

### 4.3.1 Overall Health Ratings

Each riparian area was assessed on the criteria listed above in Table 1 and then given a health rating score that fit into one of the following categories, unhealthy, healthy with problems or healthy. Each category has a specific score range detailed in Table 2 which determined the overall state of the riparian area. The following calculation determines the score of the assessed riparian area.

Riparian Health Rating Calculation:

$$(\text{Actual Score} / \text{Possible Score (57)}) \times 100 = \text{Derived Health Score}$$

Table 2: Riparian Health Ratings Table

Derived Health Score Range	Descriptive Category Rating
≥ 80	Healthy (Proper Functioning Condition)
60-79	Healthy with Problems (Functional At Risk)
≤ 59	Unhealthy (Non-functional)

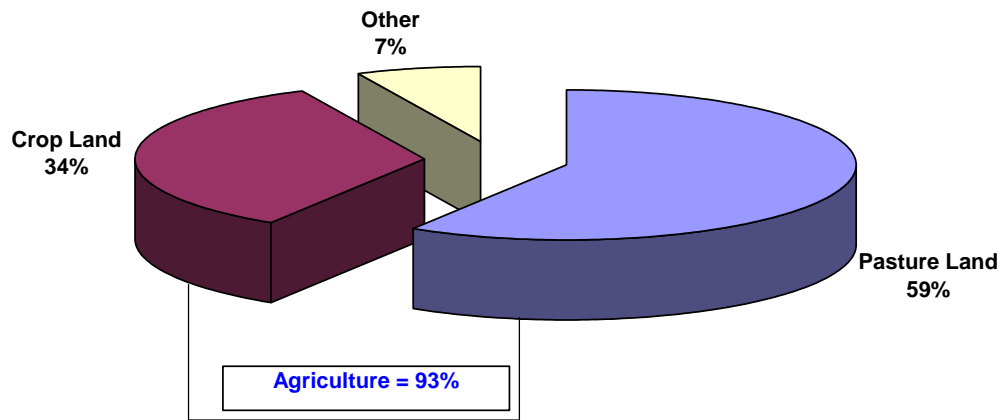
## 5. Results

### 5.1 Land-use

#### 5.1.1 Uplands

One of the primary purposes of this study was to determine the major land use practices occurring within the watershed. The primary land use in the area is agriculture representing 93% of the sites visited. Native and tame forage crop used for cattle production represented 59% of the assessment locations and 34 % of the agriculture land-use is designated as crop production. The last category is “other” which represents 7% of the studied sites (see Figure 4). Recreation hiking trails, bike paths, and parks primarily located in the city of Moose Jaw and the headwaters at Buffalo Pound Provincial Park.

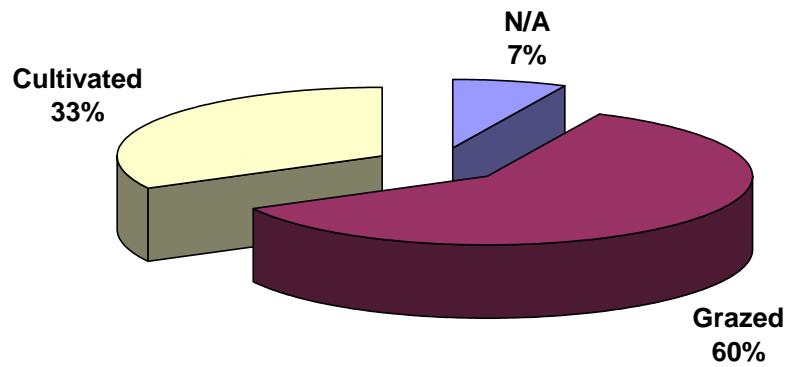
Figure 4: Land Use Practices for the Moose Jaw River Watershed



### 5.1.2 Riparian

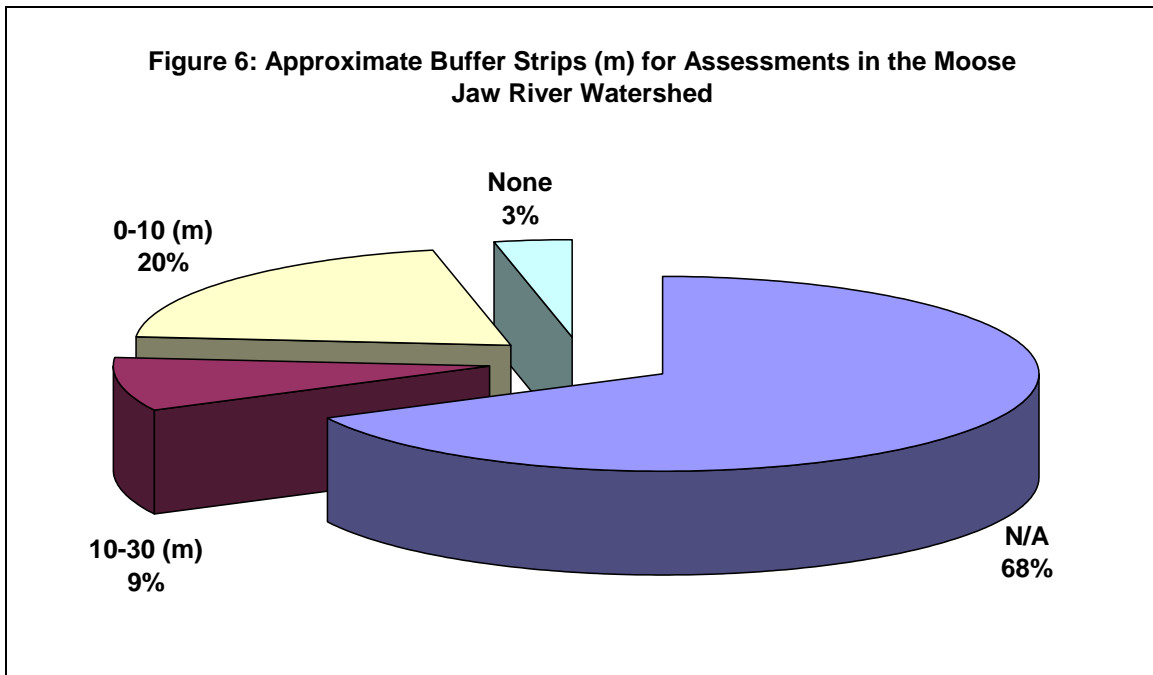
The outcome of the riparian health assessment is largely dependant upon the riparian land use practices. Improper management of a riparian area can result in an increased amount of noxious weeds, invasive plants and channel incisement. It can reduce the amount of preferred shrubs and plant cover. The presence of livestock can have a heavy impact on the overall health of the riparian area. Figure 5 represents the land use of the riparian areas in the study. The not applicable category represents recreational areas and non-agricultural land.

