

**SUSTAINABILITY HIGHLIGHTS**

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Natural hazards and disturbances—depending on their frequency, magnitude, intensity and nature—can have significant implications for the sustainability of ecosystems and communities. For example, while a moderate flood or forest fire can contribute to ecosystem health by replenishing natural resources and ecosystem function, a more significant event can also conflict with the ongoing needs of a community.

- Recent natural hazards and disturbances within the Fraser Basin include flooding, interface fires, drought, Mountain Pine Beetle infestation, and the spread of invasive plants.
- There is also the potential for catastrophic events, which are likely to occur in the future, particularly in the Fraser Valley and Greater Vancouver-Sea to Sky regions of the Fraser Basin, with the potential of a Fraser River flood of record, <sup>i</sup> a catastrophic earthquake, a tsunami, or a volcanic eruption of Mount Baker.
- Although Fraser River flows reached flood stage in 1999, impacting some homes and communities, there has been no catastrophic flood in the Lower Fraser since 1948, when 16,000 people were evacuated, 2,300 homes were damaged or destroyed, and direct flood damages cost \$142 million (1994 dollars). <sup>1</sup>

<b>Social and Economic Costs of Natural Hazards</b>	<b>POOR/GETTING WORSE</b> - Average cost to government disaster assistance and average insurance costs are high, increasing, and in some cases unquantifiable.
<b>Managing and Adapting to Natural Hazards</b>	<b>GETTING BETTER</b> - Communities are assessing natural hazard risks, developing management strategies, and establishing plans to adapt, respond and prepare for hazards such as flooding, drought and interface fires.

**ISSUES AND TRENDS**

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**Social and Economic Costs of Natural Hazards in BC and Canada** <sup>1,2,3,4</sup>

Natural hazard events come with varying, but significant costs. It has been estimated that average annual flood-related Disaster Financial Assistance<sup>ii</sup> expenditures in BC during the 1990s were \$13 million.<sup>1</sup> Estimates of potential flood damages of a Fraser River flood of record range from \$2-\$6 billion, not including the indirect costs associated with disruption of critical infrastructure and the economy.<sup>2</sup> Using 2001 Population Census

figures, about 327,000 people now live in about 120,000 dwellings in the floodplain of the lower Fraser River (increases of 68% and 81% respectively, since 1981) ([See Population](#)).<sup>3</sup>

On average, the costs of managing forest fires in BC is \$87 million; however, the total cost of fires in 2003 has been estimated at \$700 million.<sup>3</sup> Perhaps most shocking is that disaster-related costs in Canada-including federal, provincial, and insured losses-have increased by 2,900% between 1945 and 1999.<sup>4</sup>

### **Flooding in the Fraser Basin**<sup>5</sup>

In the winter of 2004, there was an unusually warm period in January, which resulted in ice break-up, flows, and subsequent ice jams near Hixon, in the Upper Fraser region, which also resulted in flooding. The most significant flood vulnerabilities within the Fraser Basin are in the Fraser Valley and Greater Vancouver-Sea to Sky regions. For example, in the fall of 2003, extreme storms led to floods in Squamish, Pemberton, Mount Currie, Hatzic Prairie and the Chilliwack River Valley. A new study managed by the Fraser Basin Council suggests that the predicted water levels associated with the Fraser flood of record are higher than previously thought, and several lower Fraser River communities would not be adequately protected by existing diking systems.<sup>5</sup>



### **Natural Disturbances**

#### ***Mountain Pine Beetle***<sup>7,8</sup>

The area of BC forest affected by the Mountain Pine Beetle (MPB) has more than doubled from 4 million ha in 2003 to 8.7 million ha in 2006. This outbreak has resulted in short-term economic benefits due to increased harvest rates of affected timber, but there will inevitably be long-term socio-economic costs as future timber harvest opportunities are lost and environmental impacts emerge: see [Forests and Forestry](#).

