2897

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THE DISCONNECTED SEDIMENT CONVEYOR BELT: PATTERNS OF LONGITUDINAL AND LATERAL EROSION AND DEPOSITION DURING A CATASTROPHIC FLOOD IN THE LOCKYER VALLEY, SOUTH EAST QUEENSLAND, AUSTRALIA

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ABSTRACT

The sediment (dis)connectivity concept is the water-mediated transfer of sediment between different compartments of a catchment sediment cascade involving four possible dimensions or linkages (longitudinal, lateral, vertical and temporal). Quantifying the strength of these linkages within and between compartments provides a means to understand the internal sediment flux dynamics of a catchment. The aims of this paper are to examine (1) the dynamics of longitudinal and lateral (dis)connectivity by quantifying patterns of erosion and deposition that occurred during a catastrophic flood, and (2) how the patterns of connectivity can be changed through management actions that better utilise floodplain sediment storages. Multi-temporal LiDAR and air photos are used to quantify volumetric change with respect to geomorphic settings and units. The results show that over the length of the trunk stream, the high-magnitude event was net depositional with high longitudinal sediment disconnectivity. At the reach scale, an alternating pattern of high and low longitudinal connectivity associated with contraction and expansion zones was evident. The efficiency of sediment transfer from the uppermost compartment to the most downstream compartment decreased exponentially, while the strength of lateral connectivity increased for each expansion reach. Modelling results show that increasing channel boundary roughness along expansion reaches with riparian revegetation can increase the frequency of lateral connectivity and floodplain sediment storage, thereby decreasing reach-to-reach connectivity and reducing end-of-catchment sediment delivery. This contrasts with the current trend of building levees along the bank tops of expansion reaches, which decrease lateral connectivity and increase reach-to-reach connectivity.

KEY WORDS: connectivity; catchment management; sediment cascade; process zones; flood mitigation

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