**Figure 5: Riparian Land-use for the Moose Jaw River Sub-Watershed**



### 5.1.2.1 Buffer Strips

For a riparian area to perform the necessary functions and stay healthy there needs to be a certain distance from the water to up-land activity. A best case scenario would be about a 30 metre span (Agriculture and Agri-Food Canada, pg 28). This buffer consists of permanent vegetation, including grasses, shrubs and trees which is important for bank stability and erosion control. Buffers also provide a transportation route and protective cover for many animals inhabiting the watershed. A combination of a desktop study and field work determined approximate buffer widths for each study site with grain practices occurring. Operations with grain practices are likely to cultivate the sensitive riparian. See Figure 6 for results. The “not applicable” category represents the livestock operations instead of the grain farming operations.



## **5.2 Components to Riparian Health Study**

There are two large sections each with several components that make up the criteria for a riparian health assessment. The vegetation section consists of seven components; vegetation cover of the floodplain and streambank, invasive plant (weeds) canopy cover, invasive plant (weeds) density/distribution, disturbance vegetation cover, preferred tree and shrub establishment and regeneration, utilization of preferred trees and shrubs, and standing decadent and dead woody material. The soil/hydrology section uses five components to interpret the state of the riparian area based on physical characteristics of the waterway and adjacent areas. The five components are; streambank and root mass protection, human-caused bare ground, streambanks structurally altered by human activity, pugging, hummocking and/or rutting, and stream channel incisement.

Each assessment site is evaluated on each component and rated using a number scale. The number scale is outlined in the *Caring for the Green Zone, Riparian Health Assessment for Streams and Small Rivers*. The following is the results gathered from the study for each component.

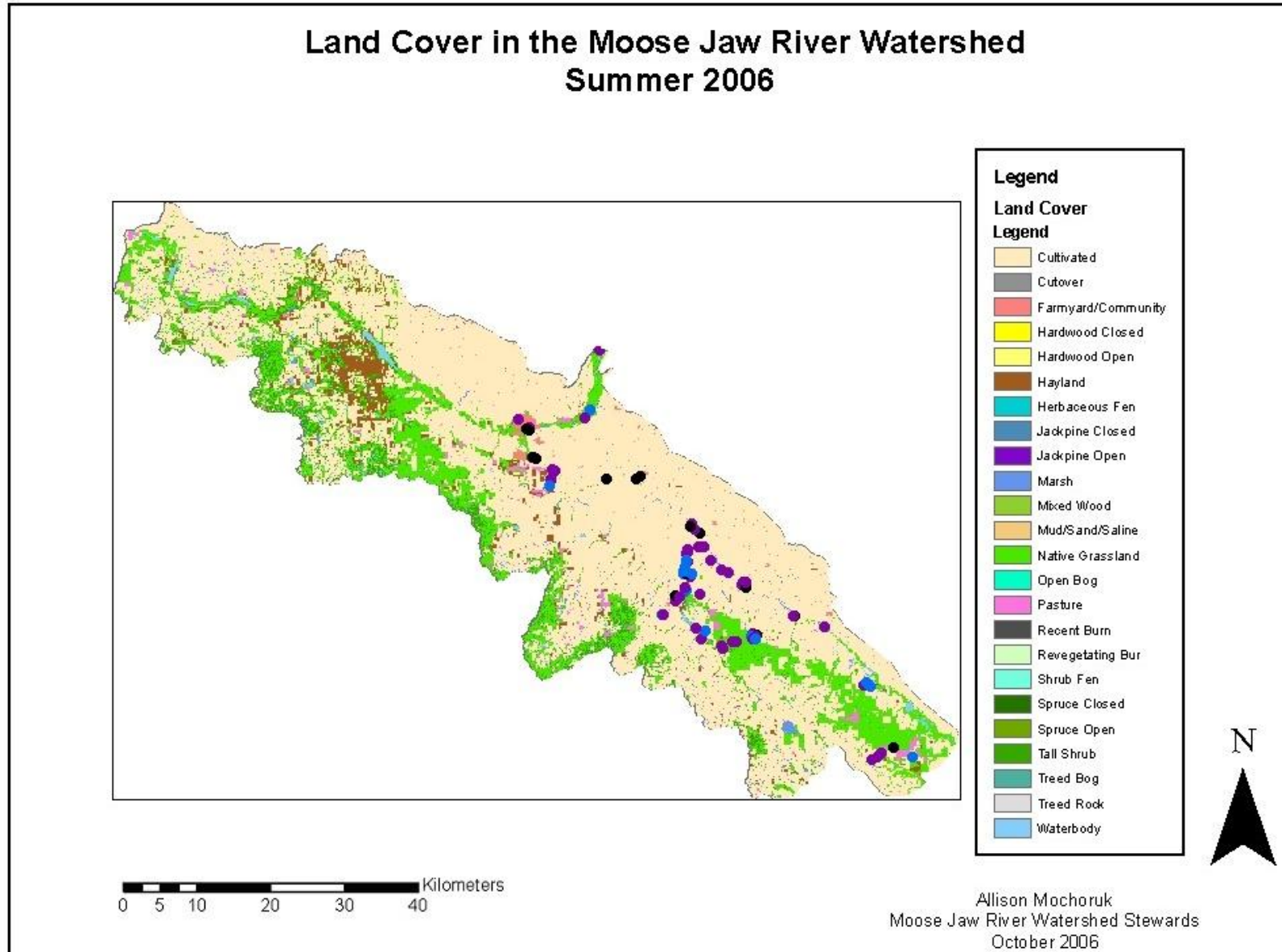
For the purpose of figures the extensive water network of the Moose Jaw River Sub-Watershed are broken down into *The Moose Jaw River* and *Other Tributaries* which includes the Avonlea Creek, Baildon Creek and the Moose Jaw River Tributaries.

### **5.2.1 Vegetation Section**

The land cover for the Moose Jaw River Sub-Watershed is mostly cultivated or native grass/pasture See Figure 7.

