

# BIODIVERSITY PERFORMANCE REPORT | 2015

MAY 2016





## CORPORATE STRATEGY ON **BIODIVERSITY** | 2015–2020

The *Corporate Strategy on Biodiversity, 2015–2020* provides a framework for taking account of and protecting biodiversity. It is inspired by the Quebec government's guidelines on biological diversity (*Orientations gouvernementales en matière de diversité biologique*). Hydro-Québec has also adopted a Sustainable Development Action Plan 2015–2020 and publishes an annual *Biodiversity Performance Report*.

### ISSUES AND OBJECTIVES IN BIODIVERSITY

#### ISSUE 1



#### PROTECT AND RESTORE ECOSYSTEMS

##### **OBJECTIVE 1**

Take account of species assemblages and ecosystems

##### **OBJECTIVE 2**

Help preserve special-status species and protected areas

##### **OBJECTIVE 3**

Foster connectivity between natural habitats and help combat invasive alien species

#### ISSUE 2



#### DEVELOP TOOLS THAT HELP MAINTAIN BIODIVERSITY

##### **OBJECTIVE 4**

Design tools, frameworks and best-practice guides

##### **OBJECTIVE 5**

Participate in conserving Québec's biodiversity

#### ISSUE 3



#### ACQUIRE KNOWLEDGE

##### **OBJECTIVE 6**

Carry out surveys and environmental follow-ups

##### **OBJECTIVE 7**

Further the development of knowledge on biodiversity and ecosystem services

#### ISSUE 4



#### RAISE AWARENESS, INFORM AND EDUCATE

##### **OBJECTIVE 8**

Encourage collaboration and knowledge sharing

##### **OBJECTIVE 9**

Raise awareness among Hydro-Québec personnel and the general public about the importance of protecting biodiversity

BIODIVERSITY  
PERFORMANCE REPORT | 2015

COVER PHOTOS



Weir, fish pass  
and developed  
spawning ground in  
the Rivière Rupert



Telemetric monitoring  
of golden eagles in  
the Romaine complex



Glossy buckthorn,  
an invasive alien species  
*(Photo: Rob Routledge,  
Sault College, Bugwood.org)*



Walleye caught  
during a scientific  
fishing program



Environmental  
follow-up on the  
Rivière Eastmain

# SUMMARY

---

Hydro-Québec operates a huge fleet of facilities, and in doing so affects biodiversity in the surrounding habitats. In order to ensure responsible and sustainable management, it carries out its activities in a way that protects biodiversity and its associated ecological services.

In 2015, to improve its governance in the area of biodiversity, Hydro-Québec adopted a new corporate strategy on biodiversity, as well as a new action plan on sustainable development. In addition, it completed its first public accountability report on biodiversity, the *Biodiversity Performance Report – 2014*.

In 2015, Hydro-Québec carried out a number of measures to implement the objectives in its new corporate strategy on biodiversity. Here are a few of its achievements illustrating the magnitude of this effort:

- 99% of the electricity generated by Hydro-Québec was from renewable energy sources
- 94% of the vegetation control in transmission line rights-of-way was done mechanically, without the use of herbicides
- \$107,500 in donations and sponsorships to support organizations that help maintain biodiversity in Québec
- 116 wildlife species were studied
- 30 employees participated in a pilot project to assess the relationships between Hydro-Québec's activities and ecosystem services
- 52 published studies by Hydro-Québec on biodiversity
- 13 academic conferences on the natural environment presented
- 5,493 schoolchildren were educated about protecting biodiversity
- 1,164 employees received training on biodiversity

In 2015, Hydro-Québec measured environmental changes and monitored the status of wildlife populations in 16 environmental follow-ups. These studies show that species richness and biological productivity in developed environments are comparable to those in nearby natural environments: for example, a reservoir is an aquatic ecosystem comparable to a natural lake in Québec. The new environments created provide the habitats and food required for a rich and diversified fauna. The various species present in these environments are able to complete their life cycles and maintain their populations naturally. In addition, these environmental follow-up studies are a source of invaluable information which is fed into a vast databank used by Hydro-Québec to evaluate the impacts of its projects.

Hydro-Québec also paid a great amount of attention and effort to the protection of special-status species such as American shad and western chorus frog.

Through its measures to promote biodiversity in 2015, Hydro-Québec followed the Québec government's guidelines on biological diversity, *Orientations gouvernementales en matière de diversité biologique 2013*, as well as its own *Corporate Strategy on Biodiversity, 2015-2020*. Furthermore, the ideas and considerations resulting from this report will allow Hydro-Québec to optimize how it manages biodiversity.

Lastly, in an effort to make improvements and increase efficiency, Hydro-Québec will devise and adopt an annual commitment plan on biodiversity. It also plans to establish a research chair in phytotechnology at the Université de Montréal's plant biology research institute.

# EDITORIAL TEAM

---

The plant, animal and biodiversity committee, *Réseau faune, flore et biodiversité*, is composed of roughly a dozen environmental specialists from different Hydro-Québec business units that interact significantly with biodiversity. The committee serves as a platform for the exchange of information and ideas and helps to define Hydro-Québec's objectives and framework in order to maximize the consideration and protection of biodiversity and species at risk. The committee also provides scientific advice to the competent authorities (provincial and federal governments) to optimize the management of Québec natural heritage. Lastly, this network of experts on ecology is responsible for producing Hydro-Québec's annual public accountability report on biodiversity, the current document.

## VICE-PRÉSIDENCE – AFFAIRES CORPORATIVES ET SECRÉTARIAT GÉNÉRAL, HYDRO-QUÉBEC

Benoît Vanier, Biologist, M.Sc. (*Coordination and writing*)

Benoit Diab, Biologist (*Writing*)

Hervé Pageot, Attorney

## VICE-PRÉSIDENCE – TECHNOLOGIES DE L'INFORMATION ET DES COMMUNICATIONS, HYDRO-QUÉBEC

Tania Le Cavalier, Biologist, M.Sc.

## HYDRO-QUÉBEC DISTRIBUTION

Gervais Pellerin, Ecologist

Isabelle St-Jean, Biologist, M. Sc.

## HYDRO-QUÉBEC ÉQUIPEMENT ET SERVICES PARTAGÉS

Karine Brisson, Biologist, M. Sc.

Valérie Groison, Biologist, M. Sc.\*

Stéphane Lapointe, Biologist M. Sc.

## HYDRO-QUÉBEC PRODUCTION

Jean-Philippe Gilbert, Biologist, M. Sc.

## HYDRO-QUÉBEC TRANSÉNERGIE

Alexandre Beauchemin, Biologist, M. Sc.

Véronique Michaud, Biologist, M. Sc.\*



*The Réseau faune, flore et biodiversité is responsible for producing the Biodiversity Performance Report.*

\* Not in photo

# TABLE OF CONTENTS

---



- 3 Summary
- 4 Editorial Team
- 6 Introduction
- 10 Management of Biodiversity
- 13 Achievements



- 39 Conclusion
- 41 Appendix A
- 42 Appendix B

- 12 **ISSUE 1** – Protect and restore ecosystems
- 20 **ISSUE 2** – Develop tools that help maintain biodiversity
- 24 **ISSUE 3** – Acquire knowledge
- 34 **ISSUE 4** – Raise awareness, inform and educate

# INTRODUCTION

## SCOPE OF REPORT

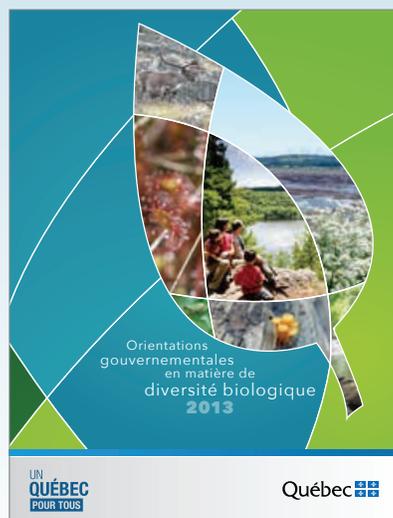
The *Biodiversity Performance Report, 2015* describes the measures undertaken by Hydro-Québec to take account of and protect biodiversity. These measures were implemented, or were the subject of a publication, between January 1 and December 31, 2015. Only activities directly involving ecosystems or living species were included. Other environmental measures concerning the human environment, archeology, visual considerations and the management of contaminants or residual hazardous materials, are covered in the *Sustainability Report 2015*.<sup>1</sup>

This public accountability exercise references the *Corporate Strategy on Biodiversity 2015-2020* (see inside front cover), which in turn is based on the Quebec government's guidelines on biological diversity (*Orientations gouvernementales en matière de diversité biologique 2013*<sup>2</sup>). This report also allows Hydro-Québec's contributions to the achievement of the Québec government's guidelines and, by extension, to the Aichi biodiversity targets, to be assessed. Lastly, a table is provided to illustrate the relationship between the achievements outlined in this report and the principles of biodiversity as set out in Quebec's *Sustainable Development Act* (see Appendix A).

This report contains only a partial description of Hydro-Québec's achievements to take account of and protect ecosystems. However, we would like to think that it will demonstrate this government-owned corporation's leadership in the management and protection of Québec's natural heritage.



Hydro-Québec's  
*Sustainability Report 2015*



Government of Québec  
*Orientations gouvernementales en matière de diversité biologique 2013*

The text of the *United Nations Convention on Biological Diversity* (1992) defines biological diversity as the «variability among living organisms from all sources including, inter alia, terrestrial, marine and other aquatic ecosystems and the ecological complexes of which they are part; this includes diversity within species, between species and of ecosystems.»

1. Hydro-Québec. 2016. *Sustainability Report 2015*. Montréal, Hydro-Québec, 75 p.

2. Ministère du Développement durable, de l'Environnement, de la Faune et des Parcs. 2013. *Orientations gouvernementales en matière de diversité biologique 2013*. Québec, 23 p.

## METHODOLOGY

The information used to prepare this report comes from three main sources:

1. Questionnaires completed by environmental specialists and validated by their supervisors
2. Reports, studies and surveys produced by and for Hydro-Québec during 2015 (see Appendix B)
3. Data transmitted directly by experts in a specific field (e.g., fish specialist, environmental instructor, etc.)

Reports produced by Hydro-Québec provided information essential in drafting this report.



Main reports on environmental activities produced by Hydro-Québec in 2015

The Vice-présidence – Affaires corporatives et secrétariat général drafted the first version of this report, the contents of which were then validated by the *Réseau faune, flore et biodiversité*.

A new feature in this year's report is the evaluation of Hydro-Québec's performance in terms of each of the nine objectives in the *Corporate Strategy on Biodiversity 2015–2020*. This assessment is based on the scope and frequency of the measures undertaken in 2015. The main purpose of this evaluation was to encourage reflection on potential avenues for improvements.

One of the following three ratings was given for each objective:

EXCELLENT	GOOD	FAIR
-----------	------	------

## CHANGES IN BIODIVERSITY

The main factors responsible for the disappearance of species are habitat loss, fragmentation and degradation. The proliferation of invasive alien species, non-sustainable use of resources and climate change also influence ecosystem dynamics.

Among the 60,000 or so species that occur in Québec, at least 500 are at risk, while more than 1,000 species have been introduced in the province. Changes in biodiversity are particularly significant in the southern part of the province, where anthropogenic pressures are the strongest, although this influence is being felt increasingly further north. In some very developed areas in southern Québec, a significant extinction debt has been incurred and delayed extinctions are probably inevitable.<sup>3</sup>

Between now and the end of the century, it is estimated that average temperatures in Québec could increase by roughly 5°C, resulting in regional climate zones being shifted 500 km to the north. The province's low temperatures and short summers limit the northern distribution of various plant and animal species. Temperature is the most influential climatic factor in Québec's biodiversity. The number of immigrations made possible by climate change will be greater than the number of extirpations that it could cause.<sup>3</sup>

3. Berteaux, D., N. Casajus and S. De Blois. 2014. *Changements climatiques et biodiversité du Québec : vers un nouveau patrimoine naturel*. Presses de l'Université du Québec. 169 p.

This is the paradox of northern biodiversity since climate change will reduce biodiversity on a global scale. However, climate change in the North will put pressure on a number of native species that will be forced to share resources with the newcomers, as well as having to adapt to the new conditions.

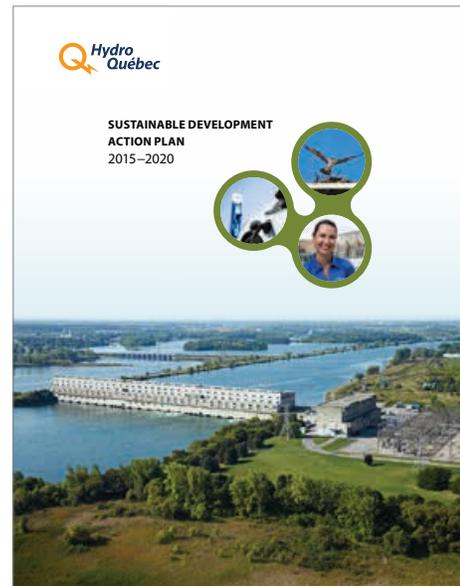
Hydro-Québec favors hydroelectricity as a renewable form of energy that helps to fight climate change. However, it operates a huge fleet of facilities and equipment, including 63 hydroelectric generating stations in operation and two under construction, 533 transformation substations, 34,272 km of transmission lines and 116,258 km of distribution lines<sup>4</sup> (see Map 1). These facilities interface with terrestrial and aquatic ecosystems, hence Hydro-Québec's preoccupation with and concern for biodiversity.



