

# Watershed assessment procedure to address cumulative effects in the eastern slopes of Alberta

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## Introduction:

The eastern slopes supply up to 70 % of the water to some river systems in southern Alberta. These public lands are under a mosaic of jurisdictions with multiple uses that include energy extraction, range, forestry, and many forms of recreation. In addition, wildfires and forest / range health issues pose threats to watershed values. Larger scale assessments have indicated that the water quality, quantity and watershed are generally in good condition, especially when compared to downstream where agriculture dominates to the landscape. However, there is public concern and evidence that smaller scale cumulative impact issues exist in the region. While assessments and monitoring conducted by a limited staff address issues as needed, there are increasing calls to provide:

1. formalized assessment tools,
2. greater capacity to address possible cumulative effects to watershed values, and
3. advice to decision makers responsible for individual components of management.

## Objectives:

1. Review existing assessment procedures from Alberta's neighbouring jurisdictions.
2. Develop an assessment procedure that is science-based and compliments existing and potential future land and resource policies.
3. Improve the overall quality of assessments in the region by capitalizing on available data that will close the gap between higher-level office assessments and more labour intensive field assessments. Alberta's industries have generated extensive coverages of high-resolution remotely-sensed and field surveyed data.

## Study Site:

For this project we partnered with the Oldman Watershed Council (OWC), a stakeholder group in the Oldman River Basin.

The Oldman River flows from the continental divide in Montana and Alberta to the south Saskatchewan River. The Oldman receives much of the water from the multiple-use forested and mountainous headwaters region which supplies water to irrigated agriculture and urban areas, where surface water is fully allocated.

