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the production of flood as natural catastrophe: EXTREME EVENTS

AND THE CONSTRUCTION OF VULNERABILITY IN THE DRAINAGE BASIN OF THE ST. FRANCIS RIVER (QUEBEC), MID-NINETEENTH TO MID-TWENTIETH CENTURY

ABSTRACT

This essay analyzes how a popular adjustment to floods gave way to the gradual build-up of vulnerability among the riparian population of the St. Francis River, where flooding events have occurred repeatedly since the middle of the nineteenth century. The need to control the river flow required that the flooding events be framed as a natural catastrophe that threatened the well-being of the population. This was especially the case when a sense of urgency accompanied the flooding events of 1913 and those of 1942 and 1943, and when droughts concurrently incited the regulation of the river flow and of the production of energy for industrial purposes. In both episodes, droughts contributed to the construction of floods as a natural catastrophe because they disrupted economic activities by provoking power shortages.

> The spring freshet is now on in earnest. The rain of Monday was the beginning. Since then the water has been steadily rising and yesterday afternoon passed the capacity of the river channel and overflowed the banks. Slowly–but surely–it continued its aggressions until before night. ... Those who have watched the progress of the spring floods for many years past predict a record breaker this year.
>
> ***Sherbrooke Daily Record***[1]

FLOODS ORDINARILY UNFOLD in a dramatic fashion. We think of them as events that break the normal pattern of a society, and the use of the term "natural catastrophe" to characterize these events conveys precisely a sense of abruptness. The fact that both journalistic accounts and later historical studies focus on single events doubtlessly contributes to that perception. But, as the

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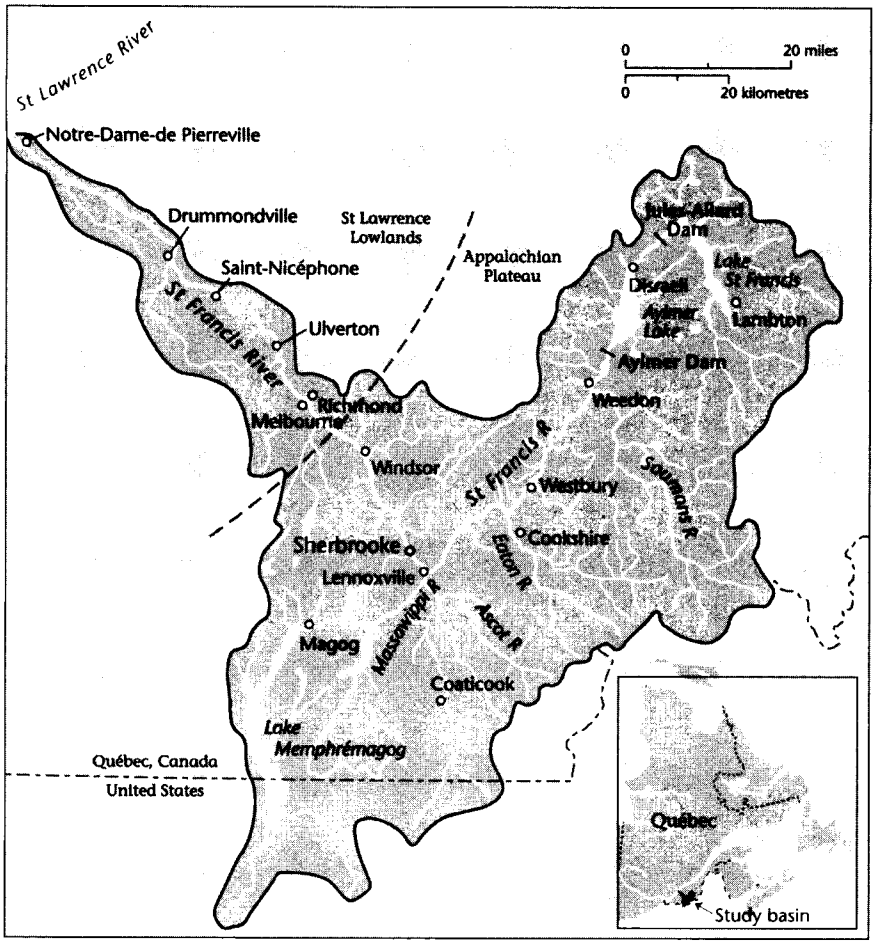
Record's quote illustrates, floods are the norm under certain circumstances. Rather than appearing as historical events, they can be a recurring phenomenon and act as a structural element of the landscape.[2] In some cases, local populations have grown used to floods and consider them inconsequential. To paraphrase Gilbert White's 1942 pioneering study of flooding in the United States, one might say that riverine inhabitants adjust to floods.[3] If we are to consider natural catastrophes over the long term, we must then ask how they become portrayed as "catastrophic" events and how their normal and normative dimensions become obliterated.

Historians and social scientists have highlighted the structural character of natural catastrophes by studying their social production. One can group such studies under three specific, albeit not exclusive, interpretations, with natural catastrophes being the product of social structures, human action, or elite discourse. In all three cases, elements of society are responsible for increasing the vulnerability of segments of the population to the consequences of a natural phenomenon. In the first interpretation, the area most severely stricken by a natural disaster usually turns out to be the one inhabited by members of ethnic minorities and lower social classes. Because such populations are ill-equipped to adequately face the danger and to recover rapidly from the resulting damages, natural catastrophes then appear to be a by-product of social inequality.[4] A second interpretation of natural disaster relates to the role of human infrastructure in increasing the intensity and frequency of catastrophes. For example, the transformation of a river harnessed to produce hydropower or straightened to facilitate transportation renders a watershed more susceptible to overflow; thus, flooding becomes the unintended consequence of efforts to control nature.[5] Closely related to the first interpretation, this nevertheless points to specific actions that modified the landscape and increased the vulnerability of the riverine inhabitants. A third interpretation results from the discursive use of environmental catastrophe by a ruling elite seeking to hide the role of human intervention in the occurrence of natural disasters, such as the construction of cheap housing on floodplains or the mismanagement of dams in times of high precipitation.[6] In such circumstances, catastrophes are naturalized by the members of the ruling of elite, who call them "Acts of God" to legitimate the socialization of the risks—that is, their distribution through the various layers of the social structure in a manner that will absolve wealthy individuals or corporations of any responsibility.

This essay proposes yet another instance of the social production of natural catastrophe, one in which a popular adjustment to floods gave way to a gradual build-up of vulnerability among the riverine population.[7] The idea of social production does not imply that natural catastrophes occur only in the realms of ideas and fantasies, but that one cannot properly understand them by examining only their physical characteristics, without any consideration of the human actions and representations surrounding their occurrence and the damage they incurred. To explore the conditions under which a natural event becomes a natural catastrophe, the essay focuses on the St. Francis River, on the south shore of the

Map 1. Location of the St. Francis Drainage Basin, Quebec, Canada



Adapted by Eric Leinberger from Julien Saint-Laurent, LIAGE, UQTR.

This map shows the sub-basins and tributaries of the St. Francis River.