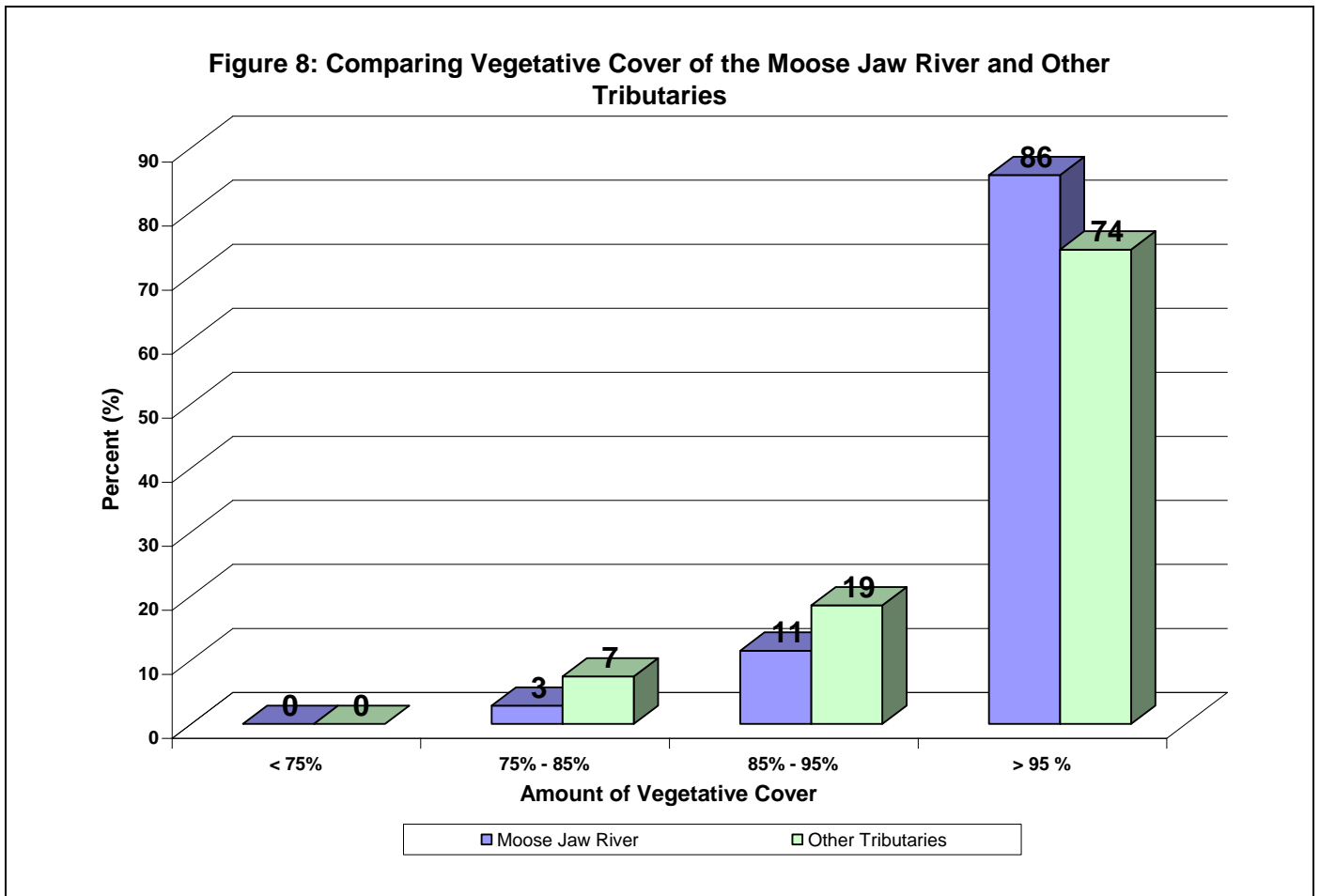


Figure 7: Land Cover in the Moose Jaw River Watershed Summer 2006



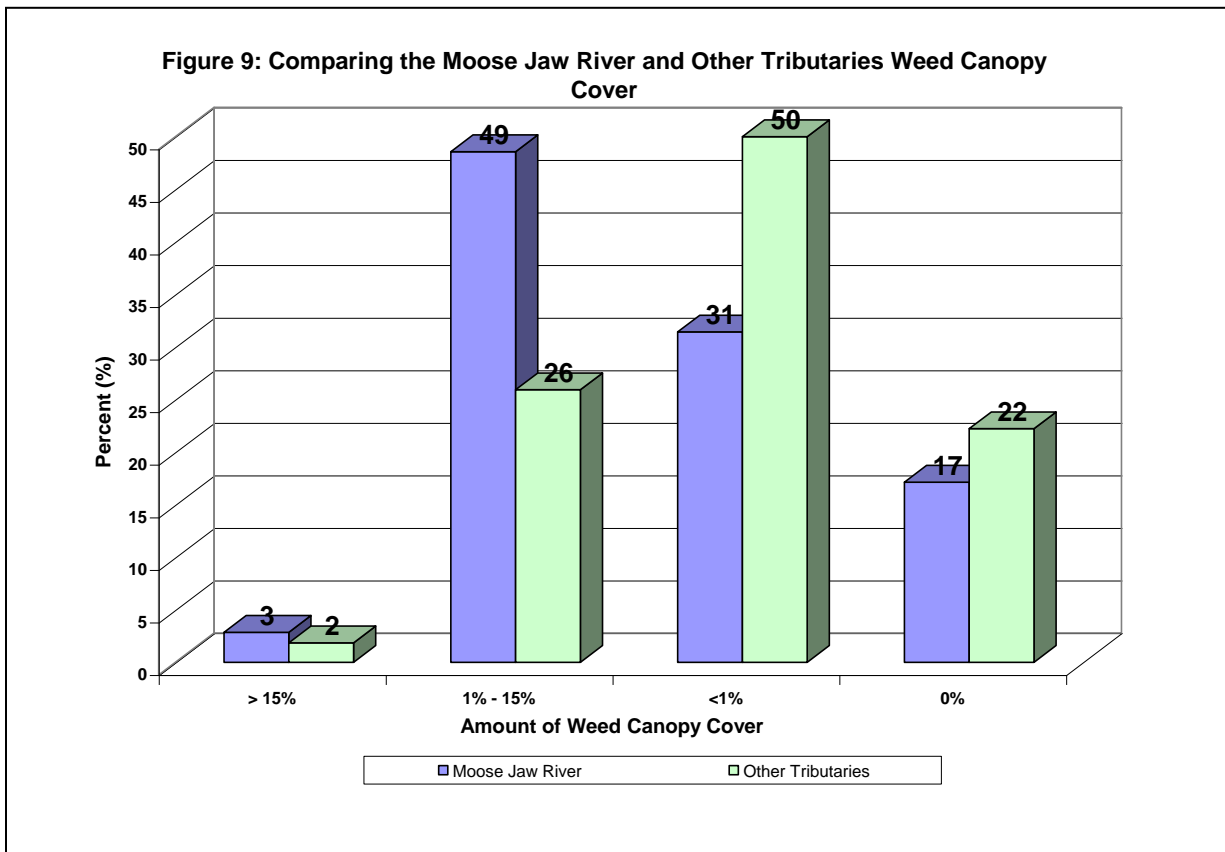
### 5.2.1.1 Vegetation cover of the floodplain and streambanks

Vegetation cover is important to reduce the erosive forces of moving water over the floodplain or along the streambanks. Proper coverage will provide many function such as; trapping sediment, absorbing/recycling nutrients and reduces the rate of evaporation. Vegetation cover is ocularly estimated by using the canopy cover method, determining what percentage of the reach is covered by vegetation and what percentage of the reach is bare ground. See Figure 8 (Adams, B.W. et al., 2001 for detailed description of canopy cover method).