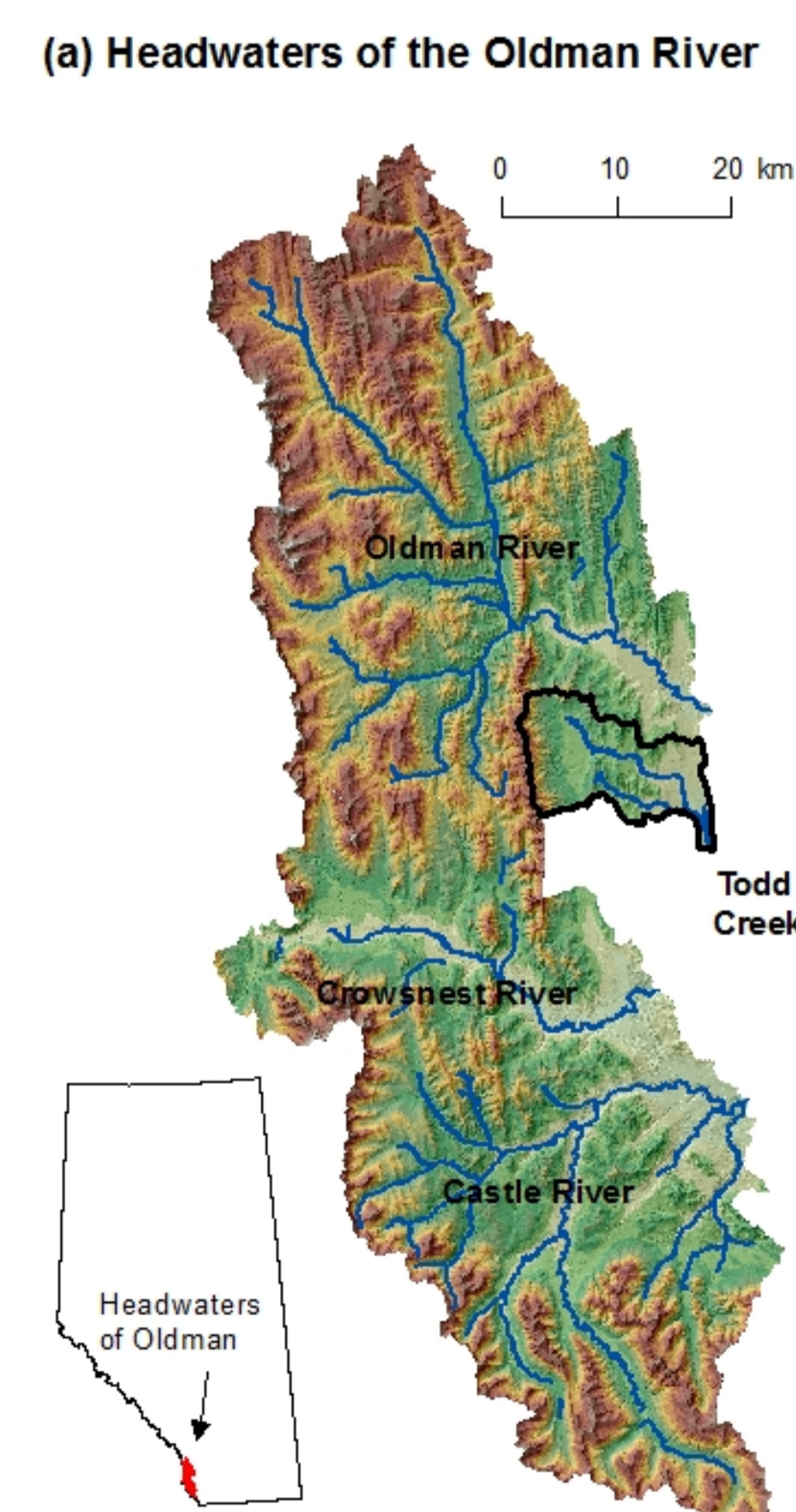
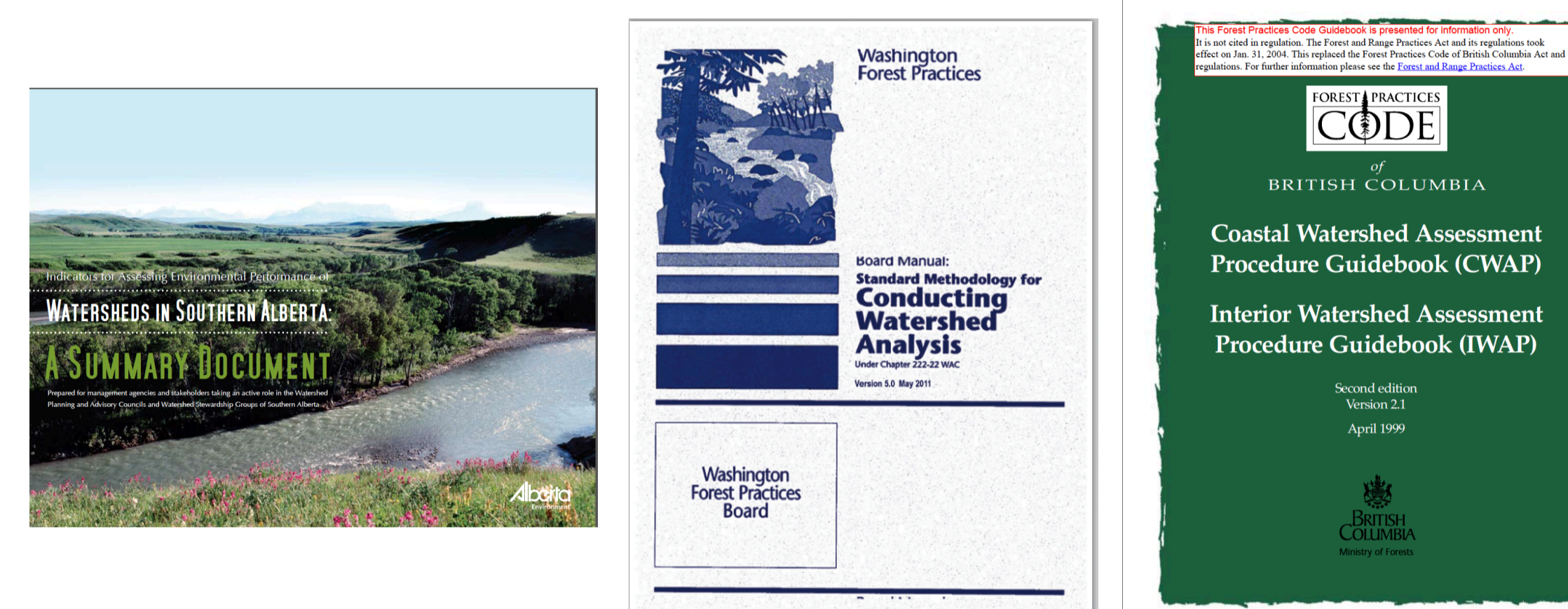


Figure 1. Study site. Headwaters of the Oldman River, Alberta.

## Review of Existing Procedures:

From our review of other procedures (e.g. BC, WA, OR), we identified three main elements for our analysis:

1. based on the concept of risk,
2. two levels of assessment (Level 1: office and reconnaissance, and Level 2: field assessments), and
3. based on watershed process knowledge specific to regions that share first order controls on watershed processes.



## Watershed Processes:

We used the concept of a cumulative effects assessment of watershed values grouped by dominant processes to guide technical reviews. Several are published in STREAMLINE.



