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Article abstract

The allocation of minimal quantities of water for environmental and biotic uses makes it possible to maintain healthy ecosystems and reinforces their ability to support human activities. The finite character of water resources, the increase in hydrologic variability owing to climatic changes, and the continuous augmentation of anthropomorphic water uses tend to reduce water quantities available for ecosystem usage. In this context, the legal protection of environmental flows acquires increasing importance. The following paper first proposes an overview of hydrologic principles that militate in favour of reserved instream flows. Then follows a brief review of legal provisions in various foreign jurisdictions describing the methods used for residual flows protection. In closing, an overview of the Québec legal framework for managing hydraulic resources determines the extent of legal protection afforded to environmental and biotic usages.

The Emergence of Environmental Flow Protection in Québec Law

Hugo TREMBLAY*

The allocation of minimal quantities of water for environmental and biotic uses makes it possible to maintain healthy ecosystems and reinforces their ability to support human activities. The finite character of water resources, the increase in hydrologic variability owing to climatic changes, and the continuous augmentation of anthropomorphic water uses tend to reduce water quantities available for ecosystem usage. In this context, the legal protection of environmental flows acquires increasing importance. The following paper first proposes an overview of hydrologic principles that militate in favour of reserved instream flows. Then follows a brief review of legal provisions in various foreign jurisdictions describing the methods used for residual flows protection. In closing, an overview of the Québec legal framework for managing hydraulic resources determines the extent of legal protection afforded to environmental and biotic usages.

L'allocation d'une quantité minimale d'eau aux usages environnementaux et biotiques permet de maintenir la santé des écosystèmes et leur capacité à supporter les activités anthropiques. Le caractère fini des ressources hydriques, l'accroissement de la variabilité hydrologique dû aux changements climatiques, et l'augmentation constante des usages anthropiques tendent à réduire les volumes d'eau disponibles pour les usages écosystémiques. Dans ce contexte, la protection juridique

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* Ph.D. student at the UNESCO centre for Water Law, Policy and Science. I thank my supervisors Professor Patricia Wouters and Andrew Allan for their insightful comments and guidance in the preparation of this article. Any mistake or omission is mine, as are the opinions expressed therein.

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des débits écologiques revêt une importance croissante. Cet article propose d'abord un aperçu des principes hydrologiques qui militent en faveur d'une protection des débits écologiques réservés. Puis, une revue sommaire de dispositifs légaux mis en place dans certaines juridictions étrangères indique quelques méthodes utilisées afin de protéger les débits résiduels. Finalement, une étude du cadre juridique québécois de gestion des ressources hydriques détermine l'étendue de la protection légale des usages environnementaux et biotiques.

Freshwater ecosystems face serious threats[1]. Owing to loss of habitat and biodiversity, freshwater ecosystems are generally in far worse condition than forests, grasslands or other terrestrial ecosystems[2]. Extinction

1. Millennium Ecosystem Assessment, *Ecosystems and Human Well-Being : Wetlands and Water. Synthesis*, Washington, World Resources Institute, 2005 ; Carmen Revenga, "Conditions and Trends of Freshwater Ecosystems and the Challenges to Meet Human Water Needs", in Caroline King and others (eds.), *Water and Ecosystems. Managing Water in Diverse Ecosystems to Ensure Human Well-Being*, Hamilton, United Nations University, 2007, p. 1.
2. Peter M. Vitousek and others, "Human Domination of Earth's Ecosystems", *Science*, vol. 277, No. 5325, 1997, p. 494, at page 497.

rate for freshwater fauna is estimated to be a thousand times higher than background rate, and future extinction rate is expected to be five times higher for freshwater fauna than for terrestrial species[3].

Legal protection of freshwater ecosystems and their various components is crucial[4]. Natural water flows and hydrologic regimes in rivers and watersheds fulfil essential functions sustaining freshwater ecosystems and must be preserved from unacceptable anthropogenic degradation[5]. This necessity is recognised in Québec, and the provincial government undertook to establish rules governing flow alteration in 2002[6]. Such rules are bound to play a fundamental role for freshwater conservation in the context of increasing hydrological variability and resource exploitation. On one hand, various record low flows in Québec rivers have been established during the spring of 2010 due to an extremely mild winter and precipitations 20 percent below average[7]. On the other hand, a recent governmental initiative fostering small-scale hydro-power development resulted in the initiation of 31 projects altering the hydrologic regime on various rivers to the dissatisfaction of environmental NGOs[8].

3. Anthony Ricciardi and Joseph B. Rasmussen, "Extinction Rates of North American Freshwater Fauna", *Conservation Biology*, vol. 13, No. 5, October 1999, p. 1220, at page 1221.
4. See Hugo Tremblay, "An Analytical Framework for Legal Regimes Applicable to Freshwater Ecosystems", (2009) 20 *Water Law* 152.
5. Australia, *The Brisbane Declaration. Environmental Flows are Essential for Freshwater Ecosystem Health and Human Well-Being*, 10th International River Symposium and International Environmental Flows Conference, Brisbane, 3 - 6 September 2007, [Online], [www.unesco.org/water/pdf/brisbane_declaration.pdf] (15 March 2010).
6. Undertaking 22 in Ministry for the Environment of Québec, *Water. Our Life. Our Future. Québec Water Policy*, Québec, Publications du Québec, 2002, p. 3, 30, 47, 49 and 50, [Online], [www.mddep.gouv.qc.ca/eau/politique/policy.pdf] (10 July 2010) [hereinafter "Québec Water Policy"]. These rules intend to take cumulative impacts into account in order to ensure sufficient flows for aquatic ecosystems health.
7. Paul Journet, "Des niveaux d'eau 'anormalement bas'", *La Presse de Montréal*, 26 May 2010, p. A5 ; Éric Yvan Lemay, "Des impacts 'catastrophiques'", *Le Journal de Montréal*, 31 May 2010. For an overview of climate change impacts on water resources, see Richard Turcotte, "Les ressources en eau", in Claude Desjarlais and Anne Blondlot (eds.), *Savoir s'adapter aux changements climatiques*, Montréal, Ouranos, 2010, p. 40.
8. See Minister of Natural Resources and Wildlife, *Granting of Waterpowers in the Domain of the State for Power Stations of 50 MW and Less. Reference Guide for Local and Aboriginal Communities*, Government of Québec, 2008, [Online], [www.mrnf.gouv.qc.ca/english/publications/energy/granting_waterpowers.pdf] (15 March 2010) ; Hydro-Québec, *Identification des soumissions reçues. PAE 2009-01. Programme d'achat d'électricité provenant de petites centrales hydroélectriques de 50 MW et moins*,

Against this background, the development of a legal framework preserving environmental flows has recently become apparent in Québec. This article first contextualises issues related to environment flows (1), and then details the emergence of a regime for environmental flow protection in Québec law (2).

1 Perspectives on environmental flow protection

The object of this section is to present principles of eco-hydrology that establish the need for allocating water to environmental uses (1.1), and offer examples of legal approaches to environmental flow protection in different jurisdictions (1.2.)[9].

1.1 Principles of eco-hydrology : Environmental flow protection as a necessity

Hydrologic regimes in surface waters are generally described through a series of characteristics related to magnitude, rate of change, frequency, timing, duration and inter-annual variability[10]. Flow magnitude refers to the quantity and velocity of water in a river channel. Variation in flow magnitude depends on water inputs from precipitations and aquifers, the alternation between dry and wet periods generating baseflows and peak discharges. The speed at which flow magnitude varies is described through the rate of change and depends in part on the intensity and duration of rainfalls as well as on groundwater resurgence. Regular precipitation patterns can cause recurrent flooding and minimum flows at certain times of the year, leading to seasonal variations described through frequency and timing. Finally, inter-annual variability refers to flow regimes that change from year to year due to irregular precipitation patterns.

Hydrologic regimes are identified as the master variable among the dynamic processes related to freshwater ecosystems[11]. Natural water flows constitute the template upon which evolution forges survival strategies and determine the composition, abundance and arrangement of biological

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2010, [Online], [www.hydroquebec.com/distribution/fr/marchequebecois/pae-200901/pdf/soumissions2010-03-17.pdf] (15 March 2010) ; and Roy Dupuis, "Petites centrales hydroélectriques. Un processus défaillant", *Le Devoir*, 27 and 28 March 2010, p. C5.

9. The overview of legal provisions does not cover issues related to the effectiveness of environmental flow protection.

10. See Andrea Bradford, "An Ecological Flow Assessment Framework : Building a Bridge to Implementation in Canada", *Canadian Water Resources Journal*, vol. 33, No. 3, Fall 2008, p. 215, at pages 217-219.