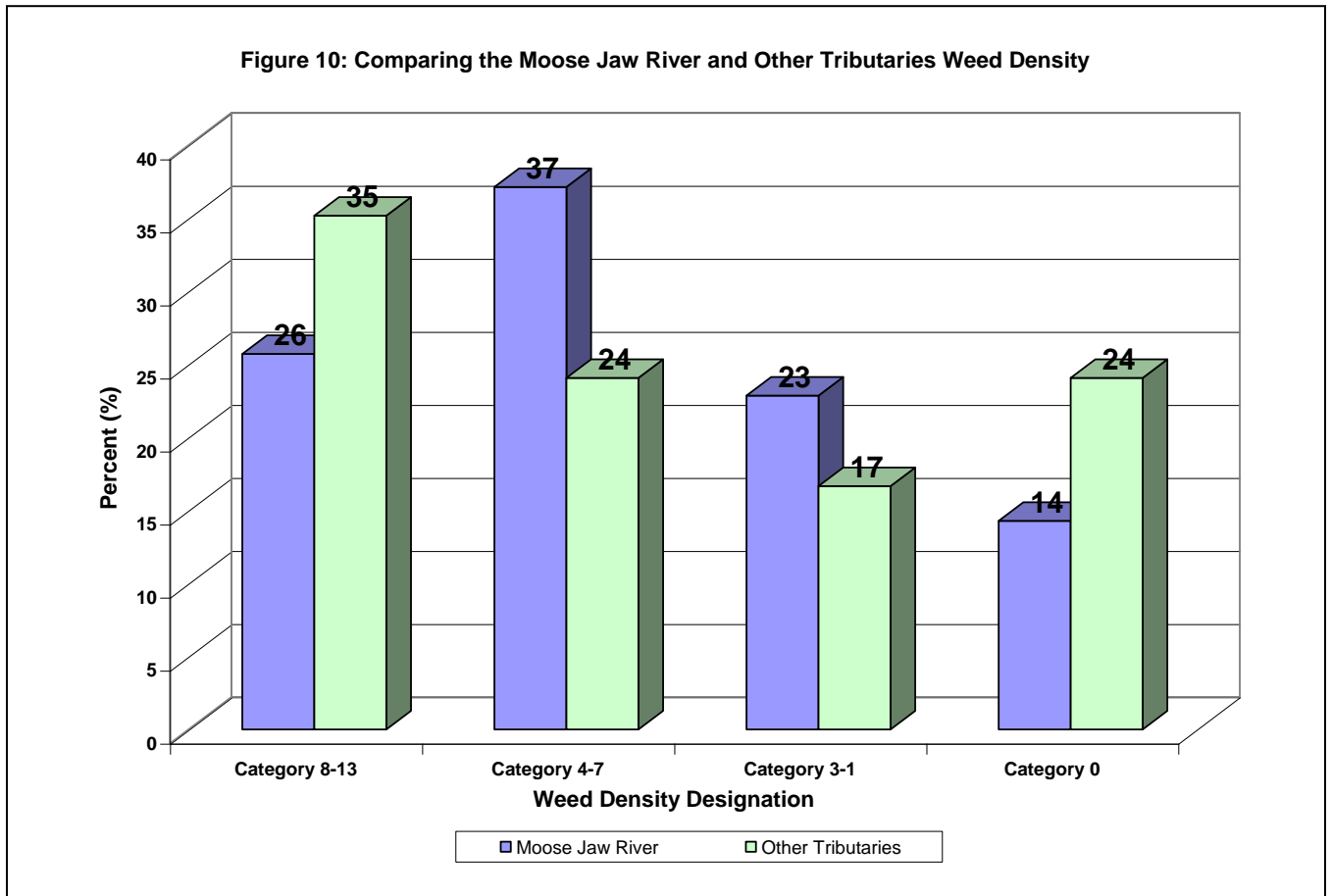


### 5.2.1.2 Invasive Plants (weeds)

Invasive plants are often referred to as “noxious weeds”. The introduction of noxious weeds can cause environmental or economic damage (Adams, B.W. et al., 2001). The presence of noxious weeds disturbs biodiversity and is an indicator of a degraded ecosystem. Due to the ecological imbalance that invasive plants create they are evaluated on two different levels a) canopy cover and b) density/distribution to determine the degree of infestation. Canopy cover is the area that the invasive plants cover on a percentage scale. For results of this category see Figure 9.



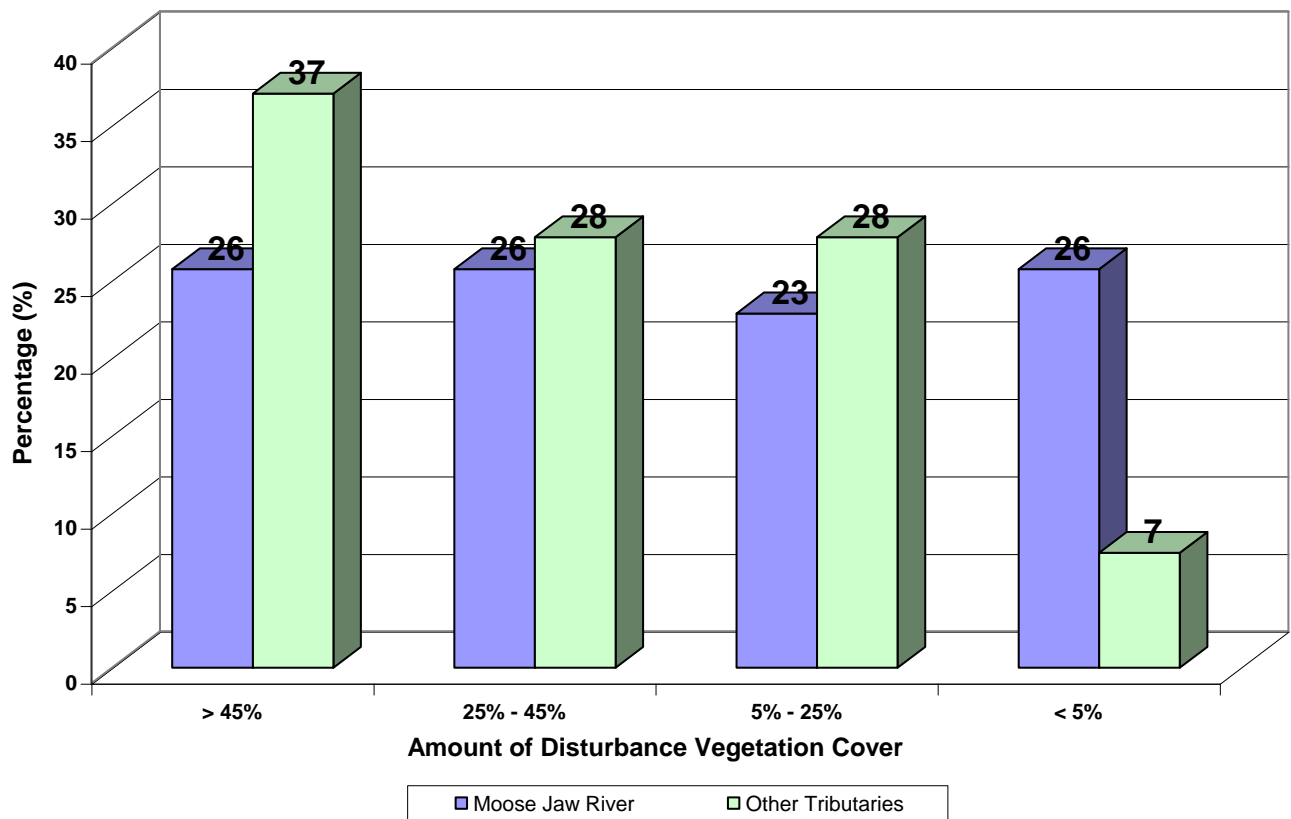
Density/distribution is the degree of patchiness and/or evenness over the reach based on the figure found on page 37 of *Caring for the Green Zone*. For the results of the density/distribution section see Figure 10. A complete list of the invasive species present throughout the riparian health study is included in Appendix 3.



