Woody debris effects on upland river hydrological processes

Zora van Leeuwen
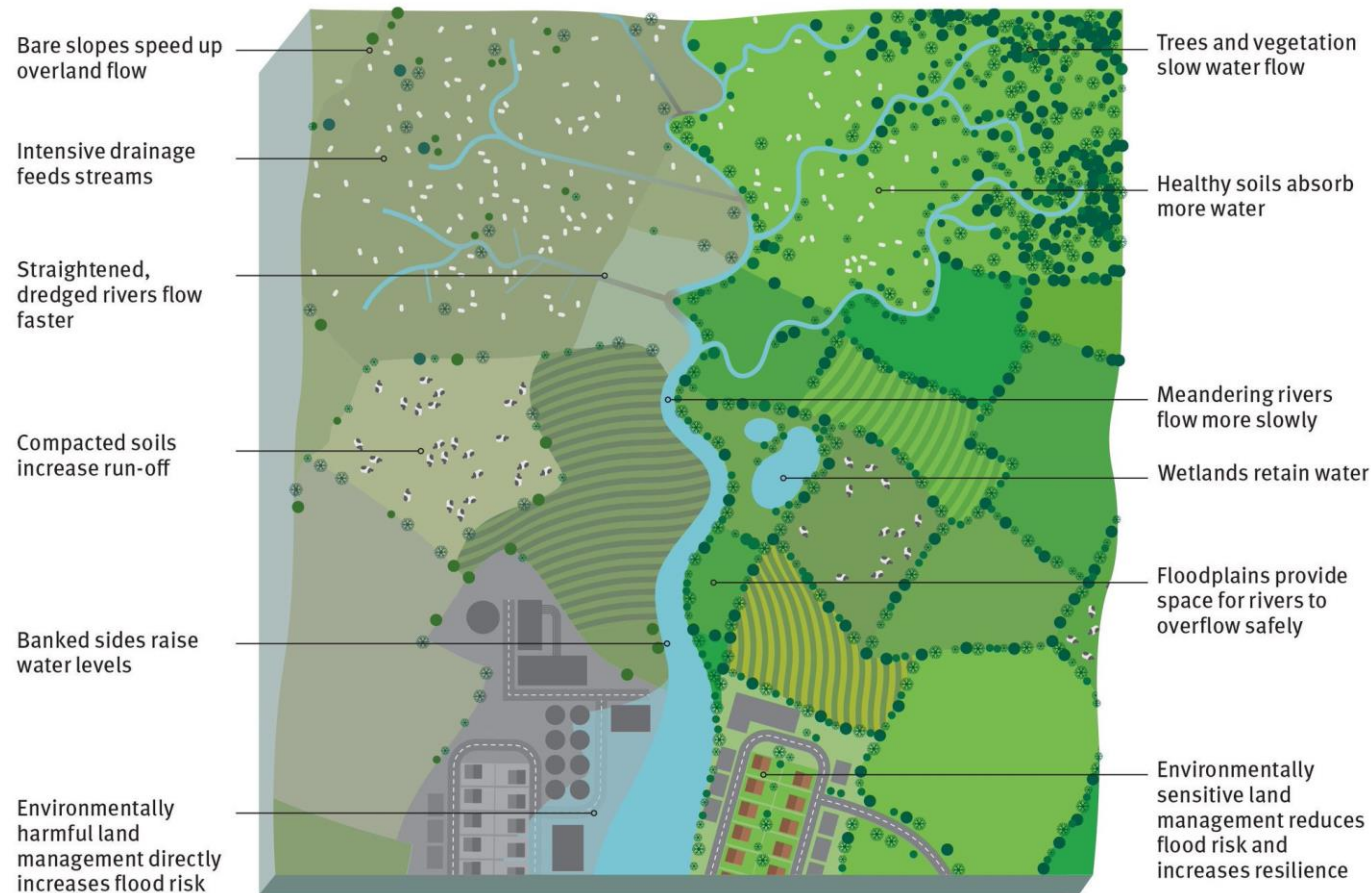
Lee Brown, Megan Klaar, Mark Smith