11. Robert J. Naiman and others, "Legitimizing Fluvial Ecosystems as Users of Water : An Overview", *Environmental Management*, vol. 30, No. 4, 2002, p. 455, at page 457.

communities found in pristine freshwater ecosystems[12]. The various characteristics of hydrological regimes perform functions that influence the viability, reproductive capacity and sustainability of various freshwater species[13]. For example, modification of the timing, frequency or duration of floods can eliminate spawning or migratory cues for fish, or reduce access to spawning areas[14]. According to the dominant scientific paradigm, the alteration of natural flow characteristics degrades aquatic ecosystem integrity[15].

Human activities cause significant alterations of natural water flows that impact aquatic ecosystems[16]. Although changes in land uses, wildlife exploitation and pollutant discharges can all significantly degrade freshwater ecology, natural flows are directly affected by specific quantitative anthropogenic water uses[17]. For example, excessive water withdrawals and inter-basin water transfers can induce stream channel dewatering and river closure, which may result in loss of biodiversity, reduced surface water quality and extensive damage to aquatic ecosystems[18]. In particular, dams and other water impoundments have the most pervasive impacts on water flows because they can modify all characteristics of surface hydrologic regimes[19]. Dams can alter natural patterns in water temperature, sediment transport, nutrient flows, river channel morphology, floodplain vegetation

12. Stuart E. Bunn and Angela H. Arthington, "Basic Principles and Ecological Consequences of Altered Flow Regimes for Aquatic Biodiversity", *Environmental Management*, vol. 30, No. 4, October 2002, p. 492.
13. David A. Lytle and N. LeRoy Poff, "Adaptation to Natural Flow Regimes", *Trends in Ecology and Evolution*, vol. 19, No. 2, February 2004, p. 94.
14. Brian D. Richter and others, "How Much Water does a River need ?", *Freshwater Biology*, vol. 37, No. 1, February 1997, p. 231, at page 232.
15. N. LeRoy Poff and others, "The Natural Flow Regime. A Paradigm for River Conservation and Restoration", *BioScience*, vol. 47, No. 11, December 1997, p. 769.
16. David Dudgeon and others, "Freshwater Biodiversity : Importance, Threats, Status and Conservation Challenges", *Biological Reviews*, vol. 81, No. 2, May 2006, p. 163, at pages 165-166.
17. Hydrologic regimes are affected by numerous human activities. For example, urbanisation prevents infiltration and decreases the water retention capacity in a watershed, thereby increasing flushing speed and flashiness : see generally J. David Allan, "Landscape and Riverscapes : The Influence of Land use on Stream Ecosystems", *Annual Review of Ecology, Evolution, and Systematics*, vol. 35, 2004, p. 257. However, such impacts are indirect and must be excluded from the scope of this article to focus on human activities with direct impacts on natural water flows.
18. See Angela H. Arthington and Bradley J. Pusey, "Flow Restoration and Protection in Australian Rivers", *River Research and Applications*, vol. 19, No.s 5-6, 2003, p. 377.
19. Brian D. Richter and Gregory A. Thomas, "Restoring Environmental Flows by Modifying Dam Operations", *Ecology and Society*, vol. 12, No. 1, June 2007, p. 1.

community, as well as connectivity between upstream reaches and estuaries, thereby altering aquatic ecosystem quality[20].

In this context, the unallocated flow of water intentionally preserved in rivers and streams further to the prescriptions of management frameworks is identified as environmental flow. Quantitative water uses directly affecting natural water flows must be regulated to prevent unacceptable freshwater ecosystem degradation. Because all quantitative anthropogenic water uses alter characteristics of natural hydrologic systems, environmental flow protection does not require restoring hydrologic regimes to pristine condition but depends on a political process through which societies establish a balance between resource exploitation and conservation[21].

1.2 Examples of legal frameworks for environmental flow protection

Environmental flow protection is a feature of a growing number of legal frameworks for water resources management in various jurisdictions. Water scarcity is a driver for the development of legal frameworks allocating water to ecosystem uses. In Australia, both commonwealth and state water law foster environmental flow protection. At commonwealth level, the *Water Act* provides a framework regulatory structure that requires the scheduling and delivery of environmental water to maintain ecosystem functions and biodiversity with specific regards to the interstate Murray-Darling basin[22]. At state level, legislation such as the *Water Management Act* impose legal duties on governments to make management plans establishing rules with respect to environmental flows in order to protect water sources and ecosystems[23]. Under such plans, water quantities in excess of

20. World Commission on Dams, *Dams and Development. A New Framework for Decision-Making*, London, Earthscan, November 2000, p. 72-95, [Online], [www.dams.org//docs/report/wcdreport.pdf] (10 July 2010).

21. Megan Dyson, Ger Bergkamp and John Scanlon (eds.), *Flow. The Essentials of Environmental Flows*, Gland, IUCN, 2003, p. 6-8, 40 and 41, [Online], [www.freshwaterlife.org/servlet/BinaryDownloaderServlet ?filename=1132762166455_Flow.pdf] (10 July 2010). Brian D. Richter, "Re-Thinking Environmental Flows : From Allocations and Reserves to Sustainability Boundaries", *River Research and Applications*, 2009 [Early View -Articles online in advance of print], identifies principles to establish boundaries on alterations to flow regimes.

22. See *Water Act 2007* (Cth.), No. 137 of 2007. A plan for the Murray-Darling basin is due for release this year.

23. *Water Management Act 2000* (N.S.W.), No. 92 of 2000, ss. 8-8E [hereinafter "WMA"]. Whether this regime still grants a priority to environmental water allocations limiting human consumptive uses has become unclear further to legislative and case law developments : Alex Gardner, Richard H. Bartlett and Janice Gray, *Water Resources Law*, Chatswood, LexisNexis Butterworths, 2009, p. 358-363.

specific volumetric long-term average annual extraction limits may not be withdrawn for any purpose[24]. Similarly faced with an arid climate, South African law incorporates environmental flow requirements through an ecological reserve from which water abstraction is prohibited in order to protect aquatic ecosystems[25]. Although the reserve still remains undetermined, the development of operational rules for environmental flow requirements in some South-African basins can entail variable withdrawal curtailments that are dependent on natural variations in river flows[26].

As increasing water resources exploitation generates growing water stress, environmental flow protection has also emerged in the legal frameworks of temperate jurisdictions. In Switzerland, the *Loi fédérale sur la protection des eaux* aims at maintaining appropriate flow regimes through a permit system for water withdrawals : a water use that substantially affects the flow of a watercourse when combined with other uses may be permitted if the residual flow in the watercourse is not reduced under a certain quantitative level[27]. Transposition of the *Water Framework Directive* in the national legal order of some European jurisdictions such as Scotland results in the development of state-of-the-art water resources management regimes that aim at restoring aquatic ecological quality by setting reference conditions for various characteristics of natural flows[28]. Regulations implementing the Scottish *Water Environment and Water Services Act* identify different ecological quality levels based, *inter alia*, on detailed aspects of hydrological regimes such as water volumes in daily river flows and natural lake outflows[29]. The conjunction of river basin planning with a

24. For example, see *Water Sharing Plan for the Hunter Unregulated and Alluvial Water Sources 2009* (N.S.W.), No. 347 of 2009, ss. 18-20. Due to extreme drought, many of these water sharing plans have been suspended, changing the allocation priority of environmental water uses and resulting in the disconnection of wetlands and stoppage of flows in some streams : see WMA, *supra*, note 23, ss. 49A and 60 ; and New South Wales Office of Water, [Online], [www.water.nsw.gov.au] (15 March 2010).
25. See *National Water Act* (S. Afr.), No. 36 of 1998, Government Gazette, No. 19182, vol. 398, 26-08-1998.
26. Denis A. Hughes and Stephen J. L. Mallory, "Including Environmental Flow Requirements as Part of Real-Time Water Resource Management", *River Research Application*, vol. 24, No. 6, July 2008, p. 852.
27. *Loi fédérale du 24 janvier 1991 sur la protection des eaux*, RS 1814.20, R.O. 1992, 1860, ss. 29-36.
28. See EC, *Directive 2000/60/EC of the European Parliament and of the Council of 23 October 2000 Establishing a Framework for Community Action in the Field of Water Policy*, [2000] O.J., L 327/1, annex II and V.
29. *Water Environment and Water Services (Scotland) Act 2003*, A.S.P., 2003, c. 3 ; *Scotland River Basin District (Classification of Water Bodies) Directions 2009*, [Online], [www.scotland.gov.uk/Resource/Doc/296362/0092087.pdf] (15 March 2010), and *Scotland River*

licensing regime covering quantitative anthropogenic water uses is intended to ensure good ecological status for aquatic ecosystems notably through the preservation or restoration of some environmental flows[30].

