

A Preliminary Survey and Overview of Ecological Restoration in Quebec



“Souche minière” by Véronique Doucet

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Key restoration contexts in Quebec

Context	Law & policy	Overall objectives	Examples
Mineral mine sites	QC Mining Act and regulations	Restore “natural conditions,” eliminate health and envt’l harm, ensure visual acceptability to the community.	-East-Sullivan mine -Sullivan mine -Wood-Cadillac mine
Wetlands and peatlands	QC Env’t’l Quality Act; QC Water Policy	“The protection and restoration of wildlife habitats in aquatic, riparian, and wetland environments.”	-Bois-des-Bel peatland -St. Lawrence ZIPs
Species protection	QC Act Respecting Threatened or Vulnerable Species, other	MDDEP or MRNF may “establish programs to promote ...,the restoration of damaged habitats or the creation of new habitats” of listed species.	-False sedge hop -White pine -Western chorus frog -Allegheny mountain dusky salamander
Protected areas sites	QC Parks Act and implementing regulations and policies	Active management in QC national parks to restore deteriorated ecosystems or restore or maintain species of concern.	-Mt. Orford QNP -Îles de Boucherville QNP -La Mauricie NP -Forillon NP
Lakes, rivers and streams	Various, e.g. QC Env’t’l Quality Act, St. Lawrence Action Plan	Various, e.g. restore fishing to degraded stream; renaturalize riparian habitats; limit nutrients and cyanobacteria; “agroenvironmental restoration.”	-Nicolet River -Etchemin River -Lac St-Augustin -Fouquette River -St. Lawrence ZIPs
Forests	Varied; public and private sector	No broadly applied objectives were identified.	-mixed pine forests in southern Quebec

Mine site rehabilitation



<http://www.mrnf.gouv.qc.ca/english/mines/rehabilitation/rehabilitation-east-sullivan.jsp>



East Sullivan mine (Cu, Zn, Cd, Ag) site, before and after – forest residue cover.
\$9.7 million



<http://www.mrnf.gouv.qc.ca/english/mines/rehabilitation/rehabilitation-wood-cadillac.jsp>



Wood Cadillac gold and silver mine – biofiltration and stream diversion.
\$3.4 million



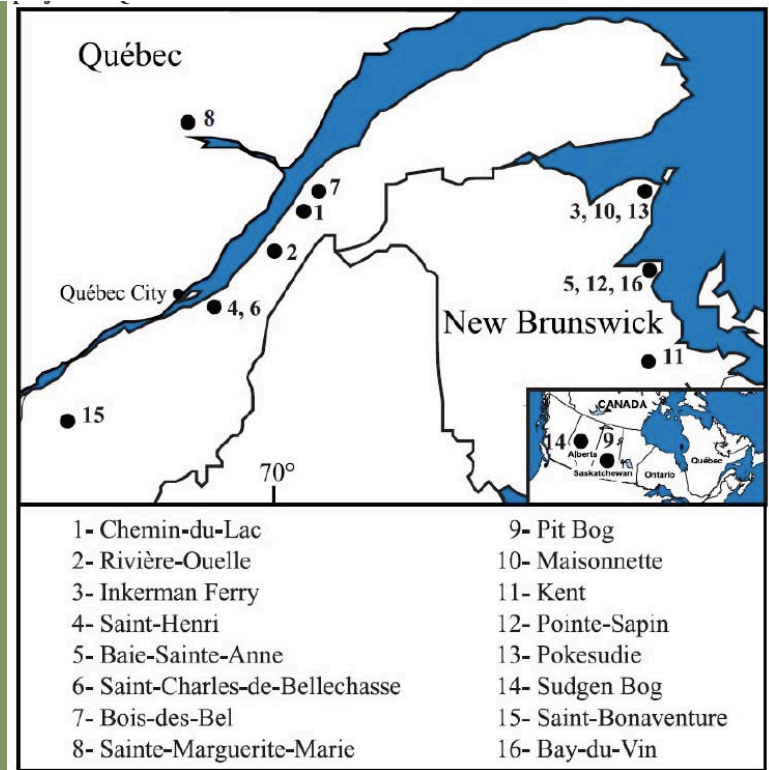
<http://www.mrnf.gouv.qc.ca/english/mines/rehabilitation/rehabilitation-lorraine.jsp>



Lorraine nickel and copper mine – multi-layer cover and limestone drain.
\$1.8 million

Peatland restoration

Map of large-scale peatland restoration sites in Quebec and the ROC



Source: Quinty and Rochefort 2003.