## Level 1 Assessment Procedure:

In 2012/13 we completed a pilot assessment to test our procedure. We developed a local advisory team (e.g., Oldman Watershed Council, fisheries biologist, agrologist, forester) that identified:

### 1. Watershed values:

e.g., conservation of the westslope cutthroat trout, regional water supply

### 2. Watershed processes and associated proposed procedures suitable for the region's pressures, data, and existing policies:

We identified three broad categories of watershed processes and used these to account pressures that may alter the processes (Figure 2):

**Erosion:** e.g., sedimentation from surface erosion of roads. We used several indicators and erosion models, however, we ultimately identified that the public use of linear features as a data deficiency which increased uncertainty and required future work to be useful.

**Riparian:** e.g., livestock grazing and floodplain alteration. We used several detailed datasets to predict floodplain extent (Figure 3C).

**Hydrology:** e.g., changes in peak flow and channel scour identified with an Equivalent Clearcut Area approach, which will identify watersheds for future analyses, modelling or field investigations.

### 3. Available datasets and gaps:

Known locations of westslope cutthroat trout  
Information on dispersed pressures, such as ATV trail use

## Connections between Processes and Values:

Erosion, riparian, and hydrologic processes operate independently and also interact to cause impacts to watershed values. For example, road surface erosion can generate fine sediment and reduce the productive capacity of spawning and rearing habitat for westslope cutthroat trout. Livestock grazing on floodplains can promote erosion of streambanks.

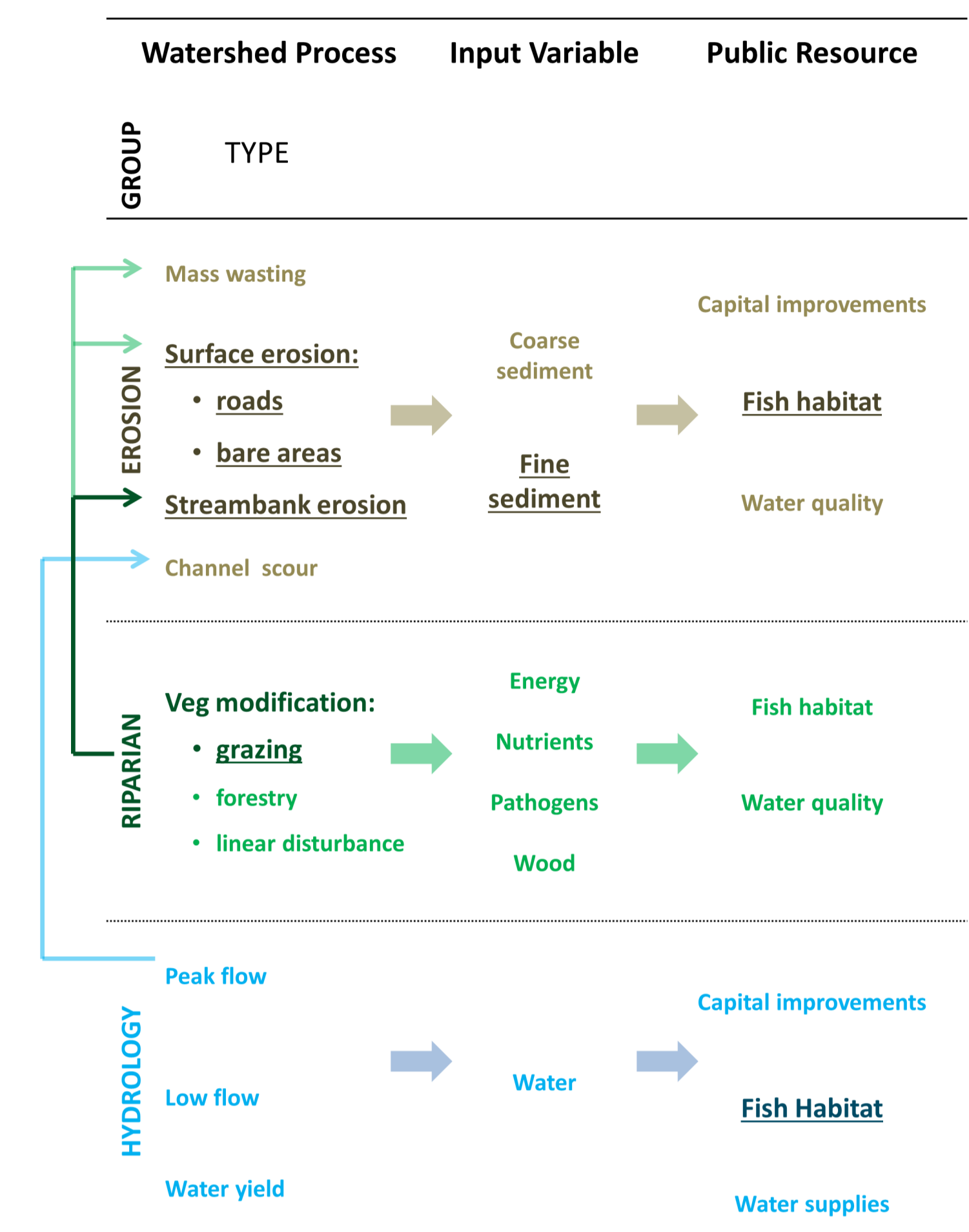


Figure 2. Connections between watershed processes, watershed input variables, and public resources in East Slope watersheds (adapted from WDNR 2011)