In Canada, legal provisions protecting aspects of hydrological regimes have also emerged in some provincial jurisdictions[31]. The following section analyses the legal framework pertaining to environmental flow protection in Québec.

2 The legal framework for environmental flow protection in Québec

In Québec, water is relatively abundant. Unlike more arid Canadian jurisdictions such as Alberta where water resources in some basins are fully allocated since 2004, Québec's hydrology generally ensures minimum low flows to sustain environmental water uses without requiring restrictions on abstractions for agricultural or industrial purposes[32]. In this context, dams

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Basin District (Surface Water Typology, Environmental Standards, Condition Limits and Groundwater Threshold Values) Directions 2009, p. 28-35 and 57-58, [Online], [www.scotland.gov.uk/Resource/Doc/298071/0092869.pdf] (15 March 2010).

30. See Scottish Executive, *Implementing the Water Environment and Water Services (Scotland) Act 2003 : Development of Environmental Standards and Conditions. Policy Statement*, Scotland, March 2007, [Online], [www.scotland.gov.uk/Resource/Doc/173722/0048451.pdf] (15 March 2010), and *Water Environment (Controlled Activities) (Scotland) Regulations 2005*, Scot. S.I. 2005/348.

31. See Rob de Loë and others, *Water Allocation and Water Security in Canada : Initiating a Policy Dialogue for the 21st Century*, Guelph, University of Guelph, 2007, [Online], [www.environment.uwaterloo.ca/research/wpgg/Documents/1-de_Loe_et_al_2007_Final_Report.pdf] (10 July 2010) and the two technical background reports, [Online], [www.environment.uwaterloo.ca/research/wpgg/pubs/gordon_ws.htm] (15 March 2010).

32. In August 2006, Alberta stopped accepting applications for new water allocations in three sub-basins as a result of concerns related to insufficient instream flows and over-allocation : see *Bow, Oldman and South Saskatchewan River Basin Water Allocation Order*, Alta. Reg., 171/2007 ; David J. Pernitsky and Natalie D. Guy, "Closing the South Saskatchewan River Basin to New Water Licences : Effects on Municipal Water Supplies", *Canadian Water Resources Journal*, vol. 35, No. 1, Spring 2010, p. 79 ; and Auditor General of Alberta, *Report of the Auditor General of Alberta*, Edmonton, Office of the Auditor General of Alberta, April 2010, p. 53 ff., [Online], [www.oag.ab.ca/files/oag/OAGApr2010report.pdf] (10 July 2010). Even relatively unpopulated basins in northern Alberta are grappling with environmental flow issues due to energy production : see Alberta Environment and Fisheries and Oceans Canada, *Instream Flow Needs and Water Management System for the Lower Athabasca River*, February 2007, [Online], [http ://environment.alberta.ca/01229.html] (15 March 2010) ; Dan Ohlson, Graham Long and Todd Hatfield, *Phase 2 Framework Committee Report*, Fort McMurray, Cumulative Environmental Management Association, 2010, [Online], [www.cemaOnline.ca/index.php/management-frameworks/phase-ii-water-management-framework] (15 March 2010). By comparison, a legal review does not currently reveal water scarcity as a recurring problem in Québec's surface waters system, although low

and impoundments have particularly significant impacts on environmental flows relative to other water uses that directly affect water quantity such as abstractions and diversions[33]. Given the specificity of the management framework applicable to water impoundments as well as the large number of dams in Québec's rivers due to reliance on hydro-power production, this section firstly details how the regulation of impounding work construction and operation can preserve downstream residual environmental flows (2.1), and secondly, examines the effect of the legal regimes governing other water uses that have a direct impact on water quantity such as withdrawals and diversions (2.2.)[34].

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flows may cause localised issues for human water usage from time to time. For example, extreme low flows in the Mille Îles River were alleviated during the summers of 2001 and 2002 in order to protect municipal water abstractions for drinking purposes : see Jean-François Cyr and Mickaël Fontin, *Rivière des Mille Îles. Étude des solutions de soutien des étiages critiques. Rapport Sommaire,* Québec City, Centre d'expertise hydrique du Québec, 2005, [Online], [www.cehq.gouv.qc.ca/debit-etiage/mille-iles/index.htm] (15 March 2010). Current extreme low flows in the Mille Îles River will be solved by dredging : Louis-Gilles Francœur, "Le fleuve reçoit une aide d'urgence", *Le Devoir*, 23 June 2010, p. A3.

33. For studies detailing the hydrological impacts of dams on downstream flow characteristics in Québec, see Francis Lajoie and others, "Impacts of Dams on Monthly Flow Characteristics. The Influence of Watershed Size and Seasons", *Journal of Hydrology*, vol. 334, Nos. 3-4, February 2007, p. 423 ; Ali A. Assani, Francis Lajoie and Charles Laliberté, "Impacts des barrages sur les caractéristiques des débits moyens annuels en fonction du mode de gestion et de la taille des bassins versants au Québec", *Revue des sciences de l'eau*, vol. 20, No. 1, 2007, p. 127 ; Ali A. Assani and others, "Comparison of Impacts of Dams on the Annual Maximum Flow Characteristics in Three Regulated Hydrologic Regimes in Québec (Canada)", *Hydrological Processes*, vol. 20, No. 16, October 2006, p. 3485 ; and Ali A. Assani and others, "Impact des barrages sur les débits annuels minimum en fonction des régimes hydrologiques artificialisés au Québec (Canada)", *Revue des Sciences de l'Eau*, vol. 18, No. 1, 2005, p. 103.

34. According to Laurent Astrade, "La gestion des barrages-réservoirs au Québec : exemples d'enjeux environnementaux", *Annales de Géographie*, vol. 107, No. 604, 1998, p. 590, at pages 591-592, the most important works among the 10,000 or so dams, dikes and weirs on Québec's territory are owned by a limited number of stakeholders, among which Hydro-Québec, the provincial government, and large companies such as Alcan and Abitibi-Bowater. 94 percent of Québec's electricity generation capacity relies on hydro-power. Specific focus on impoundments is especially relevant given the conjunction of renewed hydro-power project development with the sanction in 2009 of a reformed legal regime regulating water withdrawals that excludes water impoundments : see *An Act to affirm the Collective Nature of Water Resources and Provide for Increased Water Resource Protection*, R.S.Q., c. C-6.2, s. 19 (*Environment Quality Act*, R.S.Q., c. Q-2, s. 31.74, [Online] [www.worldwatercouncil.org/fileadmin/wwc/Programs/Right_to_Water/Pdf_doct/Bill_92.pdf] (10 July 2010)) (not in force) [hereinafter "ACNWR"], Minister of Natural Resources and Wildlife, *Using Energy to Build the Québec of Tomorrow. Québec Energy Strategy 2006-2015*, Québec City, Government of Québec, 2006, p. 10-29, [Online], [www.mrnf.gouv.qc.ca/english/publications/energy/strategy/

2.1 The regulation of flows downstream of dams and impoundments

2.1.1 The general impact of administrative authorisation regimes

In Québec, the construction and operation of dams and other impoundments are subject to a variety of authorisation regimes under discretionary administrative power in both provincial and federal law that aim, *inter alia*, at preserving the environment or one of its component from impacts generated by human activities[35]. Within their respective domains, these regimes can protect natural water flows. An impoundment project altering the hydrologic regime may not be authorized because it has unacceptable consequences for the environment, a conservation habitat or a protected zone. In many cases, a projected impoundment may also be authorised under specific conditions that minimise or compensate resulting environmental impacts, among which alterations to environmental flows.

In provincial legislation, various preventive environmental impact assessment regimes provided by the *Environment Quality Act* that submit water impoundments projects to preliminary governmental and ministerial authorisations have a particular importance[36]. While all water storage projects are considered for inclusion under the assessment regimes applicable in the James Bay region and in the territory north of the 55th parallel, only the construction and operation of a dam or a dike impounding a reservoir

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energy-strategy-2006-2015.pdf] (10 July 2010) ; and HYDRO-QUÉBEC, *Strategic Plan 2009-2013*, Montréal, Hydro-Québec, p. 19-23, [Online], [www.hydroquebec.com/publications/en/strategic_plan/pdf/plan-strategique-2009-2013.pdf] (10 July 2010). At bottom-line, the choice to distinguish impoundments from other withdrawals despite the numerous regime overlaps that blur this distinction is intended to provide additional focus on the environmental flow issues specific to Québec and respect the contours of the emerging regulatory framework for water allocation at the provincial level.

35. Municipalities and regional county municipalities may regulate impoundment works that alter flow regimes : see *Municipal Powers Act*, R.S.Q., c. C-47.1, and *Règlement sur la gestion de l'écoulement des eaux des cours d'eau municipaux*, City Council of Trois-Rivières, Regulation No. 2007, c. 144, 19 November 2007. Due to the number and variety of applicable regimes, this article does not aim at exhaustive coverage. On the provincial regimes applicable to impoundments, see Lorne GIROUX and others, "Le régime juridique applicable aux ouvrages de retenue des eaux au Québec", (1997) 38 *C. de D.* 3.