### 5.2.1.3 Disturbance Vegetation

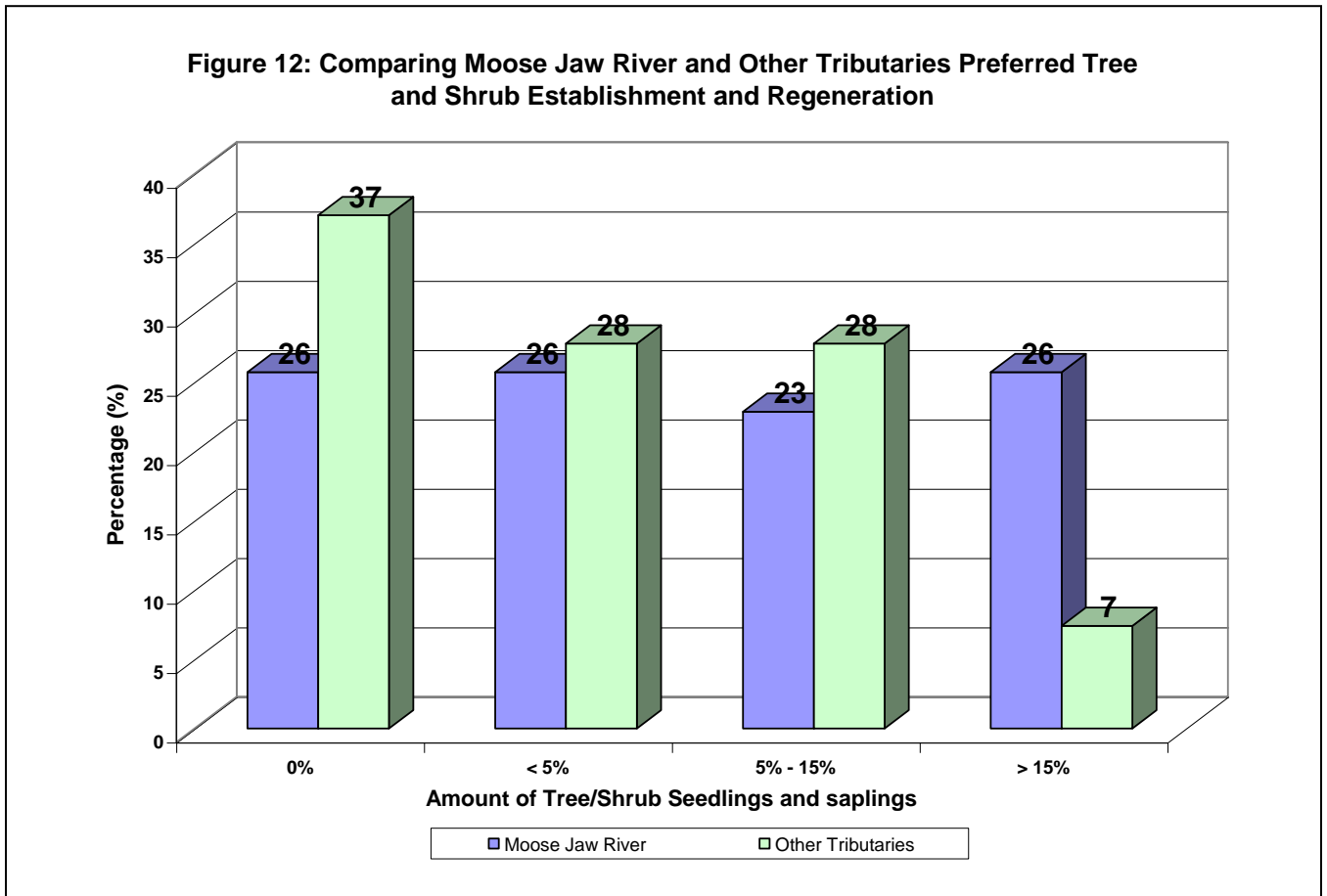
Disturbance vegetation is unfavourable herbaceous plants, which tend to be shallow rooted, less productive, and has limited value for bank stabilization and erosion prevention. A strong presence of these indicates an alteration of the expected plant community and their abundance can indicate a history of over grazing (Adams, B.W. et al., 2001). For the purpose of this study, disturbance vegetation is evaluated on it's percent cover of the entire reach. Results found in the study for this component are displayed in Figure 11. For a complete list of the disturbance vegetation found in the study see appendix 4.

