# Do we know how much river gravel is lost through extraction?

## What do cross-section surveys tell us about gravel movement?

**Les Basher[1], Ian Fuller[2], Eric Verstappen[3]**

**[1]Landcare Research, Nelson; [2]Geography Dept., Massey University; [3]Tasman District Council, Richmond**

# Background

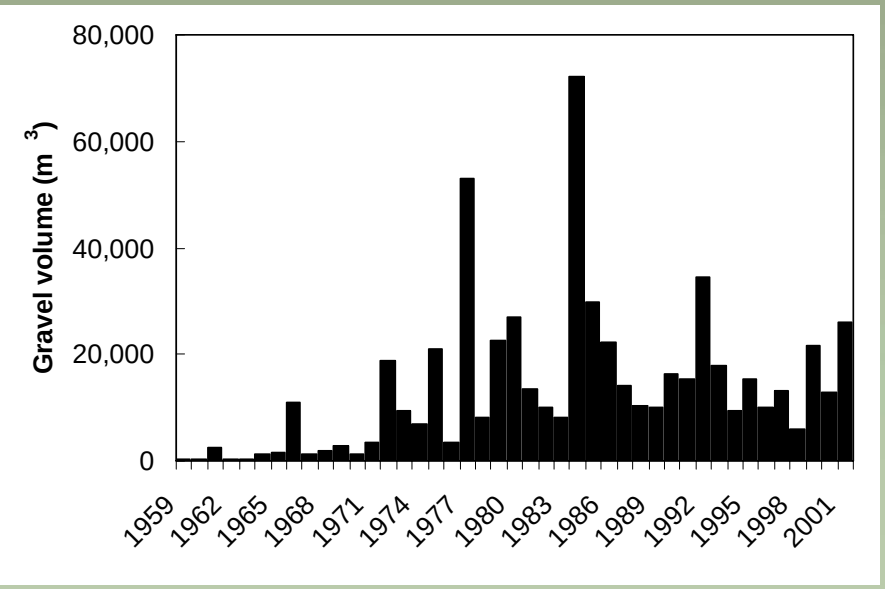
- periodic cross section surveys are the main tool used by councils to allocate gravel extraction from rivers bed by considering
  - trends in mean bed level (MBL)
  - estimates of gravel extraction
  - estimates of long-term rate of gravel supply

- debate about trends in MBL, changes in gravel storage within the Motueka, and the influence of gravel extraction on those trends

# Aims

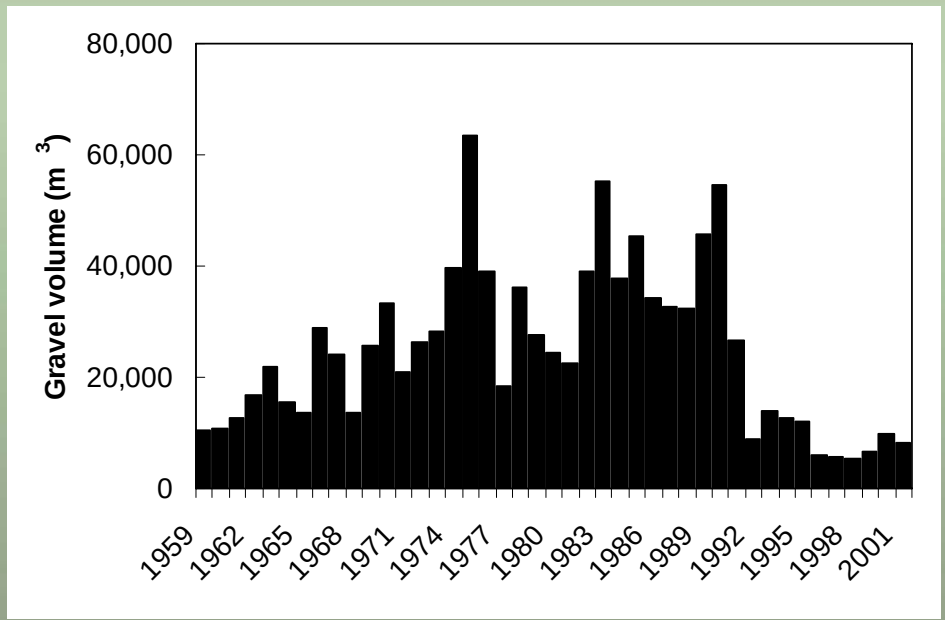
- compile all river cross-section data for the Motueka River and provide a comprehensive analysis of all data using a consistent methodology (“end area method”)
- calculate changes in mean bed levels and volume of gravel stored in the river channel through time
- compare gravel volume changes with gravel extraction rates, and determine the influence of gravel extraction on trends in riverbed levels
- consider alternatives to cross section analysis