St. Lawrence River in Quebec (Map 1). The St. Francis River played a central role in the economic development of Eastern Townships, an area settled early in the nineteenth century by immigrants from both the British Isles and the United States to French-speaking Lower Canada. The settlement of that pioneering community and the ensuing urbanization of the area led to a pattern of diversified land use and an intensive use of the rivers and lakes of the drainage basin. Rapid industrialization, the intensification of agricultural production and logging profoundly modified the flow of the main streams.[8] All these features render this drainage basin an ideal site for this study, especially since floods occurred repeatedly from the end of the nineteenth century to the middle of the twentieth century.[9] Indeed, analysis of regional newspapers, local histories, and municipal archives illustrates that, in most cases, inhabitants who lived by the river were fully cognizant of the flood risks. Despite long-term visible patterns of human

adjustment, a sense of urgency accompanied the floods of 1913 and 1942-1943. In both episodes, the regional economic and political elites portrayed the floods as natural catastrophes, mobilizing public opinion to regulate the St. Francis River and stabilize the production of energy for industrial purposes. Their intervention and the consequent construction of infrastructure to prevent or attenuate the consequences of flooding instilled a sentiment of vulnerability among the riverine population, thereby contributing discursively and materially to the production of floods as natural catastrophes.

HUMAN ADJUSTMENTS TO FLOODS

THE ST. FRANCIS RIVER is the principal waterway of the St. Francis drainage basin, which is mainly located in the physiographic region of the Appalachians. It occupies a total surface area of 10,221 square kilometers, including 1,526 square kilometers in northern Vermont. Large variations (304 m-762 m, with the higher altitudes in the Adirondack Mountains) and a low river flow characterize its hydrography.[10] The upper section of this basin is composed of several large lakes, including Lake Aylmer and Lake St. Francis, where the St. Francis River originates. Wooded areas cover the mountains, hills, and valleys upstream, while farmland and urban areas dominate the large plains in the lower section of the basin, before the river enters Lake St. Pierre in the St. Lawrence. A dense drainage pattern with steep slopes on the upper basin, the convergence of major tributaries short in length but with significant volumes of water in the middle basin, and high precipitation-low temperature spring conditions that accelerate snow melt combine to increase the water level abruptly and raise it over the river banks.[11] Extreme climatic events such as short torrential rains or extended rainfall also cause major flooding.[12] This is especially the case in towns located close to a tributary that can disturb the hydrology of the main course during periods of extremely high water levels.[13] For instance, the high drainage density of the Eaton, Massawippi, Magog, and Watopéka rivers increases the risk of flooding for their respective sub-basins.

Because of its physical and physiographic characteristics, the St. Francis River drainage basin is prone to frequent flooding, although this is only part of the story. The St. Francis River heavily influenced the settlement and industrialization pattern in the Eastern Townships, which in turn affected the vulnerability of settlements to floods. At a time when inadequate road systems confined transportation to waterways, the rivers of the Eastern Townships were poorly suited to large-scale navigation. Frequent breaks in river profile limited travel to canoes and flat-bottom scows between rapids and waterfalls, and portages were necessary at many points along the river. Settlements such as Windsor Mills, Bromptonville, and Drummondville eventually grew up at these locations, which also benefited from the presence of waterfalls that were tapped for their hydraulic power. That natural advantage was similarly sought at the confluence of the St. Francis River and its major tributaries, where the industrial centers of East Angus, Lennoxville, and Sherbrooke took advantages of water power sites, "the positive corollary to the non-navigability of Eastern Townships rivers."[14]

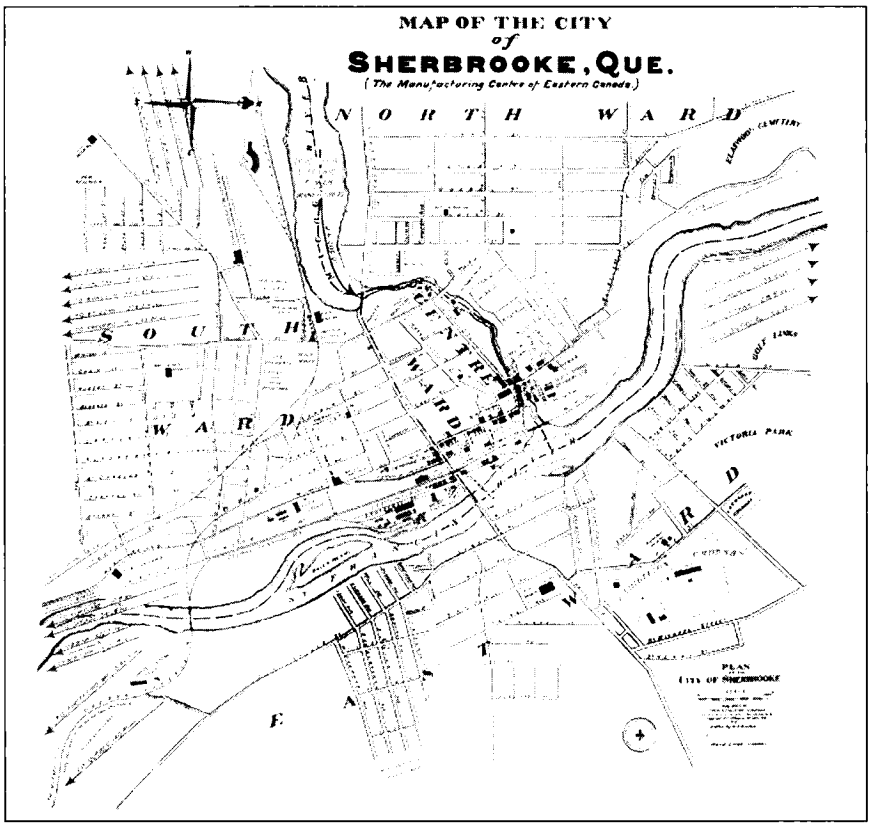
These municipalities have experienced floods of varying intensity on a regular basis. Between 1850 and 2000, sixty-three floods affected from one to nineteen municipalities, six of which were stricken more than fifteen times.[15] Generally, the spring snowmelt, rainfall, and ice jams that hindered the flow of the river were the events most often listed as the cause of the largest floods. Riverine inhabitants expected spring floods on an annual basis, unlike flash floods, which resulted from exceptional precipitation in summer or fall. Although spring flooding may have had the unfortunate consequence of carrying large ice blocks responsible for the material destruction of public infrastructure such as roads or bridges, it lasted only a few days, and normal activities resumed rapidly once buildings and goods were dry again.

The vulnerability of a municipality depended on its location on the river, and that of its inhabitants on the district they lived in. The location of a municipality at the confluence of a tributary and the St. Francis River contributed strongly to the intensity of the floods, especially during spring, when ice aggregated in front of dams or on other obstacles, such as the remnants and foundations of bridge piers or abutments to ice-breakers. Industries and municipalities whose infrastructure modified the river flow sometimes affected municipalities upstream. Within a given municipality, some districts were more affected than others, with the urbanization triggered by the arrival of the railway in 1853 modifying the exposure of inhabitants to floods. Initially built on hills away from the flood plain, municipalities such as Richmond and Sherbrooke moved their centers closer to the river, where the railway ran and the train station was built.[16] Patterns of vulnerability differed accordingly, as did attitudes toward floods.