**Figure 11: Comparing Moose Jaw River and Other Tributaries Disturbance-caused vegetation cover**



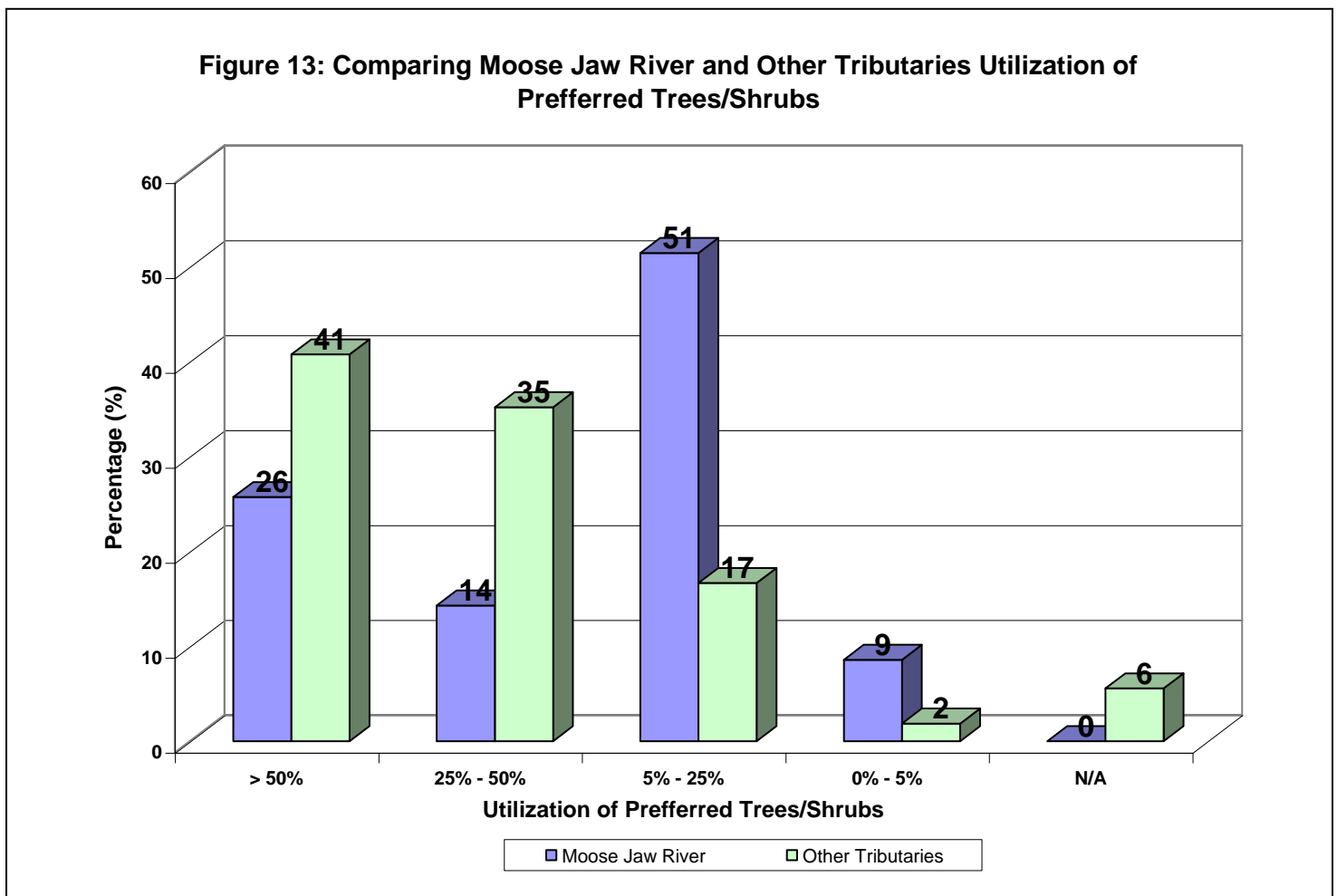
#### 5.2.1.4 Preferred Tree and Shrub Establishment and Regeneration

Preferred woody vegetation is extremely important to the riparian ecosystem. Their extensive root systems stabilize banks and improve water quality by using their roots to uptake nutrients. Their canopy structure provides shelter for wildlife and livestock and protects the soil from erosion. This component is evaluated based on the percentage of preferred trees/shrubs in the seedling and/or sapling stage. The results for the preferred tree and shrub establishment and regeneration are displayed in Figure 12.



### 5.2.1.5 Utilization of Preferred Trees and Shrubs

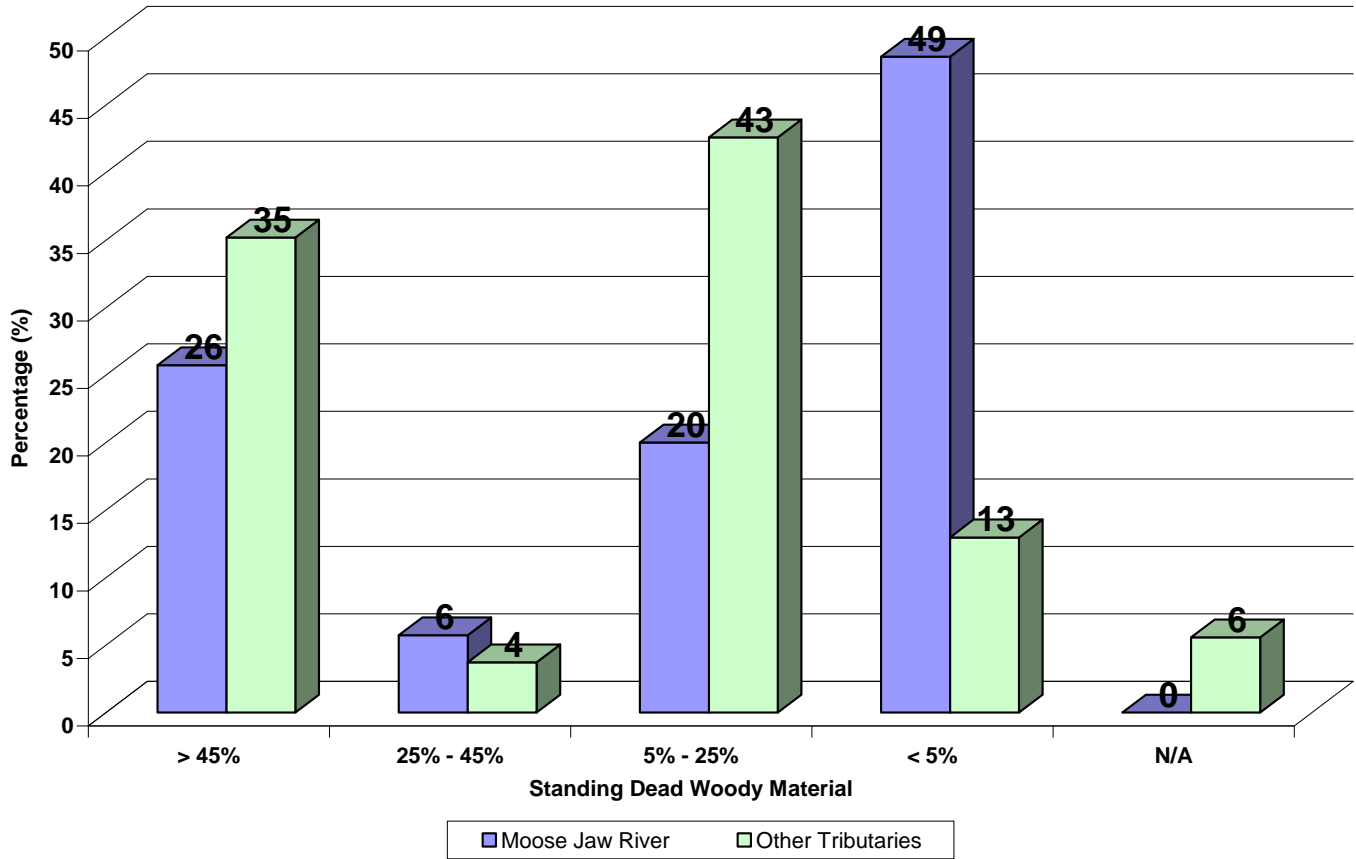
Woody vegetations are key elements to riparian ecosystems. Preferred trees and shrubs not only provide a source for shelter but can also be a source of food for wildlife and livestock. The amount or level woody vegetation is used will determine how viable the plant will be within the reach. If plants are over utilized they can; have depleted root reserves, lead to replacement by less desirable plants, or lead to invasion by disturbance or weed species. For the results from the riparian study for utilization of preferred trees and shrubs see Figure 13.