Hydro-Québec's  
Annual Report 2015

More specifically, the objectives of the Biodiversity Performance Report are to:

- Document measures adopted in 2015 by Hydro-Québec to protect biodiversity and take account of it in its ongoing operations
- Assess the success of the implementation of the *Corporate Strategy on Biodiversity 2015–2020*
- Demonstrate innovative measures undertaken (Action 8 of Hydro-Québec's *Sustainable Development Action Plan, 2015–2020*)
- Measure the degree to which the Quebec government's guidelines on biological diversity (*Orientations gouvernementales en matière de diversité biologique 2013*) have been taken into account
- Describe how the three principles of sustainable development related to biodiversity in Quebec's *Sustainable Development Act* are being taken into account
- Identify the challenges to be met and suggest potential avenues for improvement



Sustainable Development Action Plan  
2015-2020

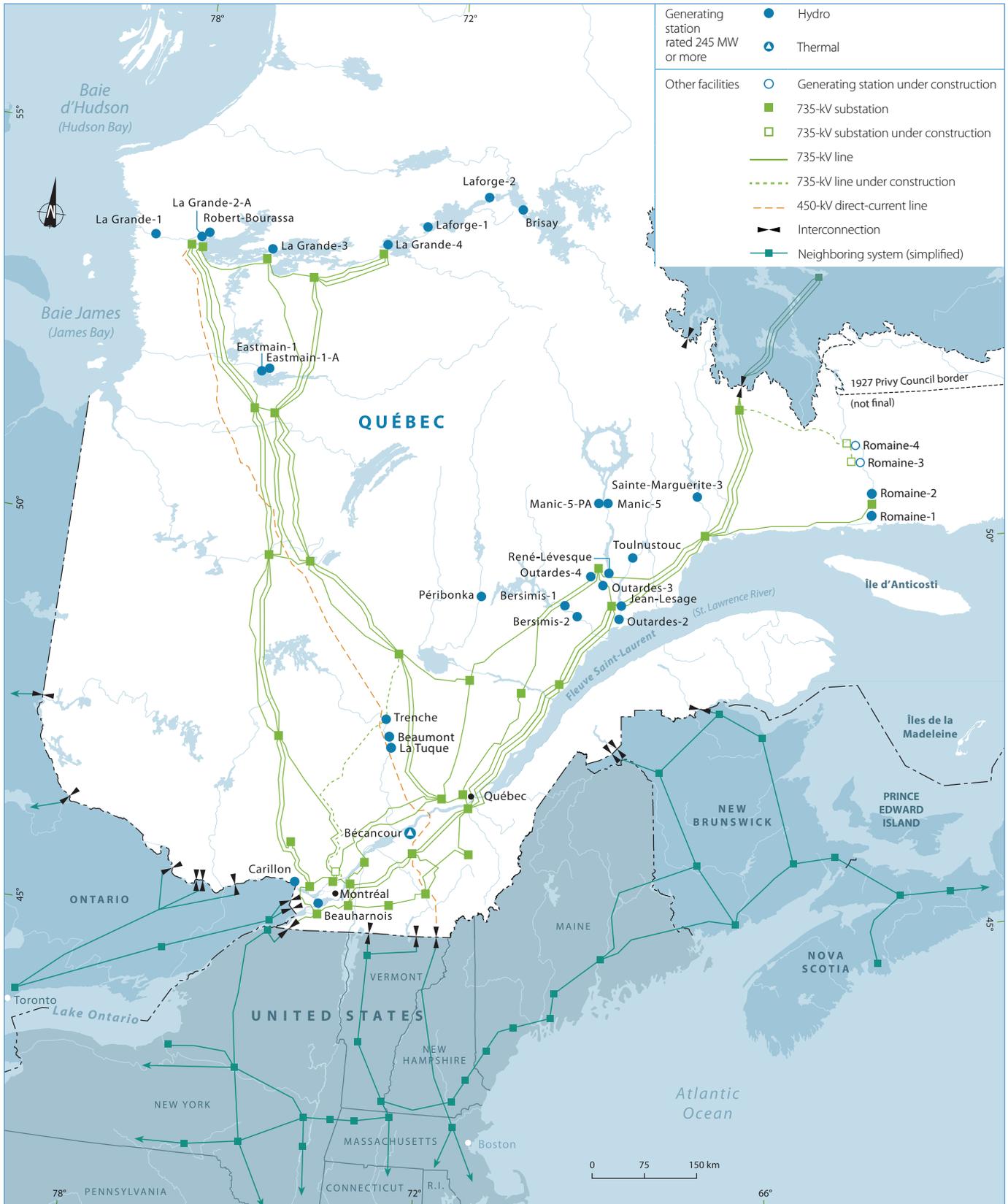
## OBJECTIVES

This second edition of the *Biodiversity Performance Report* constitutes Hydro-Québec's public accountability report on biodiversity. It is intended for readers knowledgeable about ecology (scientists working for governments, universities and other research organizations) as well as for individuals interested in the protection of natural habitats.

The purpose of the Quebec government's guidelines on biological diversity (*Orientations gouvernementales en matière de diversité biologique 2013*) is to facilitate the incorporation in decision-making of principles arising under the Sustainable Development Act, particularly those involving the preservation of biodiversity, the respect of ecosystems' support capacity and the internalization of costs. These guidelines also respond to the government's commitments regarding the implementation of the United Nations' *Convention on Biological Diversity*.

4. Hydro-Québec. 2016. *Annual Report 2015*. Affaires corporatives et secrétariat général. Montréal, Hydro-Québec. 102 p.

Map 1– Our major facilities



# MANAGEMENT OF BIODIVERSITY

## INNOVATIVE GOVERNANCE

In its *Biodiversity Performance Report – 2014*,<sup>5</sup> Hydro-Québec targeted potential avenues for improvement in the governance of biodiversity. The main improvement made in 2015 involved integrating and coordinating the components of biodiversity management (strategy, planning, implementation and public accountability reporting). Figure 1 shows the components in the governance process used by Hydro-Québec to integrate biodiversity management into its ongoing operations.

Figure 1 – The management of biodiversity at Hydro-Québec



**AVENUE FOR IMPROVEMENT:**  
IN 2016, HYDRO-QUÉBEC PLANS TO SHARE ITS EXPERTISE IN THE GOVERNANCE OF BIODIVERSITY.

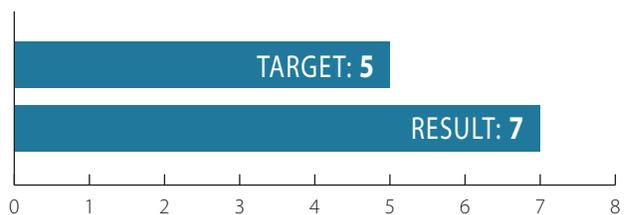
## NEW BIODIVERSITY STRATEGY

In accordance with the findings in the *Biodiversity Performance Report – 2014*, Hydro-Québec formulated a new *Corporate Strategy on Biodiversity 2015–2020* (see inside front cover). The new strategy is the product of a major review in order to respond to the Quebec government’s guidelines on biological diversity (*Orientations gouvernementales en matière de diversité biologique 2013*), as well as recent trends in the field of biodiversity. The new strategy addresses issues where Hydro-Québec, like the Québec government, is working to improve its own practices by 2020. For example, Objective 1 – *Take account of species assemblages and ecosystems* will help to improve the management of Québec’s natural heritage in relation to the species-by-species approach that is currently being used.

### NEW ACTION PLAN: BIODIVERSITY TARGETS MET

As described in the *Biodiversity Performance Report – 2014*, Hydro-Québec has broadened the scope of the biodiversity measures contained in its *Sustainable Development Action Plan, 2015–2020 (SDAP)*<sup>6</sup> for all its divisions. It has met and exceeded its biodiversity targets, which has helped to further the protection of biodiversity in terms of the four major issues identified in the Corporate Strategy on Biodiversity (see Figure 2).

Figure 2 – Number of innovative measures in biodiversity implemented in 2015 versus targets set in SDAP



<p><b>DIVERSITÉ BIOLOGIQUE</b></p>	<p><b>ACTION:</b> CONTINUE MEASURES THAT TAKE INTO ACCOUNT AND PROTECT BIODIVERSITY AND ECOSYSTEM SERVICES</p> <p><b>INDICATOR:</b> NUMBER OF INNOVATIVE MEASURES IMPLEMENTED ANNUALLY TO TAKE INTO ACCOUNT AND PROTECT BIODIVERSITY AND ECOSYSTEM SERVICES</p> <p><b>2015 RESULT:</b> TARGET EXCEEDED, WITH SEVEN INNOVATIVE MEASURES IMPLEMENTED</p>
------------------------------------	--

5. Hydro-Québec. 2015. *Bilan des réalisations en biodiversité – 2014*. Montréal, Hydro-Québec. 32 p.

6. Hydro-Québec. 2015. *Sustainable Development Action Plan, 2015-2020*. Montréal, Hydro-Québec. 17 p.

## SEVEN INNOVATIVE MEASURES IMPLEMENTED BY HYDRO-QUÉBEC IN 2015

1. Determination of priority biosecurity issues (Objective 3)
2. Adoption of a new corporate biodiversity strategy integrating the government guidelines on biodiversity (Objective 4)
3. Publication of our first biodiversity performance report (Objective 4)
4. Development of a protocol for assessing the ecological value of Hydro-Québec's properties (Objective 4)
5. Assessment of the interdependencies between our activities and ecosystem services (Objective 7)
6. Dissemination of environmental studies carried out by and for Hydro-Québec online (Objective 8)
7. Development of an educational kit for grade 3 and 4 students with an interactive section on the importance of protecting biodiversity (Objective 9)

### AVENUE FOR IMPROVEMENT:

HYDRO-QUÉBEC WILL USE THE OBJECTIVES DEFINED IN THE CORPORATE STRATEGY ON BIODIVERSITY 2015–2020 TO PLAN ITS MEASURES ON BIODIVERSITY IN 2016.

## IMPLEMENTATION

The respect and preservation of the environment are fundamental values for Hydro-Québec. Most of its activities that could have a significant impact on natural ecosystems are governed by an ISO 14001–certified environmental management system. This standard helps us systematically take account of key elements of biodiversity in our ongoing operations and continually improve the effectiveness of the protection measures undertaken. For example, Hydro-Québec has established ecological instream flows at the outlets of its hydroelectric developments and a framework for guiding and overseeing environmental assessments. In addition, it has developed solid expertise in implementing measures for protecting and restoring natural habitats. In 2015, 94% of vegetation control in transmission line rights-of-way was done mechanically, without resorting to herbicides.

## MONITORING AND REPORTING

Hydro-Québec carries out many environmental follow-ups, surveys and assessments to measure changes in the environment, and monitor the status of wildlife and plant populations and the effectiveness of mitigation, enhancement and compensation measures. These studies enable the company to take any necessary corrective actions required. In addition, environmental follow-up studies provide an invaluable source of information, which is fed into a vast databank used by Hydro-Québec to evaluate the impacts of its projects.

In 2015, Hydro-Québec carried out 16 environmental follow-ups comparing wildlife abundance with a pre-project baseline (see Appendix B). In the interests of transparency, Hydro-Québec has been making these follow-ups available on its Web site since June 2015. These studies show that species richness and biological productivity in developed environments are comparable to those in nearby natural environments: for example, a reservoir is an aquatic ecosystem comparable to a natural lake in Quebec.<sup>7,8,9</sup> The new environments created provide the habitats and food required for a rich and diversified fauna. The various species present in these environments are able to complete their life cycles and maintain their populations naturally.

In addition, Hydro-Québec published its first annual public accountability report on biodiversity, the *Biodiversity Performance Report– 2014*.<sup>10</sup>

## IMPROVEMENT

Based on information that comes mainly from follow-ups, surveys and assessments, Hydro-Québec determines the steps to be taken to improve the effectiveness of measures that it has initiated to take account of and protect biodiversity. For example, since the *Biodiversity Performance Report – 2014* contained very little quantitative data, a series of indicators were added so that the efforts made can be better evaluated, resulting in a report that incorporates various indicators, quantitative data and graphs.

7. Hydro-Québec Production. 2015. *Aménagements hydroélectriques de la Chute-Allard et des Rapides-des-Cœurs. Bilan des activités environnementales 2014*. Montréal, Hydro-Québec. 56 p.

8. Hydro-Québec Production. 2015. *Complexe de l'Eastmain-Sarcelle-Rupert. Bilan des activités environnementales 2014*. Montréal, Hydro-Québec. 151 p.

9. AECOM and Hydro-Québec Production. 2015. *Aménagements hydroélectriques de la Chute-Allard et des Rapides-des-Cœurs. Suivi environnemental 2014 en phase exploitation : suivi de la sauvagine*. Montréal, Hydro-Québec. 58 p. and app.