Built at the confluence of the Magog and St. Francis rivers, the city of Sherbrooke–which had become the administrative and economic center of the Eastern Townships at the middle of the nineteenth century–exemplifies this differential vulnerability and adaptability to floods linked to the urbanization and industrialization of the Eastern Townships (Map 2).[17] Sherbrooke grew up around the Magog River, close to its discharge into the St. Francis River. At that point, the St. Francis River offered a small current and an unsubstantial amount of energy. It exerted a weak draw on both industrialists and workers who elected to inhabit the West Ward, close to the factories. Harnessed for its hydraulic power, the Magog River threatened neither the grist and sawmills located on the south shore nor residences of the economic elite on the north shore because of the depth of its gorges.[18] The arrival in 1853 of the St. Lawrence and Atlantic Railroad linking Montreal to Portland, Maine, modified the development axis of the city, as factories, storehouses, and hostels were established close to the central station in the Center Ward. Thereafter, workers for these industries inhabited the east shore of the St. Francis River, and both sides of the floodplain were occupied.[19]

While the factories and hostels of the Center Ward were sometimes inundated, the story of floods in Sherbrooke is mainly that of its East Ward. A mix of individuals from diverse social and occupational backgrounds rapidly populated the lowlands of the flood plain. Unlike the inhabitants of Sherbrooke's West Ward, which remained the working-class district and was mainly composed of tenants,

Map 2. The Wards and Rivers of the City of Sherbrooke



Excerpt from W. S. Brodeur, *Map of the City of Sherbrooke, Que.: The Manufacturing Centre of Eastern Canada* (St. John: N.B:C. Fred. McAlpine Company, 1910).

the inhabitants of the East Ward owned their houses, and a large proportion of them rented out a story of the house. Hence the flooded area was not characterized by a class- or ethnic-based segregation. The economic and social conditions in the East Ward only began to decline in the 1930s, in the aftermath of the Depression.[20] Recurring flooding deteriorated the buildings in that area, and the more affluent residents moved up the hill, renting their houses to the unemployed. Prior to that, however, inhabitants of the East Ward claimed to benefit from proximity to both their workplace and the cultural center of Sherbrooke, close to the central station. Trains brought news and trends from the larger cities, while the hostels and their saloons animated the cultural and social life of Sherbrooke.

Far from deterring individuals from acquiring property on the floodplains of the St. Francis River, floods meshed with other features to build the deep sense of belonging that characterized the inhabitants of the East Ward. These people were separated from the "mainland" by the river and claimed to have a privileged view of the City of Sherbrooke.[21] That psychological distance was also an ecological one, as floods contributed as much to the building of identity among the residents of the East Ward as did being close to the downtown area and living on the "other

side" of the city.[22] Journalistic accounts described the interactions and preparedness of the inhabitants facing flooding whenever the East Ward was drowned "once again."[23] As the water rose slowly but surely, those living in that "vulnerable" area scurried to move their belongings to the upper stories of their homes, while merchants emptied their basements until the water subsided. Once they completed that routine, people flocked to the river banks to view the seasonal spectacle of rising water and blocks of ice and logs racing down the river. Boats and canoes were used, not to flee but rather to visit neighbors, deliver mail, and attend school or church.[24]

That readiness to accept floods, not as a fatality but as a spectacular event whose consequent damages could be and often were avoided, also marked the general attitude of inhabitants of other riverine municipalities who anticipated a flood each spring. Proven local knowledge evolved around these floods, as riverine inhabitants watched for a series of signs in springtime that foretold the danger, such as rising temperatures, the amount of snow received and remaining on the forest floor and the amount of rainfall. A certain combination of these markers announced an imminent flood and signalled the need to act preemptively. Inhabitants were well aware of their vulnerability in regard to the high water marks, which they regularly revised in light of flooding and the extent of damages recorded. Newspaper accounts relayed that knowledge, but the strategy was not foolproof.[25] In 1913, for example, Richmond merchants saw the water of the St. Francis River recede on March 11, and thought that the flood had subsided for that spring. On March 24, however, the river rose rapidly, catching Richmond inhabitants off guard, and many suffered severe losses, including usually prudent merchants who had no time to retrieve their goods from the basement.[26] In subsequent years, few damages were recorded, despite the river overflowing in 1914, 1915, and 1916.[27]

INUNDATIONS AND INDUSTRIALIZATION

LOCAL KNOWLEDGE EXHIBITED adaptability, but it also contributed to the construction of vulnerability by spreading rumors and generating uncertainty and anxiety. Dams and bridges were said to have collapsed, their debris running wild on rivers. Log booms were reported to have been set loose, roadways carried away, and ice blocks and logs were alleged to be threatening levees and dams.[28] Riverine inhabitants closely scrutinized the management of dams and log booms upstream, and sometimes successfully prevented industries from provoking flooding.[29] The acceptability of natural damage from flooding contrasted with accusations of damage caused by or attributed to industrial infrastructure.

In that regard, industrialization linked to logging and power dams on the St. Francis River and its tributaries contributed as much as the location of municipalities to the inscription of floods in the river landscape and the creation of vulnerability among the inhabitants of the Eastern Townships. Once the railroads were built and the 1854 reciprocity treaty with the United States bolstered the growth of sawmills in the Eastern Townships, forest exploitation took off on a large scale.[30] Wood was the most abundant and accessible natural

resource in the region, and companies that installed sawmills bought large tracts of forest to ensure a steady supply of wood. C. S. Clark and Company (1853) acquired forest reserves around Lake St. Francis and Lake Aylmer when it built a sawmill beside Brompton Falls, downstream from Sherbrooke.[31] These reserves were later transferred to the Brompton Pulp and Paper Company when E. W. Tobin, a lumber merchant from the Eastern Townships, bought the former site of the C. S. Clark and Company sawmill in 1901 and hydraulic power from Brompton Falls to set up a paper mill.[32] Similarly, the owners of a pulp mill at Windsor Mills (1864) and those of the Royal Paper Mills at East Angus (1882) acquired the forest land in the drainage basin of the Watopéka and Salmon rivers.[33]

These industrial sites were prone to flooding because of their location at the juncture of the St. Francis River and a tributary, and, more importantly, because of the presence of a dam. There, blocks of ice collided and aggregated, hindering the course of the river and often causing it to overflow. Furthermore, lumber activities modified the river landscape. To supply the sawmills and paper mills downstream, logs were collected in booms upstream and driven down the river starting in May, when the water was at its highest. The importance of stream driving for that industry was such that the Brompton Pulp and Paper Company gained control of the water rights of the St. Francis River and of smaller streams, as well as storage and shore rights of several lakes at the headwaters of the river.[34] But log booms sometimes broke, and free-floating logs destroyed smaller dams and increased damage during a flood. Farmers, residents, and industrialists sued for damages incurred to riverine properties by the break-up of log booms or the mismanagement of dams.

