

The Really Big One, *Vancouver* magazine, May 1994

FROM MY APARTMENT in the little town of Ladner, I can see the brown, moody waters of the Fraser. The river is in front of me as I write, always changing, always the same: a steady reference point in an unpredictable world. It's unlikely, for instance, that the residents of this Vancouver suburb will open up their blinds one morning and discover that the river has evaporated or been diverted to California. What is possible, though, is that late one spring we might find the river wetter than usual, its waters lapping against the sides of our homes. Yes, just one more thing to worry about for the 250,000 or more Greater Vancouverites who have chosen—perhaps unwisely—to live on the floodplain of the Fraser.

You may laugh, but the possibility of a severe flood is the main reason I live on the top floor. If the waters rise, I can untie my kayak from the sundeck railing and paddle to the nearest grocery store. That would be, let's see, in Tsawwassen, about eight kilometres away, where there's some higher ground. But Tsawwassen might be crowded; it's the only higher ground around. Everyone will be there with their dogs and—yikes—farm animals.

Perhaps I'll just stay home and get ready, as the manuals say, to render assistance. Canned food and bottled water? Check. Candles, warm clothing, quilts, extra flashlight and portable radio batteries? Check. Propane camp stove? Check. Extra propane canisters? Oops, still in the car, now enjoying a free carwash in its underground garage.

Okay, so I tend to be obsessive. Cruel people have even called me overprepared. All I know is that the Fraser will flood again. Absolutely for sure. Only nobody knows when. And it will not be a laughing matter. This is straight from the mouths of experts responsible for protecting us. Government engineers predict a one-in-three chance that, sometime in the

next 40 years, the Fraser will rise faster than a plugged toilet, then threaten to burst its dikes and inundate the countryside with several metres of water and—as a non-refundable, going-away present—an invigorating layer of mud.

It's a shame that earthquakes get all the press. You probably haven't even been introduced to the concept of the 200-year Designated Flood Level. This is the peak of a flood so serious that it's likely to occur only once every 200 years. The last time a 200-year flood hit Vancouver was 1894. Exactly 100 years ago this month the biggest flood in recorded memory—the one all subsequent floods have been measured against—cruised through the neighborhood.

Richmond, where half of today's floodplain residents live, went completely under, as did Delta and much of Coquitlam, Pitt Meadows and Maple Ridge. So did vast areas of the upper valley around Matsqui, Sumas and Chilliwack—perhaps 750 square kilometres all told. The floodplain was sparsely populated in 1894; still, two human and many animal lives were lost, and damage was considerable. Flood-control officials are trying—unsuccessfully, they say—to get people to realize that if flood waters ever exceed 1894 levels, our existing dikes will not be sufficient to contain them.

We haven't had a huge flood around these parts for decades, but everyone remembers what happened last summer on the Mississippi. Fifty people died in that catastrophe; 40,000 had to be evacuated. Airports, fire stations, roads and railway lines were submerged. Water supplies were contaminated. Property and crop damage estimates were nearly \$15 billion. Ninety-three thousand square kilometres in nine states were flooded. The flood crest was the highest ever recorded—14 metres above normal. Imagine meeting one of those when you were out picking up the milk.

It could happen here. Eventually, something similar *will* happen here. Do you know your way around a sandbag? Volunteers on the Mississippi had to

fill 26.5 million of them in 1993. As I watched last summer's news, I realized that floods were yet another subject I was profoundly ignorant about. What would a big flood be like? How should I prepare myself? Here are some of the things I discovered when I set out on a quest for greater flood awareness.

BC ENVIRONMENT'S REGIONAL headquarters is in an innocuous office building in Surrey. Neil Peters, head of engineering for the water management branch, is almost eager to be interviewed. Part of his ministry's mandate is to heighten public awareness of flood hazards.

"Large floods in the Fraser are primarily due to rapid snowmelt," he reassures me. "It takes a combination of events: average snowpack or larger, fairly cool spring to hold it in place, then at least three weeks of hot weather." We're not talking about flash floods caused by heavy rainstorms, which are dangerous and unpredictable but generally over pretty quickly. It's the annual freshet, or spring runoff, that has real potential for calamity. The freshet can remain near crest levels for up to two weeks as it brings melting snow and spring rains down from its enormous watershed: one-quarter of the entire province.

Areas prone to flooding represent less than one per cent of this basin but, wouldn't you know it, that's where people like to live. Floodplains are flat and fertile. Conveniently, rivers run through them. Floods don't occur very often, and most floodplain residents soon forget about the dangers. Especially if they're cozily ensconced behind a big old dike. And when the Fraser hits 5.5 metres at Mission's historic water-elevation gauge, that's where they'd better be, because the dike is all that's standing between them and about 7,000 cubic metres per second of very muddy water. A good-sized Fraser freshet might stay above 5.5 metres for as long as a month.

