Athabasca Watershed Council

INFO SHEET 7 **Spring 2012**

Stream Crossings

Effect on Fish, Wildlife & Water Quality

The design and placement of road crossing structures (culverts and bridges) over fish-bearing streams must ensure that the stream's connectivity is not disrupted. Structures must continue to allow the **passage of fish** and other aquatic organisms throughout the length of the stream. Most fish need to travel up and down the stream and its tributaries to find mates, spawn, grow, find food, and find a resting place. Fish require certain stream flow velocities at different stages of life. Changes in water depth affect several stream physical properties (example, water temperature) and many biological processes (example, survival of aquatic and riparian plants).

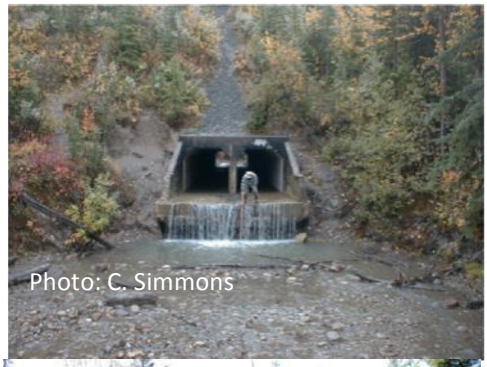
Photo: C. Simmons


Photo: Foothills Stream Crossings Partnership

Culvert bottom placed above the stream bed disrupts fish passage. Too narrow or too wide culverts change the stream's velocity and/or water depth.


Photo: M. Hayward

A bridge maintains the connectivity of a stream and most of its riparian corridors ensuring uninterrupted fish and wildlife passage through it.

Another important factor to consider is the maintenance of the connectivity of the stream's **riparian corridors** to allow uninterrupted **passage of wildlife** that rely on riparian habitat. Structures should provide for safe passage of animals that otherwise would have to cross over the road with the risk of collision with vehicles. Roads with heavy traffic discourage some animal species from crossing and thereby isolate populations which is unhealthy for the maintenance of genetic diversity and the perpetuation of the species.

Active or recent soil excavations and construction of stream crossing structures, can result in **sediments** and/or **contaminants** entering a stream. This problem can be minimized by installing proper mitigation practices to control runoff, erosion and sedimentation (examples: silt fences, check dams, structural mats, etc.) combined with active re-vegetation.


Photo: C. Simmons

New arch culvert with silt fences and narrow bands of naturally re-established vegetation.


Photo: M Montemayor

Check dams—mulch socks on a sloping strip of land cleared of trees and seeded with grass.

The Athabasca State of the Watershed Report Phase 2 has identified ***Stream Crossing Density*** (Number of stream crossings per tertiary watershed area) as one of the **pressure indicators** that has a potential to cause ecological impact. This indicator includes all types of stream crossing structures and all sizes of streams. A tertiary watershed of the Pembina sub-watershed showed Moderate ***Pressure Rating*** (see map on the right).

Criteria for *Stream Crossing Density* are:

- Low Pressure: <0.4 stream crossing/km^2
- Moderate Pressure: ≥0.4 to <0.6 stream crossings/km^2
- High Pressure: ≥0.6 stream crossings/km^2

Another indicator is the density of culverts only since culverts tend to be often incorrectly placed or under– or over-sized with respect to fish needs. Culverts are used in smaller streams.