Partly because of their lack of deference toward other inhabitants and industrialists of the area, and partly because of their carelessness in supervising the driving of logs down the river, C. S. Clark and Company and Brompton Pulp and Paper Company had their dams and log booms under popular surveillance, and often were declared at fault for causing floods, littering agricultural fields, and damaging the crops of the riverine farmers.[35] In the Upper St. Francis district, settlers protested against the building of dams by C. S. Clark and Company, whom they held responsible for spring flooding.[36] The company also was reviled by the citizens of Bromptonville for its causeway, which, they claimed, intensified ice run debacles and inundations of the city.[37] In 1903, after the Brompton Pulp and Paper Company dynamited an ice jam that threatened its mills, it was sued by a factory owner whose establishment was knocked over by blocks of ice.[38] Thanks to their close political ties with the provincial government—a member of the Legislative Assembly eventually purchased C. S. Clark and Company—these companies survived legal attacks and pursued the industrial transformation of the river.[39]

Furthermore, the vulnerability of riverine inhabitants and the frequency and intensity of flooding were exacerbated by massive deforestation under the land-clearing regime of settlement and the lumber industry. By the end of nineteenth century, riverine inhabitants and government officials already claimed that deforestation had transformed the water flow of the St. Francis River.[40] Early in

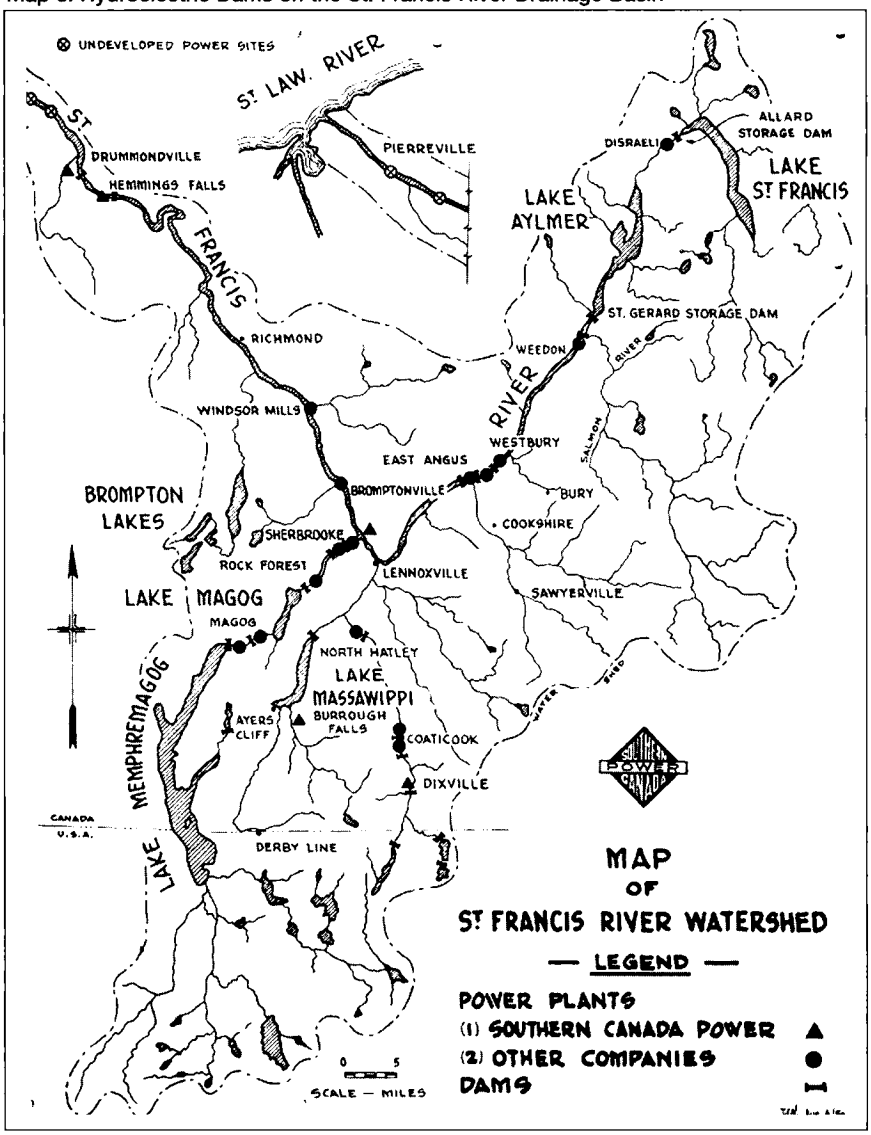
the nineteenth century, businessmen also were expressing concerns about the effect of deforestation on the short-term supply of sawmills and paper mills, as well as the long-term effect on river flow and hydroelectric potential.[41] By 1920, most paper mills began obtaining their wood from regions north of the St. Lawrence River because they could no longer rely on the local forest for their supply.[42] Solutions to variations in stream flow were sought earlier, as the consequences of the erratic behavior of the St. Francis River became more acute following intensive hydroelectric development of the region from the 1890s on.

Until the end of nineteenth century, the St. Francis River was not utilized to any extent by industry for energy production, unlike its tributaries, which were heavily used by early industries such as grist mills and sawmills. Given the river's large width and glacial deepening, which provided hanging valleys with large heads favorable for hydroelectric purposes, advanced technology was required to build an appropriately sized dam for it.[43] The second industrial revolution increased the demand for electric power and fostered a series of transformations of the St. Francis River. Besides the paper industry, which actively sought and bought hydropower sites, publicly owned power companies such as those in Sherbrooke and Drummondville and privately owned companies such as St. Francis Hydraulic Company or Southern Canada Power also transformed the St. Francis River by building large dams (Map 3). Technological development eventually facilitated the use of rivers with large flows on the north shore of the St. Lawrence, but around 1910, half the hydropower plants in the province of Quebec were located in the Eastern Townships. As the industrial transformation of the St. Francis River and the Eastern Townships accelerated, the hydrological regime changed, and so did the perception of the river.

PRODUCING FLOODS AS DISASTERS

LARGE WATER-LEVEL FLUCTUATIONS under flood and drought conditions brought unbearable uncertainty for heavily capitalized plants that required increasingly larger amounts of energy. Floods inflicted losses on Eastern Townships manufacturers, inundating factories, sweeping away log piles, and breaking down power equipment, but it was drought that led local businessmen to seek the support of the provincial government for the regulation of the St. Francis River. Not that drought was new to the area. In 1837, for example, farmers blamed the abnormal low level of the river for failing to deliver spruce logs to a sawmill in Sherbrooke.[44] But as the frequency and intensity of droughts increased at the turn of the century, manufacturers and power plants whose energy supply depended on a regular river flow had to cease their activities for long periods of time in 1891, 1895, and 1901.[45] During the summer of 1903, the St. Francis and Magog rivers ran dry because of a "great and unprecedented drought."[46] At Magog, the Dominion Textile mills spun at half time for two months and stopped for four months in the winter of 1904. In Sherbrooke, the Paton and Lomas woollen factories ceased operations because their hydraulic wheels stopped for lack of water, and the city power plant was regularly unable to light the streets. In Bromptonville, the paper mill's dam had only one of its nine

Map 3. Hydroelectric Dams on the St. Francis River Drainage Basin



Dan Anderson, "St. Francis River Stream Flow Control," *The SCP News* (September 1950), 9.

hydraulic turbines working.[47] Companies installed power engines, while those who could not afford to do so ceased operations until the following spring. Manufacturers' associations also dredged the rivers with dynamite to ensure a minimum flow (Figure 1).