Neil Peters knows a lot about dikes. His office is responsible for 330 kilometres of them in the Fraser Valley. There are “good” dikes, as Peters describes them, built since 1968 by the Fraser River Flood Control Program, a \$150-million federal/provincial agreement that expires in 1995; “so-so” dikes, which mostly protect agricultural land; and the biggest category, “no” dikes. “On the Mississippi last summer, 80 to 90 percent of dikes built to reduced agricultural standards failed,” says Peters, compared to about 20 percent of the higher, government-standard dikes.

The FRFCP dikes, which surround most of the developed areas, are built to withstand a flood equal to that of 1894. Building them higher is possible; Holland’s dikes, for instance, are constructed to 10,000-year flood levels. But that would be extremely costly, claims Peters, and only generate a false sense of security for those who live behind them. Especially because—pay attention here; you won’t want to miss this next bit—in the event of a major earthquake the dyking system would probably be so badly damaged that it couldn’t be repaired before the next freshet.

Dikes have other limitations: they tend to deteriorate after extended periods of high water, and they can be weakened by seepage, animal burrows, tree roots and erosion. “If there’s one weak section,” Peters says, “a dike is good for nothing.” The more the river is diked, the faster it flows and the higher it gets. Downstream, however, where the river widens, deepens and splits into channels, the dikes are only about one-third as high as they are around, say, Chilliwack. Peters assures me that all these factors are carefully incorporated into dike design. “But dikes are only good up to a certain point,” he cautions, “and then uncertainty takes over. If we have a flood higher than 1894, then you might expect a fair number of the major dikes to fail. If it’s at about the 1894 level, there might be one or two failures. Who knows?”

Nobody. But *Flooding*, a 1993 publication from Environment Canada, paints a worst-case scenario for a dreaded PMF or Probable Maximum Flood: over \$2 billion in damage, 50,000 homes affected, 200,000 people evacuated. The Lower Mainland would be virtually cut off from the rest of the province. The airport would be inundated; all commercial and industrial operations on the floodplain would be completely disrupted. Even the course of the Fraser itself could change.

THERE HAVE BEEN DIKES on the Fraser since the 1860s, when the first farmers arrived. If you didn't have a dike, your farm tended to float out to sea at a critical point in the growing season. The great flood of 1894 paid little attention to those early earthworks. Colonel the Honourable James Baker, provincial secretary, who was instructed "to proceed to the Fraser River valley with a view to rendering government assistance to any sufferers from the floods," reported on his findings in that florid, rather charming style adopted by Victorian officials.

"I put myself in communication with some of the principal inhabitants," he wrote. "The reports I received were very contradictory. I determined to proceed with caution, and at once chartered the small tug *Blonde*, placed on board six tents and a few sacks of flour, some bacon, tea, and sugar, and a small supply of medicines which might prove useful." He met "large quantities of good fencing and parts of bridges" floating down the river and advised that "the farms were deeply inundated, many up to the eaves of the houses."

Baker spent most of the next month commandeering vessels to move livestock and feed. He rescued 21 horses, 397 cows, 198 pigs and 102 sheep. He just missed the reeve of Chilliwack, who had paddled to New Westminster in a canoe to get help, but still managed to settle a life-threatening dispute between the citizens of Chilliwack and those of Sumas

over the planned dynamiting of a log jam. “In all instances,” wrote Baker, “the settlers, including women and children, manifested a cheerful and brave spirit under their misfortunes.”

After 1894, much energy was put into dike construction. These efforts were rewarded during the next major flood in 1948. Still, although water levels weren't as high as in 1894, the carnage was much greater. The intervening decades had seen the Fraser Valley's first suburbs built, plus a huge increase in agricultural, commercial and industrial development. The flood severed CPR, CNR and Trans-Canada Highway routes, washed away 82 bridges and deposited a layer of silt that would produce giant vegetables for years. Ten people died, 2,000 homes were damaged, 16,000 residents evacuated and about \$140 million in damage done (1994 dollars).

News reports had a somewhat feverish tone compared to James Baker's elegant 19th-century calm. “The heroism of the people who battled the 1948 floods against the tremendous odds of elements beyond their control cannot be told in simple words,” wrote Eric Sanderson in *Nature's Fury*, a booklet on the flood published by local journalists. “Little people, young and old, who asked no more of life than contentment and security, toiled like giants on the dikes.”

“Modern Canada had never seen a flood like this,” exclaimed Bruce Hutchison in his 1950 book, *The Fraser*. “Dikes crumbled and dissolved like sugar, or suddenly exploded, tossing trees, stumps and barns into the air. A cargo of uprooted trees poured out to sea, and with it poured the carcasses of milk cows, horse, pigs and sheep. . . . A cat was actually seen swimming down the river with a mouse riding on its back.”