# Trends in gravel extraction




**Upper Motueka**

**Lower Motueka**



# Bed level and gravel storage trends

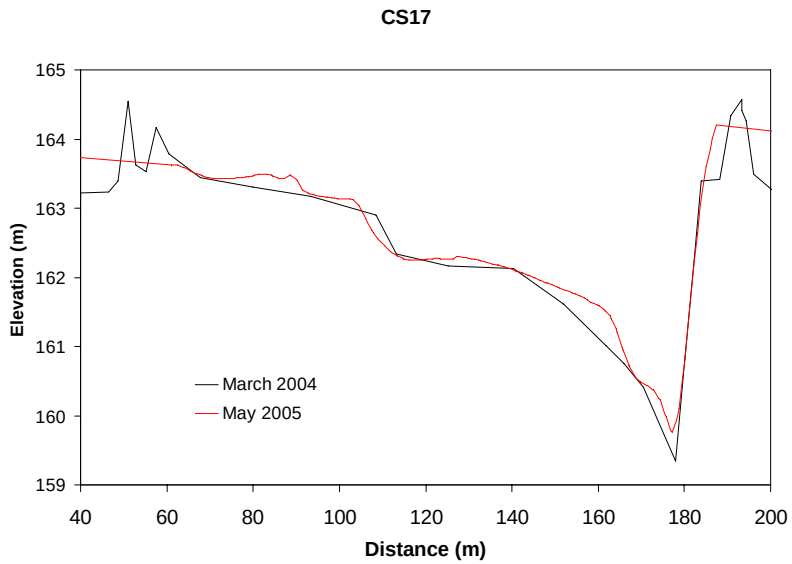
- the river bed is degrading resulting in a loss of channel storage of gravel
  - Upper Motueka (1960-2004) –0.33 m
  - Lower Motueka (1978-2001) –0.34 m

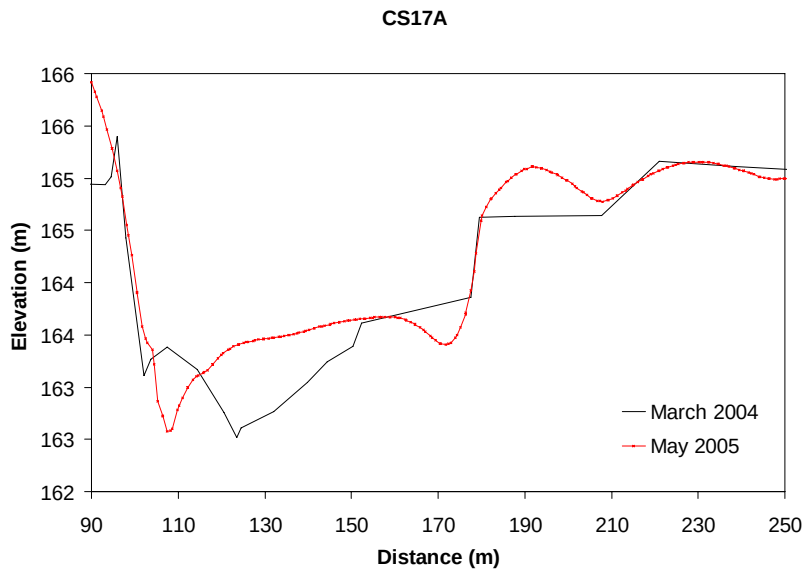
- superficially much, but not all, the change in gravel storage can be accounted for by gravel extraction

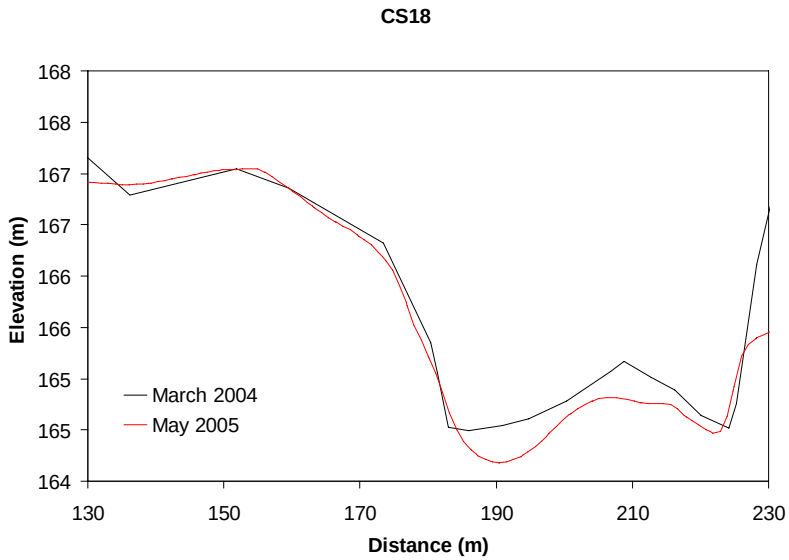
- there are large error limits on the gravel storage volume changes derived from cross sections

