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Large wood and stream longitudinal disconnectivity

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Large wood historically influenced diverse geomorphic and ecological processes in channels from first-order streams to major rivers. Centuries of deforestation and wood removal from channels have significantly reduced the presence of wood. The presence of large wood tends to decrease longitudinal connectivity, but increases lateral and vertical connectivity that arises from the presence of wood as an obstacle in the channel. Channel-spanning logjams, in particular, enhance vertical connectivity via hyporheic exchange flow and lateral connectivity via overbank flow, channel avulsion, lateral channel migration, or formation of secondary channels. In mountain streams, these effects are likely to be more pronounced in relatively wide, low gradient reaches with thicker alluvium and greater space for floodplain development and channel lateral mobility. River restoration increasingly includes maintaining or reintroducing large wood to channels, but there are relatively few studies that can be used to constrain management targets by providing data on instream large wood loads in unmanaged streams in diverse geographic settings. Here, we document the longitudinal distribution and persistence of logjams in the US Southern Rocky Mountains over a period of a decade. Key results include: (1) The longitudinal distribution of logjams varies significantly between successive stream reaches. Reaches are hundreds to thousands of meters in length and defined based on consistent stream gradient and channel lateral confinement. (2) Individual logjams change on an annual basis and typically persist less than a decade, although new logjams form frequently. (3) Individual logjams are more persistent in wide, low gradient reaches. (4) The population of logjams within a reach is more resilient to major floods in wide, low gradient reaches. The continuing breakup of jams and formation of new jams underscores the importance of ongoing wood recruitment in a natural river corridor. The results also imply that large wood reintroduction may be most effectively focused on specific types of wood process domains where the persistence and geomorphic effects of large wood are enhanced.