Nothing like the '48 flood has happened since, although a peek through library clipping files reveals that flooding in BC makes headlines almost every year. 1972: “\$6 million claimed for floods.” 1975: “Massive traffic jam as river overflows.” 1981: “Worst flooding and mudslides in years.”

1984: “Floods sever BC road and rail links with rest of Canada.” 1989: “Flood aid for some, certainly not all.”

I live in a fool’s paradise, my research tells me. It’s only a matter of time before disaster will strike.

NOW THAT’S A DIKE,” says Fred Wodtke, appreciatively. We’re on Sea Island, admiring the broad, grassy slope that protects the airport runways. Wodtke is a deputy inspector of dikes, the man on the spot, and he hasn’t been as approving about all the earthworks he’s shown me today around Richmond. One dike appears to be evolving into an uncontrolled industrial storage site; others on private land are sprouting substantial timber.

We’re in Richmond at my request. This municipality, with 135,000 residents on two flat, rivermouth islands totally surrounded by dikes, seems like a special case when it comes to flood control. It’s recent vibrancy will not have escaped your eagle eye; Richmond has surged with new homes, new people and commercial development over the last few years.

Richmond is a special case, says Neil Peters: “If there’s a dike breach in the upstream end, where water levels are higher, the river can flow in and flood Lulu Island, and it could essentially fill up like a bathtub. The worst-case scenario is that Richmond would become one huge lake filled up to the height of the dikes. A 1989 study determined that this would only take about a day or a day and a half.”

This intriguing image brings us to our next topic and a really excellent idea: floodproofing. The floodplain, under constant development pressure, would ideally be protected by tough laws restricting certain activities (like building). But it’s a bit late for that. Floodproofing, where the living quarters of homes are raised above peak water level, is the next best form of protection. If a dike breaks, floodproofed structures are sitting pretty. While 85 percent of BC’s local governments have floodproofing bylaws for new

subdivisions, “historic settlement areas,” which cover over one-third of the Greater Vancouver floodplain, get off the hook just like that. They’re exempt.

Why is this? Under the FRFCP agreement with the feds, BC must “encourage a program of land use zoning and floodproofing to diminish potential flood losses.” Encouragement, note, not enforcement: too much resistance from developers and local governments otherwise. Floodproofing is expensive, and floodproofed buildings, perched on little mounds like brooding hens, look strange. The older suburbs of east Richmond present a bizarre streetscape; new, floodproofed houses loom haughtily over their puny, deluge-prone neighbors. In the upper Fraser, some buildings would have to be raised nine metres to clear the 200-year flood level.

Richmond plans to construct an internal north-south dike parallel to Number 8 Road, which would stop an upstream breach and protect the gleaming towers and shopping emporia further west, which are in a “historical settlement area” and exempt from floodproofing. But this dike is nowhere near being built. Thirty-two stations could pump flood waters out at almost 4,000 cubic metres per minute, says the municipality. But in 1948, the Fraser’s peak flow was 15,000 cubic metres per second. Meanwhile, Richmond feels safe enough.

“My opinion,” says Bob Pollock, municipal superintendent of public works, “is that we don’t have any problems with the dikes at our elevation”—he pauses for a fraction of a second—“unless there was just an unheard of freshet.” “My perception,” says Neil Peters, “is that flood awareness is not very high in Richmond. We’ve had a hard time convincing certain municipal officials that they are even in a floodplain. There’s so much implied security from the dikes that they don’t feel there’s a big threat.”

THE FLOODPLAIN management branch occupies several floors of the environment ministry bunker in Victoria. On the fourth floor is the River Forecast Centre, responsible for tracking flow levels and issuing flood warnings. I don't know what I was expecting the River Forecast Centre to look like—a sort of wartime crisis room, I suppose, with giant video screens and banks of instruments with flashing lights. Instead, in a cubicle, I find Robin McNeil in front of a very big computer.

McNeil explains how the snowpack is measured for water content and the data fed into a computer model of the Fraser watershed along with five-day weather forecasts. The program, calibrated with flood information from previous years, can spit out flow predictions. “Beyond that,” says McNeil, “we can put in all sorts of ‘what ifs.’ What if there’s another 1948 hot spell, for instance? If there’s any danger of us getting into flood-warning levels, which doesn’t happen very often, we’ll start issuing weekly, then bi-weekly bulletins. In a critical situation, we’ll issue daily or even hourly bulletins.”

