

WATER, SCIENCE AND HUMANS:

Exploring the Hydrosocial Cycle in the St. Francis River Watershed

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ABSTRACT

Water as a physical entity cannot be separated from society through which it flows. The concept of the hydrosocial cycle, although not fully theoretically defined, is premised on the idea that the circulation of water - as a linked physical and social process - brings to light wider political economic, social, and ecological processes. This paper asks: What can be learned about the nature of the hydrosocial cycle from an exploration of the socio-physical dualism inherent in a specific watershed planning process? In response to the Quebec Water Policy (2002), watershed organizations have sprung up in the province of Quebec. Each organization is mandated to develop, implement and monitor a local watershed management plan based on the principles of stakeholder dialogue and collaboration. One of these is the St. Francis River Watershed Committee, responsible for the 10,230 km² St. Francis River Watershed – the third largest of the 33 priority watersheds identified in the Quebec Water Policy. Based on document analysis, this study examines the activities of the Committee in its first five years (2003-2008). The findings of the St. Francis River watershed case suggest that issues of socio-spatial representation, information gathering and report writing, funding, and public recognition and involvement bring to light the explicit socio-physical dualism of watershed planning. The findings provide insights on how to collapse this dualism, and raise further questions for the emerging conceptualization of the hydrosocial cycle. *Keywords: watershed planning, participatory process, socio-spatial representation, Quebec*

Introduction

The flow of water is driven by the force of gravity as well as by the decisions made by humans through social, political, economic and legal systems. While the term “hydrological cycle” has been well established for decades to denote the movement of the water molecule through the Earth’s biophysical systems, the term “hydrosocial cycle” is being applied by social scientists to emphasize the social dimension of water as it cycles through these linked biophysical and social systems.

Water as a bio-physical entity, it is argued, cannot be separated from the society through which it flows. Rather the two are merged seamlessly into a single unit - the hydrosocial cycle.

This perspective allows the researcher to collapse the dualism that distinguishes nature from society. The concept of the hydrosocial cycle is premised on the idea that “the circulation of water as a physical and social process-brings to light wider political economic, social, and ecological processes” (Swyngedouw 2004). Budds and Linton (2009) argue:

Considering water as a socio-physical process makes it impossible to abstract water from the social circumstances that give it meaning and from the social and ecological relations that get consolidated in material flows of water. At the same time, attending to the social dimensions of these flows provides a means of analysing water's political nature so as to promote/facilitate change in what is often taken to be a fixed set of circumstances.

The concept of the hydrosocial cycle opens up new frontiers for the understanding of society-environment relations that remained fairly unexplored until now, especially exactly how social and ecological relations get consolidated in the material flow of water. This study takes up that challenge by asking the question: What can be learned about the nature of the hydrosocial cycle from an exploration of the socio-physical dualism inherent in a specific watershed planning process?

Based on a review of documentation produced by the watershed planning efforts in the St. Francis River Watershed in the southeastern corner of the Canadian province of Quebec, the purpose of this paper is to explore what socio-physical dualism exists in watershed planning activities and how we may begin to collapse the water-society dualism for more appropriate understanding of the environment. It does so by reviewing the work of the St. Francis Watershed Committee over the past five years and examines issues of representativeness, funding, and public recognition as helpful for expanding our understanding of the hydrosocial cycle in general, and for watershed planning in particular.

The Hydrosocial Cycle: An Emerging Concept

The term “hydrosocial cycle” is a relatively new one, having been invoked by a number of researchers who are exploring water's social and biophysical relationships. For example, Merrett (1997) has examined the social and biophysical in an examination of the engineering and economics of water delivery and treatment systems in urban areas. Bakker (2007) investigated the legal, management, and ethical issues associated with water delivery and use. However, neither of these writers included any expanded discussion about the nature of the hydrosocial cycle and its potential for understanding human-environment relationships.

Falkenmark and Rockstrom (2004) explained how water flow links nature and society through water's many parallel functions as the ‘blood stream’ of both the biosphere and the imbedded anthroposphere, and the resulting conflicts that arise. Yet their perspective was one of examining trade-offs between human and environmental needs, perpetuating a dualism between water's physical and social processes.