NFM MUG

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JBA consulting · JBA trust

Yorkshire Dales Rivers Trust
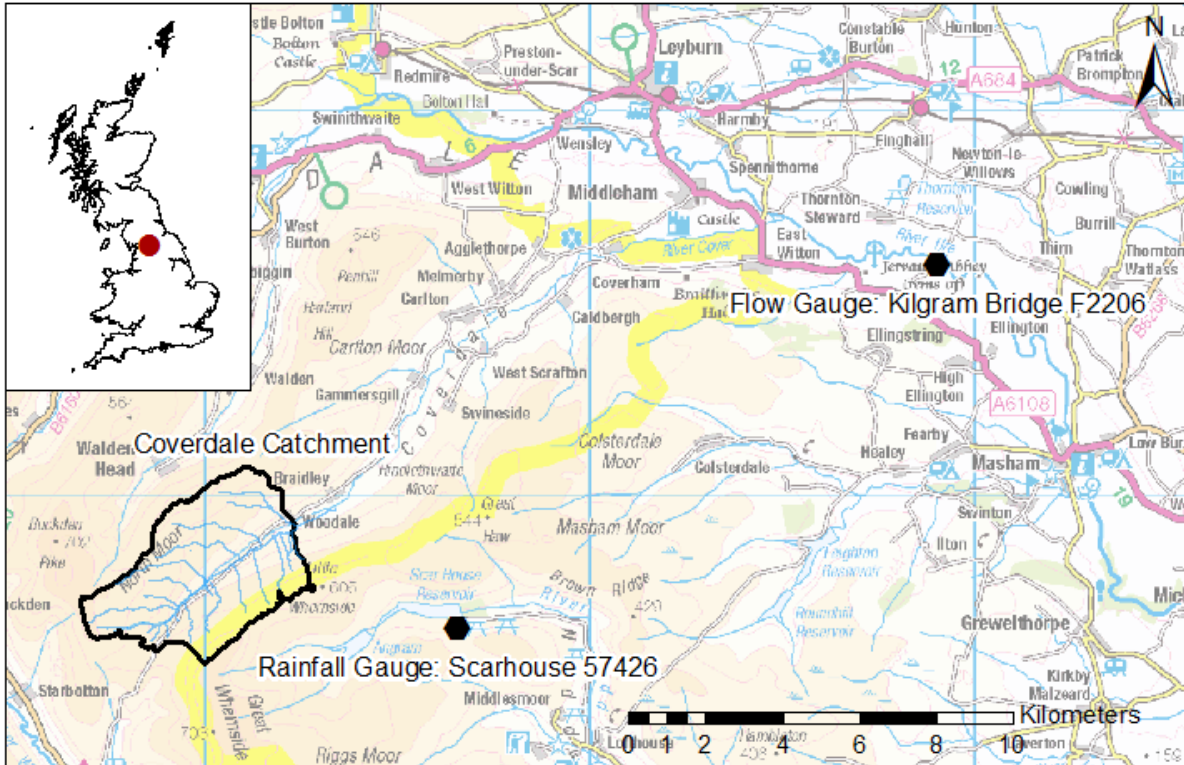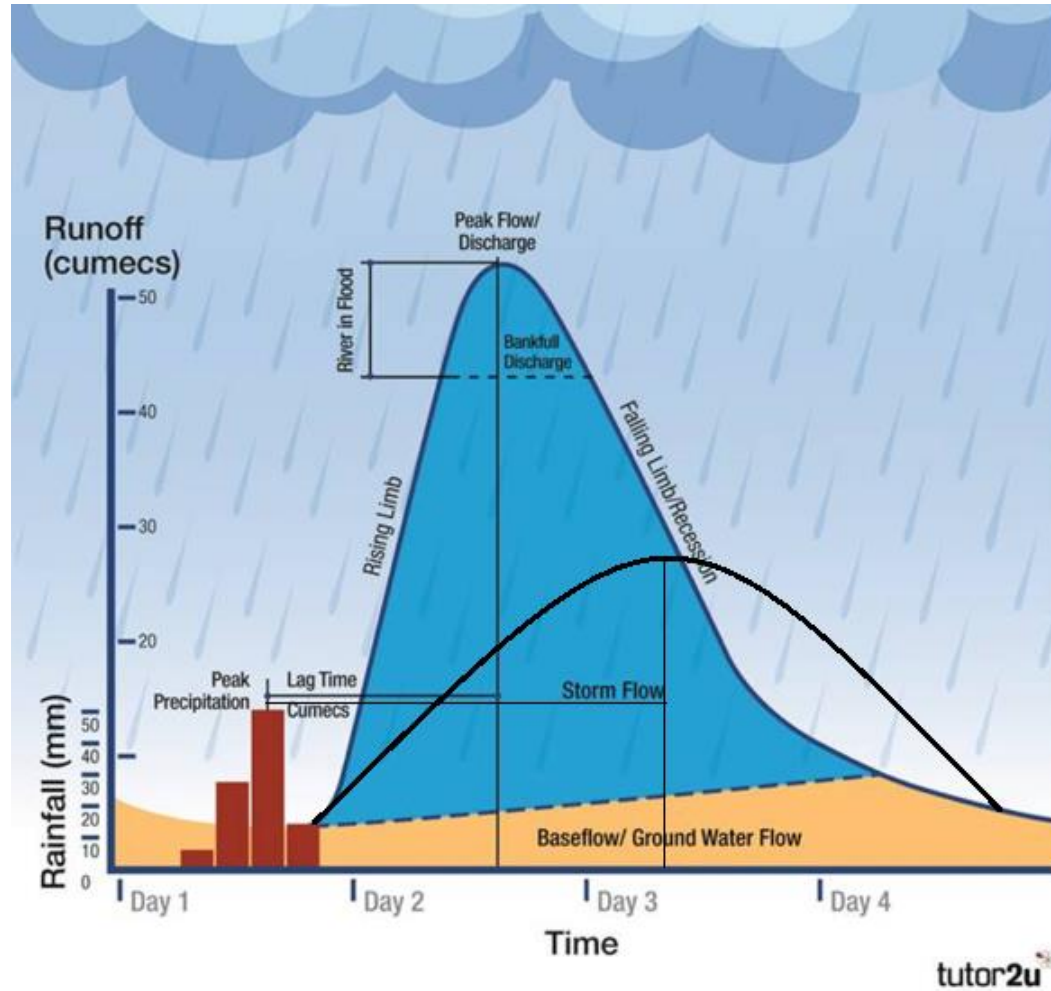
NERC SCIENCE OF THE ENVIRONMENT

