Title: Data Associated with “Logjam Characteristics as Drivers of Transient Storage in Headwater Streams”

Abstract
Logjams in a stream create backwater conditions and locally force water to flow through the streambed, creating zones of transient storage within the surface and subsurface of a stream. We investigate the relative importance of logjam distribution density, logjam permeability, and discharge on transient storage in a simplified experimental channel. We use physical flume experiments in which we inject a salt tracer, monitor fluid conductivity breakthrough curves in surface water, and determine breakthrough-curve skewness to characterize transient storage. We then develop a companion numerical model in HydroGeoSphere to reveal flow paths through the subsurface (or hyporheic zone) that contribute to some of the longest transient-storage timescales. In both the flume experiments and numerical simulations, we observe backwater formation and an increase in hyporheic exchange at logjams. Observed complexities in transient storage behavior depend largely on surface water flow in the backwater zone. As expected, multiple successive logjams provide more pervasive hyporheic exchange by distributing the head drop at each jam, leading to distributed but shallow flow paths. Decreasing the permeability of a logjam or increasing the discharge both facilitate greater surface water storage and volumetric rate of hyporheic exchange. Understanding how logjam characteristics affect solute transport through both the channel and hyporheic zone has important management implications for rivers in forested, or historically forested, environments.

Plain Text Abstract
Logjams in a stream create zones of slower moving water and locally force water to flow through the streambed, creating zones of temporary retention in stagnant areas of the stream and shallow subsurface. We refer to these areas as zones of transient storage. We investigate the relative importance of the spacing of logjams, how tightly packed a logjam is with fallen branches and leaves, and the amount of stream flow on transient storage in a simplified experimental channel. We use a physical scaled model of a river in which we inject a salt tracer and measure its flow downstream using data loggers. We also develop a companion computer model to simulate water and salt movement in the stream and streambed. In both our physical model and computer model, we observe an increase in surface water retention and surface water-subsurface water exchange at logjams spaced closely together and more tightly packed. Less water stored on the surface corresponds with more stagnant flows in surface dead zones and more overall transient storage. Understanding how logjam characteristics affect the downstream flow of chemicals has important implications for stream water quality and the management of forested, or historically forested, watersheds.

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Format of data files – .csv, .m (Matlab), .pdf

Location where data were collected – Engineering Research Center Hydraulics Lab, Colorado State University

Time period during which data were collected – 2020-01-01, 2021-09-01

File Information

This repository contains data for the experimental flume and numerical model runs referenced in Marshall et al., 2022. Source code, data csv files for statistical analysis, and calculated temporal moments are included.

- MarshalletalRawData.csv – Flume and model raw data

  Definitions:
  - LLS – low discharge, low permeability, single logjam
  - HLS – high discharge, low permeability, single logjam
  - LHS – low discharge, high permeability, single logjam
  - HHS – high discharge, high permeability, single logjam
  - LLM – low discharge, low permeability, multiple logjams
  - HLM – high discharge, low permeability, multiple logjams
  - LHM – low discharge, high permeability, multiple logjams
  - HHM – high discharge, high permeability, multiple logjams

- MarshalletalTempMoOutputs.csv – Flume and model outputs

  Definitions:
  - LLS – low discharge, low permeability, single logjam
  - HLS – high discharge, low permeability, single logjam
  - LHS – low discharge, high permeability, single logjam
  - HHS – high discharge, high permeability, single logjam
  - LLM – low discharge, low permeability, multiple logjams
  - HLM – high discharge, low permeability, multiple logjams
  - LHM – low discharge, high permeability, multiple logjams
  - HHM – high discharge, high permeability, multiple logjams

- TempMoScript.m – Sample Matlab fluid conductivity breakthrough curve and temporal moments script for the flume runs

- TempMoScript.pdf – .pdf version of the TempMoScript.m script, included for preservation and reusability purposes