36. *Environment Quality Act*, R.S.Q., c. Q-2, ss. 31.1-31.9, 153-167 and 187-204 [hereinafter "EQA"]. The two regimes applicable to northern Québec territories result from the integral transposition of the *Agreement Concerning James Bay and Northern Québec*, 11 November 1975. On the complex interactions between the various impact assessment regimes in northern Québec, see *Quebec (Attorney General)* v. *Moses,* 2010 SCC 17. The more general authorisation regime under EQA, *supra*, note 36, s. 22, is briefly examined under section 2.2 as it indiscriminately applies to impoundments and abstractions or diversions.

or a lake that exceeds a specific surface as well as the construction and operation of a hydroelectric station with a capacity that exceeds 5 MW are subject to preliminary governmental authorisations in southern Québec[37]. If the impoundment project is authorised, the competent authority may impose binding conditions on its construction and operation to preserve some characteristics of downstream flows[38]. In addition, other authorisation regimes generally applicable to impoundment projects can impose conditions with respect to downstream flows[39]. Although their scope is necessarily limited, authorisation regimes applicable to dam projects in protected natural habitats may also play a role in restricting alterations to environmental flows[40].

Since 1999, the *Politique des débits réservés écologiques pour la protection du poisson et de ses habitats* defining reserved ecological flows to maintain normal fish life-cycles applies to impoundment projects subject to the provincial authorisation regimes mentioned[41]. Scientific methods identified in the *Politique* serve to determine the minimum modulated water flows necessary to ensure fish passage and conserve the pre-existing

37. EQA, *supra*, note 36, s. 131 (11), annex A (c) and (d), and *Regulation respecting environmental impact assessment and review*, R.R.Q., 1981, c. Q-2, r. 9, ss. 2 (1) (a), 2 (1) (l) and 3 [hereinafter "RREIAR"].

38. EQA, *supra*, note 36, ss. 31.5, 114, 122.1, 122.3, 123.1, 164 (2), 167, 200, 201 and 203.

39. *Watercourses Act*, R.S.Q., c. R-13, ss. 30-36, 56-61 and 71-75. According to L. Giroux, *supra*, note 35, p. 31 and 68, authorisations under these regimes sometimes contain provisions for the maintenance of residual flows. According to the Centre d'expertise hydrique du Québec, dam owners and operators occasionally detail downstream ecological flow requirements stemming from other regimes in impounded water management plans stipulated under the dam safety authorisation regime although the latter is not concerned with environmental flows : see *Dam Safety Act*, R.S.Q., c. S-3.1.01, ss. 2, 4, 5-13, 19, and *Dam Safety Regulation*, R.Q., c. S-3.1.01, r. 1, ss. 30-34.

40. See *An Act Respecting the Conservation and Development of Wildlife*, R.S.Q., c. C-61.1, ss. 128.6-128.15, and *Regulation Respecting Wildlife Habitats*, (1993), 125 G.O.Q. II, 3536, ss. 1, 19 and 20 [hereinafter "RRWA"].

41. Direction de la faune et des habitats, *Politique de débits réservés écologiques pour la protection du poisson et de ses habitats*, Québec City, Faune et Parcs Québec, April 1999, p. 1-5, [Online], [www.bape.gouv.qc.ca/sections/mandats/chute-allard/documents/DB1.pdf] (10 July 2010) [hereinafter "Politique"], which also applies to impounded water management plans presented to the Minister for Sustainable development, the Environment and Parks [hereinafter "MSDEP"]. Thus, the *Politique* must be considered in the course of an environmental impact assessment for a dam or impoundment under the authorisation regime applicable to southern Québec : Direction des évaluations environnementales, *Directive pour la réalisation d'une étude d'impact sur l'environnement d'un projet de digue, de barrage, de centrale hydroélectrique ou de détournement d'un fleuve ou d'une rivière*, Québec City, Ministère du Développement durable, de l'Environnement et des Parcs, July 2010, p. 9-10,13, 17-20 [Online], [www.mddep.gouv.qc.ca/evaluations/documents/Centrale.pdf] (15 March 2010).

quantity and quality of fish habitats after the alteration of downstream hydrologic regimes by the projected impoundments[42]. Reserved flows thus determined must be protected in principle. However, the *Politique* indicates that residual flows inferior to reserved flows may be accepted when an impoundment project would not otherwise be economically or technically feasible[43]. In such a case, lost fish habitats must be compensated elsewhere to ensure no overall net loss. Authorisations granted for dams and impoundments since 1999 evidence that the *Politique* is considered[44].

By contrast, no specific normative framework prescribes reserved ecological flows downstream of impoundments at the federal level. Nevertheless, some legal regimes can preserve characteristics of environmental flows[45]. The *International River Improvements Act* explicitly prohibits the construction, operation or maintenance of a dam, reservoir or other work

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42. Discharge, hydraulic and habitat preference methods : *Politique*, *supra*, note 41, p. 11-13. According to Daniel Caissie, Nassir El-Jabi and Cindie Hebert, "Comparison of Hydrologically Based Instream Flow Methods Using a Resampling Technique", *Canadian Journal of Civil Engineering*, vol. 34, No. 1, 2007, p. 66, at page 68 : "Interestingly, calculated 7Q2 for Quebec rivers represented instream flow values of approximately 33 % of the MAF [mean annual flow], making [the recommended] method comparable to other methods, at least for Quebec rivers." (Reference omitted) For additional scientific perspectives on these methods in a Canadian context, see *Canadian Water Resources Journal*, vol. 28, special issue on Conservation Flows, 2003, p. 133.
43. *Politique*, *supra*, note 41, p. 5, 8-10 and 14.
44. For example, see *Décret 530-2009 concernant la délivrance d'un certificat d'autorisation à Hydro-Québec pour le projet d'aménagement du complexe hydroélectrique de la rivière Romaine sur le territoire de la municipalité régionale de comté de Minganie*, (2009) 141 G.O. II, 2488 (modulated reserved flow based on 20 percent of average natural flow) ; *Décret 378-2005 concernant la délivrance d'un certificat d'autorisation en faveur d'Hydro-Québec pour le projet d'aménagements hydroélectriques de la Chute-Allard et des Rapides-des-Cœurs sur le territoire de la Ville de La Tuque*, (2005) 137 G.O. II, 1778 (in one cut-off river section, modulated residual flow lower than prescribed reserved flow to preserve economic profitability) ; *Décret 582-2005 concernant la délivrance d'un certificat d'autorisation en faveur de la Société en commandite Magpie pour le projet d'aménagement hydroélectrique du site du barrage Magpie sur la rivière Magpie sur le territoire de la Municipalité de Rivière-Saint-Jean*, (2005) 137 G.O. II, 4975 (pre-project average natural river flow : 177 m^3/s ; constant reserved flow in cut-off river section : 3 m^3/s ; diurnal aesthetic flow for summer recreational activities : 25 m^3/s), [Online], [www.mddep.gouv.qc.ca/evaluations/lisprode.htm] (15 March 2010).
45. Although many federal regimes limit alterations to surface water flows, the protection of some characteristics of ecological flows thereunder is often incidental. For example, under the *Navigable Waters Protection Act*, R.S.C., 1985, c. N-22 [hereinafter "NWPA"], dams affecting navigable water are generally prohibited unless authorised, and the limits of flow and elevation of water for navigation purposes must be maintained : *Navigable Waters Works Regulations*, C.R.C., c. 1232, ss. 1, 7 (4). Such a regime can be construed as a protection for minimum constant flows in some surface waters, but it cannot preserve ecosystem uses that depend on variable water flows.

that alter natural water flow from any place in Canada to any place outside Canada[46]. The significance of this prohibition is considerably reduced by its narrow scope, by various exceptions thereto, and by the possibility of obtaining licences[47]. A less explicit but broader regime for protecting environmental flows from impoundments derives from dispositions regulating fish passage under the *Fisheries Act*[48]. According to the FA, the Minister of Fisheries and Oceans (hereinafter "MFO") may determine that dams or dikes must be provided with passes or canals to be maintained and supplied with sufficient quantities of water for the free passage of fish[49]. Also, the MFO may determine that sufficient water flows over instream obstacles and into the river downstream must be provided for the unimpeded descent of fish and for the flooding of spawning grounds[50]. Under this regime, a minimum flow order can, even retrospectively, require water releases from a reservoir equivalent to 45 percent of the natural river flow at all time[51]. Finally, although a federal regime submits impoundment projects to a procedure for environmental impact assessment, the evaluation of alterations to hydrological characteristics such as flow rate and current velocity proceeds on a case-by-case basis[52].