Adjustment to drought became increasingly cumbersome, expensive, and unsatisfactory. Industrialists, manufacturers, and local politicians began organizing a concerted response to the irregular behavior of the St. Francis River, but to little avail. Droughts brought little inconvenience to the lives and well-

Figure 1. Dredging the Magog River with Dynamite during the Drought of 1903

Historical Society of Magog, Fonds R. Courtemanche, no 213.

being of individuals, however, so their frequency could hardly legitimate public involvement, especially at a time when the provincial government prided itself on its limited interventions in social and economic realms. Besides, the government lacked expertise in that domain, and only when it created the Quebec Streams Commission in 1910 did it gather the technical staff to assess the hydroelectric potential of the province and harness it for industrial development.[48]

The spring flood of 1913 provided the economic and political elite of the Eastern Townships with an opportunity to demand the regulation of the St. Francis River flow. Torrential rain unexpectedly struck the Eastern Townships in late March, and early ice thaw and rapid snow melt caused ice jams and inundated towns all over the drainage basin.[49] Bridges were destroyed and carried away, roads and highways were flooded and damaged, and houses were removed from their foundations or knocked over.[50] Logs and ice blocks piled up on railways, and traffic on the Grand Trunk Railway (formerly the St. Lawrence and Atlantic Railroad) was suspended. The Jenckes Machine Shop and Walter Blue Shop in Sherbrooke and the mills of Brompton Pulp and Paper Company in Bromptonville and St. Francis Paper Mill in Windsor Mills had to close down.[51] More than one thousand workers were without work for several days.[52]

In April 1913, the provincial government received a petition requesting the construction of dams on Lake St. Francis and Lake Aylmer to regulate the water regime of the St. Francis River. The petitioners were the mayors of Sherbrooke, Drummondville, Pierreville, and Richmond, the Sherbrooke Board of Trade, and the presidents of Dominion Textile, Jenkes Machine Company, Tourville Lumber

Mills, South Shore Power and Paper Company, Canada Paper Company, and Brompton Pulp and Paper Company. They cited first and foremost "the necessity to reduce the spring flooding that caused considerable damage downstream."[53] They also insisted on the necessity of reducing the volume of water and of preventing damage to bridges, the destruction of inventory and goods in commerce and the inundation of manufacturers and plants.[54]

For all these expressed concerns, floods nevertheless received cursory treatment in their arguments, which is quite perplexing given the recent event. Previous to that, however, industrialists had not been vocal in times of flooding, except when accused of negligence in managing dams or log booms or of causing damage to private or public property. But their business usually resumed rapidly, once the machinery dried out and the logs collected downstream. Moreover, the costs associated with recovering from a slowdown of a few days were minor compared to the economic consequences of a low and irregular energy output. Not only did manufactures and factories have to shut down their activities entirely, but the bad press coverage hurt the reputation of the region, which was built on the availability of cheap and reliable hydropower for its industrial and manufacturing sector.

Of all the consequences of the floods, it was the potential power wasted during times of high water that enticed the petitioners to seek some form of control over the St. Francis River.[55] Many cities had been through major inundations over the past decades, but they were mainly concerned about the consistent availability of water for electricity generation. That was central to their industrial, demographic, and fiscal growth and, consequently, to their perception of the St. Francis River. Officials in the city of Drummondville insisted on the possibility of increasing the amount of horsepower they could promise and deliver to industries willing to establish themselves in the city. Leaders in Sherbrooke and Richmond claimed that their cities' importance would increase with the improvement of hydraulic forces. The petitioning manufacturers also considered drought an extreme event of greater consequence than flooding.[56] They were either direct producers or consumers of energy derived from the St. Francis River or its tributaries (such as the Magog River in the case of Dominion Textile), or paper companies and sawmills that used the St. Francis River for power generation or log driving from their forest reserves. The irregular behavior of the rivers affected all these industrial activities, and the construction of reservoir dams at the headwaters of the St. Francis River would enable the storage of energy that power plants would otherwise lose.

The flood of 1913 mobilized economic and political authorities to address a problem that confronted them in times of low water. The solution was to funnel surplus water created during springtime precipitation and snowmelt to prevent power shortages and the ensuing disruption of economic activity. The overflowing river was problematic because it amounted to wastage. Droughts, then, contributed to the production of flooding as natural catastrophe.[57]

The provincial government submitted the petition to the Quebec Streams Commission, whose mandate also included identifying potential hydroelectric

sites and building reservoirs for the regulation of river flow for industrial use.[58] The following year, Jules Allard, the minister of lands and forest and head of the Quebec Streams Commission, presented the Legislative Assembly with a bill that gave the Commission the authority to build dams on the St. Francis River, "so as to insure a uniform river flow and to avoid spring floods."[59] The construction of a dam fell within the mandate of the Commission, which also expected to receive royalties from companies along the St. Francis River that would benefit from the water stored upstream. Nevertheless, the minister felt compelled to expound a rationale based on the need for flood protection to gain the support of the Legislative Assembly. Allard also invoked the need to protect farmers, who were said to have complained over recent years about the scarcity of water at the end of the growing season. Farmers indeed had complaints, but these were of a different order, concerning the loss of crops and access to city markets when roads and fields were inundated and damaged.[60] There were also farmers around Lake St. Francis whose fields would be inundated with the building of a reservoir-dam.[61] Against those farmers, political and economic leaders argued that the regional benefits derived from increasing the river's energy potential outweighed personal interests. MPs for the counties of Sherbrooke and Richmond, C. E. Therrien and Provincial Treasurer Walter G. Mitchell, explicitly linked the regulation of the St. Francis River with the possibility for the City of Sherbrooke to proceed with the hydraulic sites it had acquired over the past years and to "hydroelectrically develop" the Eastern Townships and supply the municipalities of Windsor Mills and Richmond.[62] Finally, the personal interests of the few farmers living around Lake St. Francis were pitted against the national interest by Premier Louis-Alexandre Taschereau, who claimed in his Inaugural Address of 1917 that the dams built on the St. Maurice and St. Francis rivers enabled the government to augment the power upon which the industrial development of the province rested.[63]

Although more costly than initially envisioned, expropriation proceeded and the Quebec Streams Commission completed the Allard Dam at the outlet of Lake St. Francis in November 1917.[64] It also acquired the dams at the outlet of Lake Aylmer from the Brompton Pulp and Paper Company and rebuilt them to transform the two upstream lakes into reservoirs.[65] Unlike the Commission's other engineering works, which aimed to regulate a minimal flow at a certain point in time, dams upstream from the St. Francis River released a steady flow throughout the year.[66] The Commission was then following the advice of leading industrialists who, unlike local populations, could not tolerate the irregular behavior of the river. That perception was linked to the close connection between their industries and the river, which superseded the relationship between the riverine population and the river.