Scholars from science studies have moved beyond critiques of positivist natural science to consider the participation of more-than-human entities in scientific practice and in the produc-

tion of scientific knowledge. Geographers Noel Castree and Bruce Braun (2001) and David Demeritt (2001, 2002), long interested in the social construction of nature, have tried to define and explain the nature-society interface and have reflected upon the repercussions of this dualism upon society and decision-making. These perspectives converge in a shared concern with the deployment of scientific nature in political and administrative discourse and an interest in theorizing natures that are politically-responsive (Budds and Linton, 2009).

Meanwhile, political ecologists are exploring the politicization of environmental change. By becoming an object of decision-making, nature takes on a political aspect. Thus the urgent need to resolve conflicts over forests, fisheries, farming practices, urban sprawl, among others, calls for a critical rethinking of democracy, citizenship and of nature itself. In this light, Adkin (2009) recently documented sixteen case studies of environmental conflict in Canada, all of which question “how democratic aspirations can push back against the tight policy monopolies that control the environmental agenda in Canada”.

Water, as a political object, is increasingly the focus of academic attention. Drawing from a social theory perspective, Swyngedouw (2004) critically examined the flow of social power through the water delivery system. His long-term, in-depth research in Guayaquil, Ecuador on the complex relationships that constitute urban natures provides insights into the study of water ecology within its political economic context. He lays the foundation for the rethinking of water, nature and society by theoretically linking them together, revealing a perspective on the flow of urban water that cannot be disassociated from its social and political and economic agents.

Budds (2009) examines how the idea of water flows as inherently cyclical became historically embedded in the concept of a “hydrological cycle”, and the extent to which the observed water flows may also have been influenced by societal ideas about how water should behave. Drawing on insights from political ecology as well as natural science literature on hydrology and modeling, and based on an examination of physical water resources assessment undertaken in a Chilean river basin, she critically reflects on how the notion of a cycle in hydrological science became popularly accepted. Her work provides a basis for critical analysis and development of the notion of a cycle within the emerging concept of the hydrosocial cycle.

Despite, and perhaps as a result of, these diverse approaches, the literature on the concept of the hydrosocial cycle is still in its infancy, remaining vague and theoretically undefined. In attempting to bring the wider aspects of the hydrosocial concept to the forefront, the 2008 Annual Meeting in Boston of the Association of American Geographers included an afternoon of special sessions, organized by Jessica Budds and Jamie Linton, entitled “Water, Science, Humans: Adventures of the Hydrosocial Cycle¹”. The paper presentations which followed, authored by researchers working in five continents and representing a dozen disciplines, also revealed a wide diversity of empirical findings and theoretical approaches. Each stemming from an interest in how science is used in environmental decision-making, the presentations showed members of the audience how various social network analysis tools were coupled with a variety of data gathering methods – surveys, document analysis, field studies, and personal interviews - to explore the role of social networks in the flow of scientific understandings amongst civil society groups and other actors in the area under investigation.

In this emerging field of study, there is no singular conceptual framework which leads to an

agreed explanation of the variety of empirical results – there is no tested theory of hydrosociology that applies to all cases. Yet, through these research projects, an umbrella of knowledge is being formed over what is being called the hydrosocial cycle, serving to frame a deeper understanding of it built upon this diversity of theoretical foundations. In the same vein as the studies presented at the Boston meeting, the St. Francis River case discussed in this paper serves to explore the explicit dualism that exists in watershed planning. By bringing to light and analyzing how the separation of biophysical and social components have prevailed in the St. Francis watershed planning case, we can reflect on what that separation means and how watershed planning can be improved.

The Quebec Water Policy

The Quebec Water Policy was launched in November 2002 as a result of an extensive public consultation process to gather public opinion in every region of the province (BAPE 2000). The report dealt with such key water issues such as water treatment, health, exploitation of groundwater, aquatic habitats, privatization of water services, water pricing, water exports and watershed-based planning. These efforts served to provide the general orientation for substantial policy development which became the Quebec Water Policy. The first orientation of the Quebec Water Policy stipulates that water governance must be reformed. It states:

This reform involves the development and enunciation of a shared, comprehensive vision of water resources to ensure consistent implementation. It aims for an evolution of the existing system of governance, particularly through greater participation by the different water users in both decision-making and the various actions resulting from these decisions (Quebec Water Policy 2002, 15).