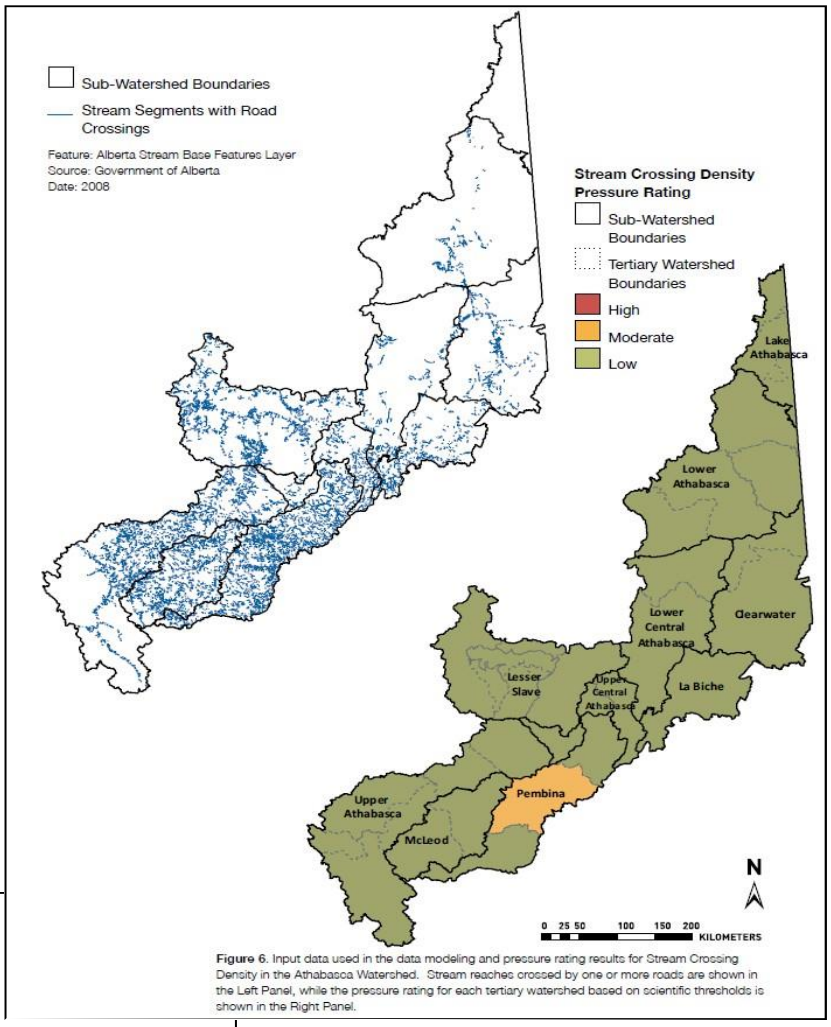

Figure 6. Input data used in the data modeling and pressure rating results for Stream Crossing Density in the Athabasca Watershed. Stream reaches crossed by one or more roads are shown in the Left Panel, while the pressure rating for each tertiary watershed based on scientific thresholds is shown in the Right Panel.

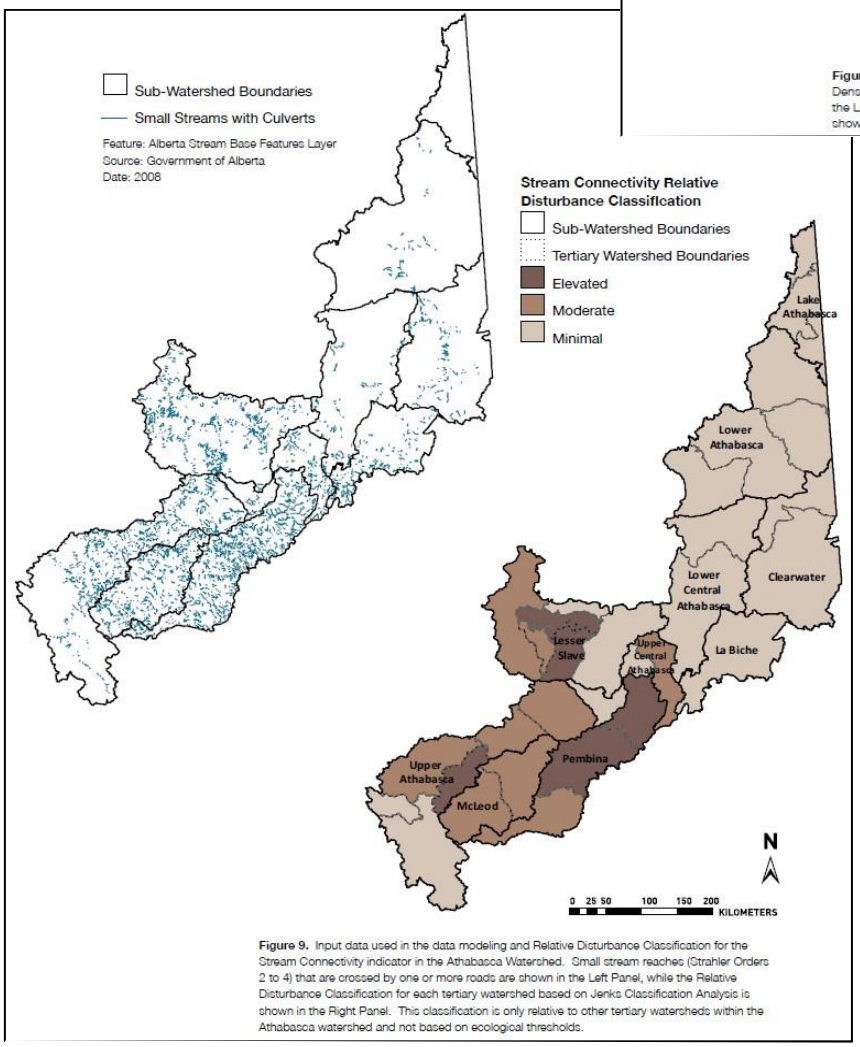

Figure 9. Input data used in the data modeling and Relative Disturbance Classification for the Stream Connectivity indicator in the Athabasca Watershed. Small stream reaches (Strahler Orders 2 to 4) that are crossed by one or more roads are shown in the Left Panel, while the Relative Disturbance Classification for each tertiary watershed based on Jenks Classification Analysis is shown in the Right Panel. This classification is only relative to other tertiary watersheds within the Athabasca watershed and not based on ecological thresholds.

Areas in the watershed with predominantly forestry, agriculture, and coal and gravel mining land uses showed Moderate to Elevated ***Relative Disturbance Classification*** for the indicator ***Stream Connectivity*** (Number of **culverts** per 100 km^2 area of tertiary watershed) (see map on the left). This indicator has no ecological thresholds and classification was derived through Jenks analysis. This method is based on natural groupings that are inherent in the data and identifies break points (big jumps in data) that group similar values to maximize the differences between classes. This classification is only relative to all the other tertiary watersheds in the Athabasca watershed.

Criteria for *Stream Connectivity* are:

- Minimal Disturbance Classification: ≤3.5 culverts/100 km^2
- Moderate Disturbance Classification: >3 to ≤9.5 culverts/100 km^2
- Elevated Disturbance Classification: >9.5 culverts/100km^2