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46. *International River Improvements Act*, R.S.C., 1985, c. I-20, ss. 2 and 4 [hereinafter "IRIA"]. The IRIA is in force since 1955.
47. *Id.*, ss. 2 and 7, and *International River Improvements Regulations*, C.R.C., c. 982, s. 3. In recent years, no licence has been granted on Québec territory : Environment Canada, *International River Improvements Act. Annual Reports for 2004–2007*, Ottawa, Government of Canada, 2009, [Online], [www.ec.gc.ca/Publications/default.asp ?lang=En&xml=166DAB3A-DE6F-46C9-9A03-D9E429F51741] (15 March 2010).
48. *Fisheries Act*, R.S.C., 1985, c. F-14 [hereinafter "FA"]. The more general FA regime for fish habitat protection is examined under section 2.2 as it applies not only to impoundments but also to abstractions or diversions.
49. *Id.*, s. 20.
50. *Id.*, s. 22. On the application of both sections 20 and 22 by the administrative authority, see Fisheries and Oceans Canada, *Practitioners Guide to Fish Passage for DFO Habitat Management Staff*, Ottawa, Fisheries and Oceans Canada, 2007, p. 3-5.
51. See *British Columbia Hydro and Power Authority* v. *Canada (Attorney General)* (1998) 149 F.T.R. 161 (F.C.). In this instance, the order is cancelled on procedural grounds further to judicial review.
52. See *Canadian Environmental Assessment Act*, S.C., 1992, c. 37 [hereinafter "CEAA"] ; *Comprehensive Study List Regulations*, SOR/1994-638 (Can. Gaz. II) [hereinafter "CSLR"] ; *Law List Regulations*, SOR/1994-636 (Can. Gaz. II) ; Natalie Nicole, "Le processus fédéral d'évaluation environnementale et les projets de développement hydroélectrique", in Service de la formation permanente, Barreau du Québec, vol. 175, *Développements récents en droit de l'environnement (2002)*, Cowansville, Éditions Yvon Blais, 2002, p. 53.

2.1.2 The regulation of water flows in the St. Lawrence River

Regulation of the St. Lawrence River significantly impacts provincial freshwater ecosystems and sectoral water usages[53]. A particularised study of the institutional framework regulating water levels in the St. Lawrence River reveals the importance of a specific legal regime that affects environmental flows in Québec and that connects provincial hydrology to a transboundary watershed[54].

The St. Lawrence River plays a fundamental role in Québec's waterscape for both anthropogenic and environmental water uses. A third of Québec's territory and 97 percent of Québec's population are located in its drainage basin[55]. The River provides 40 percent of the province's annual water recharge and 45 percent of Québec's annual water withdrawals[56]. It supplies drinking water for three million people in some 100 riparian municipalities[57]. The St. Lawrence River also supports an enormous aquatic ecosystem characterised by rich fauna and flora biodiversity as well as significant species endemism in fish and bird communities[58]. A reported 80 percent of the areas protected under the ARCDW are located within the St. Lawrence River riparian zone[59].

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53. Québec Water Policy, *supra*, note 6, p. 31.
54. Clinton Edmonds and Associates, *Lake Ontario and St. Lawrence River – Changes in the institutional structure and their impact on water levels, 1950-2001. Report to International Lake Ontario-St. Lawrence River Study Board*, Ottawa, University of Ottawa, Institute of the Environment, January 2002, [Online], [www.losl.org/PDF/ChangesandImpacts1950-2001-e.pdf] (15 March 2010).
55. See Centre Saint-Laurent, Infos Saint-Laurent, [Online], [www.qc.ec.gc.ca/CSL/INF/inf027_f.html] (15 March 2010).
56. Alain N. Rousseau and others, "Usages et approvisionnement en eau dans le sud du Québec : Niveau des connaissances et axes de recherche à privilégier dans une perspective de changements climatiques", *Canadian Water Resources Journal*, vol. 29, No. 2, Summer 2004, p. 121, at pages 122 and 132.
57. Québec Water Policy, *supra*, note 6, p. 31.
58. See Nicolas Audet and others, *Overview of the State of the St. Lawrence River 2008. Water, Sediments, Shorelines, Biological Resources and Uses. Monitoring the State of the St. Lawrence River*, Sainte-Foy, State of the St. Lawrence Monitoring Committee, St. Lawrence Plan, 2008, [Online], [www.planstlaurent.qc.ca/sl_obs/sesl/publications/portrait/2008/portrait_global_2008_e.pdf] (10 July 2010) ; Louis-Gilles Françœur, "Ecosystem in Peril. The St Lawrence River", in Gregor G. Beck and Bruce M. Litteljohn (eds.), *Voices for the Watershed. Environmental Issues in the Great Lakes-St. Lawrence Drainage Basin*, Montreal and Kingston, McGill-Queen's University Press, 2000, p. 137.
59. Commission sur la gestion de l'eau au Québec, *L'eau, ressource à protéger, à partager et à mettre en valeur*, Report 142, vol. II, Québec City, Bureau d'audiences publiques sur l'environnement, 2000, p. 220.

The St. Lawrence River is managed through a transboundary legal regime as the emissary of the North American Great Lakes Basin[60]. One of the cornerstones of this transboundary regime, the Boundary Waters Treaty between Canada and the United States of America, characterises the St. Lawrence River as boundary waters[61]. The Boundary Waters Treaty generally prohibits uses, obstructions or diversions of boundary waters affecting the natural level or flow of boundary waters, except further to an authorization from Canada or the United States within their respective jurisdictions and with the approval of the International Joint Commission (hereinafter "IJC")[62]. The principles that guide IJC's discretionary power to approve a project affecting the natural level of boundary waters establish a preference towards water uses for domestic purposes, then navigation and finally power generation and irrigation, but ignore the need to ensure sufficient water quantity and quality for wildlife and environmental protection[63]. IJC's orders of approval may include conditions and criteria governing the construction and operation of a project.

Since the Boundary Waters Treaty authorization regime entered into force, the IJC has received a number of applications for projects with a

60. Doctrine on the transboundary legal framework applicable to the Great-Lakes-St. Lawrence River Basin is abundant : for example, see Anne-Marie La Rosa, "Le droit international à la sauvegarde de l'écosystème des Grands Lacs et du fleuve Saint Laurent", (1992) 33 *C. de D.* 399, and Noah D. Hall, "The North American Great Lakes", in Joseph W. Dellapenna and Joyeeta Gupta (eds.), *The Evolution of the Law and Politics of Water*, Doredrecht, Springer, 2009, p. 281.

61. *Treaty relating to Boundary Waters and Questions arising along the Boundary between Canada and the United States*, signed at Washington, January 11, 1909, Preliminary article [hereinafter "Boundary Waters Treaty"], reproduced as Schedule to the *International Boundary Waters Treaty Act*, R.S.C. 1985, c. I-17 [hereinafter "IBWTA"].

62. Boundary Waters Treaty, *supra*, note 61, art. III.

63. Boundary Waters Treaty, *supra*, note 61, art. VIII ; Marcia Valiante, "How Green is my Treaty ? Ecosystem Protection and the 'Order of Precedence' under the Boundary Waters Treaty of 1909", (2008) 54 *Wayne L. Rev.* 1525. The IBWTA, *supra*, note 61, and its afferent regulation, the *International Boundary Waters Regulations*, SOR/2002-445 (Can. Gaz. II), do not guide the discretionary power of the Canadian Minister of Foreign Affairs to grant a license in situations subject to art. III of the Boundary Waters Treaty : IBWTA, *supra*, note 61, ss. 11 and 16. Section 5 of the *Seaway Property Regulations*, SOR/2003-105 (Can. Gaz. II), provides that no person shall do anything that is likely to divert the flow of a river or stream, cause or affect currents, cause silting or the accumulation of material or otherwise reduce the depth of the waters of the deep waterway between the port of Montréal and the Great Lakes, while section 24 provides an authorization regime for works in this waterway as defined under the NWPA, *supra*, note 45. Of note is the fact that the IRIA authorisation regime is not applicable to dams and other impoundment works within boundary waters as defined by the Boundary Waters Treaty : IRIA, *supra*, note 46, s. 7 (b).

potential impact on the level and flow of the St. Lawrence[64]. One of these projects, sponsored by the governments of Canada and the United States and approved by the IJC, has a significant impact on the flow of the St. Lawrence River in Québec since the late 1950s[65]. The operation of the approved dams and locks, among which the Moses-Saunders hydropower dam near Cornwall, is adjusted weekly to regulate water levels by applying thirteen regulation criteria contained in Plan 1958-D that relate to the stabilisation of water levels in Lake Ontario, maintenance of minimal levels for navigation, facilitation of energy production, and minimisation of flooding risks[66]. A series of operating curves in Plan 1958-D covers different trends in the water supply conditions for Lake Ontario and dictates that if the

64. The IJC dockets suggest that approximately 120 applications for all types of projects and all boundary waters across the Canada-U.S. border have been made since 1909 : see [Online], [http ://bwt.ijc.org/index.php ?page=for-researchers&hl=eng] (15 March 2010). According to Joseph W. DELLAPENNA, "International Law's Lesson for the Law of the Lakes", (2007) 40 – 4 *U. Mich. J.L. Ref.* 747, 756, applications to the IJC between 1909 and 1976 consisted of 3 projects related to water diversions, 15 related to changes in water levels and flows, and 36 related to dams. Notably, dockets 98R and 102A indicate that an application for the regulation of the Richelieu River is suspended until the IJC is satisfied that environmental impacts are acceptable : see INTERNATIONAL JOINT COMMISSION, *Regulation of the Richelieu River and Lake Champlain*, Washington and Ottawa, International Joint Commission, 1981, [Online], [www.ijc.org/php/publications/pdf/ID559.pdf] (10 July 2010).

