The distribution and impact of roads and railroads on the river landscapes of the coterminous United States

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Floodplain roads and railroads are common features in river landscapes, but their distribution and impacts have not been explicitly studied. This dissertation discusses the impacts of floodplain roads and railroads on channel and floodplain processes in river landscapes at the continental, regional, and local scales. At the continental scale, I documented the spatial patterns of roads and railroads in the floodplains of the continental United States and the regional variability of their potential impacts. Based on these results, I developed a conceptual model based on topography and the interaction of transportation and stream networks that suggests that the area of lateral disconnection caused by transportation infrastructure should be most extensive in mid-sized alluvial valleys in relatively rugged settings, such as those located in the western United States. I used pre-existing digital geologic, hydrologic, and transportation data with Geographic Information Systems software to map floodplain areas and lateral disconnection along the floodplains of two river systems in Washington State. I developed methods to quickly and inexpensively delineate potential or historic floodplain surfaces, to analyze lateral floodplain disconnection caused by different types of structure, and to rank floodplain reaches in terms of salmon habitat potential. Although all floodplains exhibited disconnection, the floodplain maps and habitat rankings helped identify opportunities for habitat preservation and restoration. At the local scale, I mapped and measured the impacts of lateral disconnection, showing that channel and riparian habitat was degraded in locations with floodplain transportation infrastructure confining the channel compared with similar nearby sites lacking such confinement. Railroad grades and road beds function as confining structures in the riparian zone, disrupting flood pulses and the exchange of water, sediment, and biota between channels and their floodplains and within the floodplain. Over longer time periods, these structures can also impede the natural meandering and migration of channels across their floodplains, disrupting the erosional and depositional processes that drive the high habitat and biological diversity characteristic of floodplains. My results show that human-caused disconnections need to be further incorporated into river science and management. This dissertation includes previously published and unpublished co-authored material.