Aim: Collect empirical evidence to quantify the impact of leaky dams on the downstream flood hydrograph
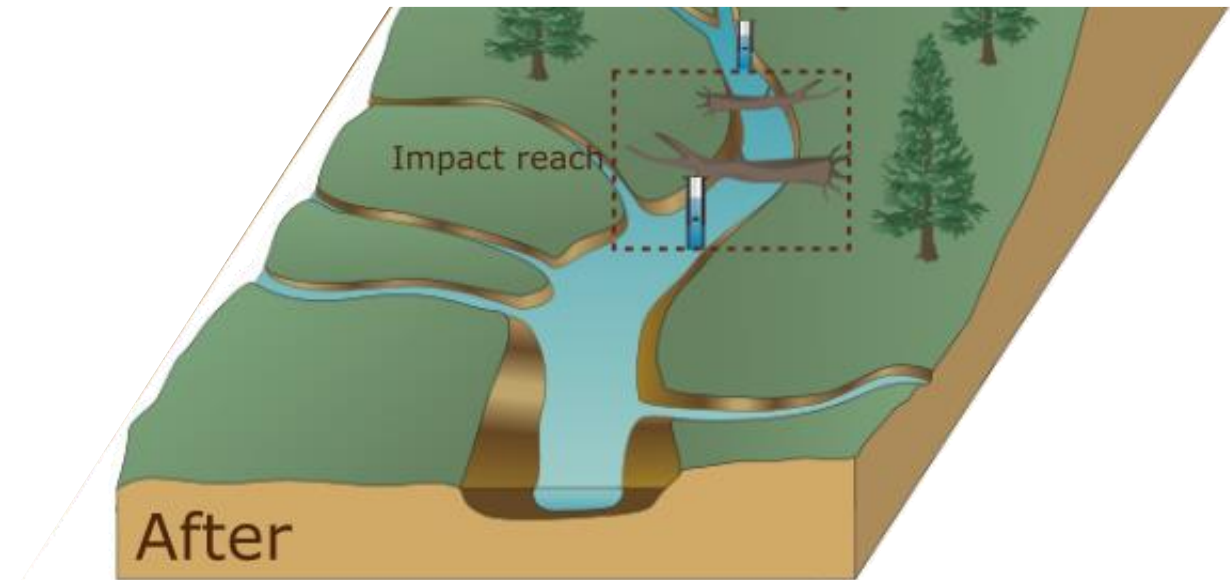
Monitoring leaky dams in the 12km^2 headwater of the River Cover, Yorkshire Dales National Park