VULNERABILITY AND VIGILANCE

THE DECADES FOLLOWING the transformation of the upstream lakes witnessed no drought conditions in the St. Francis drainage basin. Nevertheless, among the riverine populations the probability of being inundated had reverted to the threat of being inundated, partly as a result of meteorological conditions and

partly as a result of the expectations nurtured around the infrastructure controlling the river flow. Except for March 1936, no major spring floods occurred. Flash floods, however, frequently struck the area, such as the ones recorded on September 10 and 11, 1924, and on November 3 and 4, 1927, when thirty-six hours of continuous rainfall caused five deaths and necessitated more than $2 million in railway and highway repairs.[67] Litigation by individuals became more common, and targeted both companies and municipalities.[68] Citizens accused the city of Sherbrooke of not "taking elementary precautions," even if the "overflow was easy to foresee and avoid," and of neglecting its sewage infrastructure, which led to the inundation of basements in districts thus far spared, such as the West and South wards.[69] In a letter sent to the municipal council, they expressed their disappointment with previous flood control policies: "Many among us believed that the improvements at the headwaters of Lake St. Francis and water conservation would be sufficient to regulate the river flow and prevent inundations. Experience demonstrates that the dike to retain water does not suffice."[70] They petitioned the Quebec Streams Commission and the provincial department of public works, demanding the removal of obstructions from the river bed between Sherbrooke and Bromptonville to prevent inundations.[71]

Faced with these repeated demands for protection against flood, the chief-engineer of the Quebec Streams Commission admitted that the reservoirs only covered a quarter of the drainage basin and that their construction brought only small changes to flooding conditions.[72] He specified that changes to the river landscape could diminish the damages, but that citizens should never expect anything like absolute protection. In 1931, the Commission undertook a topographical survey of the riverbed to locate and eliminate obstacles between Lennoxville and Richmond.[73] It also considered multiplying the number of dams and reservoirs along the river and creating a series of reaches to store ice. But both projects proved too costly and their results too uncertain to receive the go-ahead. Nevertheless, Sherbrooke was granted governmental subsidies for preventive engineering work, mainly as a measure of Depression relief.[74] In 1933, four-hundred--meter-long retaining walls were erected on both sides of the St. Francis River. Afterward, residents demanded two additional protection walls along small streams in the city that each spring were transformed into an "impetuous torrent."[75] In 1939, officials from the city of Sherbrooke and the federal department of public works agreed to build other protection walls along the St. Francis River.[76]

During the 1940s, a series of extreme events once again revealed to the Eastern Townships population and industrial interests their vulnerability to the ups and downs of the St. Francis River. Between June 13 and 15, 1942, forty-eight hours of rain caused the worst flooding ever along the river.[77] A year later, most of the towns were still recovering when abundant rain between June 12 and 16 inflicted even more damage. The provincial department of public works estimated repair costs for roads and bridges at $1 million for 1943, while the Eastern Townships Associated Boards of Trade evaluated the losses at $9 million for both floods.[78]

By that time, people had ceased to be accustomed to floods. Attitudes toward

the river and its erratic behavior—or was it the population that had become capricious?—had generated greater demands for safety. Far from being removed, the risk of loss and destruction had intensified. Increasing vulnerability paralleled the local population's diminished capacity to cope systematically with flooding. Their vigilance, however, did not cease. Rather than keeping a close watch on the river, riverine inhabitants directed their attention to making claims for protection and reparation to the various levels of government. They petitioned the mayor of Sherbrooke and demanded that the city reimburse damage and investigate liability for the flooding. Petitioners identified excessive storage of water in upstream reservoirs, broken booms, obstacles such as floating pulpwood, and retaining walls that narrowed the river as contributing to the flooding.[79] Others, including Armand Crépeau, the engineer of the City of Sherbrooke, urged that the river be dredged over many kilometers.[80] Otherwise, inundations would grow worse year after year, since each summer floods carried gravel and sand into the streams and formed banks close to two meters deep and many meters long where tributaries such as the Magog, Watopéka, or Massawippi rivers discharged into the St. Francis. Constituents also pressed their MPs to raise the issue in both the federal and provincial parliaments and asked that governmental engineers prepare a report indicating work required to prevent similar inundations.[81]

To address these concerns, the Quebec Streams Commission mandated Leonard Cartier, a consulting civil engineer from Montreal's École Polytechnique, to conduct a series of studies on the flood problem and potential solutions related to river management in the St. Francis drainage basin.[82] Cartier made it clear that floods had ceased to be probable events and instead had become a constant threat awaiting long-term solutions: "There is the possibility that more severe floods will occur and that such floods as have occurred in past years manifest a menacing frequency of recurrence." In that regard, Cartier questioned the efficacy of previous works, since the Aylmer and Allard dams controlled only a fifth of the drainage basin. But Cartier also considered that "any improvement works in channels such as dredging, deepening, widening, suppressing natural obstacles or ordinary man-made obstructions" would be inefficient and expensive. Furthermore, no protective infrastructure could correct the problem at its source. For Cartier, the main cause of a flood was the synchronized concentration of the inflow from the tributary Eaton, Moe, Salmon, and Coaticook rivers and, more precisely, the fact that "the larger part of the precipitation runs off rapidly toward the river without being held back by natural obstacles that are usually found in other river basins."[83] The solution rested on "a general not local, comprehensive not piece-like plan," such as the use of natural possibilities of small storage along the tributaries to collect runoff waters and delay their flowing into the main stream.