### 5.2.1.6 Standing Decadent and Dead Woody Material

The amount of decadent and dead woody material is an indication of the declining health of a reach. There are many different factors that can contribute to the decline in health of both mature and young woody material such as; change in water flow, flooding of reach or chronic overuse of browse. There are two aspects to assess with this component; canopy cover or woody material and the percentage of that canopy cover that is decadent or dead. See Figure 14 for the results.

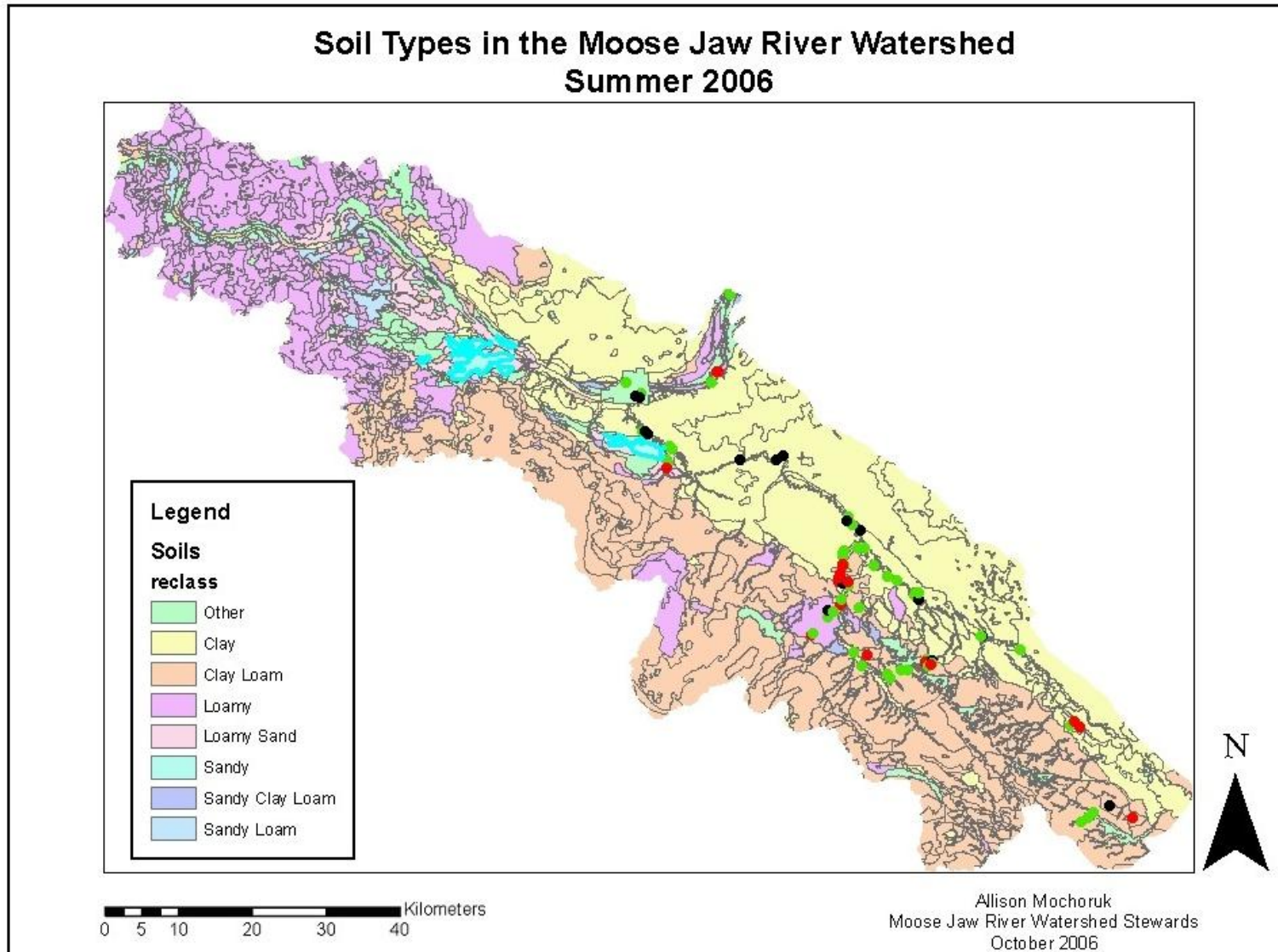
**Figure 14: Comparing Moose Jaw River and Other Tributaries Standing Decadent and Dead Woody Material**



### 5.2.2 Soil/Hydrology Section

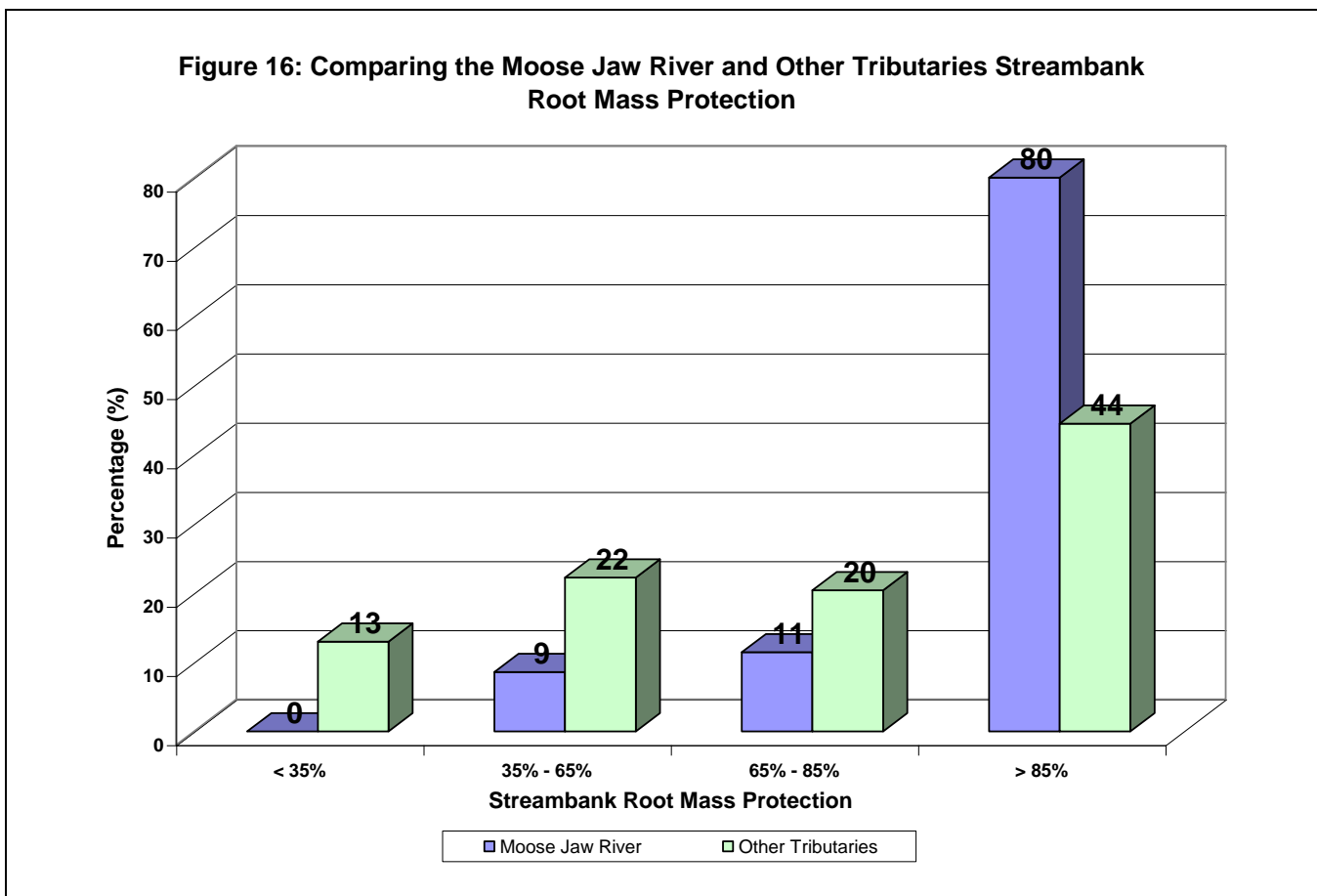
The soil classes for the Moose Jaw Sub-Watershed are depicted in Figure 15.