Peatland restoration at Bois-des-Bel peatland, near Rivière-du-Loup (Peatland Ecology Research Group)



Restoration

1 year

2 years

3 years

4 years

8 years

Wetlands restoration

Comparison of wetlands mitigation policies in Canada

Jurisdiction	Mechanism of implementation	Mitigation hierarchy	Compensation guidelines	Reporting guidelines
Government of Canada	(1) EA; Individual Decisions	Yes	No	No
	(2) EA; Permit for a HADD (harmful alteration, destruction or disruption) of fish habitat	Yes	Some	Some
British Columbia	(1) None	No	No	No
	(2) Licence for Forestry Operations and Penalties	No	No	No
Alberta	Water Act permits; EA	Yes	Yes	Some
Saskatchewan	Environmental Management & Protection Act; Watershed Authority Act; EA	No	No	No
Manitoba	Water Protection Act; EA	No	No	No
Ontario	Permits related to Planning Act; Conservation Authorities Act; and EA	No	No	No
Quebec	Quebec Environmental Quality Act—Development Permit	Yes	Yes	No
New Brunswick	Watercourse and Wetland Alteration Permit; EA for wetlands >2.0 ha	Yes	Draft	Some
Prince Edward Island	Environmental Protection Act	Yes	Yes	Some
Nova Scotia	Environment Act wetland alteration permit; EA for wetlands >2.0 ha	Yes	Some	Some
Newfoundland and Labrador	Environmental Assessment Regulations for 'undertakings'	No	No	No

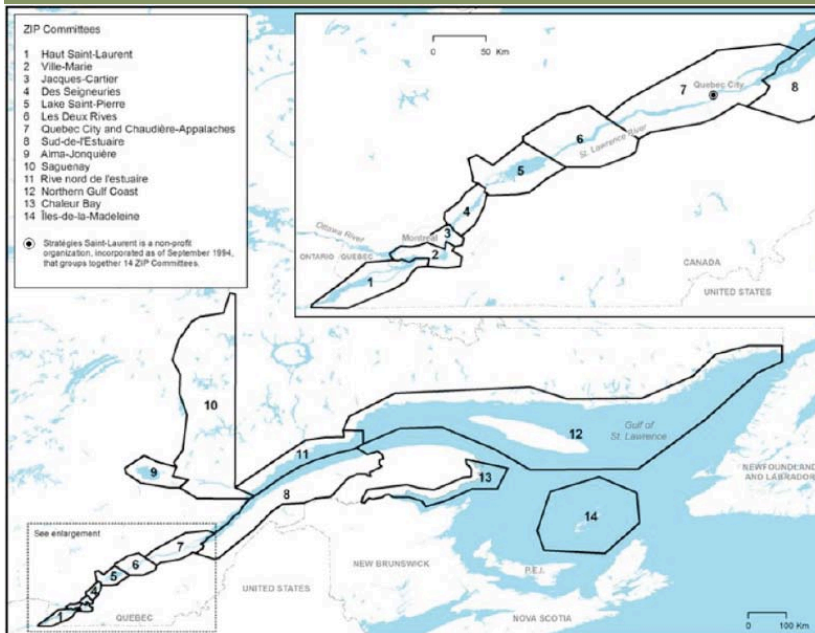
Modified from Rubec, C.D.A. and A.R. Hanson (2009)