10. Hydro-Québec. 2015. *Bilan des réalisations en biodiversité – 2014*. Montréal, Hydro-Québec. 32 p.

# ISSUE 1

## PROTECT AND RESTORE ECOSYSTEMS

99%

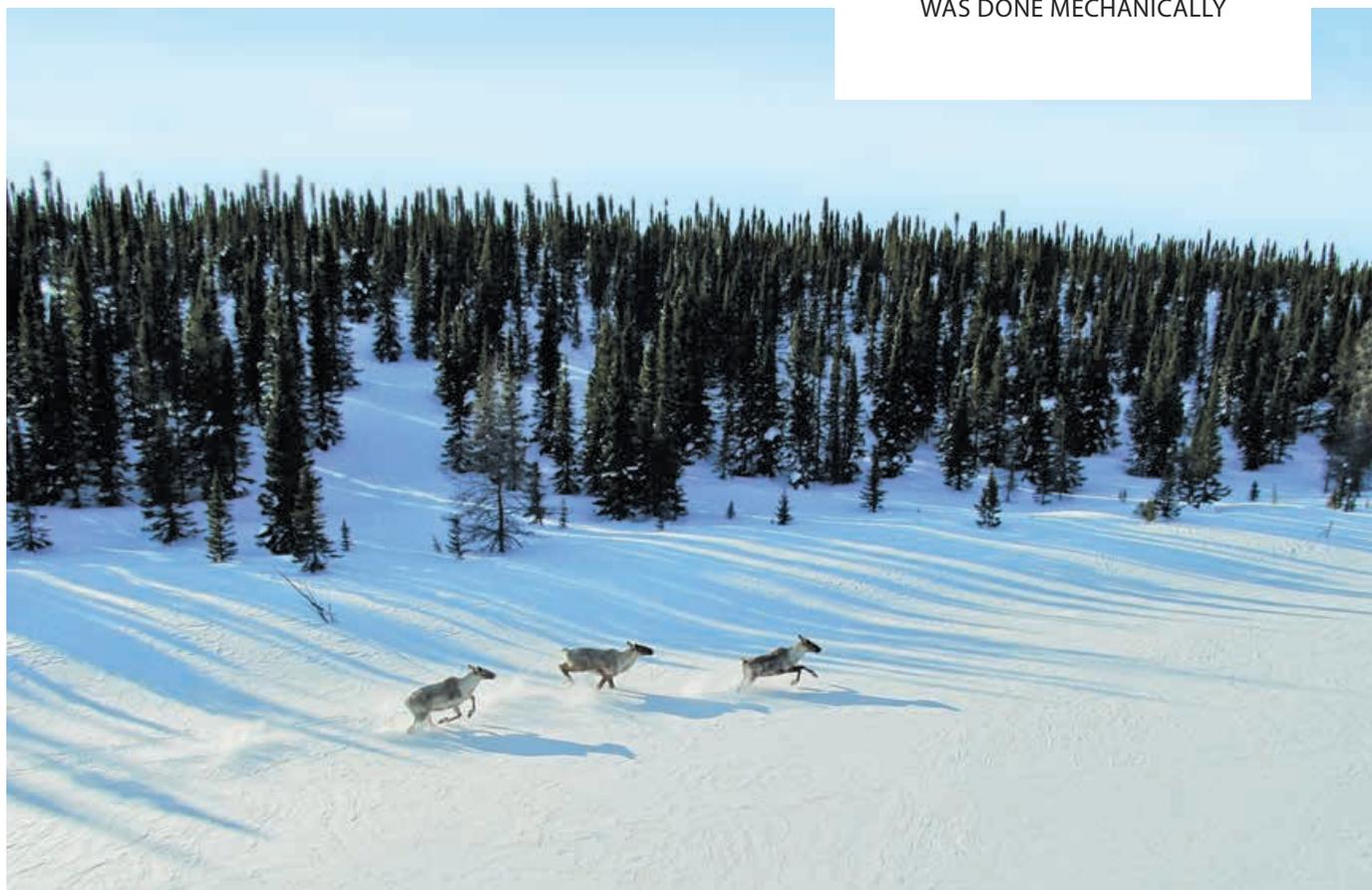
OF THE ELECTRICITY GENERATED  
BY HYDRO-QUÉBEC COMES FROM  
RENEWABLE RESOURCES

15

SPECIAL-STATUS WILDLIFE SPECIES  
WERE PROTECTED  
BY HYDRO-QUÉBEC THANKS TO  
ITS PARTICIPATION IN AT-RISK SPECIES  
RECOVERY TEAMS COORDINATED  
BY THE MINISTÈRE DES FORÊTS,  
DE LA FAUNE ET DES PARCS (MFFP)

94%

OF THE VEGETATION CONTROL  
IN TRANSMISSION LINE RIGHTS-OF-WAY  
WAS DONE MECHANICALLY



# ACHIEVEMENTS

This section presents the measures undertaken by Hydro-Québec, as well as results that were published between January 1 and December 31, 2015. They are organized according to the issues and objectives set out in the *Corporate Strategy on Biodiversity 2015–2020*. Appendix A shows the links between this report’s content and the biodiversity-related principles in Quebec’s *Sustainable Development Act*.

## OBJECTIVE 1 Take account of species assemblages and ecosystems

EXCELLENT	GOOD	FAIR
	●	

Hydro-Québec favors an ecosystem-based management approach to maximize gains in biodiversity.

### CLEAN, RENEWABLE ENERGY

Hydro-Québec generates electricity almost exclusively from a clean, renewable source of energy: water. Since 99% of its power is generated from hydroelectricity, this reduces climate change-related pressures on biodiversity in Quebec and around the globe. Although hydroelectric generation modifies ecosystems, the latter remain productive and maintain their biodiversity.

### FOREST ECOSYSTEMS

Hydro-Québec must offset the residual impacts of its projects on ecosystems. In the Lanaudière administrative region, for example, the construction of two new transmission lines (Pierre-Le Gardeur–Saint-Sulpice and Mauricie-Lanaudière) required the felling of trees. An area of roughly 19 ha was reforested in regional county municipalities (RCM) that have less than 30% forested area in their territories.

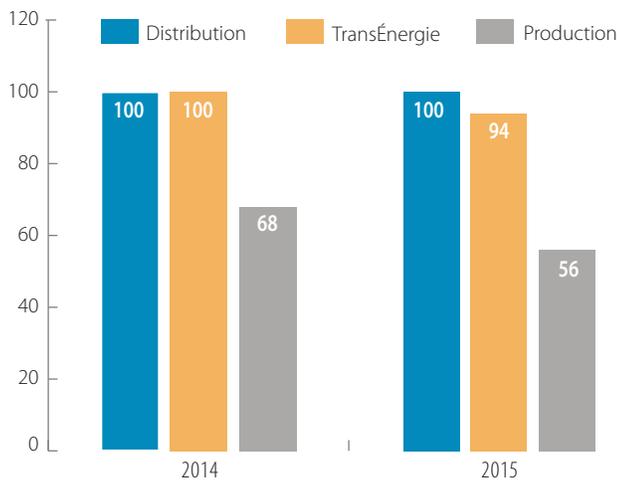


*Tree planting as part of a compensation project*

## VEGETATION CONTROL

Hydro-Québec must control the vegetation near its facilities to maintain system reliability. In 2015, mechanical vegetation control was used in 11,011 ha (94%) along its transmission lines, while herbicides were used in 705 ha (6%). Near hydro-electric facilities, 256 ha were treated with mechanical methods (56%) and 197 ha with herbicides (44%). Along distribution lines, 179,761 spans were cleared or pruned mechanically. In addition, measures to enhance biodiversity were carried out in 172,443 of these spans (96%), including pruning, selective clearing, snag preservation and on-site management of wood waste. The annual target of 90% was exceeded.

Figure 3 – Percentage of total area treated mechanically



## AQUATIC ECOSYSTEMS

After the demolition of the Corbeau generating station on the Rivière Gatineau, a walleye spawning ground was developed by using part of the materials in the cofferdam. This not only benefits walleye but could encourage spawning by other species of fish.

**AVENUE FOR IMPROVEMENT:**  
FAVOR ECOSYSTEM-AND SPECIES-ASSEMBLAGE-BASED MANAGEMENT RATHER THAN THE SPECIES-BY-SPECIES APPROACH CURRENTLY POPULAR IN QUÉBEC.

## OBJECTIVE 2

### Help preserve special-status species and protected areas

EXCELLENT	GOOD	FAIR
●		

Hydro-Québec works closely with governments and environmental organizations to take account of and protect special-status species. It implements many different measures to preserve diversity in protected areas and any zones rich in biodiversity.

## PROTECTION OF SPECIAL-STATUS SPECIES

Hydro-Québec helps to protect special-status plant and animal species by providing its survey results to the Centre de données sur le patrimoine naturel du Québec (Québec natural heritage data centre), which is associated with the Ministère du Développement durable, de l'Environnement et de la Lutte contre les changements climatiques (MDDELCC) and the MFFP.

## AT-RISK SPECIES RECOVERY TEAMS

Hydro-Québec participates actively in recovery efforts for special-status species. In 2015, Hydro-Québec biologists participated in six recovery teams coordinated by MFFP, thus helping to protect 15 species designated at risk in Québec, such as the American shad and woodland caribou (see Table 1).



Bald eagle

Tableau 1 – Hydro-Québec participation in at-risk wildlife species recovery team

GROUP	SPECIAL-STATUS WILDLIFE SPECIES
Fish	Minnnows and small percids: <ul style="list-style-type: none"> <li>– Channel darter</li> <li>– Eastern sand darter</li> <li>– Bridle shiner</li> <li>– Grass pickerel</li> </ul> American shad
Amphibians and reptiles	Western chorus frog Québec turtles: <ul style="list-style-type: none"> <li>– Blanding’s turtle</li> <li>– Common musk turtle</li> <li>– Wood turtle</li> <li>– Common map turtle</li> </ul>
Birds	Birds of prey: <ul style="list-style-type: none"> <li>– Bald eagle</li> <li>– Golden eagle</li> <li>– Peregrine falcon</li> <li>– Short-eared owl</li> </ul>
Mammals	Forest-dwelling woodland caribou

### LITTLE BROWN BAT

Since 2010, this species (also called little brown myotis) has been using a small building near the surge chamber of the Bersimis-2 generating station (Québec’s North Shore) as a maternity roost. The roost, which houses roughly 650 individuals, is the largest known one in Québec. Every summer since 2013, surveys of the roost have been conducted in collaboration with MFFP to monitor changes in the population and determine whether it is being affected by white-nose syndrome (WNS). This disease, which is currently decimating a number of bat species in Canada, has prompted the federal government to emergency list the little brown bat as Endangered.

During the most recent survey in July 2015, only 113 little brown bats were found at the site. The sharp drop in the number of individuals could be attributed to the cold, rainy summer or to WNS. Consequently, more surveys must be carried out to determine the health of the colony. In addition, an artificial roost installed near the building contained roughly 15 individuals in 2015.



*Little brown bat*  
 (Photo: Whitney Cranshaw, Bugwood.org)

### AMPHIBIANS AND REPTILES

The construction of Blainville substation resulted in the loss of habitat for the four-toed salamander, a species likely to be designated as threatened or vulnerable by Québec. Hydro-Québec has promised to protect 3.3 ha of wetlands (swamps) on land that it owns where the species has been recorded.



*Four-toed salamander*  
 (Photo: Martin Ouellet / Amphibia-Nature)

The western chorus frog, designated as vulnerable by the Québec government, occurs in small isolated populations on the south shore of the St. Lawrence. One of these populations is found in a woodland located at the intersection of the municipalities of Brossard, La Prairie, Carignan and Saint-Jean-sur-Richelieu. Hydro-Québec owns some of the lots in the transmission line right-of-way in this area. During a survey carried out by an environmental group in 2014, a significant decline was observed in chorus frog numbers, mainly because of the presence of beaver, which were flooding the frogs’ habitat. As a member of the western chorus frog recovery team, Hydro-Québec carried out work in collaboration with MFFP allowing the capture of 10 beavers and the dismantling of 15 dams, thus reducing the size of the permanent flooded area. The aim of this

work was to increase the amount of periodically submerged habitats available to the species and thus encourage the use of the woodland, which appeared to have almost no western chorus frogs in 2014.

During the expansion of Bout-de-l'Île substation, a compensation plan was proposed, mainly to offset the loss of wetlands. The plan provided for the development of enhancements for plants and wildlife in an area of 11.7 ha in the right-of-way north of the substation. In the summer of 2015, improvements were made to artificial hibernacula (hibernation sites) constructed for snakes in 2013 to decrease the risks of freezing in winter. A threatened and vulnerable species specialist from MFFP was present at the jobsite to coordinate the measures to be implemented. Through this work, Hydro-Québec is helping to improve our knowledge on the construction of hibernacula. The corrective measures undertaken improve the use of these habitats by snakes, particularly Dekay's brownsnake, a species likely to be designated as threatened or vulnerable in Québec.