What am I hoping to see?

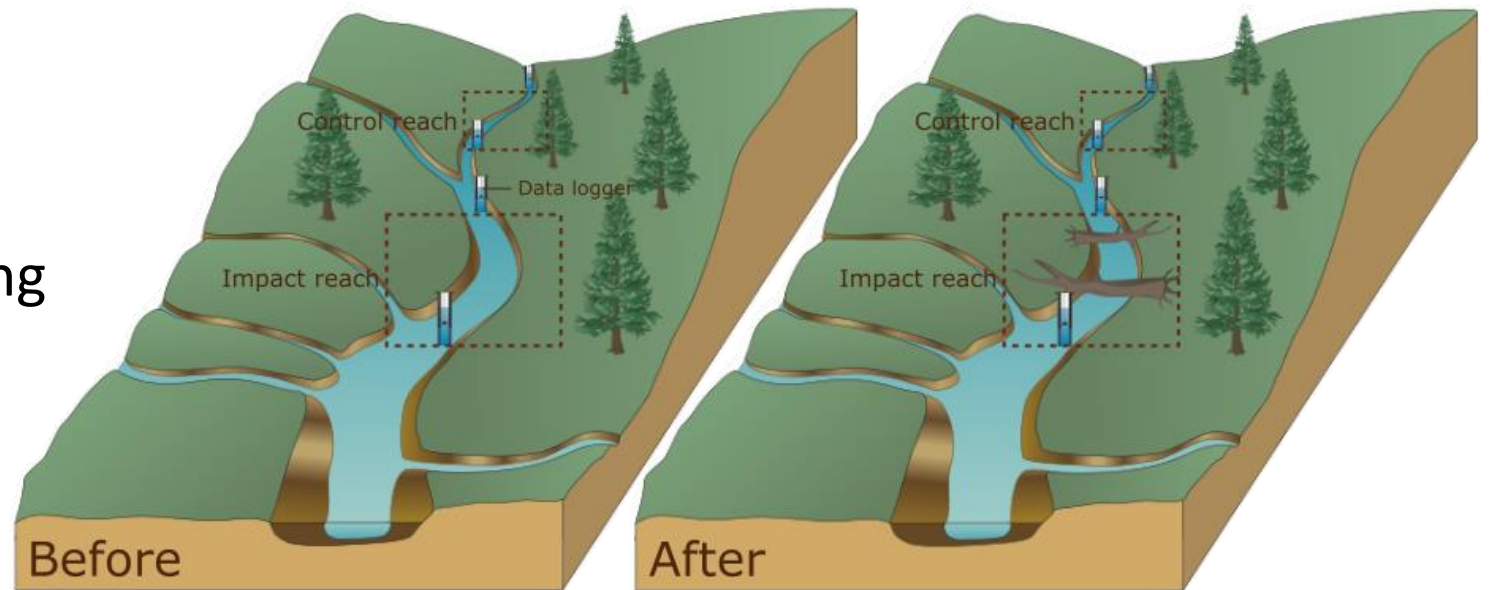# Change detection – Before After Control Impact (BACI) experiments