In order to facilitate the development of a “shared comprehensive vision of water management”, one of the government’s major commitments has been related to implementing watershed-based management for thirty-three major watercourses located primarily in the southern, most populated portion of the vast province. At the local and regional levels, watershed organizations are responsible for implementing integrated management, from a sustainable development perspective, by preparing a Watershed Plan for the entire watershed which includes watercourses, lakes, marshes and other wetlands, as well as aquifers within the boundary of the watershed (Quebec Water Policy 2002, 19).

Although the principles of integrated watershed management are practiced in many parts of Canada and the world, this new policy orientation was the first in Quebec. The government chose a hybrid structure, or “collaborative” model of watershed management, which differed from the strictly government-directed or citizen-directed models seen in other places. Each watershed organization was to be composed of members who have agreed to collaborate and act jointly on behalf of all water management players and other interested parties. Although these watershed organizations have no legal authority to make statutory decisions (that responsibility remains with the Minister of Environment), their role of deliberative planning tables were

aimed at enhancing a more participatory decision-making process toward sustainable water governance in the province. The government's commitment to sustainable water governance relied heavily on developing a shared vision among the disparate groups at these watershed planning tables that are maintained, funded and supervised by the government and responsible for implementing watershed plans. The Quebec Water Policy (2002, 22) also recognized "the constant need for information, knowledge, and research in support of the decision-making process". To support these information gathering needs, the government promised to "assemble and develop the information on water and aquatic ecosystems essential for water governance" (Quebec Water Policy 2002, 24) through a number of initiatives which included designing and developing an information system of water-related data in various government departments, and by creating a network of government and university-based water experts for the exchange and distribution of water-related information.

Essentially, according to the policy, these newly-created watershed organizations would form the central means by which local groups and citizens could become involved in water governance reform, obtain information about the quality of their watersheds, and form the primary means by which this anticipated water governance reform would actually take place.

The St. Francis River Watershed

In exploring the efforts of these newly-created watershed organizations and the goal of moving toward sustainable water governance reform in the province, a case study was chosen where the activities of a watershed committee and its knowledge about the biophysical aspects of the watershed itself was sufficiently advanced to produce a useful exploration of the hydrosocial cycle at work. Consequently, the St. Francis River Watershed was chosen.

Description of the St. Francis River Watershed

The St. Francis River Watershed is situated south of the St. Lawrence River, encompassing an area of 10,228 km² in southern Quebec bordering the states of Maine, New Hampshire and Vermont (Figure 1). Fifteen percent of the watershed is located in Vermont.

The St. Francis River Watershed is the third largest of the thirty-three priority watersheds identified in the Quebec Water Policy. There is a large diversity of topographic, hydrologic and ecological characteristics within the watershed. In its higher elevations in the eastern portion close to the Maine border is found Lake St. Francis, source of the St. Francis River which forms the principal waterway of the watershed. In this highland area, forests cover the mountains and hills. In its middle reaches flow several major tributaries which drain the mixed forest and farmlands to the south, including those in Vermont and contains the main urban centre of Sherbrooke. The lower section, where the river drains into the Lake St. Pierre in the St. Lawrence River, is lowland dominated by farming activities.

The demographic variation is also pronounced. The St. Francis River Watershed touches on three major administrative regions, Centre-du-Québec (11 %), Estrie (80 %) and Chaudière-

Appalaches (9 %), which includes 102 municipalities, twelve counties, and the city of Sherbrooke. In total, the watershed contains an estimated 350,000 inhabitants, about 5% of the population of the province (COGESAF 2006).

The St. Francis River Watershed Committee²

Early in 2002, municipal governments, environmental organizations, and agriculture, forest and commercial resource sector representatives gathered to form a provisional watershed committee recognizing that the provincial government would soon be handing down its Water Policy. The provisional committee spent the first several months giving presentations in several cities of the watershed, explaining the central objectives of the new provincial Water Policy and its role as a multi-stakeholder planning organization. Its mission and objectives were largely taken directly from the Water Policy documents, in that it supported the government's movement toward water governance reform and the central role that watershed committees would play in this reform.

Following its formal acceptance by the provincial government in the spring of 2003, the St. Francis River Watershed Committee (SFRWC) was formally charged with developing a Watershed Plan for the St. Francis River, and provided a one-year grant of \$65,000 which was renewable annually. Its planning meetings are held every second month, and an Annual Meeting is held each year in April.