Wetlands restoration examples

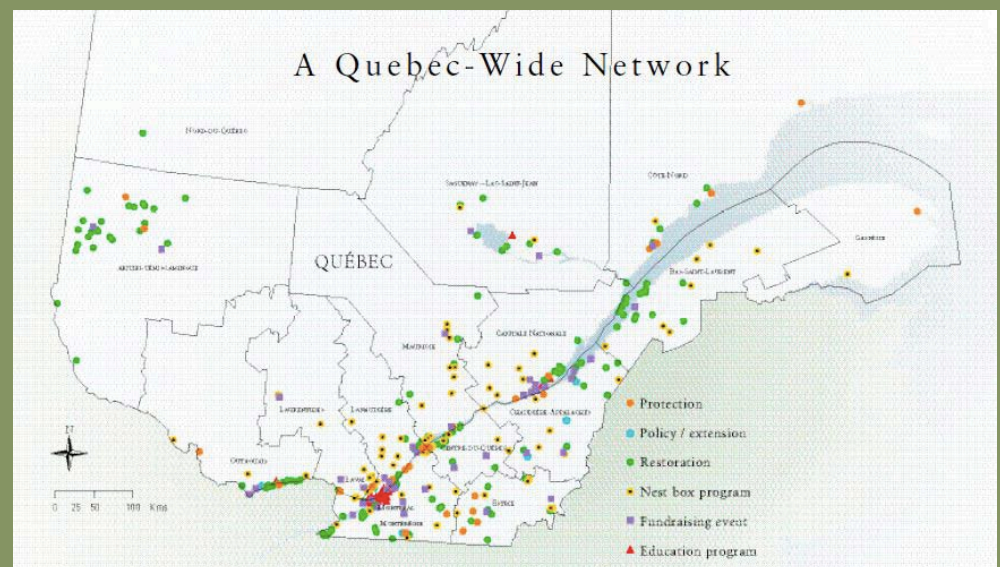
St. Lawrence Action Plan – 12 *Zones d'intervention prioritaire* (ZIPs)

- Ecological Rehabilitation Action Plans (ERAPs) reflect local community priorities and include wetland (and other) restoration projects

- E.g. Berthiaume du Tremblay marsh in Laval



Ducks Unlimited wetlands restoration and other projects (Ducks Unlimited 2005)



Species-related restoration



Restoration of False sedge hop (*Carex lupuliformis* Sartwell) at Parc national d'Oka

- In Canada only in southern ON and QC
- 450 re-introduced to natural habitat in in 2008, with more re-introductions planned

Controlled burning to restore White pine (*Pinus strobus*) in La Mauricie National Park

- Only 1% of park's tree species now
- 6 prescribed burns since 1995



Recovery plans for Allegheny Mountain dusky **salamander** (*Desmognathus ochrophaeus*) and Western chorus frog (*Pseudacris triseriata*)



Restoration and Protected areas



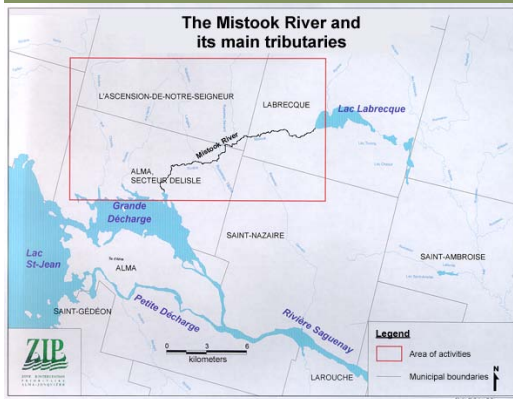
Ecosystem rehabilitation at Parc national du Mont Orford:

- Erosion control on access road
- Rehabilitation of forest edge along ski slopes and understory in off-slope areas
- New snowmaking protocol to reduce damage to vegetation and impacts on streams and Étang des cerises.

Pilot project on restoration of forest landscape in Parc national des Îles de Boucherville (Laliberté et al. 2006)



Restoration of rivers, lakes and streams



Alma-Jonquière ZIP: cleanup and restoration of the Mistook, Aux Harts and Aux Chicots rivers:

- Revegetation of riparian areas
- Stock fencing
- Removal of garbage and debris
- “Restoration” of fish habitat (e.g. riffle-pool sequences)

Nicolet River restoration:
Community-led restoration of biophysical conditions to support fish:

- Tree planting in watershed
- “Restoration” of river geomorphology with rock sills, stream deflectors, etc.
- Bank stabilization
- Reintroduction of salmonids



Insights and Conclusions

Not always clear what is “ecological restoration” in QC -- more consistent understanding and practice possible, using SER definitions, etc.