Detecting Change: Before After Control Impact experiments
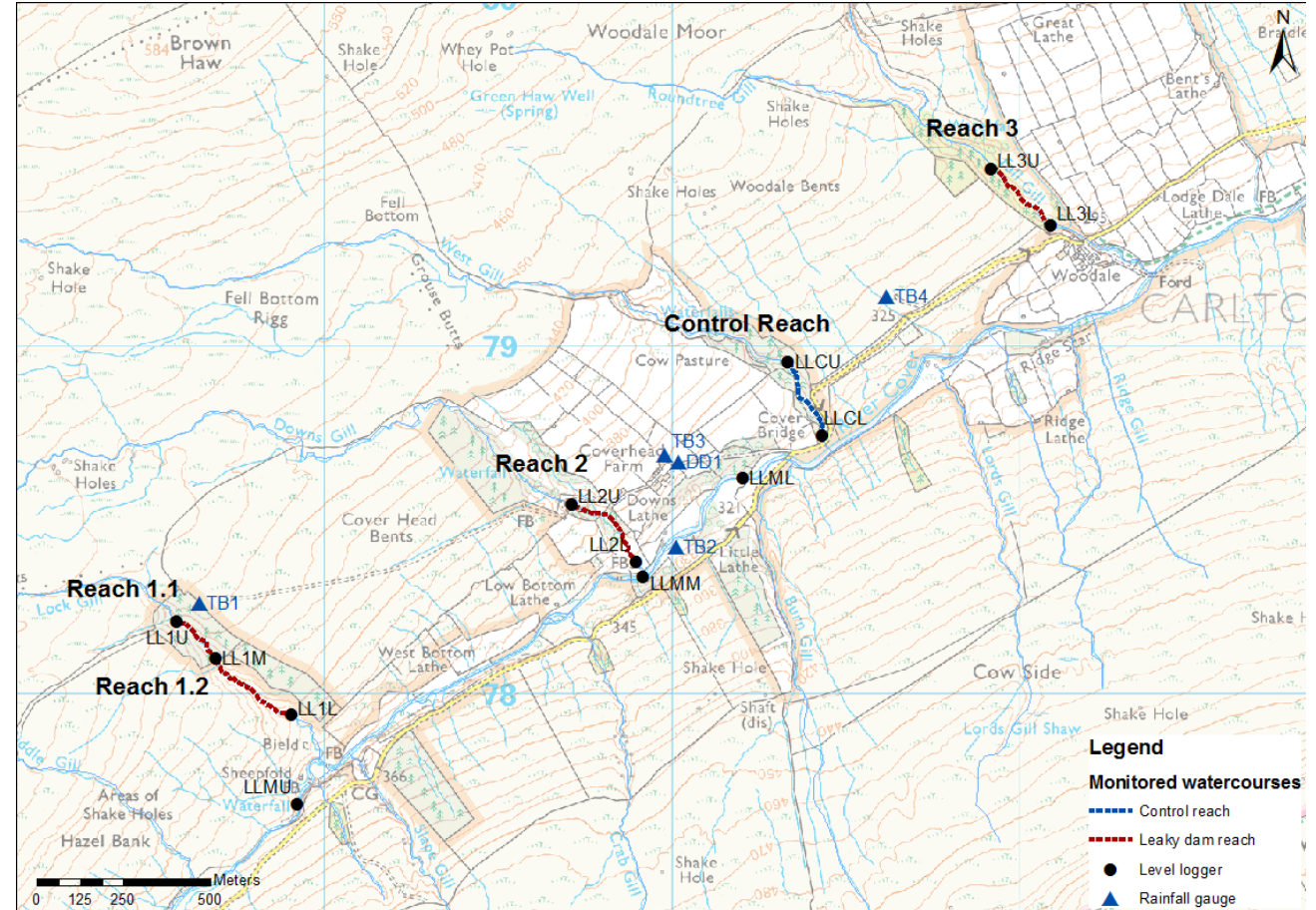
Step 1: Baseline monitoring