Examining the Work of the SFRWC: Implications for the Hydrosocial Cycle

Having completed five years of activities, the SFRWC's record serves to reveal the biophysical and social processes at work contributing to the emerging understanding of the dynamics of the hydrosocial cycle.

Socio-Spatial Representation

According to its mission statement, the new watershed organization was required to facilitate open dialogue and cooperation between all the water interests acting in the territory of the watershed, and with members of the general public (COGESAF website). One of the first challenges of the provisional group was to design the composition of the committee members which would fairly represent all the water interests acting in the territory of the watershed. The provisional committee, having organized itself prior to the adoption of the Water Policy, had initially been assembled by word of mouth and by personal invitation without government involvement. As it soon became clear that the new organization would become officially recognized by the provincial government, the provisional committee moved to design its full composition based on fair socio-spatial representation. This goal presented the provisional committee with a sizable challenge, given the biophysical size and diversity of the watershed and its demographic characteristics.



Figure 1. Location of the St. Francis River Watershed, Québec, Canada
Previously published in Castonguay (2007, 822). Used with permission.

The provisional committee created three local interest sectors: local government sector (e.g., mayors and municipal councilors); economic sector (e.g., those working in the fisheries, agriculture, and forestry sector); community sector (e.g., environmental groups, tourism and recreation groups, and education and cultural institutions). They also divided the territory into three sections (Upper, Middle and Lower sub-watershed), and sought equal representation from the electoral colleges in each sub-watershed.

In April 2003, the first Annual meeting as the newly-formed government-support organization included a board of 31 volunteer members, elected by their constituent groups, as follows:

- 9 elected municipal government officials (3 in each sub-watershed)
- 9 representatives from education, recreational and local environmental sectors (3 in each sub-watershed)
- 9 representatives from agriculture, forestry and commercial sectors (3 in each sub-watershed)
- 3 representatives from the regional environmental coalitions (1 in each sub-watershed)
- 1 First Nations representative (for the entire watershed)

From a hydrosocial perspective, the linkages are noticeable between societal actors and biophysical characteristics of the watershed. Each sub-watershed in which water flows necessitated, and achieved, adequate representation on the watershed planning committee. Rather than provide representation based solely on social factors such as population base or sectoral interests, the committee sought to allow the water regions themselves, or sub-watersheds, to have their own spatial representation based on topography. Further, in 2007, the organization changed its name from (translated) “St. Francis River Watershed Management Committee” to “Water Governance Council for the Watersheds of the St. Francis River” to reflect this new reality. This change explicitly reduced the focus of planning to the sub-watersheds while allowing an overarching committee, now called council, to oversee the planning process.

While fair democratic representation in environmental participatory planning processes, including watershed planning and management, has been the topic of much academic inquiry (e.g., Renn, Webler and Wiedermann 1995), little attention has been placed on socio-spatial analysis of representation in watershed planning. In seeking to represent the St. Francis Watershed socio-spatially, representatives were charged with not only speaking on behalf of their social constituents (e.g., their sectorial social interests) but also on behalf of the spatial and bio-physical characteristics of the sub-watershed.

Watersheds, by their very nature, combine topographically-based hydrologic features and people who inhabit them. Consequently, they could be conceived as coupled social-biophysical systems which require representation of both social and biophysical features for appropriate planning and management. This coupling occurs in a highly complex, potentially unpredictable and risky manner, including the growing scale of the ecological footprint of the human activities in the watershed and the implications of these activities downstream.

The promotion of socio-spatial representation in the watershed planning committee helps dissolve the dualism between water and society and blends them into one single hydrosocial cycle. The sub-watershed scale provides a means to remove the artificial divide between social and physical reality of the watershed. It tends to provide a more accurate focus for individuals involved in watershed planning because daily activities and knowledge base is usually more

extensive at this geographical scale.

The degree to which socio-spatial representation of the St. Francis River watershed case has moved beyond the nominal realm (the existence of elected socio-spatial representatives on the committee) to the substantive realm (the evidence of socio-spatial deliberations in, and outcomes from, the watershed planning process) is explored in the next section.