Unfulfilled opportunities: authority without action

Rich arena for further study!

- A more comprehensive survey and evaluation
- Research on funding
- Comparative studies

How about a Symposium on Ecological Restoration in Quebec?

Thank you!

References

- Angers, V.A., Bouthillier, L., Gendron, A. and T. Montpetit, 2008. Plan de conservation de la rainette faux-grillon en Montérégie - Arrondissement de Saint-Hubert. Centre d'information sur l'environnement de Longueuil et Équipe de rétablissement de la rainette faux-grillon de l'Ouest au Québec.
- Boudreau, S. 1999. Restauration de tourbières exploitées, abandonnées et recolonisées par diverse communautés végétales. Masters thesis. Laval University, Quebec City, Quebec.
- Canadian Geographic. 2010. Community Awards Network, Comité de restauration de la rivière Etchemin. URL http://www.canadiangeographic.ca/cea/archives/archives_individual.asp?id=175 [accessed 27 April 2010].
- Coté, C. 2010. Une minuscule grenouille disparaîtra du Québec. Cyberpresse. Montreal, Quebec. URL <http://www.cyberpresse.ca/environnement/201004/20/01-4272199-une-minuscule-grenouille-disparaitra-du-quebec.php> [accessed on 24 April 2010].
- Corporation de gestion des Rivières des Bois-Francis (CGRBF). 2010. La CGRBF. URL <http://www.pourvoirie-bois-francis.qc.ca/corporation-rivieres-bois-francis.html> [accessed on 27 April 2010].
- Couillard, L. and G. Jolicoeur. 2008. Plan de conservation de l'aster du Saint-Laurent (*Symphytotrichum laurentianum*) : Espèce menacée au Québec. Quebec Ministry of Sustainable Development, Environment and Parks, Direction du patrimoine écologique et des parcs, Quebec City, Quebec.
- Coursol, F. 2001. Carex faux-lupulina. Quebec Ministry of Sustainable Development, Quebec City, Quebec. URL <http://www.mddep.gouv.qc.ca/biodiversite/especes/carex/carex.htm> [accessed on 24 April 2010].
- Ducks Unlimited Canada. 2005. Knowledge, Action, Awareness: Quebec. Quebec City, Quebec.
- Dugré, V. 2006. Caractérisation des milieux humides du circuit de pêche Mont-Orignal. Comité de restauration de la rivière Etchemin. Saint-Léon-de-Standon, Quebec.
- Ehrenfeld, J.G. 2000. Defining the limits of restoration: the need for realistic goals. *Restoration Ecology* 8(1):2-9.
- Environment Canada. 2010. Restoration of threatened wetlands. Canadian Wildlife Service, Ottawa, Ontario. URL <http://www.qc.ec.gc.ca/faune/faune/html/restoration.html> [accessed 27 April 2010].

Équipe de rétablissement de la rainette faux-grillon de l'ouest. 2000. Plan derétablissement de la rainette faux-grillon de l'ouest (*Pseudacris triseriata*) au Québec, Jutras J., éditeur, Société de la faune et des parcs du Québec, Québec.

Fondation Hydro-Quebec pour l'environnement. 2004. Annual Report 2004. URL http://www.hydroquebec.com/fondation-environnement/en/pdf/annual_report_2004.pdf [accessed on 27 April 2004].

Fonds d'action québécois pour le développement durable. 2007. Le FAQDD 5 ans plus tard: Impact des groupes environnementaux en développement durable. Quebec City, Quebec. URL http://www.faqdd.qc.ca/_telechargements/sect_publications/Brochure.pdf [accessed 27 April 2010].