## ***Invasive Plants*** <sup>9</sup>

Numerous invasive plants-or noxious weeds-are now established in the Fraser Basin and throughout BC, resulting in a variety of environmental and economic impacts. Invasive plants threaten fragile ecosystems, reduce biodiversity and cost the economy millions of dollars due to reduced crop yields, range productivity and forest regeneration, as well as costs to control or eradicate invasive plants.

### **INSPIRED ACTION**

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#### **What is being done?**

##### ***Managing and Adapting to Natural Hazards*** <sup>10,11</sup>

Following the 2003 fire season, the BC government required that all regional districts develop emergency plans. All of the eight regional districts in the Basin have completed their plans, and are now developing more detailed vulnerability assessments of fire and other risks.

- 23 local governments in the Basin have developed or initiated community wildfire plans, which include planning, communications, fire fuel treatment and other measures to reduce fire risk.
- In 2005/06 the Fraser Basin Council and Ministry of Environment assisted with the installation of 36 flood level gauges in 16 BC communities.
- 90% of local government respondents to a 2002 survey had established emergency flood plans.

The Invasive Plant Council was formed to address the issue of invasive plants in BC with a goal to build cooperation and coordination to protect BC's environment and minimize negative social and economic impacts caused by the introduction, establishment and spread of invasive alien plants: [www.invasiveplantcouncilbc.ca](http://www.invasiveplantcouncilbc.ca).