Information Gathering and Report Writing

Three years into its mandate, in May 2006, the SFRWC succeeded in producing a Comprehensive Watershed Analysis Report (COGESAF 2006). The 258-page report, filled with maps and charts and divided into two sections (“Portrait” and “Diagnostic”) represents only the first step toward a Watershed Plan (COGESAF 2006). The “Portrait” contains basic descriptions of the characteristics at the scale of the entire watershed, and includes chapters on general features, land cover, land use, water usages, water quality and risks to human health. The “Diagnostic” describes the major water quality “hot spots” in the watershed, with each chapter relating to a specific sub-watershed.

In producing its Watershed Analysis Report, the SFRWC focused almost exclusively on inventorying the physical state of the watershed, and areas of major ecological concern. Ironically for the so-called “analysis” document, the report is primarily descriptive - there is no examination of the reasons for the areas of environmental concern, and the possible linkages with human activities that may be associated with, or causing, the environmental degradation areas outlined in the report. As such, the SFRWC seems to have framed the watershed as a hydrological phenomenon rather than a hydro-social phenomenon. In doing so, the SFRWC seems to have been incapable of analyzing the more social aspects of water quality. The socio-spatial representation of the committee members remained nominal in nature, maintaining a dualism between water and society, and effectively ignoring the social factors so closely tied to the hydrological conditions, such as reasons for water degradation and prospect for water quality improvements through changes in awareness, education and social practices.

This deficiency is partially explained in the Watershed Analysis Report’s preface which is careful to point out to readers that the report is not complete and is based on the host of uncoordinated studies performed in the past which the authors were able to gather within the time and funding constraints they faced. Almost no updated primary information was gathered for the report. Nonetheless, the lack of resources for a more detailed report exacerbates the water-society dualism and enables the generation of technical information disassociated from the lives of people responsible for the water degradation.

From a hydrosocial perspective, even within the time and financial constraints it faced, more attention in the Watershed Analysis Report should have been placed on examining social phenomena in the watershed, such as a history of hydrosocial relations in, or an environmental history of, the watershed. Again, this lack of detailed attention is partially explained by lack of expertise and funding. The issue of funding is addressed in the next section.

Funding

To support its water policy reform, the Quebec provincial government provided each of the thirty-three priority watershed committees an annual funding grant of \$65,000 for capital needs and operations. In doing so, the Quebec government recognizes that adequate funding is needed for watershed committees to enlarge the knowledge base of the watershed's hydrosocial system and fulfill its mandate to assist in the movement toward sustainable water governance reform in the province.

However, the funding almost exclusively ended up supporting the existence of the Committee, rather than any actual work performed toward fulfilling its mandate. Consequently, the watershed committees across the province needed to find other sources to support, with varying levels of success, their mandated tasks. More funding was required to hire biologists and geographic information systems specialists to perform the necessary data gathering and analysis needs toward producing a comprehensive and accurate Watershed Plan.

Further, the same amount of funding continued to be provided to each of the thirty-three priority watersheds despite the biophysical reality that the priority watersheds vary in size from 68 km² to 43000 km². The President of the SFRWC has repeatedly argued that the criteria of the watershed's biophysical scale should help determine the level of funding – in essence calling for spatial-based financial equity - claiming that the funding provided is insufficient for the 10,000 km² territory under the committee's mandate (Raiche 2007).

One may question how the funds required for watershed planning flow across biophysical and social systems. A hydrosocial examination is needed to investigate this area of spatially-based financial equity. The data needs for watershed planning are enormous, and this is especially true for large biologically and socially diverse watersheds such as the St. Francis River Watershed. When funding is spread equally across watershed organizations, it creates a bias in the system where larger watersheds are disadvantaged over other smaller watersheds. In the case of the SFRWC, mentioned above, the annual funding was used to maintain the committee's existence and to produce a descriptive hydrological report, without any consideration of the social linkages to the watershed's hydrological conditions. As such, the quality of the planning efforts may have been compromised by inadequate funding. Further hydrosocial analysis is needed to explore the funding support more thoroughly to illuminate the degree to which the provincial government is acting on its commitment toward sustainable water governance reform and encourage public recognition and involvement in its water reform. For example, one might explore the applicability of funding formulae that take into account both watershed scale criteria and demographic indicators – and search for means by which the provincial government can make more equitable funding decisions for the hydrosocial cycle.