Fonds d'action québécois pour le développement durable. 2010. Aperçu. URL http://www.faqdd.qc.ca/01_1_aperçu.asp [accessed 27 April 2010].

Fortin, C., V. Banci, J. Brazil, M. Crête, J. Huot, M. Huot, R. Lafond, P. Paré, J. Shaefer, and D. Vandal. 2005. National recovery plan for the wolverine (*Gulo gulo*) [Eastern Population]. National Recovery Plan No. 26. Recovery of Nationally Endangered Wildlife (RENEW). Ottawa, Ontario.

Francoeur, L. 2005. Québec sévit pour protéger les marais. *Le Devoir* du 24 août 2005.

Francoeur, L. 2006. Certains milieux humides seront moins protégés. *Le Devoir* du 29 novembre 2006.

Francoeur, L. 2008. Remblayage de marécage à Laval - Québec conclut une entente à l'amiable avec le promoteur délinquant. *Le Devoir* du 28 mai 2008.

Frenette, M. 2008. Plan de conservation des salamandres de ruisseaux au mont Covey Hill, Montérégie, Conservation de la nature Canada et Équipe de rétablissement des salamandres de ruisseaux. Montréal, Quebec.

Girard, M., C. Lavoie and M. Thériault. 2002. The Regeneration of a Highly Disturbed Ecosystem: A Mined Peatland in Southern Quebec. *Ecosystems* 5(3): 274-288.

Giroux, I. and M. Simoneau. 2008. État de l'écosystème aquatique du bassin versant de la rivière Nicolet : faits saillants 2004-2006. Quebec Ministry of Sustainable Development, Environment and Parks, USBN 978-2-550-53174-6.

Government of Quebec. 2002a. Quebec Water Policy. Quebec City, Quebec.

Government of Quebec. 2002b. Parks Policy: Activities and Services. Société de la faune et des parcs du Québec, Direction de la planification des parcs, Quebec City, Quebec.

Government of Quebec. 2004. Plan directeur du Parc national des Hautes-Gorges-de-la-Rivière-Malbaie. Société de la faune et des parcs du Québec, Direction de la planification des parcs, Quebec City, Quebec.

Government of Quebec. 2007. Traitement des demandes d'autorisation des projets dans les milieux humides. Ministry of Sustainable Development, Environment and Parks. Quebec City, Quebec.

Government of Quebec. 2009. Plan stratégique 2009-2014. Ministry of Sustainable Development, Environment and Parks. Quebec City, Quebec.

Government of Quebec. 2010a. Carcajou. Fiches descriptives des espèces menacées ou vulnérables. Ministry of Natural Resources and Wildlife. URL <http://www.mrnf.gouv.qc.ca/faune/especes/fiches-descriptives/carcajou.jsp> [accessed on 24 April 2010].

Government of Quebec. 2010b. Rainette faux-grillon de l'Ouest. Fiches descriptives des espèces menacées ou vulnérables. Ministry of Natural Resources and Wildlife. URL <http://www3.mrnf.gouv.qc.ca/faune/especes/menacees/fiche.asp?noEsp=2> [accessed on 24 April 2010].

Government of Quebec. 2010c. Aires Protégées. Ministry of Sustainable Development, Environment and Parks. URL http://www.mddep.gouv.qc.ca/biodiversite/aires_protegees/terres-pub.htm#parcs-flor accessed on 27 April 2010].

Government of Quebec. 2010d. Mont-Orford, Rehabilitation of degraded natural areas of the skiable terrain and golf course. Ministry of Sustainable Development, Environment and Parks. URL <http://www.mddep.gouv.qc.ca/parcs/Mt-Orford/rehabilitation/index-en.htm> [accessed on 27 April 2010].

Groupe Rousseau Lefebvre. 2010. Marais Berthiaume du Tremblay. URL <http://www.rousseau-lefebvre.com/marais.htm> [accessed on 27 April 2010].

Hamann, J. 2010. «Verdir» les pits de sable. In *Au fil des événements: Le journal de la communauté universitaire*. Laval University, Quebec City, Quebec. URL <http://www.aufil.ulaval.ca/articles/verdir-les-pits-sable-23761.html> [accessed 27 April 2010].