Despite the mobilization of civilian committees and public bodies in the wake of the 1943 flood, companies that possessed dams on the St. Francis River had remained aloof from the debate. While the reservoir dams proved to be of limited usefulness in preventing floods, their storage capacity satisfied the growing

industrial needs. Following the construction of the reservoir dams on St. Francis and Aylmer lakes, the Electric Department of the City of Sherbrooke and its regional rival, Southern Canada Power Company, had multiplied invitations and financial assistance to factories to attract them to the Eastern Townships. Municipalities had seconded the efforts of power companies by publicizing the vast amount of energy available from the St. Francis River. As a result, large Canadian and American textile firms established subsidiaries in the region, and the manufacturing sector grew steadily between 1920 and 1940. The demand for electricity soared, even more so since older textile factories in Sherbrooke, Coaticook, and Magog, which had relied on hydraulic power or air-operated machines turned to electricity. But because of its small hydrographic capacity, the St. Francis River had limited hydroelectric potential, and industries and cities became more vulnerable to energy shortages.[84]

As long as the flood control measures did not impinge upon the regulation of the river flow, industries tolerated the damage caused by flooding and did not feel hard-pressed to intervene in the debate. That attitude changed in 1948. In the spring of that year, the St. Francis River went on another rampage. Bromptonville suffered particularly on March 22, when blocks of ice congregated in a narrow section of the river and broke the Brompton Pulp and Paper Company dam. The water level rose approximately six meters in a few hours, and giant ice flows spilled over the bank into the central area of town, where the river rejoined its original bed. The flood destroyed eighteen houses, severely damaged another forty, and left one hundred people homeless. Damage was estimated to be in excess of $500,000 for the city, and several hundred thousand dollars for the railway companies.[85] In the fall of that same year, however, power companies had to operate at their lowest level ever owing to a shortage of water. The City of Sherbrooke ordered a part-time blackout and maintained daylight savings for electricity conservation. These measures proved insufficient to supply industrial consumers, who were required to curtail their working hours.[86]

Unlike the population, which had requested a public intervention in the wake of the floods of 1942 and 1943, industrialists and economic actors of the Eastern Townships organized a concerted response only after the drought of 1948. Under the aegis of the Sherbrooke Chamber of Commerce, industry representatives formed four committees to address the multifaceted dimensions of the St. Francis River drainage basin: flow control, flood control, beautification, and reforestation. Their aims were to help power plants along the river, prevent floods, and beautify the St. Francis River valley so as to enhance the tourist industry.[87]

In a fashion similar to the process leading to the building of retention dams in the 1910s, industries produced floods as disasters to mitigate the more threatening menace of drought. Overlapping memberships between the Flow Control Committee and the Flood Control Committee as well as regular joint meetings guaranteed that solutions to the regulation of the St. Francis River for flood control exhibited a primary purpose of flow control. Industry participants in these committees agreed to regulate the output of the Lake St. Francis and Lake Aylmer reservoirs in order to store water during spring floods and summer

flash floods, as well as to use the reservoir discharge to improve power generation at other times.[88] They also studied the improvement of the storage capacities of Lake Memphremagog and Lake Weedon, as well as Stoke, Watopéka, Coaticook, and Massawippi rivers through levee and dam construction.[89] Finally, they considered that "the most effective immediate steps would be to build additional control dams at suitable locations, so that flood waters could be impounded and released as conditions warranted. In this way flood crests could be regulated."[90] In that respect, they agreed that building control dams was more effective than building retaining walls along the banks of the river.

But industrialists and economic actors were no longer in a position to garner public support, and their discourse to further the transformation of the river and its tributaries for flow control fell on deaf ears.[91] While one might think that demands for infrastructure should have comforted a population that had grown vulnerable to floods, the inhabitants of the Saint-Francis River drainage basin had lost faith in engineering solutions to flood damage. After many years of continual inundations, riverine inhabitants ceased to view upstream storage as a means of eliminating the flood threat entirely, let alone controlling damage. With vulnerability built into the river landscape, they had grown suspicious of any modifications that might disturb the flow of the St. Francis River. Furthermore, the economic elite was unable to convince the local population to implement flow-control technology to regulate electricity generation. The importance of the Eastern Townships as a hydro-power producing area had declined during the interwar years, and the growth of energy supply on the south shore depended on improving the efficiency of existing power plants and, more importantly, on the interconnectivity between northern and southern networks to increase the distribution of electricity.[92] In 1959, after the citizens of Sherbrooke had voted against a borrowing by-law to build hydroelectric dams in Ulverton and Bromptonville, the municipal electricity department built a terminal to receive electricity from the Shawinigan Water and Power Corporation, on the north shore of the St. Lawrence River. Citizens of Sherbrooke argued that the city might be held responsible if Richmond or Bromptonville were drowned because of dam mismanagement.[93] As it addressed flood control and flow control for electricity generation separately, the population of the Eastern Townships remained attuned to the risk of inundation from any changes to the river landscape.

CONCLUSION

FLOODS OF VARYING INTENSITY had been a regular part of life in the Eastern Townships to which riverine inhabitants had become accustomed. Yet with the advent of industrialization, these events came to be seen in a different light. Heavily capitalized plants relied on a regular water flow that produced a constant supply of hydroelectric energy, but proper conservation schemes needed modifications to the river landscape. Among other things, river flow control could be improved if large amounts of water were not wasted during flooding. All these plans required that the floods be framed and publicized as a natural catastrophe

that threatened the well-being and wealth of the riverine population.

In particular, the floods of 1913 and 1942-1943 brought forth the need to implement water conservation schemes only because concurrent droughts mobilized the regional political and economic elite that needed a stable production of energy for industrial activities. The invocation of flooding was a critical step in obtaining the implementation of solutions, not to any real threat to riverine communities, but to the disorder that nature imposed on the economic and industrial order. Nature became a discursive and material tool to promote industrial development, rather than a veil to mask the disturbances experienced by a river subjugated to hydrological modifications and industrial machinery. Changing flooding into a natural catastrophe had important consequences concerning the ways in which local people dealt with floods. As the river flow was transformed discursively and materially, new patterns of vulnerability and adjustment took form. This increased sense of vulnerability to flooding resulted in a diminished capacity by the local riverine populations to adapt to and cope with their environment. Municipal and provincial governments, as well as industrial and trade associations, transferred flood control capacity and responsibility to higher levels of government and to authorities who lived outside the community. Legal and technical expertise was brought in to prevent and assess damage. Eventually, the number of individuals and institutions responsible for flooding issues rose, and responsibility extended even beyond the immediate territory of the flood. At the same time, this dislocation of expertise caused a transformation in the competencies and vernacular understanding of the local populations as it obliterated their knowledge of the St. Francis River hydrology.[94] If in the short term, local ways of dealing with flooding along rivers such as the St. Francis eventually became irrelevant, riverine communities in the long term gained a new understanding of the fallibility of river modification and flood management schemes.

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NOTES

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24. *Sherbrooke Daily Record*, April 19, 1900, October 12, 1900, March 3 1901, June 29, 1901, March 23, 1903, March 25, 1913, April 15, 1911, April 22, 1914.
25. *Sherbrooke Daily Record*, March 15, 1898, March 3, 1902, April 15, 1904.
26. *Sherbrooke Daily Record*, March 11, 1913, March 24, 1913.
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28. Examples of these rumors are found in *Le Pionnier de l'Est*, June 19, 1874, May 2, 1879, April 29, 1887; Sherbrooke *Daily Record*, June 28, 1901, March 28, 1903, July 17, 1916.
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Company, 1874), 23. Popularized by Gifford Pinchot in North America–see his "A Primer of Forestry. Part II. Practical Forestry," U. S. Department of Agriculture, Bureau of Forestry, *Bulletin* 24 (Washington, D.C.: Government Printing Office, 1905), 54-55, the idea that the forest acts as a giant sponge became widespread in Quebec among the members of the conservationist movement at the beginning of the twentieth century. See Avila Bédard, "Le Régime des Eaux," *Bulletin de la Société de Géographie du Québec* 6 (1912): 43-48. On the Eastern Townships specifically, see J. P. Martel, "Conséquences du Déboisement dans les Cantons de l'Est," *Forêt Conservation* 17 (June 1951): 13-14; Michel Jurdant and M. R. Roberge, *Étude Écologique de la Forêt de Watopeka* (Ottawa: Department of Forestry, 1965); A. P. Plamondon, *Influence des Coupes Forestières sur le Régime d'Écoulement de l'Eau et sa Qualité* (Quebec: Department of Forests, 1993); Booth, "Changing Forest Utilisation Patterns," 191-92.

