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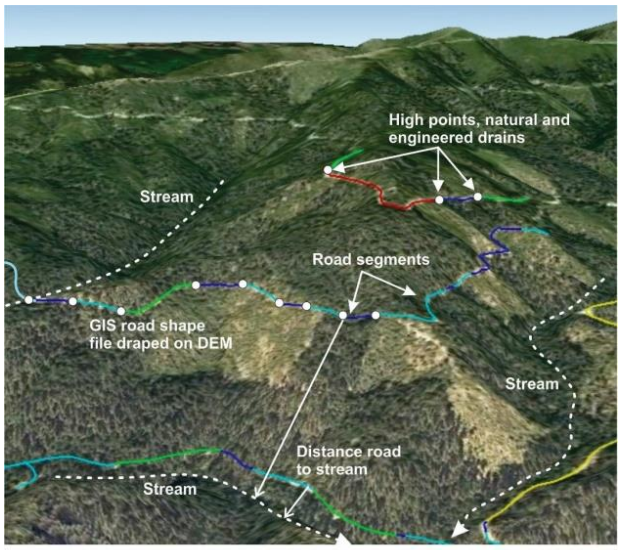
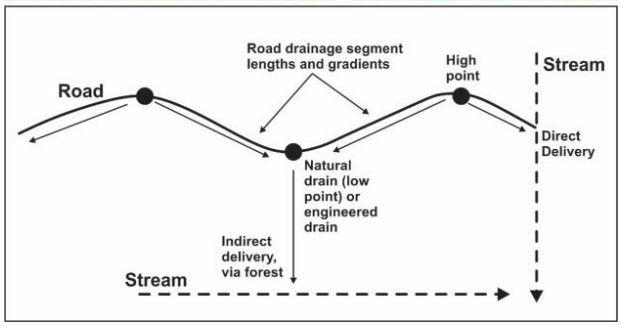
Informing Land & Resource Management

Axel Anderson

Identifying Unpaved Road Sediment Delivery to Critical Fish Habitats for Strategic Prioritization of Mitigation Actions in Alberta

In Alberta, industrial unpaved roads for forestry and energy development are the largest sources of sediment pollution impacting water quality and Bull trout and Westslope Cutthroat trout habitats. Studies in forested environments in North America have shown that only 10% to 30% of roads are hydrologically connected to stream channels and deliver runoff and sediment to them. Only a subset of those supply the majority of sediment to streams.





The aim of this project was to identify which unpaved road and cutline segments deliver the largest proportion of sediment to streams in the critical Bull Trout and Westslope Cutthroat trout habitats in Oldman and Bow Rivers (study area 1), Upper Saskatchewan and Red Deer Rivers (study area 2), Athabasca and Peace River (study area 3) watersheds. It also provided support to predict the optimum locations for new drains and gravel surfacing to maximize sediment reductions to streams and critical fish habitats.

The analysis platform integrated the wet areas mapping (WAM) synthetic stream layer and the NetMap suite of analysis tools within virtual watersheds. Airborne light detection and ranging (LiDAR) data were used to generate the stream layer and virtual watersheds. In support of this study, field data collection in southern Alberta included subsampling of road drainage features (at stream crossings and in other non-stream locations).

Results

The model showed that most sediment reduction is achieved with a small number of the most effective drains. Fifteen (study area 3) to twenty percent (study areas 1 and 2) of individual road segments in the study areas produce 90% of all sediment delivered to streams; road segment lengths vary so that 18% (study area 1), 24% (study area 2) and 14% (study area 3) of road length is responsible for producing 50% of sediment delivered to streams.