65. See INTERNATIONAL JOINT COMMISSION, *In the Matter of the Applications of the Government of Canada and the Government of the United States of America for an Order of Approval of the Construction of Certain Works for Development of Power in the International Rapids Section of the St. Lawrence River. Order of Approval*, Docket 68, 29 October 1952, [Online], [http ://bwt.ijc.org/docket_table/attachments/Docket %2068/Docket %2068 %20St. %20Lawrence %20Power %20Order %201952-10-29.pdf] (July 10 2010) ; and INTERNATIONAL JOINT COMMISSION, *In the Matters of Development of Power in the International Rapids Section of the St. Lawrence River (Docket 68) and Regulation of the Level of Lake Ontario (Docket 67). Order of Approval*, Dockets 67 and 68, 2 July 1956, [Online], [http ://bwt.ijc.org/docket_table/attachments/Docket %2068/Docket %2068 %20St. %20Lawrence %20Power %20Supplemental %20Order %201956-07-02.pdf] (10 July 2010). For hydrologic information updates, see [Online], [www.ijc.org/conseil_board/islrbc/en/main_accueil.htm] (15 March 2010).

66. INTERNATIONAL ST. LAWRENCE RIVER BOARD OF CONTROL, *Regulation of Lake Ontario : Plan 1958-D. Report to the International Joint Commission*, July 1963, p. 26-41 [Online], [www.ijc.org/en/activities/losl/documents/LOSL-July-63.pdf] (15 March 2010) [hereinafter "Plan 1958-D"]. For a section illustrating the works that affect the fluvial portion of the St. Lawrence River, see Jean-François BIBEAULT and Christiane HUDON, "Water Availability : An Overview of Issues and Future Challenges for the St. Lawrence River", *Québec Studies*, vol. 42, Fall-Winter 2006, p. 75, at page 78.

water supplies to the lake are high, for example, the curve with a higher supply indicator will be used to determine the outflows, and vice versa[67].

As a result, the operation of regulation infrastructure is the second determining factor for water levels in the fluvial portion of the St. Lawrence River after natural precipitations variations over the Great Lakes and Ottawa River watersheds[68]. When hydrological conditions correspond to hydrological data from the 1860-1954 reference period that was used to produce Plan 1958-D, flow regulation results in the reduction of flooding-related issues on the shores of Montréal in Lake St. Louis, in the increase of St. Lawrence River baseflows, and in the reduction of ice jams[69]. However, as hydrological conditions since 1963 have diverged widely from those of the 1860-1954 reference period, derogations from the norms contained in Plan 1958-D have occurred almost 50 percent of the time and the discretionary regulation of outflows has aimed at minimising detriments rather

67. Environment Canada, *Great Lakes-St. Lawrence River Regulation. What it Means and how it Works*, Burlington, Environment Canada, 1990, p. 11, [Online], [www.ijc.org/conseil_board/islrbc/en/bookshelf/06%20Great%20Lakes-St.%20Lawrence%20River%20Regulation.pdf] (10 July 2010).

68. St. Lawrence Vision 2000, *Fluctuating water levels in the St. Lawrence River*, Montréal, Minister of Public Works and Government Services Canada, 1998, p. 4-5, [Online], [www.planstlaurent.qc.ca/centre_ref/publications/diverses/enjeu_niveauxdeau_a.pdf] (10 July 2010). Regulation affects water level conditions on the St. Lawrence River as far downstream as fluvial Lake St. Pierre near the City of Trois-Rivières. Of note is the fact that management of the Beauharnois-Les Cèdres hydropower complex located at the outlet of fluvial Lake Saint-François is aligned with the operation of the Moses-Saunders dam so that the influence of the former is minor compared to that of the latter. However, other anthropogenic factors contribute to the alteration of water levels in the fluvial portion of the St. Lawrence River. The Ottawa River, a major tributary to the St. Lawrence River that is heavily regulated and has an important hydrological impact in the Montréal region, is governed by an inter-governmental agreement, the *Agreement Respecting Ottawa River Basin Regulation*, 2 March 1983, [Online], [www.ottawariver.ca/emain.htm] (15 March 2010), which aims at providing protection against flooding along the Ottawa River and its tributaries as well as in the Montréal region while also protecting the interests of various usages among which hydroelectric energy production is foremost. According to principle 1 of the *Recommendations and Guiding Principles*, p. 4, [Online], [www.ottawariver.ca/emain.htm] (15 March 2010), which guide the Ottawa River Regulation Planning Board, preservation of statutory and environmental levels and discharges is an objective of regulation. Nevertheless, it appears that there is no existing norm for dam operators to protect ecosystem interests and ensure minimum environmental flows along the mainstem of the Ottawa River : Becky Swainson, *Rivers at Risk : The Status of Environmental Flows in Canada*, Toronto, World Wildlife Fund, 2009, p. 45, [Online], [http ://assets.wwf.ca/downloads/wwf_canadas_riversatrisk_technicalreport.pdf] (10 July 2010).

69. André Carpentier, "La régularisation du Saint-Laurent", *Le Naturaliste Canadien*, vol. 127, No. 2, Summer 2003, p. 102, at page 107.

than maximising advantages for stakeholders downstream of the Moses-Saunders dam[70].

The regulation of water levels in the St. Lawrence River under Plan 1958-D has significantly affected the distribution and composition of species assemblages as well as the functioning of biotic processes in stream and riparian areas[71]. In response to environmental concerns and stakeholders dissatisfaction, the International Lake Ontario-St. Lawrence River Study Board was mandated by the IJC to formulate replacement options for Plan 1958-D and produced three candidate plans entitled A+, B+ and D+ in 2006[72]. Plan B+ provides greater environmental benefits than Plan A+ or Plan D+ as well as greater potential ecosystem improvements compared with Plan 1958-D on Lake Ontario and the upper St. Lawrence River, but all candidate plans show almost no environmental benefits below the Moses-Saunders dam[73]. At the moment, selection of a new plan by the IJC is still under review and regulation of the St. Lawrence River proceeds under *status quo*.

2.2 Regimes applicable to water withdrawals and diversions

2.2.1 Regimes contributing to environmental flow protection

Québec law contains measures affording some protection to environmental flows from water withdrawals and diversions. In some cases, the legal framework for water resources apportionment explicitly preserves water for aquatic ecosystem use. For example, the provincial regime for wildlife management individually caps agricultural withdrawals from a watercourse in a protected fish habitat to no more than 15 percent of the

70. See *id.*, p. 109-110, and regulation criterion k, Plan 1958-D, *supra*, note 66, p. 41.

71. See International Lake Ontario – St. Lawrence River Study Board, *Options for Managing Lake Ontario and St. Lawrence River Water Levels and Flows. Final Report to the International Joint Commission*, Buffalo and Ottawa, ILOSLSB, 23 March 2006, Annex 2, p. 26-27, [Online], [www.losl.org/reports/finalreport-e.html] (July 10 2010) [hereinafter "LOSL Study"], and Philippe Brodeur, Marc Mingelbier and Jean Morin, "Impact de la régularisation du débit des Grands Lacs sur l'habitat de reproduction des poisons dans la plaine inondable du fleuve Saint-Laurent", *Le Naturaliste Canadien*, vol. 130, No. 1, Winter 2006, p. 60.

72. A fourth plan, Plan E, attempts to replicate pre-project or natural flow conditions as closely as possible. Plan E is not considered a viable option because of the significant economic disadvantages it would entail, but it is used as a benchmark based on the assumption that pre-project state would be most conducive to supporting the regeneration of the flora and fauna in the system: see LOSL Study, *supra*, note 71, Main Report, p. 34-36.