*Dekay's brownsnake (Photo: David Rodrigue)*

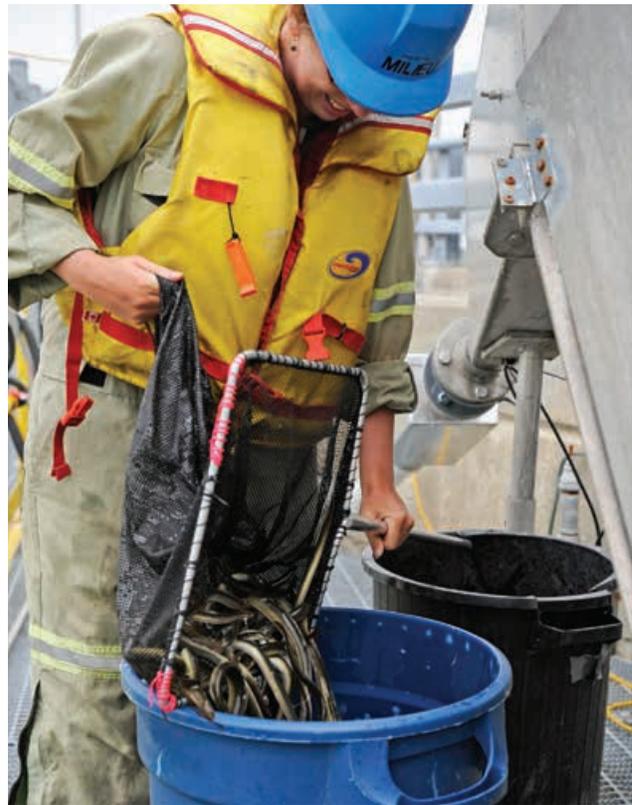
## AMERICAN EEL

American eels travel huge distances over the course of their lifetimes. After hatching in the Sargasso Sea, thousands travel up the St. Lawrence estuary to grow up in streams and rivers in Québec and Ontario, with many reaching as far as the Great Lakes. A few years later, they return to the Atlantic Ocean and Sargasso Sea to reproduce.

During the 2015 season, the two eel ladders at Beauharnois generating station allowed 17,400 American eels to reach Lake Saint-François and ultimately Lake Ontario.<sup>11</sup>

11. Milieu Inc. and Hydro-Québec Production. 2015. *Suivi des passes migratoires à anguille de la centrale de Beauharnois et du barrage de Chambly 2015*. Montréal, Hydro-Québec. 71 p. and app.

This migration is the smallest recorded by Hydro-Québec since the construction of the two ladders in 2002 and 2004, but is still close to three times greater than the smallest run ever recorded, which was in 1998.



*Counting the eels migrating through the fish passes at Beauharnois generating station*

At Chambly dam, the eel ladder allowed 2,247 eels to reach Lake Champlain, or nearly 1,000 more than in 2014.<sup>11</sup>



*Migrating eels*

The Mitis-2 hydroelectric facility is the first manmade obstacle in the migration route of American eels heading to their nursery habitats upstream in the Rivière Mitis. Since 2014, Hydro-Québec has been attempting to use capture sites, in collaboration with MFFP, to eventually transfer the eels outside the Mitis and study the feasibility and effectiveness of this measure. While 4,000 eels were captured in 2014, only 280 were caught in 2015.<sup>12</sup> Despite this, the operations carried out this year helped us identify the areas to be improved so that the capture objectives could be met.

## AMERICAN SHAD

An ultrasonic guiding system, or ultrasound barrier, developed by Hydro-Québec was installed in front of the Rivière-des-Prairies generating station to keep American shad away from the facility. In addition, two side-scan sonars were used to assess the presence of shad immediately upstream of the powerhouse water intakes and in the forebay of the spillway in order to be able to maintain the flow to the water intakes and allow the eels to go around the structure. Despite the low runoff conditions, this system limited generating unit shutdowns because of the shad to a few hours and allowed large numbers of shad to continue their migration to the Atlantic Ocean.<sup>13</sup> A similar guiding system has also been tested at the mouth of the river across from Île Bizard. The ultimate aim of this pilot project is to guide these fish towards the Rivière des Mille-Îles or the St. Lawrence so that they avoid the Rivière des Prairies.

## OTHER STUDIES

Several surveys were carried out in preparation for the Chamouchouane–Bout-de-l'Île project, particularly:

- A complementary study on American cancer-root populations (a special-status plant species) in Rawdon in order to develop a compensation project
- An inventory of special-status wildlife species and their habitats at the site of the docking area and two towers to be built in the Rivière des Prairies



*Jean Caumartin, a fish biologist, supervising the shad survey, and angler Denis Carrière, in front of the Rivière-des-Prairies generating station*

## PROTECTED AREAS AND HIGH-BIODIVERSITY HABITATS

To contribute to achieving the government's objective of creating protected areas covering 17% of the province's territory by 2020, Hydro-Québec is analyzing the Québec government's proposals and working to harmonize this network of protected areas with hydroelectric development and operations. As of March 2016, 9.32% of the province's area was protected.

Hydro-Québec took part in an issue table on the conservation of the Lac à la Tortue bog to determine management issues and develop measures to be undertaken to protect the Lac-à-la-Tortue ecological reserve. The reserve's flora includes three species likely to be designated as threatened or vulnerable in Québec: white fringed orchid, northern yellow-eyed-grass and twin-scaped bladderwort.



*Northern yellow-eyed-grass  
(Photo: Rob Routledge, Sault College, Bugwood.org)*

12. Verreault, G., J. Dessureault and M. Tremblay. 2015. *Caractérisation de la migration des anguilles d'Amérique (Anguilla rostrata) en montagne au complexe hydroélectrique de la Mitis-2 en 2015*. Ministère des Forêts, de la Faune et des Parcs. Direction de la gestion de la faune du Bas-Saint-Laurent. Rivière-du-Loup. 13 p.

13. Milieu Inc. and Hydro-Québec Production. 2015. *Centrale de la Rivière-des-Prairies. Suivi de la dévalaison de l'aloise savoureuse et évaluation d'une barrière sonore*, 2015. Montréal, Hydro-Québec. 22 p. and app.



*White fringed orchid*  
(Photo: Wendy VanDyk Evans, Bugwood.org)

In collaboration with Nature-Action Québec, Hydro-Québec acquired three lots totaling 3.2 ha to offset the loss of wetlands resulting from the construction of Pierre-Le Gardeur substation. Nature-Action Québec, an organization that promotes the implementation of best environmental practices, will be the landowner and look after stewardship of the property, which consists primarily of shrub swamp. An application to MDDELCC to have the land designated as a nature reserve on private land will be made to guarantee the protection of the land in perpetuity. Hydro-Québec also donated \$175,000 to the organization to restore and protect 3.5 ha of wetlands.

Hydro-Québec owns several lots totaling 418 ha on Mount Original, an ecologically important site in the Chaudière-Appalaches region. These lots contain a huge wetland. In March 2014, Hydro-Québec signed a voluntary conservation agreement for the Mount Original wetland. In 2015, in partnership with two private forest development agencies in the region, Agence de mise en valeur des forêts privées des Appalaches and Agence régionale de mise en valeur des forêts privées de la Chaudière, Hydro-Québec agreed to protect these lots and never to sell them.

**AVENUES FOR IMPROVEMENT:**  
HELP INCREASE THE EFFECTIVENESS  
OF THE PROTECTION OF SPECIAL-STATUS SPECIES  
AND NATURAL HABITATS IN QUÉBEC.  
  
CONTINUE DISCUSSIONS WITH THE COMPETENT  
AUTHORITIES TO DEVELOP A MULTIPLE-SPECIES APPROACH  
AND ENSURE MORE VERSATILE PROTECTED AREAS.

## OBJECTIVE 3

### Foster connectivity between natural habitats and help combat invasive alien species

EXCELLENT	GOOD	FAIR
	●	

The connectivity of the major natural habitats in the southern part of Québec has become a key environmental issue. Natural or constructed corridors could mitigate the impacts caused by the loss and fragmentation of natural habitats. Such enhancements would allow genetic exchanges between habitats.<sup>14</sup> Examples include the Appalachian Corridor and *Trame verte et bleue* (blue and green network) in the greater Montreal region.

Invasive alien species are non-native organisms introduced into an ecosystem, which disturb the functioning of the ecosystem owing to their abundance. In Québec, 43 exotic pests have been introduced since 1882, while nearly 900 species of vascular plants have become naturalized since 1600.<sup>15</sup>

Human beings also play a major role in habitat fragmentation and the proliferation of invasive alien species, two threats that are exacerbated by climate change.

#### CONNECTIVITY

Hydro-Québec promised to reconstruct the Normand dam in the Mauricie region instead of dismantling it. The level of the new dam (weir) was determined jointly with Sépaq and the wildlife sector of the MFFP. The dam will respond to tourism and recreation needs as well as wildlife requirements by allowing fish to migrate upstream.

14. Morrison, M. L. and H. A. Mathewson. 2015. *Wildlife Habitat Conservation – Concept, Challenges and Solutions*. John Hopkins University Press. Baltimore. 185 p.

15. Berteaux, D., N. Casajus and S. De Blois. 2014. *Changements climatiques et biodiversité du Québec : vers un nouveau patrimoine naturel*. Presses de l'Université du Québec. 169 p.

## INVASIVE ALIEN SPECIES

### BIOSECURITY AND INVASIVE ALIEN SPECIES

Under Action 8 of its 2015–2020 *Sustainable Development Action Plan*, Hydro-Québec is working to identify priority biosecurity issues. Among the latter, the problem of invasive alien species (IAS) was identified as a major issue. In a context in which the ramifications and questions surrounding this issue are gaining in importance at all levels of government (international, national, provincial and municipal), Hydro-Québec has targeted nine specific living organisms (those designated as *high risk* or *very high risk* in at least one category or *moderate risk* in at least two categories), which are already the subject of phytosanitary requirements or are being monitored by the authorities.

The harmful organisms targeted, all considered IAS, will be further analyzed and studied in 2016. They include the following:

- crown rust of oats (the alternate host is the glossy buckthorn)
- emerald ash borer
- the fungus responsible for Dutch elm disease
- scleroderris canker
- balsam woolly aphid
- black knot
- white pine blister rust
- bronze birch borer
- the fungus responsible for annosum root rot

### EMERALD ASH BORER

In the fight to control the emerald ash borer, Hydro-Québec is collaborating actively with the authorities in the Montréal Metropolitan Community (MMC) to coordinate the efforts to combat this invasive alien species. We are participating in the committee mandated to develop the standard regulations to be put in place by the MMC. At a meeting held in July 2015, Hydro-Québec presented the practices it uses to fight the pest and discussed measures to control the spread of the insect with several specialists. Recognized as a leader in the field owing to its best practices, Hydro-Québec is a partner in the implementation of the MMC's emerald ash borer management strategy.

Since the emerald ash borer first appeared on the scene in Québec, Hydro-Québec has modified its practices to take account of this pest in conducting its activities,

whether pruning, felling or the treatment of wood waste. As much as possible, Hydro-Québec carries out such activities from October 1 to March 15, the period when the insect is least likely to spread. Any ash cut in an infested area regulated by the Canadian Food Inspection Agency is recovered or reduced to small chips. To make commercially valuable wood less easily transportable by third parties, Hydro-Québec leaves the wood on the property in large segments to be disposed of by the owner, who is informed of the problem. Finally, Hydro-Québec provides training to employees who carry out vegetation control work, and contracts awarded to subcontractors include measure to address the issue.



*Emerald ash borer*  
(Photo: David Cappaert, Michigan State University, Bugwood.org)

### OTHER SPECIES

In June 2015, the first follow-up of special-status plant species was conducted following the construction of Blainville substation and its supply line. Two invasive alien species were found: European water reed and purple loosestrife. The follow-up will continue in 2016, 2017 and 2018 so that these species' progression in the right-of-way and nearby wetlands can be measured.

Observations carried out in 2015 showed that ragweed, a pest, and European water reed, a ubiquitous invasive alien species, had declined somewhat in some sectors near the Bout-de-l'Île substation.

#### AVENUE FOR IMPROVEMENT:

SEEK OUT BEST PRACTICES IN HABITAT CONNECTIVITY  
AND INVASIVE ALIEN SPECIES

ISSUE **2**

DEVELOP TOOLS  
THAT HELP  
MAINTAIN  
BIODIVERSITY

**First**

HYDRO-QUÉBEC BIODIVERSITY  
PERFORMANCE REPORT

**\$107,500**

IN DONATIONS AND SPONSORSHIPS  
TO SUPPORT ORGANIZATIONS  
THAT HELP TO MAINTAIN  
BIODIVERSITY IN QUÉBEC

**\$964,485**

IN GRANTS GIVEN OUT  
BY THE FONDATION HYDRO-QUÉBEC  
POUR L'ENVIRONNEMENT



## OBJECTIVE 4

### Design tools, frameworks and best-practice guides

EXCELLENT	GOOD	FAIR
●		

To ensure that biodiversity management is as systematic as possible, the appropriate governance mechanisms need to be put in place, along with guidelines and procedures.

#### GOVERNANCE

Hydro-Québec demonstrated innovation in governance in 2015. It produced a completely new biodiversity strategy inspired by the guidelines formulated by the Québec government,<sup>16</sup> which provides a framework for taking account of and protecting biodiversity (see inside front cover). It also deployed a new biodiversity indicator for all its business units, consisting of the number of innovative measures implemented annually to take account of and protect biodiversity and ecosystem services. Lastly, for the first time, Hydro-Québec produced a public accountability report in biodiversity,<sup>17</sup> in accordance with the government guidelines (see the section on the Management of Biodiversity, page 10, for more information).

