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CARBON POOLS ALONG HEADWATER STREAMS WITH DIFFERING VALLEY GEOMETRY IN ROCKY MOUNTAIN NATIONAL PARK, COLORADO

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ABSTRACT: Headwaters are known to be important in the global carbon cycle, yet few studies have investigated carbon (C) pools along stream-riparian corridors. To better understand the spatial distribution of C storage in headwater fluvial networks, we estimated above- and below-ground C pools in 100-m-long reaches in six different valley types in Rocky Mountain National Park, Colorado. Valley types were distinguished based on downstream gradient and valley-bottom width relative to active channel width (valley geometry) and the presence of biotic drivers, such as beaver dams and channel-spanning logjams associated with old-growth forest, that are capable of creating multi-thread channel patterns. The six contrasting valley types are: laterally confined valleys in old-growth forest; laterally unconfined valleys with multi-thread channels in old-growth forest; laterally unconfined valleys with single-thread channels in old-growth forest; laterally confined valleys in young forest; beaver-meadow complexes with multi-thread channels and mixed riparian vegetation (conifer, willow, and herbaceous); and abandoned beaver-meadow complexes with single-thread channels and dominated by herbaceous vegetation. We compared carbon stored in the riparian vegetation (live and dead), instream and floodplain large wood, and floodplain sediment for each 100-m-long valley segment. Preliminary comparisons of aboveground C pools show that live and dead biomass C pools differed among valley types, and were highest in the laterally unconfined valley segment with multi-thread channels and dominated by riparian old-growth forest. Belowground C pools were highest in the beaver-meadow complexes, reflecting the substantial storage potential of wide, low-gradient valleys and the high C content of floodplain sediments. Although multi-thread channel segments influenced by beaver or logjams cover less than 25 percent of the total length of headwater river networks in the study area, they may account for more than three-quarters of the stored C along the river network. Results suggest that historical removal of beavers and old-growth forests have likely resulted in a reduction of total ecosystem C pools and potential for C storage along headwater river networks in the Colorado Front Range.

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