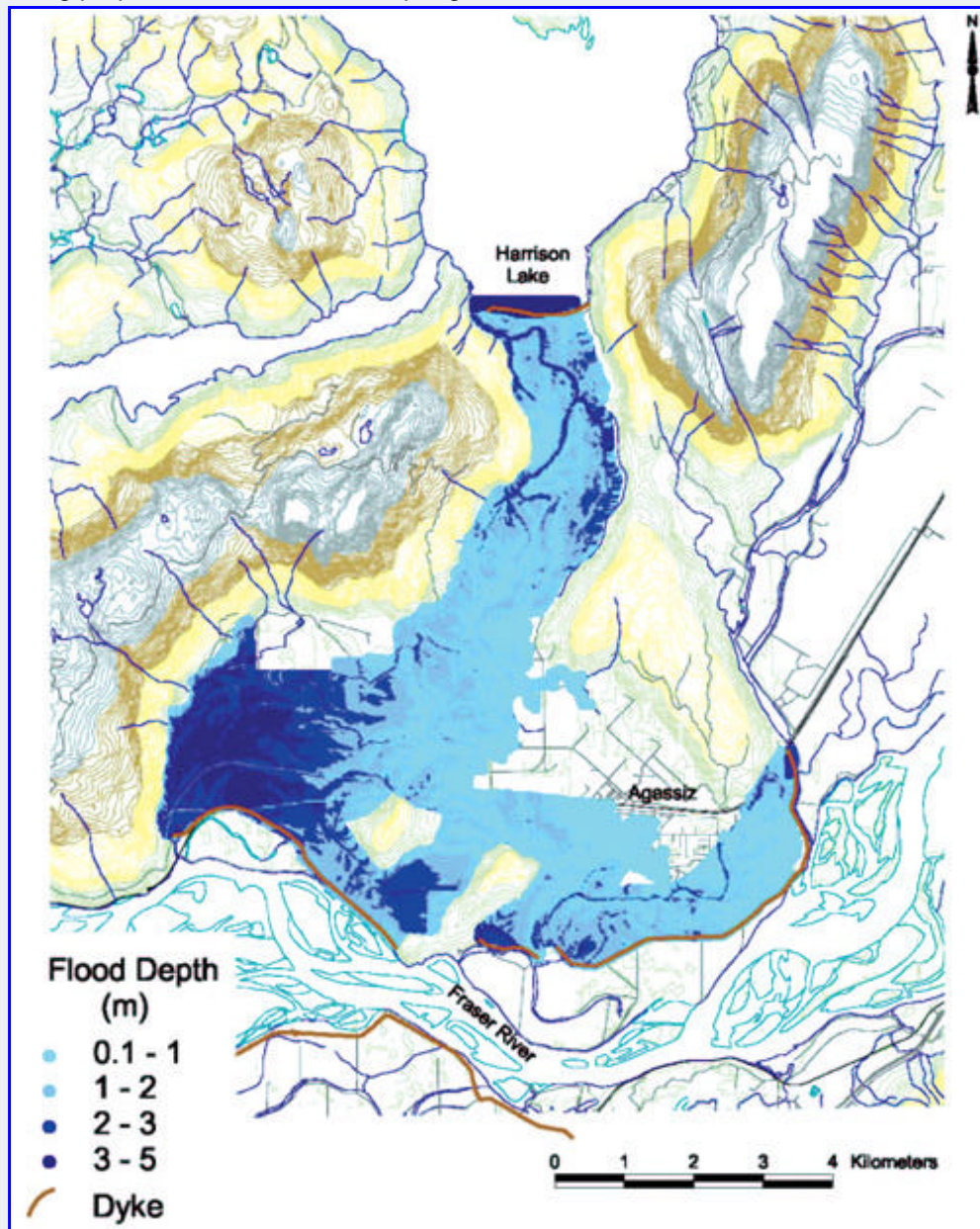
#### **What else can we do?**

- Organizations, businesses, households and individuals can develop emergency preparedness plans and supply kits to deal with various types of natural disasters.
- Local, regional and provincial emergency plans should be developed, tested, used for training, and updated on a regular basis.
- All orders of government and the private sector should explore opportunities to establish long-term, cost-shared funding programs for the mitigation of natural hazards and associated impacts. An ounce of prevention is worth a pound of cure.

### New floodplain maps

The Fraser Basin Council, the BC Ministry of Environment and four local governments in the Fraser Valley are working together to develop new floodplain maps, using a computer model that simulates a flood scenario based on the Fraser River flood of record.

The District of Kent will use this information to develop a bylaw for the community to guide future development decisions and construction practices, including the flood construction level. The maps will also provide an invaluable resource for emergency planning and preparedness by estimating, not only the extent and depth of potential flooding, but also the timing of flooding in different parts of the community should there be a failure in the dike system. Similar maps are being prepared for Harrison Hot Springs, Mission and Abbotsford.



New digital map of the floodplain in the Kent-Agassiz area of the Fraser Valley region, showing the estimated area and depth of flooding if the dikes were to fail during a Fraser River flood of record.

## REFERENCES

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3. Government of BC. Firestorm 2003: Provincial Review.
4. Office of Critical Infrastructure Protection and Emergency Protection Canada. Presentation.
5. Northwest Hydraulic Consultants Ltd. 2006. Final Report-Lower Fraser River Hydraulic Model.
6. BC Ministry of Forests, Forest Protection Branch. Fire Season Summary Data..
7. Ministry of Forests, Forest Practices Branch. 2006: [www.for.gov.bc.ca/hfp/index.htm](http://www.for.gov.bc.ca/hfp/index.htm).
8. BC Ministry of Forests and Range, Forest Practices Branch. 2005 Summary of Forest Health Conditions in British Columbia.
9. Invasive Plant Council: [www.invasiveplantcouncilbc.ca/](http://www.invasiveplantcouncilbc.ca/).
10. Union of BC Municipalities. Personal communication. Sue Clark, Program Officer. 2006.
11. Fraser Basin Council. Personal communication. Steve Litke, Program Manager. 2006.

## FOOTNOTES:

- i. The largest Fraser River flood on record occurred in 1894 with a peak flow of 17,000 m<sup>3</sup>/s. The second largest occurred in 1948.
- ii. Disaster Financial Assistance (DFA) is available to homeowners and renters, small businesses, farm operators, charitable and non-profit organizations, local government and provincial ministries. DFA provide funds to replace or restore items essential to a home, livelihood or community service that were damaged or destroyed during a disaster event.