## Example outputs:

High resolution LiDAR DEMs enable detailed mapping of watershed fish habitat, road erosion risk, and floodplains that when combined, show high risk locations for field assessments.

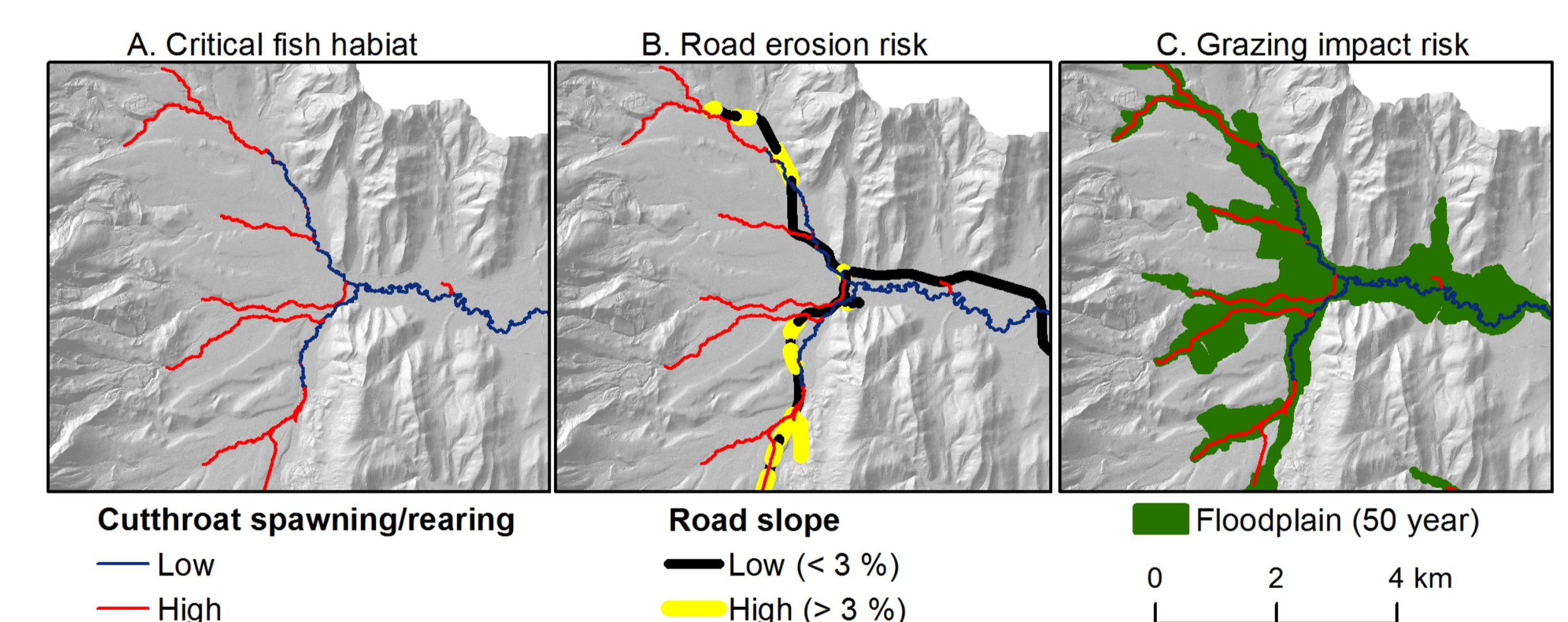


Figure 3. Example of the use of high resolution data for Level 1 assessments

## Next Steps:

- Implementation of the Level 1 system for a larger portion of the Eastern Slopes Region in the Oldman River watershed with an emphasis on greater input from stakeholders.
- Development of Level 2 protocols for the region. Initial indications suggest that erosion and sedimentation from road and recreational use may present a risk to various water values.
- Identify the feasibility and need of developing procedures for different hydrological regions, e.g. Alberta Foothills.
- Provide focus for data and knowledge deficiencies identified through the assessment process.

## Acknowledgements:

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