Public Recognition and Involvement

The Quebec Water Policy mandated each watershed committee “to promote watershed planning and education among the larger public residing in the watershed; to raise awareness of, and education about, water resources; and to facilitate democratic participation with respect to man-

aging water resources” (Quebec Water Policy 2002, 6). The aim was to help citizens understand and actively participate in the government’s emerging water governance reform.

The SFRWC made it possible for members of the public to join the committee as supporting members for a small financial contribution. Its annual meetings were open to the public and it advertised its activities widely in its website, in quarterly information bulletins and annual reports. It set up kiosks at several community events, and held annual golf tournaments to raise awareness and support for its activities. After the publication of its Watershed Analysis Report, the committee held public meetings in several cities of the vast territory to educate the public on the state of the watershed and to solicit opinions about priority areas of environmental concern to target in the development of the Watershed Plan.

Despite several efforts to improve communication, meetings were poorly attended and few people were aware of the SFRWC’s activities. It continues to be plagued with low membership and low attendance to its public meetings. Likewise, fundraising initiatives like golf tournaments have not resulted in very substantial results (COGESAF website).

In attempting to explain this lack of public recognition and involvement in framing an understanding of the hydrosocial cycle, one needs to explore the relevance of the flow of water in the watershed to people’s everyday lives. While it seems that the majority of people are able to make the connection between a healthy environment and their quality of life in a very general sense, more study is needed to explore how ordinary citizens relate their knowledge of their watershed, including those preparing plans which will affect them, with their quality of life. The flow of water through the consciousness of citizens, and the barriers preventing active involvement in watershed planning activities, is an untapped area of research for those studying the hydrosocial cycle. One might venture to explore how perceptions of watershed planning and management activities affect people daily lives. This would involved surveying residents on their awareness of the watershed they live in and the activities they perform that affect water quality.

Conclusion

In April 2008, a special session of the American Association of Geographers’ Annual Meeting was held in Boston, aimed at discussing the hydrosocial cycle and its varied researchers, contexts, theoretical approaches, methods, results and interpretations. This paper, first presented at the AAG Boston, is aimed at adding to this ongoing dialogue on the emerging concept of the hydrosocial cycle.

The Quebec Water Policy was adopted in 2002 by the provincial government in order to begin the transition toward what it called its sustainable water governance reform. The central pillar of its reform was to be the creation of a watershed committee in each of the thirty-three priority watersheds in the province. One of these was the St. Francis River Watershed Committee (SFRWC) just north of the Vermont and New Hampshire border.

Based on a review of the planning activities in the St. Francis Watershed between 2003 and 2008, this paper uncovered some of the factors that perpetuate the water-society dualism that dominate watershed planning activities: (1) socio-spatial representativeness; (2) information gathering and report writing, (3) funding, and (4) public recognition and involvement.

For each factor, further research is needed to explore the feasibility of watershed planning that collapses the water-society dualism into a single hydrosocial cycle. For example: (1) can socio-spatial representation improve the quality of watershed planning decisions?, (2) Does more in-depth examination of social phenomena in the watershed generate a better understanding of hydrological conditions?, (3) Can more equitable funding decisions be made by applying funding formulae that take into account combined criteria on the bio-physical scale and demographic conditions?, and finally (4) Is there a significant relationship between watershed residents' awareness and education about water conditions and their perceptions of watershed planning activities?

No doubt, there are other factors to be examined and research questions to be asked. Because watershed planning rests heavily on research, it must be made clear that narrowly-defined hydrological research is insufficient, in itself, to provide substantive decisions. In order to make effective environmental decisions that are based upon an understanding of the complex nature of water flow, we need research that collapses the dualism between water and society. Such research will bring to light the wider social, economic and ecological processes that make up the hydrosocial cycle. This study of the St. Francis Watershed, although exploratory in nature, sheds light on some of the factors that define and reinforce the dualism between water and society. This paper is thus a starting point to begin further investigations of the hydrosocial nature of watershed planning. It has provided insights on how to collapse the dualism and raised further questions for the emerging conceptualization of the hydrosocial cycle.

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Notes

1. The 2009 Annual Meeting of the Association of American Geographers also included special sessions on the hydrosocial cycle.
2. The formal name (in French) is *Conseil de gouvernance des bassins versants de la rivière Saint-François*.

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