



**Figure 4-26. Results of RGAs conducted along Blackwood Creek showing the longitudinal distribution of the combined, channel and side-slope erosion indexes, and the percent of reaches undergoing streambank failures.**

### 4.6.3 Ward Creek

The assessed portion of Ward Creek consists of three major reaches spanning the lower 6.6 kilometers of the watershed (Figure 4-29). These reaches can be divided morphologically into three sections: The alluvial fan, the volcanic canyon, and the glacial till/beaver meadow. The alluvial fan covers 1.8 km between the canyon and the lake, where a sand/gravel delta has formed at the mouth. The gradient from base level at the lake increases to about 0.02 m/m. The stream appears stable, however the depth of scour pools and scour into cut banks indicates the channel may have recently been incising and widening, perhaps during the January 1997 flood. Cut banks have lenses of silty material and clast supported gravels, cobbles, and boulders. The top 0.3 meter is typically root bound. Cut banks range from 2.5 to 7 m-high. The stream borders a residential neighborhood; however the landowners have done little to alter the stream or stream bank vegetation. Exceptions occur where rip-rap has been placed along a bend, and where a home has been built over hanging the stream thereby forming a high flow constriction. Overall, the bank-rosion potential appears to be low to moderate. There are four areas of moderate to high fine-sediment availability noted, however they make up a small portion of the 1.8 km reach (Hotspots 1 to 4, Table 4-9).

**Table 4-9. Summary of reconnaissance-level evaluation of areas of streambank instability and delivery of fine-grained sediments along Ward Creek.**

Erosion hotspot	Hotspot location (UTM)		Source of fine sediment	Relative erosion magnitude
	Easting	Northing		
1	745862	4334956	2.3 m high failing R bank	moderate
2	745816	4335040	2.6 m high failing R bank	moderate
3	745643	4335227	6 m high failing R bank	high
4	745117	4335472	2 m high failing R bank	moderate
5	744784	4335534	12 m high failing R bank	high
6	744545	4335515	1.5 m high failing R bank	moderate
7	744215	4335462	7 m high failing R bank	high
8	744064	4335444	4 m high failing R bank	high
9	743707	4335478	7 m high failing R bank	high
10	743666	4335517	4 m high failing R bank	high
11	743481	4335671	reworking fluvial deposits	low
12	743283	4335672	15 m high failing bank	high
13	743202	4335667	1.7 m high failing bank of reworked fluvial deposits	moderate
14	743139	4335718	1.7 m high failing bank of reworked fluvial deposits	high

15	743109	4335744	LWD directs flow into bank	moderate
16	743000	4335768	12 m high escarpment fails only at high flows	moderate
17	742956	4335807	reworking fluvial deposits erosion control net	low
18	742831	4335868	6 m high escarpment fails only at high flows	moderate
19	742689	4335908	2 m high failing bank	moderate
20	742651	4335947	3 m high failing bank	high
21	742602	4335916	reworking fluvial deposits	moderate
22	742373	4335962	fluvial eroding glacial deposit	moderate
23	742266	4335965	2 m high failing L bank	high
24	742161	4335926	0.5 m high failing R bank	moderate
25	742055	4335911	1.5 m high failing L bank	high
26	741991	4335898	4 m high failing R bank	low
27	741908	4335964	1.5 m high failing R bank	low
28	741785	4336085	1.8 m high failing L bank	moderate
29	741737	4336040	2.5 m high failing R bank	moderate
30	741599	4336074	1 m high failing R bank	low
31	741539	4336069	1.2 m high eroding R bank	low
32	741438	4336029	2 m high eroding R bank	moderate
33	741333	4336018	1.3 m high eroding R bank	low
34	740788	4335813	2.3 m high failing R bank.	moderate

The valley narrows through the 0.8 km volcanic canyon section, and the stream gradient increases to about 0.027 m/m. Basalt bedrock outcrops near the upper end of this section, thereby restricting channel migration and creating a grade control. The channel cuts into valley walls creating escarpments in glacial deposits 4 to 12 meters high. Several of these escarpments have their toes on gravel bars several meters away from the thalweg, thereby preventing erosion from taking place except during high flows (Hotspots 4 to 9, Table 4-9). Overall the canyon section appears to have a moderate amount of fine sediment available and exposed for erosion.

The glacial till/beaver meadow reach spans 3.1 km from the exit of the canyon until the confluence near the USGS stream gage approximately 4.7 km above the mouth meadow (Hotspots 9 to 34, Table 4-9). This reach channel meanders through a flat valley several hundred meters wide. The channel has mixed forms: cobble/boulder runs, cobble/gravel pool riffles, braided gravel/cobbles, and beaver ponds. Banks in the middle of the valley range from 0.5 to 2.0 m-high, however they become 4 to 12 m-high escarpments where the stream cuts into the