- the cross sections probably underestimate the total gravel storage volume changes (and gravel transport)
  - don't account for spatial variation between the sections
  - don't account for temporal variation between surveys

# Do the cross sections represent bed level dynamics? The cross section approach, March 2004 – May 2005

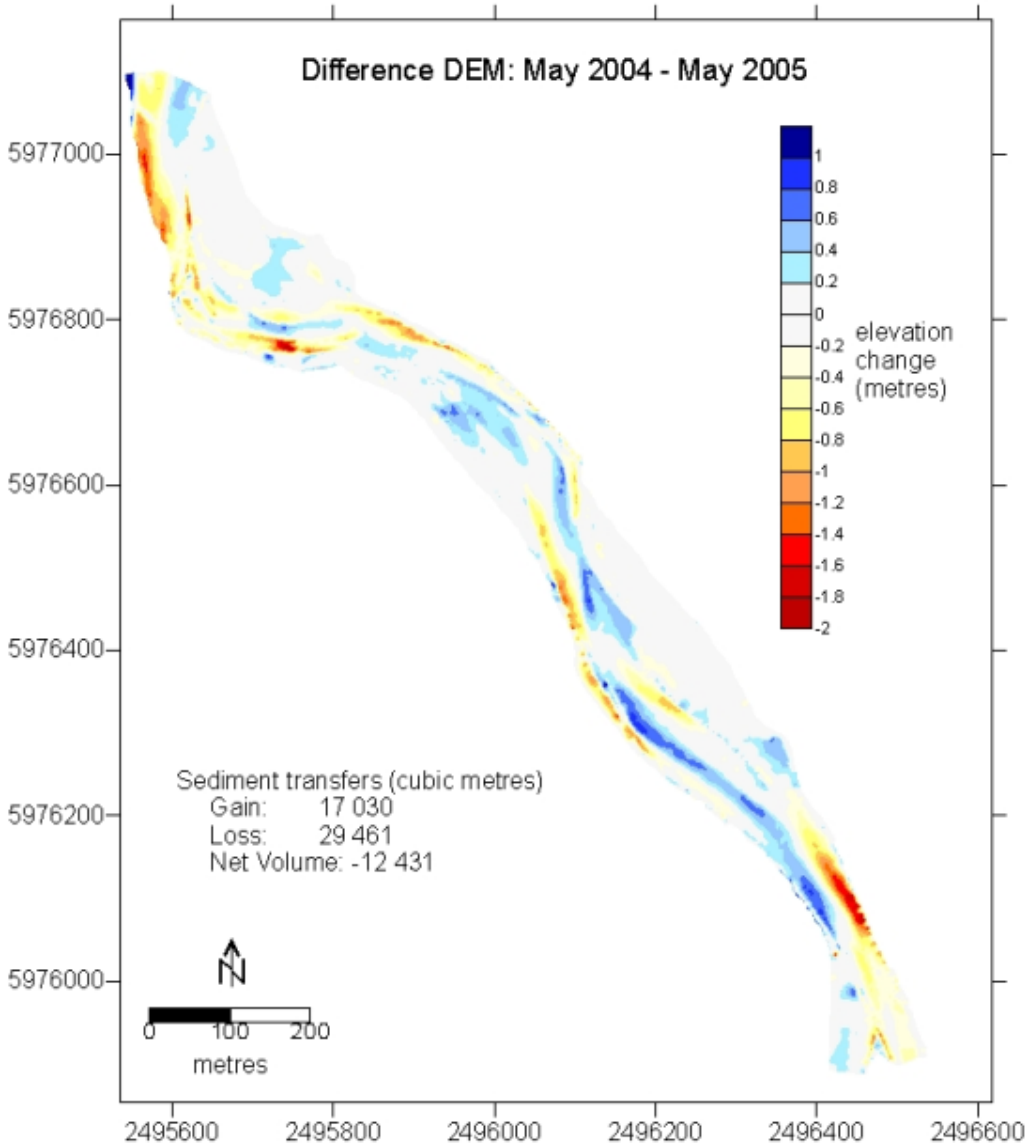



Net loss 3500 $m^3$

# Do the cross sections represent bed level dynamics? The DEM approach, March 2004 – May 2005



# Conclusions

- there are large error limits on the gravel storage volume changes derived from cross sections

- there may be large error limits on estimates of gravel extraction derived from resource consent applications
  - since not all allocated gravel is extracted
  - returns from extractors may not be accurate

- to better understand how much river gravel extraction affects riverbed levels we need better
  - data on changes in bed levels (e.g., from RTK-GPS or LIDAR surveys),
  - information on gravel supply
  - information on the amount and location of gravel extraction.