#### ASSESSMENT OF THE ECOLOGICAL VALUE OF PROPERTIES

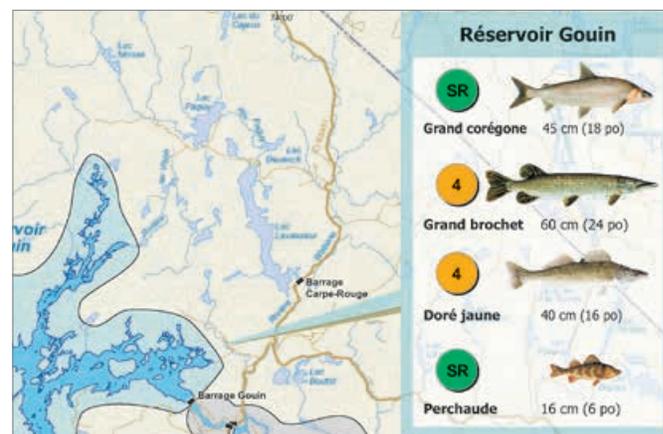
A procedure was adopted in September 2015 to determine the mechanisms to be used to develop environmental compensation strategies. As part of this exercise, the ecological potential of certain surplus properties targeted in a transaction will be evaluated beginning in 2016. This evaluation will provide information on possible compensation for upcoming projects.

The evaluation will focus on the following characteristics:

- Area of natural habitats (wetlands, forest, riparian strip, etc.)
- Diversity of natural habitats
- Presence of ecologically important forest stands
- Connectivity between surrounding natural habitats
- Presence of special-status species
- Relative rarity of habitats
- Presence of wildlife habitats
- Current use of property
- Degree of human disturbance
- Land use in adjacent properties

#### FISH CONSUMPTION GUIDES

Overall, the consumption of fish has many health benefits. However, predatory species like walleye and northern pike are more likely to accumulate mercury in their flesh. Consequently, the local public health organization Centre intégré universitaire de santé et de services sociaux de la Mauricie-et-du-Centre-du-Québec, in collaboration with Hydro-Québec, published a fish-consumption guide for Rivière Saint-Maurice water bodies (Haute-Mauricie) entitled *Guide de consommation des poissons pour les plans d'eau de la région de la rivière Saint-Maurice en Haute-Mauricie*. It contains tips on the maximum number of meals of fish to be consumed based on potential mercury concentrations, specific recommendations for pregnant women and children and other useful information.



Taken from fact sheet on consumption of fish from the Haut-Mauricie region

#### AVENUES FOR IMPROVEMENT:

PRODUCE A COMMITMENT PLAN ON INNOVATIVE MEASURES TO BE LAUNCHED IN 2016.

MONITOR THE IMPLEMENTATION OF INNOVATIVE MEASURES ON BIODIVERSITY.

16. Ministère du Développement durable, de l'Environnement et des Parcs. 2013. *Orientations gouvernementales en matière de diversité biologique 2013*. Québec, 23 p.

17. Hydro-Québec. 2015. *Bilan des réalisations en biodiversité – 2014*. Montréal, Hydro-Québec. 32 p.

## OBJECTIVE 5

### Participate in conserving Québec's biodiversity

EXCELLENT	BON	FAIR
●		

Hydro-Québec also participates in a significant way in the conservation of biodiversity in Québec in areas not affected by its facilities. It has its own foundation for the environment, which provides financial support to a number of environmental organizations.

#### FONDATION HYDRO-QUÉBEC POUR L'ENVIRONNEMENT

The *Fondation Hydro-Québec pour l'environnement* (FHQE) is a non-profit organization whose mission is to help Québec communities develop a sense of ownership of their environment, enjoy it responsibly and pass on this natural heritage to future generations. In 2015, this foundation spent a total of \$964,485 to fund 16 new projects, in nine different administrative regions. These initiatives target areas with a high ecological value and high biodiversity, and will benefit 62 threatened or vulnerable species or likely to be designated as such under Québec's Act respecting threatened or vulnerable species. Funding from the FHQE also allowed the restoration and enhancement of 561 ha of terrestrial forested habitats, 368 ha of wetlands and three watercourses and lakes.

For more information, please refer to FHQE's *2015 Annual Report*.



*Du Tremblay woodland project in the cities of Longueuil and Boucherville (Photo: Martine Hamel)*

#### NORTHERN PLAN FUND

Hydro-Québec contributed \$10 million to the Northern Plan fund. This annual contribution helps to promote the development and protection of the territory included under the Northern Plan.

#### CLIMATOLOGY (OURANOS)

Hydro-Québec provided \$800,000 in support to the Ouranos consortium, made up of over 400 scientists and professionals from various fields. The consortium participates in the Éco-Bio (ecosystem-biodiversity) program, the purpose of which is to reduce the vulnerability of ecosystems and human beings to climate change. The year 2015 is a transition year between two funding phases for the organization.



#### RESEARCH CHAIR IN THE BIOGEOCHEMISTRY OF CONTINENTAL AQUATIC ECOSYSTEMS

This research chair at the Université du Québec à Montréal aims to elucidate the phenomena linked to greenhouse gas emissions in northern aquatic environments, allowing a comparison with emissions from hydroelectric reservoirs. Hydro-Québec invested \$300,000 in the research chair in 2015.

#### INSTITUT HYDRO-QUÉBEC EN ENVIRONNEMENT, DÉVELOPPEMENT ET SOCIÉTÉ

The goal of Hydro-Québec's institute for environment, development and society at Université Laval is to improve the coordination of the university's activities in environmental science and sustainable development. It seeks to promote research, interdisciplinary dialogue and collaborations between the various actors involved, both in terms of relationships between natural, economic and social systems and the impact of their respective dynamics on the definition and pursuit of the common good. Although its mission involves sustainable development in the broad sense, many of the projects and research that it funds are related to biodiversity. The institute is funded in large part by Hydro-Québec (92% in 2014-2015). The funding agreement has been renewed from 2016 to 2020, with annual contributions of \$500,000.

## DONATIONS AND SPONSORSHIPS

Hydro-Québec also provided \$107,500 in donations and sponsorships to 19 organizations that help maintain biodiversity in Québec (see Table 2).

### CÔTE-NORD ATLANTIC SALMON HABITAT ENHANCEMENT PROGRAM

The Côte-Nord Atlantic salmon habitat enhancement program was created during the construction of the Rivière Romaine hydroelectric complex. Hydro-Québec invested \$10 million to offset the project's residual impacts on salmonids. The purpose of the program is to contribute to the strengthening and expansion of Atlantic salmon populations in the Côte-Nord region with participation from local communities, river management organizations, and the academic community. In 2015, major habitat enhancement work was undertaken to make obstacles more passable in three salmon rivers managed by the Comité de mise en valeur du saumon de la Côte-Nord and stocking was also carried out. Eventually, this work should increase the salmon populations in these rivers.



*Atlantic salmon*

**AVENUE FOR IMPROVEMENT:**  
CONTINUE OUR INVOLVEMENT IN PROTECTING  
QUÉBEC'S BIODIVERSITY.

Table 2 – Donations and sponsorships awarded to organizations helping to maintain biodiversity in Québec

NAME OF ORGANIZATION OR EVENT	CONTRIBUTION
Agence Mamu Innu Kaikusseht (AMIK)	\$5,000
Association des biologistes du Québec	\$5,000
Centre d'interprétation de la nature du lac Boivin	\$3,000
Centre d'interprétation du milieu écologique du Haut-Richelieu	\$3,500
Chapitre Saint-Laurent	\$2,000
Comité de la Réserve mondiale de la biosphère Manicouagan-Uapishka	\$10,000
Comité ZIP Saguenay	\$2,500
Conseil patronal de l'environnement du Québec	\$10,000
Conseil régional de l'environnement de l'Estrie	\$500
Conseil régional de l'environnement et du développement durable du Saguenay–Lac-Saint-Jean	\$2,500
Corporation de protection de l'environnement de Sept-Îles	\$1,000
Enviro-Action	\$1,000
Explos-Nature	\$1,500
FaunENord	\$5,000
Fédération québécoise pour le saumon atlantique	\$30,000
Festival de la bernache de Saint-Fulgence	\$2,500
Organisme de bassin versant du Témiscamingue	\$15,000
Parc de la rivière Batiscan	\$5,000
Société de gestion environnementale de Dolbeau-Mistassini	\$2,500
<b>TOTAL</b>	<b>\$107,500</b>

ISSUE **3**

ACQUIRE  
KNOWLEDGE

**52**

HYDRO-QUÉBEC PUBLICATIONS  
ON BIODIVERSITY

**116**

WILDLIFE SPECIES STUDIED

**30**

EMPLOYEES THAT PARTICIPATED  
IN A PILOT PROJECT  
TO ASSESS THE  
INTERDEPENDENCIES BETWEEN  
HYDRO-QUÉBEC'S ACTIVITIES  
AND ECOSYSTEM SERVICES



## OBJECTIVE 6

Carry out surveys and environmental follow-ups

EXCELLENT	GOOD	FAIR
●		

Hydro-Québec carries out numerous environmental follow-ups, surveys and assessments to evaluate the effectiveness of mitigation measures and monitor the status of plant and animal populations after the construction of its facilities.

### HYDRO-QUÉBEC PUBLICATIONS

Appendix B gives a list of the studies, follow-ups or surveys on biodiversity produced in 2015 by or for Hydro-Québec. Most of these reports discuss data gathered in 2014 mainly due to the delays associated with drafting and producing documents. In 2015, 52 studies on biodiversity were published, compared with 61 studies in 2014 (see Figure 4). Studies that deal with several taxa or with a broader scope, and fish studies are the most common (see Figure 5). In the studies published in 2015, 116 wildlife species were reported. (see page 24 of the *Sustainability Report 2015*).

Figure 4 – Number of studies related to biodiversity published in 2014 and 2015

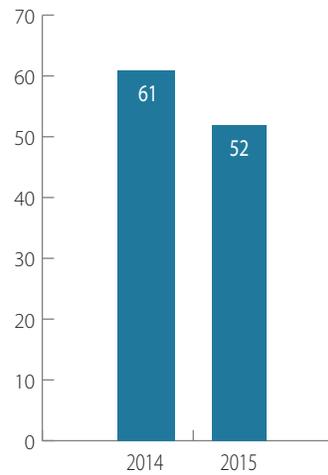
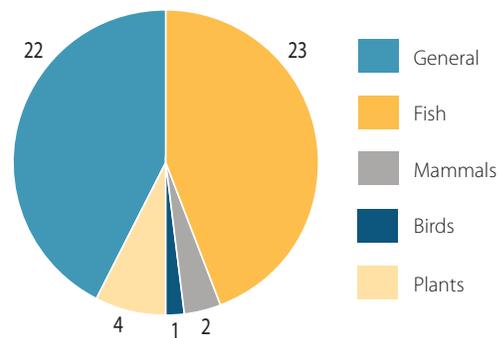


Figure 5 – Studies published in 2015 broken down by taxon

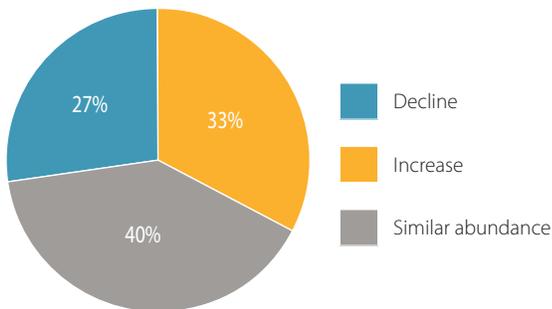


Monitoring of woodland caribou at the Romaine complex

## WILDLIFE FOLLOW-UPS

A total of 16 wildlife follow-ups and assessments published in 2015 compared the data obtained with a baseline established during the draft-design phase. They contain a wealth of information for researchers and biodiversity managers. They allowed the abundance of 55 species, populations or groups of species to be compared before and after the construction of various hydroelectric developments. These results show that species richness has remained relatively constant and no species have disappeared since the construction of the hydraulic structures. In addition, biological productivity has remained comparable. Roughly one third of species are more abundant now than before the construction of the project affecting them. Conversely, one third have decreased in numbers, while the remaining third occur in numbers similar to those in the baseline (see Figure 6). This picture comes from the environmental follow-ups published in 2015, which involve several different hydroelectric developments, located in different regions and constructed in different years. Given the high natural variability of populations and sampling biases, fluctuations are not necessarily caused by hydroelectric facilities. Even in undisturbed environments, the abundance of the various species present will show significant fluctuations, with some species increasing and others declining.

Figure 6 – Results of wildlife follow-ups in terms of abundance



## RESULTS BY TAXA

### BIRDS

The environmental follow-ups published in 2015 show that the great majority of bird species occur in similar or greater abundance than before the construction of the hydroelectric facilities.

For example, the waterfowl follow-up conducted around the Chute-Allard and Rapides-des-Cœurs facilities<sup>18</sup> yielded average breeding pair densities in the overall study area greater than that observed in the baseline (see Figure 7). However, densities were roughly twice as high in the area of the Chute-Allard and Rapides-des-Cœurs forebays than in areas unaffected by the project. Among the 12 waterfowl species recorded, the most common were American black duck (34%), common goldeneye (25%) and common merganser (10%). The higher densities of breeding pairs and broods observed in the forebays could be due to the additional habitats created and the expansion of existing habitats. The newly created habitats seemed to have had the ability to attract different species of ducks. Overall, an increase in species diversity was observed in the operation phase compared with the baseline.



