The 1996 flooding in the Saguenay Valley, Quebec – lessons from the disaster

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In July 1996, a severe rainstorm caused extreme flooding along the lower reaches of north-flowing tributaries of the Saguenay River in the Lake St Jean-Chicoutimi-La Baie area, Saguenay Valley, Quebec. Among its numerous impacts, the flooding provided multiple examples of what can go wrong at small dam sites during an extreme flood. Along the Chicoutimi and aux Sables rivers, the flood discharges exceeded the design or available spilling capacity at seven run-of-the-river dams. At four of the dams, overtopping water spilled across unconsolidated deposits adjacent to the dam and eroded a new channel that breached the reservoir. At a fifth dam site, there was no breach, but floodwaters spilled over the dam and into an urban area destroying or damaging numerous buildings and roads. All five of these dams were built in the early twentieth century and were not designed to control an overtopping flow. At the two other dams, both built post-1950, one suffered a breach in a concrete wing-wall and the other was undamaged.

The flooding also damaged or destroyed many residential buildings located on flood-prone lands along a number of rivers. Along the Chicoutimi and aux Sables rivers, the level of floodplain encroachment is readily apparent by the fact that the threshold discharges beyond which residential buildings start being inundated were exceeded by factors of 3.5 (Chicoutimi River) and 3.8 (aux Sables River) during the flood. Although floodplain mapping was initiated in the Saguenay area in 1995, in the short-term, this would have only inhibited future development on the floodplains and thus would not have prevented a 1996-type disaster. While not a problem unique to the Saguenay floods, this disaster provides yet another example of the consequences of occupying flood-prone lands.

Large-scale bank and floodplain erosion occurred locally along some Saguenay area rivers causing destruction or damage to buildings situated adjacent to the channel, but above the level of flooding. Along the Mars River, for example, catastrophic erosion of the valley bottom occurred along the lower 10 km of the river through a combination of lateral bank erosion and avulsions. This caused severe widening of the river channel and altered the channel morphology from a meandering to a braided planform. The large-scale erosion along the Mars River demonstrates that some river morphologies in eastern Canada are vulnerable to planform transformations during extreme floods. Along such reaches, bank erosion in addition to inundation levels must be considered in land management decisions.

Biographic note: Greg Brooks is a research scientist with Terrain Sciences Division, Geological Survey of Canada. He obtained a Ph.D. from the Department of Geography, Simon Fraser University, Burnaby, BC, in 1992. He is a fluvial geomorphologist by training and his research interests focus on rivers and the interactions of rivers and landslides.