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66. O. Lefebvre, "Les Forces Hydrauliques de la Province de Québec," *La Forêt et la Ferme* 2 (February 1927): 51-52, 63.
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71. *La Tribune de Sherbrooke*, October 4, 1929, October 29, 1929.
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73. Quebec Streams Commission, *Annual Report* (1931), 101-102; *La Tribune de Sherbrooke*, June 27, 1931.
74. CSHA, "Municipal Epheremides," box 82, July 7, 1930.

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76. CSHA, Plenary Commission, "Report No. 77," box 75, July 18, 1939.
77. *La Tribune de Sherbrooke*, June 16, 1942, June 17, 1942; *Sherbrooke Daily Record*, June 16, 1942, June 17, 1942.
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79. CSHA, Special Commissions, box 73, "Requêtes diverses: À son honneur le Maire de Sherbrooke," July 7, 1943.
80. LNAQSC, PSCC, P-1, box 29, file 70-4-50, E. Soles, Eastern Townships Associated Boards of Trade, Secretary-Treasurer, to the Mayor of Sherbrooke, June 2, 1944; *La Tribune de Sherbrooke*, October 14, 1944, May 17, 1944, March 19, 1945, March 20, 1945.
81. *La Tribune de Sherbrooke*, June 18, 1943, May 17, 1944; Canada, House of Commons, *Debates*, Session 1943, vol. V (July 8, 1943), 4683; Quebec, Legislative Assembly, *Debates* (March 23, 1944), 478; LNAQSC, PSCC, P-1, box 29, file 70-4-50, "Resolutions passed at Annual Meeting, re: Flood Water Control in the Eastern Townships," May 31, 1945.
82. LNAQS, PSCCC," P-1, box 29, file 7-4-50, "Étude Préliminaire des Inondations. Bassin de la Rivière Saint-François, 1 Juin 1944." These studies would later be collected in *Bassin de la Rivière Saint-François. Étude des Inondations*, 5 vols. ([Montreal]: Cartier-Leclerc, 1952-1953). *Bassin de la Rivière Saint-François, Inondation du 15 Juin 1942. Addendum au Rapport d'Avril 1953 et Addendum au Rapport de Juillet 1952* ([Montreal]: Cartier-Leclerc, 1966).
83. HQA, PSCPCL, F 15, vol. 3478, Cartier, "Comments on the Saint-Francis River flood Problem," May 28, 1945, pp. 8, 10. See also, LNAQS, PSCC, P-1, file 70-4-50, box 29, "La Rivière St-François," n.d.
84. Kesteman, Southam, and Saint-Pierre, *Histoire des Cantons de l'Est*, 591-592.
85. *La Tribune de Sherbrooke*, March 22, 1948, March 23, 1948, March 24, 1948, March 25, 1948; *Sherbrooke Daily Record*, March 22, 1948, March 23, 1948. Facing legal liabilities, the Brompton Pulp and Paper Company closed its mill in 1949. Kesteman, Southam, and Saint-Pierre, *Histoire des Cantons de l'Est*, 543.
86. LNAQS, PSCC, P-1, box 29, file 70-4-51, "1948 Was a Disastrous Year in the History of the St. Francis Valley," [n.d.].
87. *La Tribune de Sherbrooke*, December 14, 1949; LNAQS, PSCC, P-1, box 29, file 70-4-51, "St. Francis River Stream Flow Control", [n.d.]; file 70-5-50, Minutes of Technical Committee Meeting. Stream Flow Regulation-St. Francois River, February 16, 1950. The groups that cooperated included: the Eastern Townships Associated Boards of Trade, Eastern Townships Chambers of Commerce, Eastern Townships Forestry Association, Quebec Running Streams Commission, City of Sherbrooke electric department, town of Coaticook electric department, town of East Angus, town of Bromptonville, Southern Canada Power Company, Shawinigan Water and Power Company, Canada Paper Company, Brompton Pulp and Paper Company, Sherbrooke Land and Power Company, Paton Manufacturing Company, and Dominion Textile Company.
88. LNAQS, PSCC, P-1, box 29, file 70-5-50, Minutes of Technical Committee Meeting. Stream Flow Regulation-St. Francois River, April 20, 1950; June 1, June 23, November 16, 1951; Minutes of the General Meeting of the Flow Control Committee of the Sherbrooke Chamber of Commerce, April 20, 1950 ; file 70-6-51, J. C. Changong, Chief

Engineer, Quebec Streams Commission to Alphonse Saumier, Secretary, Sherbrooke Chamber of Commerce, April 26, 1951; St Francis Stream Flow control, Dan Anderson, manager, Southern Canada Power Company, [n.d]; HQA, PSCPC, F 15, vol. 3468, *St. Francis River regulation. General reports affecting the watershed. WO 10, 063*, 1950,

89. LNAQS, PSCC, P-1, box 29, file 70-5-50, Minutes of Technical Committee Meeting. Stream Flow Regulation-St. Francois River, March 10, 1950.
90. LNAQS, PSCC, P-1, box 29, file 70-5-50, Minutes of General Meeting of the Flow Control Committee, March 16, 1950.
91. HQA, PSCPC, F 15, vol. 3468, *Inondations sur la Rivière St-François* August 18, 1945; *Rivière St-François*, J. Emile Gill, Quebec Streams Commission, June 18, 1945.
92. By 1930, three power stations on the St. Maurice River, on the North shore of the St. Lawrence River, produced 200,000 hp, while the five plants that occupied all the potential power sites on the St. Francis River generated 70,000 hp. Kesteman, Southam, and Saint-Pierre, *Histoire des Cantons de l'Est*, 382-385.
93. *Sherbrooke Daily Record*, March 11, 1950; Kesteman, *La Ville Électrique*, 196. In 1939, the city of Sherbrooke abandoned a project to dam the Saint Francis River for its electric utilities company because of concerns that the water head would worsen the floods of Richmond, located 15 kilometers upstream from the proposed site at Ulverton. CHAS, Plenary Commissions, box 75, "Report No. 10", January 18, 1939. On the controversy surrounding the construction of a dam at Ulverton, see Kesteman, *La Ville Électrique*, 165.
94. Jacques Roux, "Plus de protection publique induit-elle moins de vigilance de la part du public?" in *Être vigilant. L'Opérativité Discrète de la Société du Rsisque*, ed. Jacques Roux (Sainte-Étienne: Publications de l'Université de Saint-Étienne, 2006), 143-57.