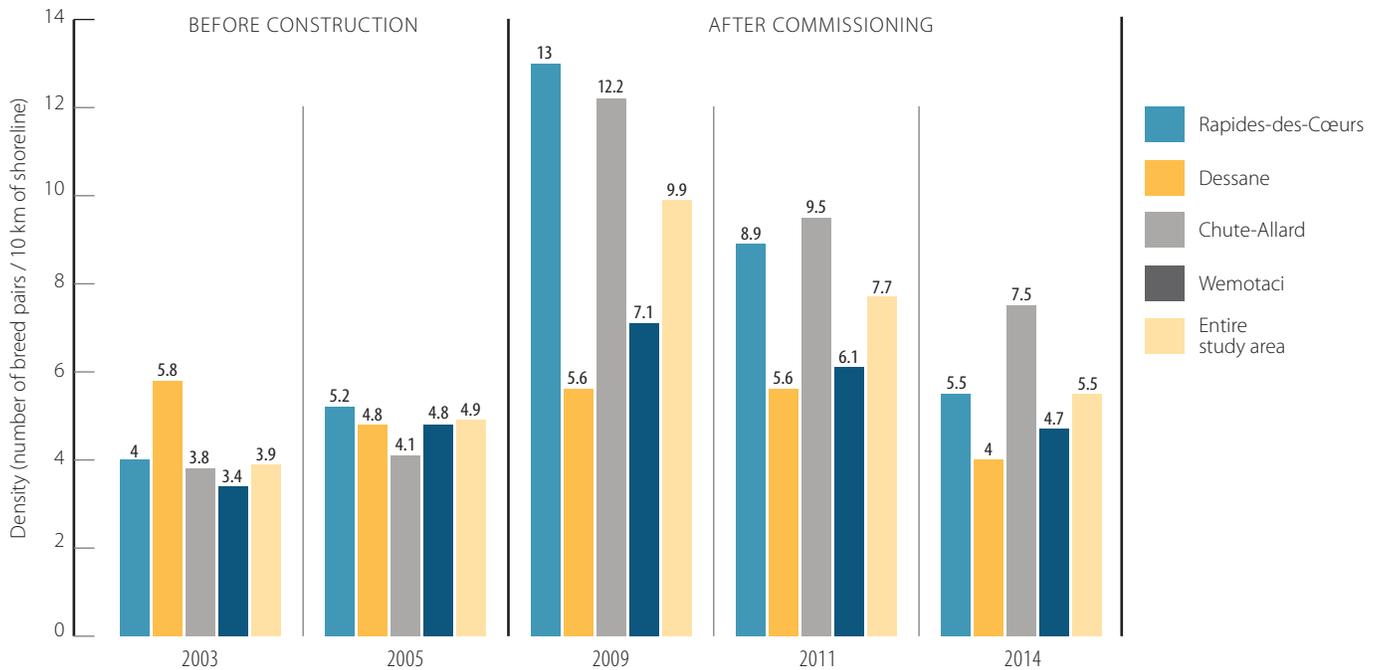
American black duck



Common goldeneye

18. AECOM and Hydro-Québec Production. 2015. *Aménagements hydroélectriques de la Chute-Allard et des Rapides-des-Cœurs. Suivi environnemental 2014 en phase exploitation. Suivi de la sauvagine.* Montréal, Québec. 58 p. and app.

Figure 7 – Average breeding pair density of anatids in four parts of the study area in 2003, 2005, 2009, 2011 and 2014



Source: Hydro-Québec Production. 2015. *Aménagements hydroélectriques de la Chute-Allard et des Rapides-des-Cœurs. Bilan des activités environnementales 2014*. Montréal, Hydro-Québec. 56 p.

In an environmental follow-up in the Mauricie region, 45 species of passerines were recorded in 2014, or six more than before construction of the Chute-Allard and Rapides-des-Cœurs hydroelectric facilities in 2005.<sup>19</sup> Dominant species according to the surveys were common yellowthroat, white-throated sparrow and swamp sparrow (see Figure 8). Overall, there has been little variation in total passerine densities and average number of species observed since the baseline was established in 2005. A significant decrease in alder flycatcher numbers in the developed channels was observed, while sparrows were increasing as a group. Avian biodiversity on the edges of the developed channels seems to have increased slightly over the years.

The construction of the Eastmain-Sarcelle-Rupert complex does not seem to have affected grouse species (Tetraoninae) in the area, which include willow ptarmigan, spruce grouse and sharp-tailed grouse. The abundance of representatives of this family remained similar in the diversion bay section but increased significantly in the reduced-flow stretch<sup>20</sup> (see Figure 9).

However, the scope of this statement is limited by strong interannual variations linked to grouse abundance cycles.



White-throated sparrow

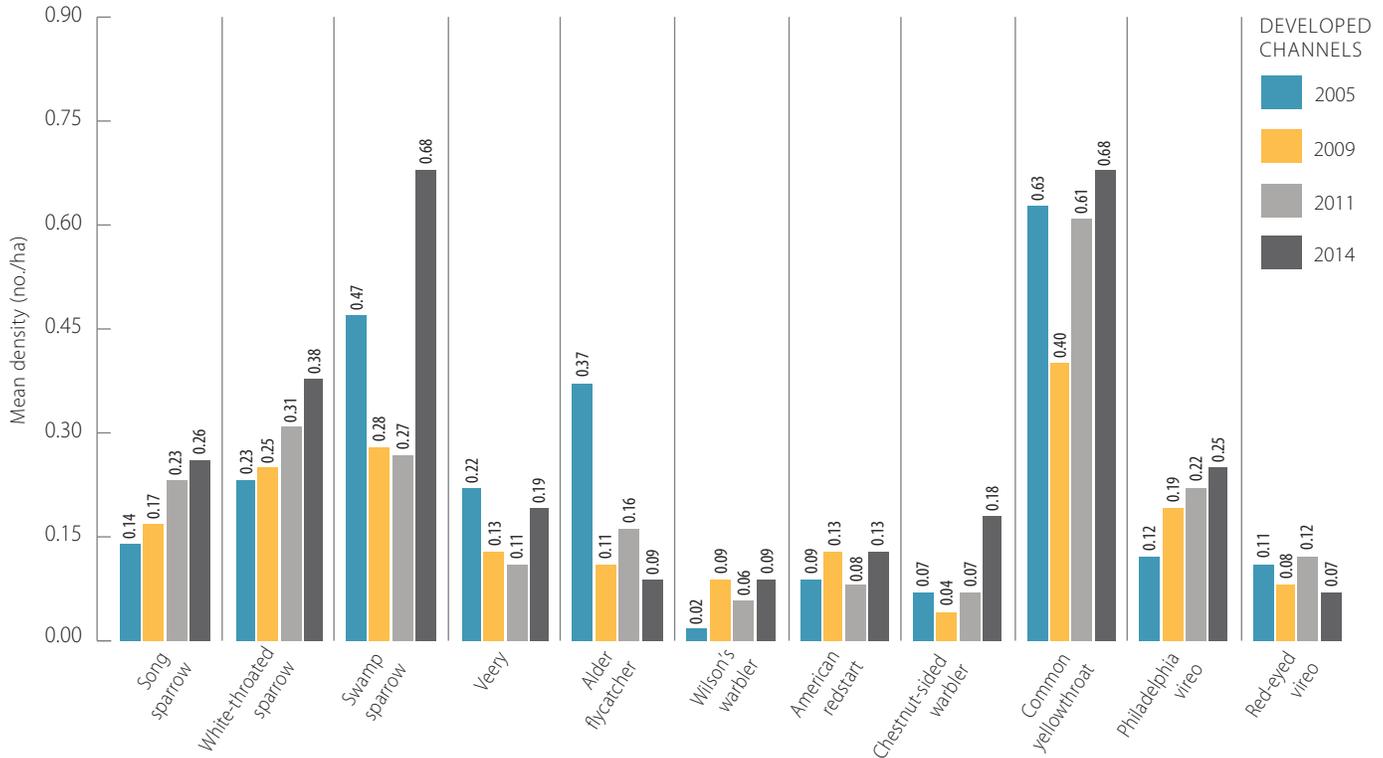


Willow ptarmigan

19. Hydro-Québec Production. 2015. *Aménagements hydroélectriques de la Chute-Allard et des Rapides-des-Cœurs. Bilan des activités environnementales 2014*. Montréal, Hydro-Québec. 56 p.

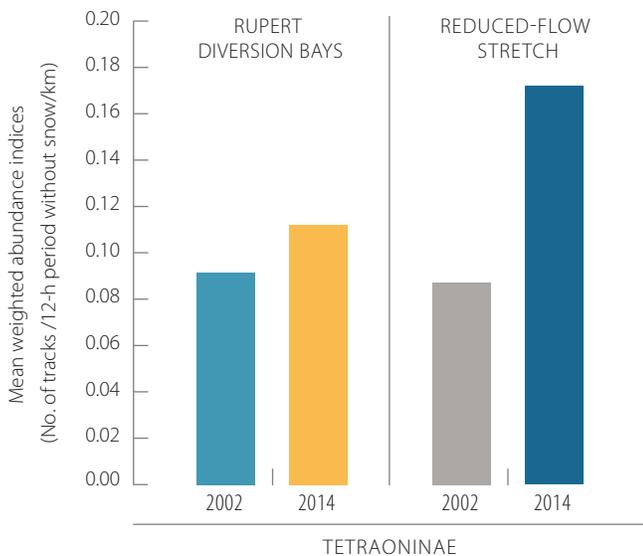
20. Consortium Otish and Hydro-Québec Production. 2015. *Centrales de l'Eastmain-1-A et de la Sarcelle et dérivation Rupert : suivi de la petite faune 2014 : suivi environnemental en phase exploitation. Rapport d'étude*. Montréal, Hydro-Québec. 54 p. and app.

Figure 8 – Comparison of average passerine densities before (2005) and after construction (2009, 2011 and 2014) at stations surveyed in developed channels (Chute-Allard and Rapides-des-Coeurs)



Source: Hydro-Québec Production. 2015. *Aménagements hydroélectriques de la Chute-Allard et des Rapides-des-Coeurs. Bilan des activités environnementales 2014*. Montréal, Hydro-Québec. 56 p.

Figure 9 – Mean weighted abundance indices for Tetraoninae (grouse) in the Rupert diversion bay section and reduced-flow stretch of the Rupert, 2002 (before construction) and 2014 (after construction)



Source: Consortium Otish and Hydro-Québec Production. 2015. *Centrales de l'Estmain-1-A et de la Sarcelle et dérivation Rupert : suivi de la petite faune 2014 : suivi environnemental en phase exploitation Rapport d'étude*. Montréal, Hydro-Québec. 54 p. and app.

## MAMMALS

Five species or groups of species of small mammals out of the nine recorded (56%) experienced a significant decline in abundance after the construction of the Eastmain-Sarcelle-Rupert complex: American mink, river otter, small mustelids (weasels), red fox and North American porcupine. Conversely, snowshoe hare increased in abundance. Lastly, the abundance of American marten, Sciuridae (squirrels) and lynx after the impoundment of the diversion bays and partial diversion of the Rupert remained similar to the baseline<sup>21</sup> (see Figure 10).



Red fox

21. Consortium Otish and Hydro-Québec Production. 2015. *Centrales de l'Estmain-1-A et de la Sarcelle et dérivation Rupert : suivi de la petite faune 2014 : suivi environnemental en phase exploitation. Rapport d'étude*. Montréal, Hydro-Québec. 54 p. and app.



North American porcupine



Moose

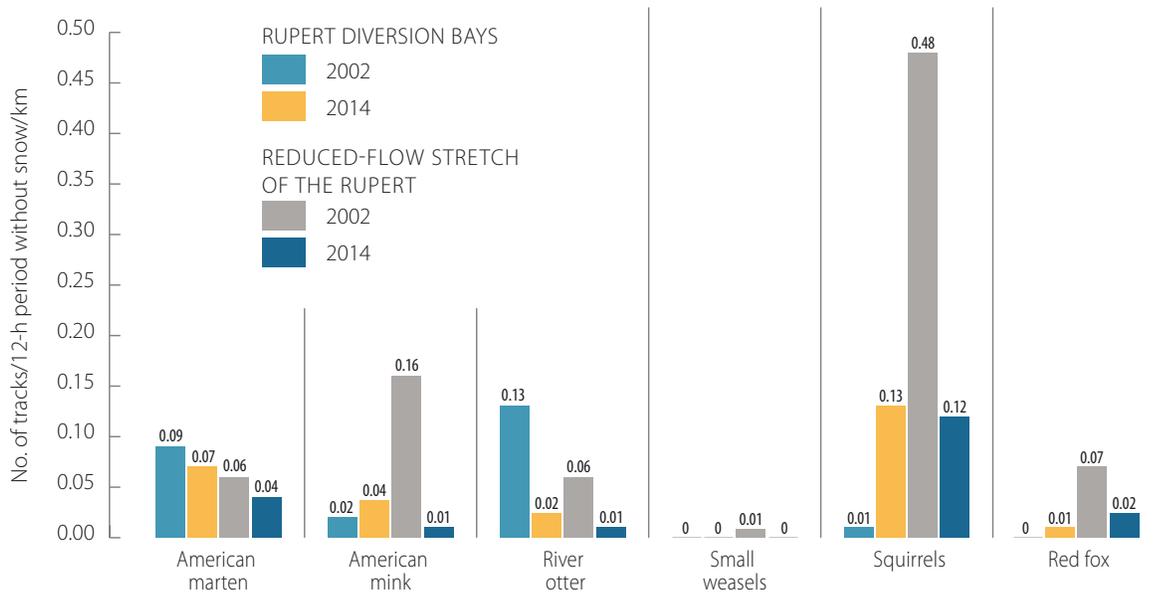
The declining numbers could be explained by the cyclical fluctuations in abundance known to occur in certain species, by the flooding of previously sampled areas or by the destruction of a large portion of the study area by forest fire, among other things.