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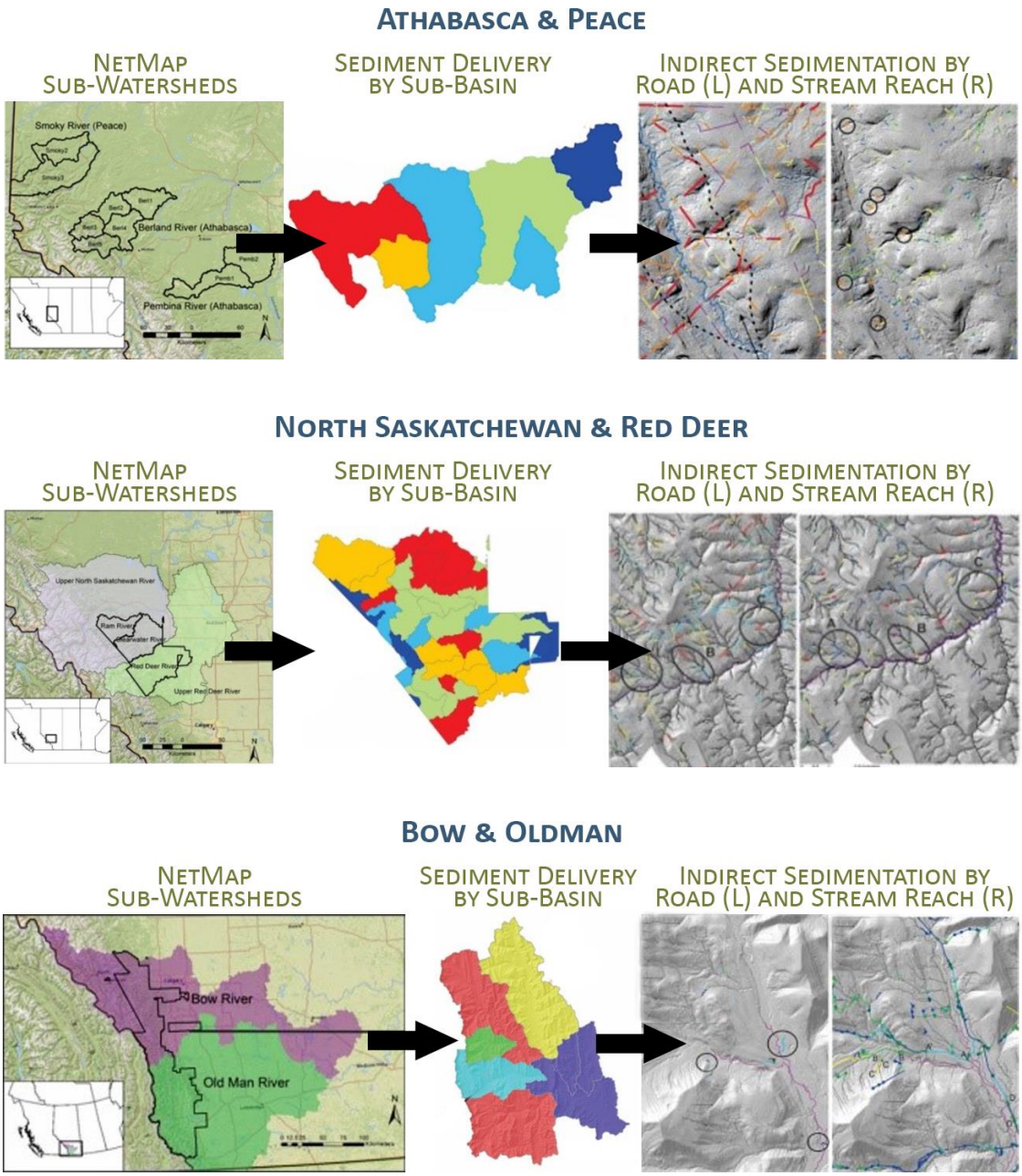
The road analysis also predicted the locations of new, optimized drains and surfacing that could be used to reduce sediment delivery to streams and Bull Trout habitat. The most sediment reduction is achieved with a small number of the most effective drains. Eighty-percent of total possible sediment reduction occurs within the highest performing 22% (study area 1), 40% (study area 2) and 24% (study area 3) of new drains.

Outcomes from the new GIS-based model could be incorporated in Alberta forest management planning, sub-regional integrated land management plans, and habitat recovery strategies.



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