Hogue-Hugron, S. 2010. Régénération spontanée et restauration des bancs d'emprunt en milieu nordique. Masters thesis project summary. Laval University, Quebec City, Quebec. URL <http://www.cen.ulaval.ca/shoguchugron.html> [accessed 27 April 2010].

Jolicoeur, G. and L. Couillard. 2006a. Plan de conservation du carex faux-lupulina (*Carex lupuliformis*), Espèce menacée au Québec. Quebec Ministry of Sustainable Development, Environment and Parks, Direction du patrimoine écologique et des parcs. Quebec City, Quebec.

Jolicoeur, G. and L. Couillard. 2006b. Plan de conservation de la sagittaire à sépales dressés sous-espèce des estuaires (*Sagittaria montevidensis* subsp. *spongiosa*), Espèce menacée au Québec. Quebec Ministry of Sustainable Development, Environment and Parks, Direction du patrimoine écologique et des parcs, Quebec City, Quebec.

Jolicoeur, G. and L. Couillard. 2007a. Plan de conservation de l'aster d'Anticosti (*Symphyotrichum anticostense*) : Espèce menacée au Québec. Quebec Ministry of Sustainable Development, Environment and Parks, Direction du patrimoine écologique et des parcs, Quebec City, Quebec.

Jolicoeur, G. and L. Couillard. 2007b. Plan de conservation de la carmantine d'Amérique (*Justicia americana*) : Espèce menacée au Québec. Quebec Ministry of Sustainable Development, Environment and Parks, Direction du patrimoine écologique et des parcs, Quebec City, Quebec.

Jolicoeur, G. and L. Couillard. 2007c. Plan de conservation de la cicutaire maculée variété de Victorin (*Cicuta maculata* var. *victorinii*) : Espèce menacée au Québec. Quebec Ministry of Sustainable Development, Environment and Parks, Direction du patrimoine écologique et des parcs, Quebec City, Quebec.

Jolicoeur, G. and L. Couillard. 2007d. Plan de conservation du gentianopsis élancé variété de Victorin (*Gentianopsis procera* subsp. *macounii* var. *victorinii*) : Espèce menacée au Québec. Quebec Ministry of Sustainable Development, Environment and Parks, Direction du patrimoine écologique et des parcs, Quebec City, Quebec.

Jolicoeur, G. and L. Couillard. 2008. Plan de conservation de l'ériocaulon de Parker (*Eriocaulon parkeri*) : Espèce menacée au Québec. Quebec Ministry of Sustainable Development, Environment and Parks, Direction du patrimoine écologique et des parcs, Quebec City, Quebec.

Joly, M., S. Primeau, M. Sager and A. Bazoge, Guide d'élaboration d'un plan de conservation des milieux humides, First Edition. Quebec Ministry of Sustainable Development, Environment and Parks, Direction du patrimoine écologique et des parcs, 2008, ISBN 978-2-550-53636-9.

Higgs, E. 2003. Nature by Design. The MIT Press, Cambridge, Massachusetts.

Laliberté, E., A. Cogliastro and A. Bouchard. 2006. Projet pilote de restauration de paysages forestiers au parc national des îles-de-Boucherville. Rapport final présenté à la direction du parc national des îles-de-Boucherville, Société des établissements de plein air du Québec (SÉPAQ). Institut de recherche en biologie végétale, Montréal, Québec.

Lavoie, C., C. Zimmerman and S. Pellerin. 2001. Peatland restoration in southern Quebec (Canada): A paleological perspective. *Ecoscience* 8(2): 247-258.

Lavoie, C., P. Grosvernier, M. Girard and K. Marcoux. 2003. Spontaneous revegetation of mined peatlands: An useful restoration tool? *Wetlands Ecology and Management* 11: 97-107.

Letendre, J., S. Pellerin, M. Lemay and V. Vermette. 2009. Reintroducing False sedge hop in Parc National d'Oka. Page 7 in *Park Journal, Parc National d'Oka*. Québec. Québec City, Québec.