Moose density measured in 2014 was at least four times greater than that measured before project construction began (2002).<sup>22</sup>

This data suggests that the impoundment of the diversion bays has not had any negative effects on the moose population in this area.

Hydro-Québec personnel flew over Romaine 2 reservoir during the impoundment process to spot any problems for wildlife and be able to respond rapidly if required. Although the flyovers led to 70 observations of wildlife, no intervention was needed. Moose was the most commonly observed species.<sup>23</sup>

Figure 10 – Mean weighted abundance indices for fur-bearing animals in the Rupert diversion bay section and reduced-flow stretch of the Rupert, 2002 (before construction) and 2014 (after commissioning)



Source: Hydro-Québec Production. 2015. *Complexe de l'Eastmain-Sarcelle-Rupert. Bilan des activités environnementales 2014*. Montréal, Hydro-Québec. 151 p.

22. Consortium Otish and Hydro-Québec Production. 2015. *Centrales de l'Eastmain-1-A et de la Sarcelle et dérivation Rupert. Suivi de l'original 2014 : suivi environnemental en phase exploitation. Rapport d'étude*. Montréal, Hydro-Québec. 34 p. and app

23. Hydro-Québec Équipement et services partagés and Hydro-Québec Production. 2015. *Complexe de la Romaine. Bilan des activités environnementales 2014*. Montréal, Hydro-Québec. 148 p.

## AMPHIBIANS

Under the environmental follow-up carried out around the Chute-Allard and Rapides-des-Cœurs hydroelectric developments, all six species of amphibians recorded were found to be more or equally abundant after commissioning than before the project.<sup>24</sup> The development of canals seems to have been favourable to anuran populations (frogs and toads). The denser cover of aquatic vegetation could partially account for this increase.

## FISH

The environmental follow-ups published in 2015 indicate that fish adapted well to the new conditions and no species had disappeared. Most of the populations studied are equally abundant or more abundant than before the construction of the hydroelectric developments.

The number of salmon spawning naturally in the Rivière Romaine declined in 2014, as indicated by the number of redds (nests), which decreased from 196 in 2003 to 76 in 2014. This drop could be partially due to the program to catch spawners to repopulate the river through artificial reproduction. Two spawning grounds and nursery and wintering habitats were developed for the species downstream of the Romaine-1 generating station.

Since the commissioning of the Eastmain-Sarcelle-Rupert complex, an annual environmental follow-up of lake cisco has been carried out in collaboration with the community of Waskaganish. After eight years of data collection, the follow-up ended in the summer of 2015. Lake cisco catches in the Rivière Rupert are now comparable to what they were before the partial diversion of the river.<sup>25</sup>



*To celebrate the end of the cisco follow-up, the community of Waskaganish organized a traditional feast in which Cree workers and Hydro-Québec employees assigned to the follow-up participated.*

24. Hydro-Québec Production. 2015. *Aménagements hydroélectriques de la Chute-Allard et des Rapides-des-Cœurs. Bilan des activités environnementales 2014*. Montréal, Hydro-Québec. 56 p.

25. Hydro-Québec Production. 2015. *Complexe de l'Eastmain-Sarcelle-Rupert. Bilan des activités environnementales 2014*. Montréal, Hydro-Québec. 151 p.

Hydro-Québec biologists are closely monitoring lake sturgeon populations to measure the effectiveness of the instream flow in the Rivière Rupert. Since this species is very long lived (over 25 years), it is used as an indicator species. To assess the effectiveness of the instream flow, Hydro-Québec is monitoring larval drift (small fish) at several locations. Counts on the Rupert seem to confirm that fish productivity is equivalent to what it was before the partial diversion in 2009. Furthermore, spawning grounds were developed on the Rupert to compensate for possible losses resulting from diversion.



*Counting lake sturgeon larvae*



*Lake sturgeon spawning*

## DISMANTLING OF TRACY THERMAL GENERATING STATION

Tracy thermal generating station has been closed for good since December 2011. The above-ground portion of the facility was dismantled in 2015, with only the underground and underwater infrastructures and those along the St. Lawrence left to be dismantled. Some of the dismantling work must be carried out at the pumping station site, filled embankment and in the aquatic environment. However, there are no recent surveys describing this habitat in terms of the plants and wildlife present. Consequently, surveys of these natural habitats were carried out during the summer of 2015. A total of 55 plant species, most wetland or aquatic species, were recorded. No special-status plant species were recorded. In terms of fish, 28 species including four special-status species (American shad, Atlantic sturgeon, lake sturgeon and channel darter) were found. Terrestrial fauna confirmed included 12 species of birds, one amphibian and one reptile, including peregrine falcon, barn swallow and common snapping turtle. Thanks to this survey, special measures can be put in place to protect these species during the remaining work to dismantle the facility.



*Peregrine falcon*

**AVENUE FOR IMPROVEMENT:**  
 PROPOSE MEASURES TO INCREASE THE EFFECTIVENESS OF ENVIRONMENTAL ASSESSMENTS AND FOLLOW-UPS AND COMPENSATION MEASURES.

## OBJECTIVE 7

### Further the development of knowledge on biodiversity and ecosystem services

EXCELLENT	GOOD	FAIR
●		

By acquiring scientific knowledge, we can preserve biodiversity and the ecosystem services it provides in an optimum way. In 2015, Hydro-Québec participated in various workshops and research committees along with other leaders in biodiversity in the province, including several Québec ministries (MDDELCC and MFFP), the Ouranos consortium, Québec Centre for Biodiversity Science and the Université de Montréal's plant biology research institute, the Institut de recherche en biologie végétale. The objective of these meetings was to better target research priorities and improve the sharing of information on Québec's biodiversity.

#### BIODIVERSITY AND ECOSYSTEM SERVICES

Since 2009, the Québec Centre for Biodiversity Science (QCBS) and its partners, including Hydro-Québec, have been working to develop a tool to evaluate the interdependencies between Québec organizations and the ecosystem services provided by biodiversity, which was completed in 2015.

Hydro-Québec volunteered to carry out the pilot project, which is coordinated by researchers at the Université du Québec à Montréal and Université du Québec en Outaouais. Hydro-Québec has made available 30 environmental experts from seven different business units for this purpose. The project is currently the subject of a master's thesis. The results will be presented in 2016. This project is the first of its kind in Québec.

#### SCIENTIFIC COLLABORATION

##### MONITORING THE RESTORATION OF A BOG

After a project to rebuild the 230-kV lines between Nicolet and Bécancour substations, the temporary access road, which goes through a large bog in Sainte-Eulalie, was dismantled. Since bogs are very acidic and nutrient-poor environments, limiting the nutrient enrichment and modification of the physicochemical characteristics of the bog water was crucial in order to preserve the bog vegetation. The work was planned in collaboration with Université Laval's peatland ecology research group, the Groupe de recherche en écologie des tourbières (GRET), and required close on-site supervision. An environmental follow-up was subsequently carried out in 2013 and 2015. The results indicate that the method adopted was successful in limiting nutrient enrichment and modification of the physicochemical characteristics of the water and also maintained the local topography. In addition, the bog vegetation has showed promising signs of growth since 2013.



*Restored peatland in Sainte-Eulalie*

## USE OF CONSTRUCTED WETLANDS TO TREAT EFFLUENTS FROM A WOODEN POLE STORAGE YARD

Since the spring of 2012, we have tested the use of constructed wetlands (using various technologies based on different physical, chemical and biological principles) to treat effluents generated by the storage of wood poles treated with CCA (chromated copper arsenate) and PCP (pentachlorophenol) in a basin. The project is being carried out in collaboration with the Université de Montréal's plant biology research institute, École Polytechnique, Stantec and HG Environnement. The results obtained thus far are promising. We are currently studying the possibility of maximizing water evaporation by plants so that effluents are no longer released.



*Sampling effluent from different constructed wetlands  
(Photo: EnviroServices)*

## VEGETATION CONTROL USING COMPETING PLANTS

This research program, carried out in collaboration with the Université de Montréal's plant biology research institute, aims to better understand growth and changes in vegetation in line rights-of-way, from the initial clearing of the line to the restoration of the right-of-way and including the planting of the seeds of species compatible with system operation. Thanks to research begun in 2000, we discovered that certain seed mixtures can successfully compete with trees, which are incompatible with system operation. The introduction of seed mixtures selected for this purpose significantly reduce the colonization of rights-of-way by trees, by limiting the germination and growth of tree species likely to interfere with system reliability.

Another part of the project is the control of invasive alien species. Although European water reed grows extremely quickly, a paint-on treatment of a herbicide seems to be an effective treatment that promotes the rapid regrowth of a natural vegetation cover and minimizes the quantity of herbicide needed. Repeated mowing appears to be ineffective, at least when done monthly. The control of Japanese knotweed by the stem injection of herbicide has shown promising results, with the mortality of almost all of the stems treated in this way.



*Japanese knotweed  
(Photo: Tom Heutte, USDA Forest Service, Bugwood.org)*

## PILOT PROJECT IN THE USE OF PHYTOTECNOLOGY IN SOIL REHABILITATION

In the summer of 2012, a 320-m<sup>2</sup> test bed was created at a former storage site in Drummondville for wood poles treated with PCP. Four plant species were planted: willow, alfalfa, fescue and mustard. Work in 2015 focussed on the physiological characterization of the plants, to measure growth, density and development in the compacted soil typical of an industrial site. The project was launched thanks to a partnership with the Université de Montréal's plant biology research institute.

**AVENUE FOR IMPROVEMENT:  
CREATE A RESEARCH CHAIR IN PHYTOTECNOLOGIES.**

# ISSUE 4

RAISE AWARENESS,  
INFORM AND  
EDUCATE

13

ACADEMIC CONFERENCES  
ON BIODIVERSITY

5,493

SCHOOLCHILDREN  
MADE AWARE OF  
THE IMPORTANCE OF  
PROTECTING BIODIVERSITY

1,164

EMPLOYEES RECEIVING  
BIODIVERSITY-RELATED  
TRAINING



## OBJECTIVE 8

### Encourage collaboration and knowledge sharing

EXCELLENT	GOOD	FAIR
	●	

When biological knowledge and expertise are shared among the scientific community, governments, First Nations groups and industry, the management of biodiversity can be optimized.

#### DOCUMENTATION CENTRE

Since June 2015, the public has had access to Hydro-Québec reports and documents through the Environment and Communities Documentation Centre online portal [CherLoc](#). Between June and December 2015, 101 new external users signed up online for the service, bringing the total number to 218. External users downloaded a total of 599 reports in PDF format in 2015, as well as borrowing hard copies of documents.

For over 40 years, Hydro-Québec has contributed substantially to the advancement of environmental knowledge. Its studies, research, methods and technologies have been discussed in numerous publications made available to interested readerships. The Environment and Communities Documentation Centre has more than 20,000 items in its collection, and more than 10,000 of them involve environmental studies and research written by or for Hydro-Québec. In addition to environmental impact assessments, there are specific studies on mitigation measures, environmental follow-ups, some species of wildlife, and more.

#### COLLABORATIONS

Hydro-Québec has shared its expertise by making presentations at various events, particularly:

- A Canadian workshop on sharing data on biodiversity held by the Université de Montréal's plant biology research institute
- ACFAS symposium on environmental assessments in northern environments

In addition, Hydro-Québec has participated in discussions on the creation of the Québec biodiversity observatory, Observatoire québécois de la biodiversité. This new

organization will promote the sharing of data to optimize the management and protection of Québec's biodiversity.

On February 23 and 24, the Manicouagan-Uapishka World Biosphere Reserve hosted a visit from two managers of another World Biosphere Reserve, the Northeast Greenland National Park, which faces similar issues and challenges. The managers were able to learn more about the Manicouagan-Uapishka model, which is based on dialogue and cooperation with big business. The workshops organized included a presentation and visit to the Jean-Lesage generating station.

#### TRANSFER OF INNU KNOWLEDGE

A follow-up on land use by the Ekuanitsh and Nutashkuan Innu will be conducted over a period of 15 years. Since 2011, 16 species of medicinal plants have been collected in the area around the Romaine 1 and Romaine 4 reservoirs. The medicinal plants were then processed and added to the community pharmacy.



Some of the medicinal plants used by the Innu

Source: Hydro-Québec. 2015. *Complexe de la Romaine, Bilan des activités environnementales 2014*. Page 107.

**AVENUES FOR IMPROVEMENT:**  
 ESTABLISH COMMUNICATIONS CHANNELS WITH OTHER QUÉBEC LEADERS IN BIODIVERSITY.  
 CONTINUE EFFORTS TO CREATE THE OBSERVATOIRE QUÉBÉCOIS DE LA BIODIVERSITÉ.

## OBJECTIVE 9

Raise awareness among Hydro-Québec personnel and the general public about the importance of protecting biodiversity

EXCELLENT	GOOD	FAIR
●		

Employees and the general public must be educated about the importance of protecting biodiversity in order to better anticipate the potential impact of our activities, taking account of the essential services that biodiversity provides to human beings (food, air and water purification, medicines, etc.).