Step 2: Build Leaky Dams

Step 3: Intervention monitoring

Step 4: Data Analysis

Step 1: baseline monitoring

Water level gauging - Practical decisions

- Pressure transducers: vented vs absolute. Other options available (e.g. max level)
- Rough cost of absolute transducer: £330-1000 per logger, don't forget the cost of barometer, data download cable (~£150) and laptop.
- Logger specs
  - battery life
  - memory
  - minimum recording time step
  - launching criteria
- Logger placement
  - access (beware nettles and unstable banks!)
  - physical placement possibilities
  - no un-gauged inflows between up- and down-stream logg
  - in-channel flow location
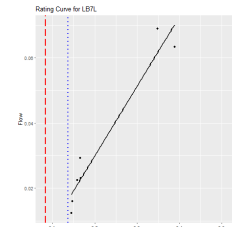 - stable cross section
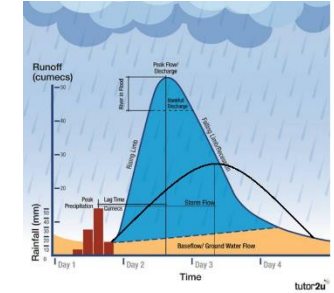
Converting levels to flows

1. Continuous water level logging
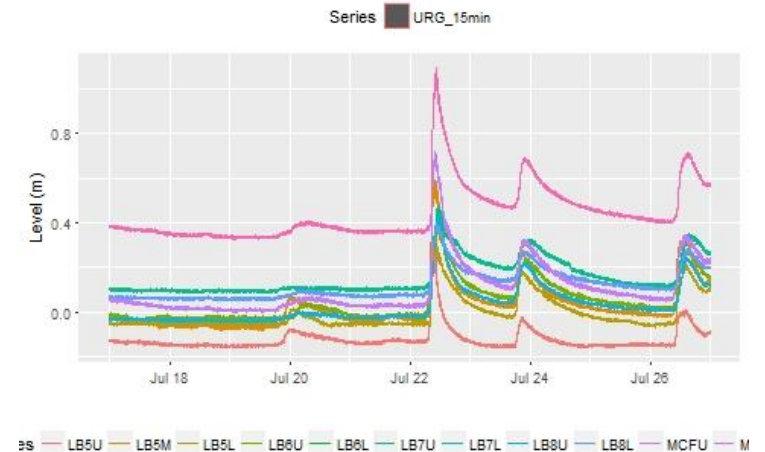

Water level
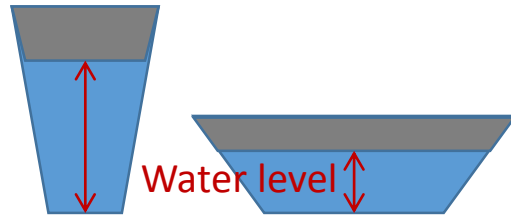
2. Develop rating curve – salt dilution gauging

3. Convert level time series to flow time series using rating curve

2017-07-22 POT event hyetograph (Scarhouse logger) and hydrograph

Series ▪ URG_15min

Step 2: Building leaky dams

- Ordinary watercourse consent obtained from North Yorkshire County Council

- 8 dams built with Yorkshire Dales Rivers Trust volunteers in ~4 days; 16 larger dams built with tree surgeon, labourer, 2 x YDRT staff in 6 days

- Dams built on watercourses with riparian trees (mainly sitka spruce plantations)