Figure 15: Soil Type Map for the Moose Jaw River Watershed



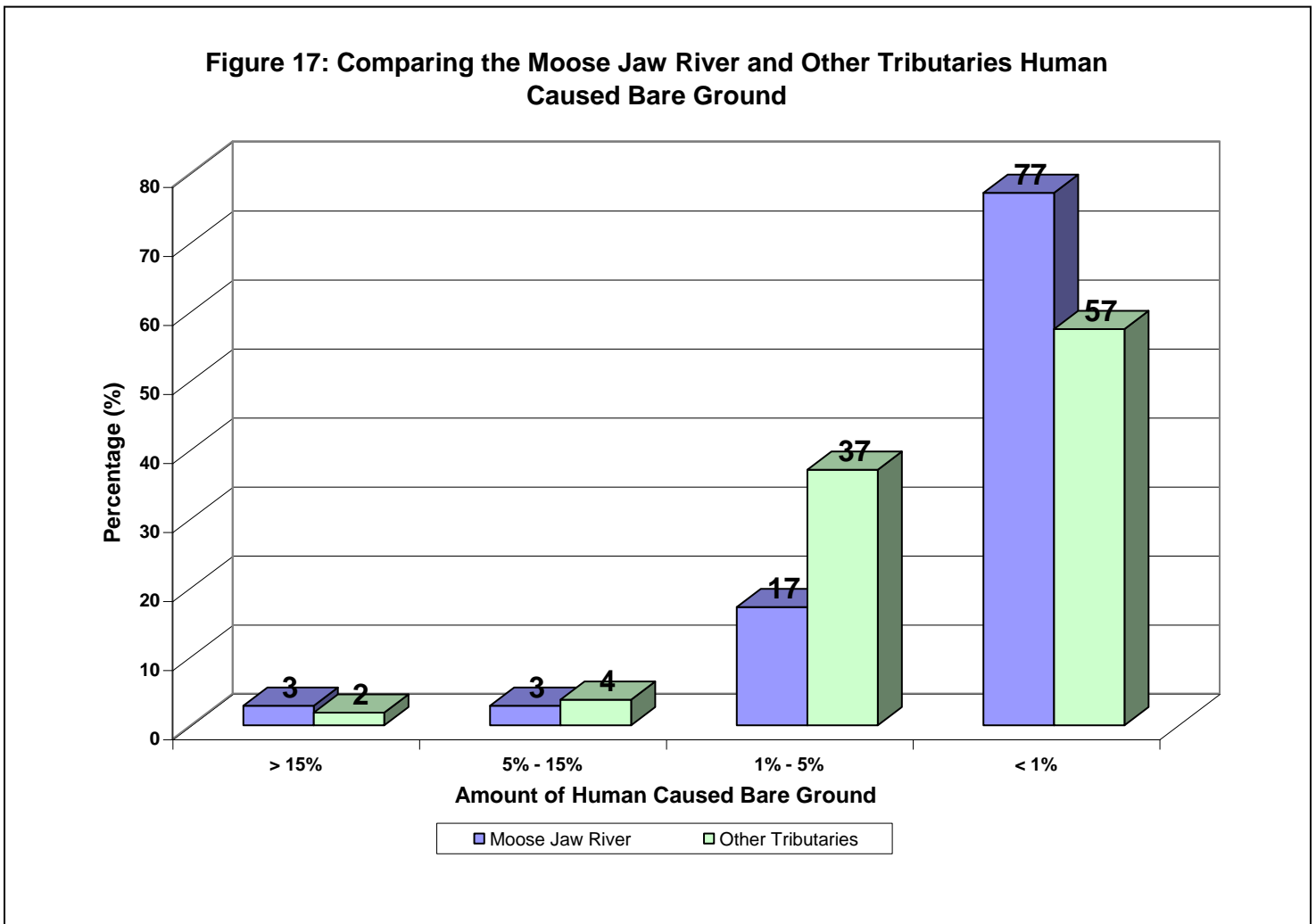
### 5.2.2.1 Streambank Root Mass Protection

Streambank vegetation has a very important role in maintaining the structure of streambanks by dissipating energy, resisting erosion and trapping sediment to build and restore banks. If the appropriate vegetation is not present the streambanks become highly eroded, will not support vegetation and reduces the ability to rebuild itself. The streambank vegetation is measured on the percentage of the reach it covers. See Figure 16 for results.



### 5.2.2.2 Human Caused Bare Ground

Human caused bare ground refers to human land uses such as; livestock grazing, cultivation, recreation, urban development, roads/trails, timber harvesting and industrial activities causing unprotected soil that is capable of being eroded by the elements. This component refers to the entire riparian area versus just the streambank and is evaluated based on the percentage of the reach that is human caused bare ground. See results for the study in Figure 17.



### 5.2.2.3 Stream banks Structurally Altered By Human Activity

Stream banks structurally altered by human activity refers to the physical degradation to the streambank structure by human practices such as livestock hoof shearing, livestock trails/wintering sites, recreational trails, crossings/fords, channelization/drainage and many more. Streambank alteration results in erosion of the channel and bank materials and water quality can decrease. This component is evaluated on the percentage of streambank area (the streambank area is defined in Adams, B.W et al., 2001 page 57) that has been disturbed by humans. See Figure 18 for results of study.

**Figure 18: Comparing the Moose Jaw River and Other Tributaries Streambank Alteration by Human Activity**