Regional offices like Surrey set various alert levels. For the Fraser there is a handy alarm bell in the Mission gauge, which indicates the height of the river above mean sea level. If the gauge reaches six metres, provincial flood-fighting staff are put on alert and dike patrols are started. At 6.5 metres, flood fighters report to assigned areas and dikes are patrolled at least once a day. Minor flooding can be expected. At seven metres, the dikes are patrolled 24 hours a day, and flooding will increase. Over seven metres, and widespread flooding in agricultural areas is likely.

The 200-year peak level is equivalent to 7.92 metres on the Mission gauge. Because a 0.6-metre freeboard is added to the “good” dikes to protect against surges and wave action, the river theoretically shouldn't overflow them until it hits 8.5 metres at Mission. At nine metres, a vast,

75,000-hectare lagoon of brown water will cover what was once the Fraser Valley.

Meanwhile, back at 6.5 metres, a phenomenon called “incident management” will have lurched into life. As your patio furniture prepares to migrate to the Gulf Islands, inexorable bureaucratic machinery will unfold like a giant Swiss army knife and swing into gear. An incident commander (from the Highways ministry) will set up shop in a Burnaby meeting room. BC Environment will assess flood danger and handle public information. The Provincial Emergency Program will get out the volunteers and deal with municipalities and other government agencies. Highways, with its equipment, will begin to actually fight the flood.

“The prime responsibility for emergency management,” says Robin Gardner, PEP manager for the Vancouver region, “rests with the individual. A good part of that is being psychologically prepared.” The municipalities, each with an emergency response program and a coordinator, play the most important role. Police, fire and engineering departments would be first on the scene. “We are really a resource for the municipalities,” says Gardner, who has hundreds of thousands of sandbags ready, stacked on pallets in a Burnaby warehouse. Depending on how the flood was shaping up, the RCMP or local police would be responsible for evacuating people—by force, if necessary—to “predesignated congregate facilities” (usually schools and recreation centres) on higher ground.

Afterwards, as you contemplate the wreckage of your home, you can console yourself with the fact that the province will probably provide disaster relief, up to \$100,000 per house, with a \$1,000 deductible and other restrictions. Small consolation? Well, you think, there’s always insurance. Think again. You can’t buy flood insurance in BC on a private residence.

ANYWAY YOU LOOK at it, the river seems to hold the winning hand. Man has done everything he can. He has dikes: important but not infallible. He has floodproofing, but can't enforce it strictly. He has flood warning systems, which are helpful but won't stop anything. He has floodplain mapping and emergency programs and money for disaster relief. All the river has is water, lots and lots of water. But if things come to a showdown, who do you think will prevail?

The only way to truly control the Fraser is to take away its water. This is not a far-fetched idea. The various hydro-electric dams on its tributaries, though not designed for flood control, could be operated to take 20 centimetres off a flood peak. Alcan's Kemano Completion Project would further reduce the river's flow. A few years ago there was talk of diverting a major upstream tributary into the Peace River system, which would have offered additional flood protection, but environmental concerns scuttled that scheme. For now, anyway, the Fraser will stay wild.

All that's left, it seems, is making minor improvements to the systems already in place. "Integrated river management" is the current buzzword for the Fraser's future. So many conflicting demands are made on the river: it's a vital wildlife habitat, a shipping channel, an irrigation source and a sewage outlet. It supplies drinking water, electricity, sand and gravel, and much of the world's salmon. It's important to aboriginal groups, flood and pollution-control experts, politicians and municipal managers. Integrated river management is getting the representatives of all these interests sitting down and talking to each other.

It already happens to a certain extent. Dikes, for instance, are often incompatible with the needs of wildlife; they begin a process that turns natural wetlands into neat rows of corn or, worse, into parking lots. But an important salt marsh in Delta was preserved recently—and flood protection provided—by an innovative dike and breakwater design with openings to

permit normal tide action. And since 1992, the Fraser Basin Management Program, representing all groups interested in the river, is also “striving for sustainability in the Fraser Basin.”

I interview FBMP’s Aubrey Brown, who is evaluating the Fraser River Flood Control Program, which expires next year, and making suggestions for the future. He believes the FRFCP should be replaced by a provincial authority to ensure that all dikes are uniformly maintained. He’s also keen on resurveying the river, recalculating flood probabilities and developing a complex computer model of the lower Fraser. This “modern management tool,” says Brown, could predict changes in the flow of the river based on various dike, dredging and channel patterns, and could also be used for pollution-control purposes.

Glutted with reports and plans, I drive back to my floodplain home, blissfully contemplating the new computer model and its implications for the future of flood control. The first thing I’ll do, I decide, is bring those extra camp-stove canisters upstairs, then make sure there’s a good long bow line on the kayak. What else? Better figure out how to turn off the gas fireplace. Is the safety-deposit box floodproof? Maybe some fishing gear would be a good idea. And a lantern. And a whistle. Go ahead. Laugh. Just remember, people laughed at Noah and look what happened to them.