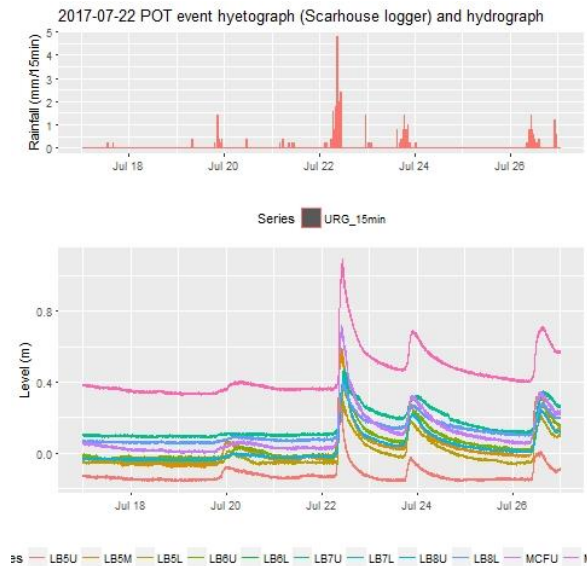- Walk-over with land-owner to select trees for felling

Step 3: Post-intervention monitoring

Step 4: Data Analysis

Hydrograph Analysis

Detection and comparison of similar events in before and after monitoring period

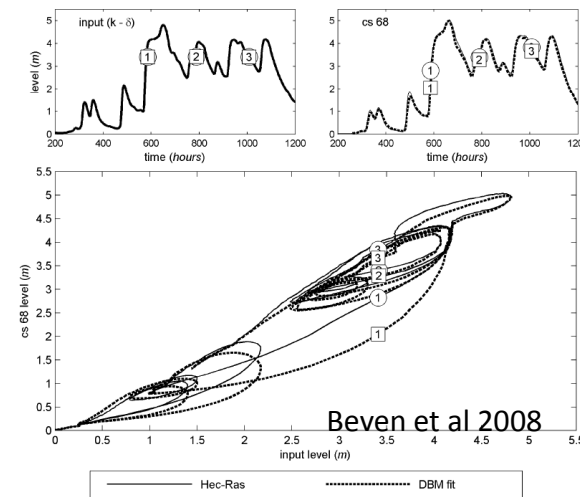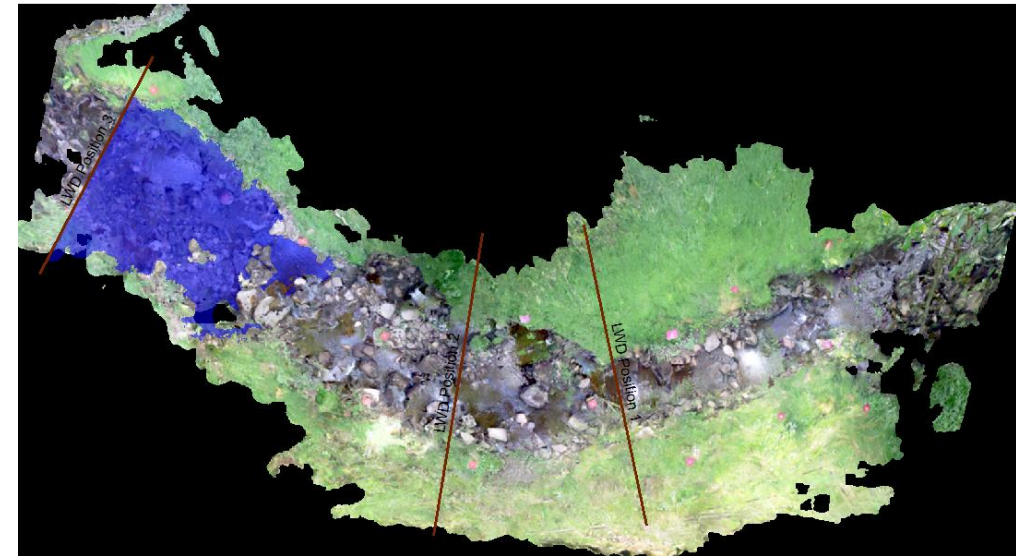## Time Series Analysis

Beven et al 2008

Figure 9. Illustration of level-to-level hysteresis using verification data (2) at cross-section 68.

Detection and comparison of change in whole time series dataset for before and after monitoring period

Storage volume model

Determination of storage volume behind leaky dams from Structure from motion models for use in routing models

Any Questions?