73. LOSL Study, *supra*, note 71, Main Report, p. 59, 68.

water flow[74]. However, streamflow protection is still mostly indirect and piecemeal, as it results from the *ad hoc* application of various sectoral authorisation regimes regulating withdrawal or diversion projects with potential impacts on the environment or one of its components, among which hydrologic regimes[75]. For example, under the EQA, a general regime within the ambit of the *Politique* applies to water withdrawal or diversion projects altering water flows, but the required preliminary ministerial authorisation cannot impose conditions to mitigate or compensate negative environmental impacts and the *Politique* has never justified the refusal of an authorisation[76]. Likewise, regimes with localised application domains may indirectly foster environmental flow protection although their effective impact remains unclear : the federal framework for protected areas restricts potential alterations to hydrologic regimes that result from withdrawals or diversions without explicitly reserving water for ecosystem uses[77].

In this context, two regimes warrant specific attention with respect to environmental flows, the first due to its breadth and the second due to its object. Firstly, the protection of fish habitat by the FA constitutes a prominent example of an authorisation regime regulating withdrawal or diversion projects with potential impacts on environmental flows[78]. Under this regime, the harmful alteration, disruption or destruction of fish habitat is prohibited unless authorised by the MFO[79]. Harmful alterations or destructions of fish habitat are generally considered to result from a variety of causes, among which channel diversions as well as changes in the hydrology or hydraulics of a watercourse where the remaining flow

74. RRWA, *supra*, note 40, s. 45.
75. See the provincial and federal environmental impact assessment regimes under the EQA, *supra*, note 36 and the CEAA, *supra*, note 52, and in particular RREIAR, *supra*, note 37, s. 2 (1) (c), and CSLR, *supra*, note 52, ss. 8-10.
76. EQA, *supra*, note 36, ss. 22, 32, and *Regulation respecting the application of the Environment Quality Act*, 1993 G.O.Q. II 5996, s. 4.
77. For example, except further to the issuance of a permit, no person shall divert or otherwise interfere with any watercourse in a federal park : *Canada National Parks Act*, S.C., 2000, c. 32, s. 17 ; *National Parks General Regulations*, SOR/78-213 (Can. Gaz. II), ss. 16-20 ; *National Historic Parks General Regulations*, SOR/82-263 (Can. Gaz. II), ss. 9-11.
78. "Fish habitat" "means spawning grounds and nursery, rearing, food supply and migration areas on which fish depend directly or indirectly in order to carry out their life processes" : see FA, *supra*, note 48, s. 34 (1) ; *Québec (Procureur général)* v. *Lauzon*, 2009 QCCQ 12150, J.E. 2010-171.
79. FA, *supra*, note 48, s 35 ; *Fishery (General) Regulations*, SOR/93-53 (Can. Gaz. II), s. 58 and Schedules VI and VII [hereinafter "FGR"] ; Fisheries and Oceans Canada, *Policy for the Management of Fish Habitat of the Department of Fisheries and Oceans Canada*, Ottawa, Department of Fisheries and Oceans, 1986.

may be below that required for successful utilisation of the habitat due to water withdrawal[80]. Applications for authorisation must describe fish habitat conditions that will prevail after project completion with respect to, *inter alia*, water width, depth, flow, velocity, and water level recurrence intervals[81]. Assessments of projected fish habitat degradation are performed on a case by case basis as there is no administrative guideline indicating generally acceptable characteristics for residual flows. However, the Department of Fisheries and Oceans might prepare a directive on this issue that would rely on the natural flow paradigm[82].

Secondly, the legal framework for groundwater management provided by the *Groundwater Catchment Regulation* constitutes an apportionment regime akin to regulated riparianism which explicitly acknowledges aquatic ecosystems water uses[83]. Since 15 June 2003, groundwater withdrawal projects with a daily capacity of 75 m^3 or more must be authorised by the MSDEP[84]. When considering whether to authorise a groundwater with-

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80. Department of Fisheries and Oceans, *Decision Framework for the Determination and Authorization of Harmful Alteration, Disruption or Destruction of Fish Habitat*, Ottawa, Fisheries and Oceans Canada, 1998, p. 12 also available [Online], [www.dfo-mpo.gc.ca/Library/231028.pdf] (10 July 2010). As mentioned in FA, *supra*, note 48, this regime also applies to impoundments, and harmful alterations covered include restriction of fish access to habitat due to dams and dikes as well as habitat conversion due to dam or reservoir operations causing a shift in habitat suitability to favour different types of fish communities.

81. Fisheries and Ocean Canada Quebec Region, *Protecting Fish Habitat to Protect Fisheries. Project Proposal Presentation Guide Submitted to Fisheries and Oceans Canada for Analysis Under the Provisions of the Fisheries Act Respecting Fish Habitat Protection*, Mont-Joli, Fisheries and Ocean Canada, June 2004, p. 11, [Online], [www.qc.dfo-mpo.gc.ca/habitat/en/Pdf/Guide%20Pr%E9sentation%20Avis%20Projet%20Juin%202004%20ANG.PDF] (10 July 2010).

82. L. Poff and others, *supra*, note 15, is identified as the scientific foundation for this directive.

83. *Groundwater Catchment Regulation*, (2002) 134 G.O.Q. II, 2657 [hereinafter "GCR"]. Once in force, the ACNWR regime will supersede the GCR regime : ACNWR, *supra*, note 34, ss. 19 (31.74), 19 (31.75), 33 and 34. On regulated riparianism, see Joseph W. Dellapenna, "Adapting Riparian Rights to the Twenty-First Century", (2004) 106-3 *W. Va. L. Rev.* 539 and American Society of Civil Engineers, *Regulated Riparian Model Water Code*, Reston, ASCE, 2004.

84. See EQA, *supra*, note 36, s. 46 (s), and GCR, *supra*, note 83, ss. 31 and 65. For detailed studies of the GCR authorisation regime, see Hugo Tremblay, "The Legal Framework for Groundwater Allocation in Québec : Towards Integrated Water Management", (2008) 4-2 *Law, Environment and Development Journal* 102, [Online], [www.lead-journal.org/content/08102.pdf] (15 March 2010), and Hugo Tremblay, *Étude du cadre de gestion quantitative des eaux souterraines au Québec*, LL.M. thesis, Québec City, Faculté de droit, Université Laval, 2007, [Online], [www.gridauh.fr/sites/fr/fichier/4b27a6f787b2c.pdf] (15 March 2010).

drawal, the MSDEP's discretionary power is guided by criteria enunciated in the GCR[85]. According to these criteria, abstractions should not draw groundwater in excessive amounts considering the resource's availability, and negative impacts caused by groundwater abstractions on watercourses and bodies of water as well as related ecosystems should be minimised. Hydrogeological studies accompanying applications for authorisation identify the possible environmental impacts of proposed withdrawals and provide detailed information with respect to the criteria guiding ministerial power[86]. In particular, hydrogeological studies indicate whether groundwater withdrawals degrade environment quality and significantly affect low flows in wetlands, watercourses or bodies of water, thereby damaging ecosystems[87]. Furthermore, authorisations under the GRC are generally valid for 10 years[88].

2.2.2 Environmental flow under the *Act to affirm the Collective Nature of Water Resources*

Although not yet in force, a framework for the quantitative allocation of water resources established by the ACNWR arguably develops and extends the approach initiated under the GRC[89]. Some features of this new framework for water allocation are relevant to environmental flow protection because the ACNWR takes aquatic ecosystem water uses into consideration[90].

Under the ACNWR, underground and surface water withdrawals except impoundments are subject to a detailed authorisation regime[91]. The discretionary power to authorise a withdrawal must be exercised so as to

85. See GCR, s*upra*, note 83, s. 1, and Ministère du Développement durable, de l'Environnement et des Parcs du Québec, *Guide d'interprétation du Règlement sur le captage des eaux souterraines (deuxième version)*, p. 1 of comments on section 1, 6 February 2006 update, unpublished document [on file with author].
86. GCR, s*upra*, note 83, ss. 33-36; H. Tremblay, *supra*, note 84, p. 35-37.
87. Robert P. Chapuis, *Guide des essais de pompage et leurs interprétations*, Sainte-Foy, Publications du Québec, 1999, p. 101-102.
88. GCR, s*upra*, note 83, s. 38.
89. On the framework's entry into force, see ACNWR, *supra*, note 34, s. 41 and *An Act to affirm the collective nature of water resources and provide for increased water resource protection*, (2009) 141 G.O.Q. II, 1875.
90. The explanatory notes for the ACNWR, *supra*, note 34, state that: "[t]he new [authorisation] scheme recognizes the need to give priority to satisfying the needs of the population but also to reconcile ecosystem needs and the needs of economic activities."
91. See ACNWR, *supra*, note 34, ss. 19 (31.74)-19 (31.87). For other exemptions, see s. 19 (31.75 (2)).

ensure the protection of water resources[92]. Priority is granted to satisfying public health, sanitation, civil protection and drinking water supply needs, but the decision to authorise a withdrawal must also aim to reconcile the protection needs of aquatic ecosystems[93]. Environmental impacts as well as the availability and distribution of water resources must be taken into account, with a view to satisfying or reconciling current and future needs of different water uses[94]. As a result, the criteria guiding the discretionary power to authorise water withdrawals impose that ecosystems water uses be considered. Although environmental flow requirements remain undefined under this regime, aquatic ecosystem water uses materialise within the legal order as a potential constraint on anthropogenic uses, thereby reflecting the inherent competition between concomitant uses of a finite resource[95].