Paquette, A. Réhabilitation de forêts par la plantation sous couvert: écologie des arbres plantés dans le sud-ouest du Québec. Dissertation. University of Montreal, Montreal, Québec.

Parks Canada. 2009. La Mauricie National Park of Canada, Controlled Burns to the Rescue of the White Pine. Ottawa, Ontario. URL <http://www.pc.gc.ca/eng/pn-np/qc/mauricie/natcul/natcul1/c/ii.aspx> [accessed 27 April 2010].

Quenneville, R. and M. Thériault. 2001. La restauration des écosystèmes de pin blanc (*Pinus strobus*): Un enjeu majeur pour le Parc national de la Mauricie. *Le Naturaliste Canadien* 125(2): 39-42.

Quinty, F. and L. Rochefort. 2003. Peatland Restoration Guide, second edition. Canadian Sphagnum Peat Moss Association and New Brunswick Department of Natural Resources and Energy. Québec City, Québec.

Rochefort, L. and E. Lode. 2006. Restoration of Degraded Boreal Peatlands. Pages 381-423 in R.K. Wieder and D. H. Vitt, editors. *Ecological Studies, Vol 188, Boreal Peatland Ecosystems*. Springer-Verlag Berlin, Germany.

Rubec, C. D. A. and A. R. Hanson. 2009. Wetland mitigation and compensation: Canadian experience. *Wetlands Ecology Management* 17:3-14.

St-Laurent Vision 2000. 2002. The Alma-Jonquière ZIP Committee, New restoration work on Saguenay tributaries. Newsletter, St. Lawrence Vision 2000, Volume 12 Issue 8 URL http://www.slv2000.qc.ec.gc.ca/bibliotheque/lefleuve/vol12no8/zip_alma_a.htm [accessed on 27 April 2010].

St-Laurent Vision 2000. 2010. Area of Prime Concern. URL http://www.slv2000.qc.ec.gc.ca/zip/accueil_a.htm [accessed on 27 April 2010].

- St. Lawrence Action Plan for a Sustainable Development. 2010. St. Lawrence Plan. URL http://www.planstlaurent.qc.ca/sl_bm/interventions_g/psl/accueil_e.html [accessed on 27 April 2010].
- Society for Ecological Restoration International Science & Policy Working Group. 2004. The SER International Primer on Ecological Restoration. Tucson: Society for Ecological Restoration International. URL www.ser.org [accessed on 24 April 2010].
- Society for Ecological Restoration International. 2010. Society for Ecological Restoration International online. URL www.ser.org [accessed on 27 April 2010].
- Therrien, J., G. Shooner, G. Bourgeois and C. Beaulieu. 1995. Étude de faisabilité sur la réintroduction du saumon atlantique dans la rivière Etchemin. Rapport du Groupe Environnement Shooner pour la Comité de restauration de la rivière Etchemin. Etchemin, Quebec. URL <http://www.crrc.ca/accueil.htm> [accessed on 27 April 2010].
- Tremblay, J., I. Bélanger, M. Desponts and G. Brunet. 2007. La restauration passive des sapinières mixtes de second venue: une alternative pour la conservation pour les sapinières mixtes anciennes. *Canadian Journal of Forest Research* 37:825-839.
- Villeneuve, N. 2010a. Domaine Islemère: «C'est proprement scandaleux!» - Thomas Mulcair. *Courrier Laval*. URL <http://www.courrierlaval.com/article-i419119-Domaine-Islemere-Cest-proprement-scandaleux-Thomas-Mulcair.html> [accessed 27 April 2010].
- Villeneuve, N. 2010b. Empiètement dans un marécage: La Résidence des Philanthropes en infraction. *Courrier Laval*. URL <http://courrierlaval.com/article-451033-Empiement-dans-un-marecage-La-Residence-des-Philanthropes-en-infraction.html> [accessed on 27 April 2010].
- Whiteway, S. 2009. Assessing the Effectiveness of Instream Structures for Restoring Salmonid Streams. Masters thesis. Concordia University, Montreal, Quebec.