Acknowledging the inherent variability of local hydrological flows and the increasing unpredictability of the water supply in a context of climate change, the ACNWR regime also places restrictions on the length of some water uses. Ministerial authorisations other than those for the supply of drinking water to a waterworks system operated by a municipality are valid for a period of 10 years[96]. If an authorisation is renewed, different conditions, restrictions or prohibitions may be imposed on the withdrawal, notably to ensure greater protection for the environment, aquatic ecosystems and wetlands[97]. Moreover, even a valid authorisation may be limited, temporarily curtailed or cancelled when a withdrawal presents a serious risk for aquatic ecosystems[98]. As a result of these temporal restrictions, risks

92. *Id.*, ss. 19 (31.76 (1)) and 19 (31.78 (1)).
93. *Id.*, ss. 19 (31.76 (2) (1)) and 19 (31.78 (1)).
94. *Id.*, ss. 19 (31.77 (1) (2)) and 19 (31.78 (1)).
95. In principle, the *Politique*, *supra*, note 41 could apply to this new authorisation regime : "[l]es activités assujetties à cette politique […] incluent également les projets de prélèvement d'eau et de dérivation de cours d'eau (ex. : creusage d'un lac artificiel)." However, the impending entry into force of the ACNWR authorisation regime with a projected regulation detailing the regime's various facets will displace the *Politique*.
96. *Id.*, s. 19 (31.81).
97. *Id.*, ss. 19 (31.79) and 19 (31.80).
98. *Id.*, ss. 19 (31.85) and 19 (31.86). On the curtailment of pre-existing withdrawals, see also ss. 33 and 34. The cancelation of an authorisation might be hindered by the legal protection of foreign investments in some instances : see Hugo Tremblay, "L'impact de l'ALENA sur la gestion de l'eau. Une question de transferts en vrac ou de souveraineté environnementale ?", *Le Devoir*, 12 August 2009, p. A7.

related to water supply variability are shared more evenly between anthropogenic uses and aquatic ecosystems relying on environmental flows[99].

Conclusion

A multitude of authorisation regimes in provincial and federal law regulate projects with potential impacts on environmental flows without explicitly referring to instream water levels or water allocations to ecosystems. The protection afforded to environmental flows under these regimes may stem from the administrative power to refuse authorisations or impose conditions on the construction and operation of projects altering natural hydrology in order to prevent, minimise or compensate potential environmental damages. Such skein of partially overlapping regimes offers a mostly indirect and fragmented protection to environmental flows against quantitative anthropogenic water uses, discounting fundamental linkages in the hydrologic cycle and aquatic ecosystems. A certain degree of fragmentation is inevitable given the size and geographical situation of the St. Lawrence River watershed, but further integration of the water resources management framework could foster the preservation of water allocations to ecosystems[100].

In this context, the adoption of the *Politique des débits réservés écologiques pour la protection du poisson* represents a significant step towards a more comprehensive framework for environmental flow protection. However, the *Politique* remains an imperfect tool. First, it does not apply to water uses anterior to 1999 and cannot serve to restore aquatic ecosystem quality compromised by an anterior use other than on a voluntary basis. Second, its implementation is discretionary, and alterations considered unacceptable under the *Politique* such as complete river-flow cut-offs are authorised in practice. The economic and technical feasibility exclusion ensures that any type of environmental flow alteration can be authorised, thus significantly reducing the *Politique*'s effectiveness as

99. According to the natural flow paradigm, if users require 100 p. 100 supply security, their total demand must be limited to the sustainable drought yield of a watershed : D. A. Hughes and S. J. L. Mallory, *supra*, note 26, p. 855.

100. Among the impediments to further integration, concurrent constitutional competence might be particularly significant due to potential legal challenges alleging the *ultra vires* nature of a definitive initiative by either the federal or the provincial government in favour of environmental flows protection : on this issue, see Michael Wenig, Arlene Kwasniak, and Michael Quinn, "Water Under the Bridge ? The Role of Instream Flow Needs (IFNs) Determinations in Alberta's River Management", in H. Epp and D. Ealey (eds.), *Water : Science and Politics*, Proceedings of the conference held by the Alberta Society of Professional Biologists, 25-28 March 2006, Calgary, Alberta, Alberta Society of Professional Biologists, p. 7-8.

a normative instrument. Third, the *Politique* focuses exclusively on the provision of water for fish and neglects the effects of flow alteration on other components of the biotic assemblages integral to aquatic ecosystem quality[101]. Fourth, reliance on the principle of compensation for lost habitat can lead to the acceptance of important shifts in ecosystem species composition[102]. For example, loss of habitats suitable to species adapted to high flow velocity can be considered acceptable under the *Politique* because balanced by gains in habitats for species adapted to standing water. However, repetition of such a compensation project after project may homogenise fish biodiversity. Finally, the discrete implementation of the *Politique* through *ad hoc* authorisations under various regimes may hinder the capacity to address cumulative impacts on environmental flows and ecosystems. This risk is particularly significant when rivers earmarked for out-of-site habitat compensation are not identified during the authorisation process for specific projects[103].

As a result, fulfilment of the governmental undertaking to extend and improve environmental flow protection remains essential. The emerging recognition of allocations to aquatic ecosystems in the legal framework for quantitative water resources apportionment constitutes a progress in this direction. Such recognition, initiated by the GCR and explicited under the ACNWR, could be further substantiated by the development of operational rules to determine damages sustained by or restorations measures for

101. Scientific methods based on other species indicators are being developed in Canada to better assess the relationship between flow alterations and freshwater ecosystem quality. According to David Armanini and others, "Development of a Benthic Macroinvertebrate Flow Sensitivity Index for Canadian Rivers", (2010) *River Research and Applications* [Early View – Articles online in advance of print], p. 2: "In Canada, salmonid fish are often used as indicator species in this respect. However, species-centric approaches – e.g. PHABSIM (Physical Habitat Simulation System) – lack generality and ignore the fact that rivers without salmon populations can sustain a healthy biota. Freshwater macroinvertebrates, which are ubiquitously distributed in rivers, provide an excellent indictor of river ecosystem health and have historically been used to develop system descriptive indices." [References omitted]

102. Although this is not demonstrated, the principles of compensation and no net loss may also cause difficulties in the implementation of the *Politique*. Such is the case with respect to the fish habitat protection regime under the FA which is guided by similar principles: see Commissioner of the Environment and Sustainable Development, *Report of the Commissioner of the Environment and Sustainable Development to the House of Commons*, Ottawa, Office of the Auditor General of Canada, Spring 2009, p. 8-52; David J. Harper and Jason T. Quigley, "Effectiveness of Fish Habitat Compensation in Canada in Achieving no net loss", *Environmental Management*, vol. 37, No. 3, March 2006, p. 351.

103. See Mathieu Bourdon, "Hydroélectricité. Jean Charest se moque du BAPE", *Le Devoir*, 1 August 2009, p. C5.

water resources in the context of an action by the Attorney General[104]. In this context, exercise of the state's police power to require the restoration of water resources could be construed as the materialisation by proxy of aquatic ecosystems rights against anthropogenic abuses.

However, progress under the ACNWR does not address gaps in environmental flow protection that result from the fragmentation of the provincial water allocation framework in two increasingly independent regimes applicable to impoundments on one hand and withdrawals on the other. Water stress caused by water resources exploitation and heightened hydrological variability would vindicate a comprehensive regime addressing water allocation issues between all anthropogenic and ecosystem uses. The reform and improvement of the *Politique* is a temporary but essential palliative as long as impoundments remain excluded from the general management regime for water withdrawals. The finalisation of a new regulation plan for St. Lawrence River flow after more than a decade of negociation must also be prioritised to adequately protect Québec's freshwater ecosystems as climate change is expected to significantly alter the Great Lakes hydrology.

104. See ACNWR, *supra*, note 34, ss. 8, 9.