### EMPLOYEE AWARENESS AND TRAINING

In 2015, a total of 7,791 Hydro-Québec employees took courses on the environment offered internally. Of these employees, 1,164 had training related to fauna and habitats, flora, wetlands and strategies for protecting biodiversity. This represents an increase of 30% over 2014, which is due mainly to a greater number of employees receiving training on accidental hydrocarbon and contaminant spills. Hydro-Québec places great importance on developing its employees' skills in order to prevent such accidents or lessen their consequences.

In 2015, a workshop was held on vegetation control. The goal was to bring together Hydro-Québec employees working in this area to discuss issues, techniques, innovations and the legal framework surrounding this activity. The workshop allowed the objectives of continuous improvement and best practices to be met.

As part of a pilot project on biodiversity and ecosystem services, 30 employees specializing in the environment were educated about the concept of ecosystem services and were encouraged to reflect on its application in Hydro-Québec's various divisions. The preliminary results were presented to the Conseil patronal de l'environnement du Québec in November 2015.

## ENVIRONMENT WEEK



**REGARD SUR LE FUTUR** VISION ET DÉFIS  
SEMAINE DE L'ENVIRONNEMENT 2015 | DU 1<sup>er</sup> AU 5 JUIN

A number of activities were carried out as part of Environment Week to educate employees about the importance of preserving biodiversity:

- Over 450 employees participated in a green dictation about biodiversity.
- Six lectures were held on subjects such as mitigation measures for salmon, ecosystem services, development of wetlands, monitoring mercury in fish and the restoration of rivers.
- Environment advisors in the Manicouagan region traveled around the regional facilities to present projects they were involved in. MFFP wildlife protection officers also made presentations on certain legal and regulatory aspects of hunting, fishing and wildlife observation.



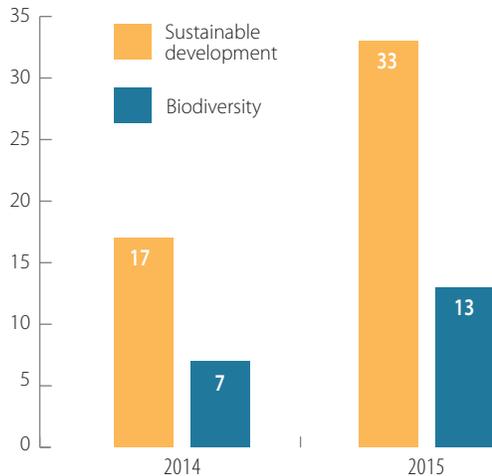
*Lecture on ecosystem services given by Gervais Pellerin*

### EXTERNAL PRESENTATIONS AND INFORMATION

#### ACADEMIC CONFERENCES

To transmit the knowledge it has acquired over the years, Hydro-Québec has taken on the task of communicating with the general public and holding conferences in various sectors. In 2015, our employees organized 33 conferences on sustainable development in institutions of higher learning in Québec. Among these, 13 (39%) dealt with the natural environment (biodiversity, mitigation measures and environmental follow-ups). This represents a significant increase over 2014, when 17 conferences on sustainable development, 7 on the natural environment, were held (see Figure 11).

Figure 11 – Number of conferences held from 2014 to 2015



As part of its annual meetings with the RCMs and municipalities in the Estrie (Eastern Townships) and Montérégie regions, our community relations team explained to elected officials Hydro-Québec’s program to strengthen biodiversity, which is applied in vegetation control activities, among other areas.

In 2015, Hydro-Québec published the first report on its performance in biodiversity, based on the Québec government’s guidelines on biological diversity (*Orientations gouvernementales en matière de diversité biologique*).

Created in 2004, our Envirovolt kit was completely revamped in 2015 and is now tailored to grade 3 and 4 students. This instructional tool invites kids to construct an electrical network from a hydroelectric generating station and reservoir in a way that respects the environment. In this way, students not only learn the elements of a hydroelectric system and are able to better understand how it works, but also discover the environmental measures

implemented by Hydro-Québec to preserve biodiversity in its electricity generation, transmission and distribution projects. Suggested activities include asking kids to pretend they are biologists and identify different plant and animal species. Kits are loaned out for a month at a time to teachers of Grades 3–4, as well as to Les Débrouillards day camps in all regions of Québec. Under an agreement with Hydro-Québec, the Réseau CDLS-CLS, present in all the regions of the province, is looking after promoting and distributing the kit to primary school teachers. In 2015, 5,493 students were able to benefit from this tool.



A primary school class using the Envirovolt kit

Hydro-Québec distributed a brochure called Protection of Birds in the Distribution System’s Rights-of-Way to make customers aware of the efforts it is making to protect birds and their nests in distribution line rights-of-way.

**AVENUE FOR IMPROVEMENT: MAKE SPECIALIZED AUDIENCES IN QUÉBEC AND ELSEWHERE MORE AWARE OF HYDRO-QUÉBEC’S EFFORTS TO PROTECT BIODIVERSITY.**



Brochure distributed in RCMs and municipalities



Biodiversity Performance Report – 2014



Protection of Birds in the Distribution System’s Rights-of-Way

The Eureka! Festival is a celebration of science in Montréal's Old Port featuring many different exhibitors, who share their passion for science with the curious of all ages. Hydro-Québec was present at this year's festival to explain the scope of its actions to protect biodiversity, particularly to young people (see Figure 12). This ninth year of the festival broke all previous attendance records, with over 107,000 visitors taking part in the activities from June 12 to 14, which represents a 22% increase over 2014. On average, 36,000 visitors attended each day, with 2,100 visitors per stand.



Hydro-Québec's stand on biodiversity at the Eureka! Festival

Figure 12 – Measures to protect flora and fauna

## MEASURES TO PROTECT WILDLIFE AND VEGETATION

**Mitigation measures to help living species**  
*Note: Several measures can apply to a single species.*

<b>TRANSPLANTING VEGETATION</b>	<b>MAINTAINING SNAGS</b>	<b>CREATING SPAWNING GROUNDS</b>
 <p>Rare plant species are transplanted to a similar habitat.</p>	 <p>The trunks of dead or felled trees are left standing. Mushrooms grow on them and they provide a habitat and food for birds, insects and small rodents.</p>	 <p>Spawning grounds are developed by adding sand, gravel or stones to the beds of rivers and streams to create the right environment for fish to lay and fertilize their eggs.</p>
<b>INSTALLING FISH LADDERS</b>	<b>FITTING ANIMALS WITH RADIO COLLARS</b>	<b>INSTALLING NEST BOXES</b>
 <p>Fish ladders are built to allow fish to get across an obstacle (falls, dam).</p>	 <p>Certain animals are fitted with radio collars to monitor their movements and learn about their behavior.</p>	 <p>Nest boxes were put up around the new reservoir to attract tree-dwelling ducks.</p>

Source: English version of poster displayed at Hydro-Québec's stand at the Eureka! Festival

# CONCLUSION

---

For the second consecutive year, Hydro-Québec has produced a public accountability report on its performance in the area of biodiversity. The report demonstrates the considerable efforts that the utility has made to protect biodiversity. Improvements to this year's report include the addition of several indicators allowing efforts and results to be quantified.

Hydro-Québec also improved its governance of biodiversity by formulating a new *Corporate Strategy on Biodiversity 2015–2020*, by developing a plan to implement innovative measures in biodiversity and by publishing its first annual biodiversity performance report.

The environmental follow-ups and assessments published in 2015 have allowed the measurement of changes in the environment and the monitoring of the status of wildlife populations. These studies show that species richness and biological productivity in developed environments are comparable to those in nearby natural environments: for example, a reservoir is an aquatic ecosystem comparable to a natural lake in Québec. The new environments created provide the

habitats and food required for a rich and diversified aquatic and terrestrial fauna. The various species present in these environments are able to complete their life cycles and maintain their populations naturally. In addition, these environmental follow-up studies are a source of invaluable information, which is fed into a vast databank used by Hydro-Québec to evaluate the impacts of its projects.

Hydro-Québec has also improved its planning in this area by establishing a cross-unit approach that encourages its various groups and divisions to institute innovative measures to protect biodiversity.

Through the actions it took in 2015 to protect biodiversity, Hydro-Québec followed the Québec government's guidelines on biodiversity (*Orientations gouvernementales en matière de diversité biologique 2013*) as well as its own *Corporate Strategy on Biodiversity 2015–2020*. Table 3 summarizes our self-assessment of Hydro-Québec's performance in 2015 for each objective in its corporate strategy. The last column describes avenues for improvement likely to be implemented by Hydro-Québec in the next few years.

Table 3 – Level of performance and opportunities for improvement for each government objective

OBJECTIVE	LEVEL OF PERFORMANCE			AVENUES FOR IMPROVEMENT
	EXCELLENT	GOOD	FAIR	
1. Take account of species assemblages and ecosystems		●		<ul style="list-style-type: none"> <li>Currently, in conserving biodiversity in Québec, the focus is on protecting individual species. A species-assemblage-based approach (plant and animal communities) or ecosystem-based approach may be more appropriate.</li> </ul>
2. Help preserve special-status species and protected areas	●			<ul style="list-style-type: none"> <li>Help increase the effectiveness of the protection of special-status species and natural habitats in Québec.</li> <li>Continue discussions with the competent authorities to develop a multiple-species approach and ensure more versatile protected area.</li> </ul>
3. Foster connectivity between natural habitats and help combat invasive alien species		●		<ul style="list-style-type: none"> <li>Seek out best practices in habitat connectivity and the effort to combat invasive alien species.</li> </ul>
4. Design tools, frameworks and best-practice guides	●			<ul style="list-style-type: none"> <li>Produce a commitment plan on innovative measures to be implemented in 2016.</li> <li>Monitor the implementation of innovative measures to protect biodiversity.</li> </ul>
5. Participate in conserving Québec's biodiversity	●			<ul style="list-style-type: none"> <li>Continue our involvement in protecting Québec's biodiversity.</li> </ul>
6. Carry out surveys and environmental follow-ups	●			<ul style="list-style-type: none"> <li>Propose measures to increase the effectiveness of environmental assessments and follow-ups and compensation measures.</li> </ul>
7. Further the development of knowledge on biodiversity and ecosystem services	●			<ul style="list-style-type: none"> <li>Create a research chair in phytotechnologies.</li> </ul>
8. Encourage collaboration and knowledge sharing		●		<ul style="list-style-type: none"> <li>Establish communications channels with other Québec leaders in biodiversity.</li> <li>Continue the efforts to establish the Observatoire québécois de la biodiversité.</li> </ul>
9. Raise awareness among Hydro-Québec personnel and the general public about the importance of protecting biodiversity	●			<ul style="list-style-type: none"> <li>Make specialized audiences in Québec and elsewhere more aware of Hydro-Québec's efforts to protect biodiversity.</li> </ul>

# APPENDIX A

---

## PRINCIPLES OF SUSTAINABLE DEVELOPMENT RELATED TO BIODIVERSITY, FROM THE QUÉBEC GOVERNMENT'S *SUSTAINABLE DEVELOPMENT ACT*

### *Terms of reference*

PRINCIPLES OF THE <i>SUSTAINABLE DEVELOPMENT ACT</i> RELATED TO BIODIVERSITY	PAGES <sup>a</sup>
<b>BIODIVERSITY PRESERVATION:</b> Biological diversity offers incalculable advantages and must be preserved for the benefit of present and future generations. The protection of species, ecosystems and the natural processes that maintain life is essential if quality of human life is to be maintained.	1-44 (all pages of this report)
<b>RESPECT FOR ECOSYSTEM SUPPORT CAPACITY:</b> Human activities must be respectful of the support capacity of ecosystems and ensure the perenniality of ecosystems.	3, 10-19, 24-33, 39-40
<b>INTERNALIZATION OF COSTS:</b> The cost of goods and services must reflect all the costs they generate for society during their whole life cycle, from their design to their final consumption or disposal.	3, 10-11, 13-15, 18-23, 25-33, 39-40

a. For details about each objective and action proposed in this report, please refer to the corresponding pages.

## APPENDIX B

### REPORTS ON BIODIVERSITY PUBLISHED BY OR FOR HYDRO-QUÉBEC IN 2015

To consult one of these reports, please visit the online catalogue: <https://cherloc.ca/>.

- AECOM and Hydro-Québec Équipement et services partagés. 2015. *Ligne à 230 kV de Saint-Césaire–Bedford. Suivi des tourbières*. Montréal, Hydro-Québec. 10 p. and app.
- AECOM and Hydro-Québec Production. 2015. *Aménagements hydroélectriques de la Chute-Allard et des Rapides-des-Cœurs. Suivi environnemental 2014 en phase exploitation : suivi de la sauvagine*. Montréal, Hydro-Québec. 58 p. and app.
- AECOM and Hydro-Québec Production. 2015. *Aménagements hydroélectriques de la Chute-Allard et des Rapides-des-Cœurs. Suivi environnemental 2014 en phase exploitation. Suivi des milieux humides aménagés dans la plaine alluviale de Wemotaci et le secteur du ruisseau RDC-04*. Montréal, Hydro-Québec. 175 p. and app.
- AECOM and Hydro-Québec Production. 2015. *Aménagements hydroélectriques de la Chute-Allard et des Rapides-des-Cœurs. Suivi environnemental en phase exploitation 2014. Inventaire des écotones riverains*. Montréal, Hydro-Québec. 38 p. and app.
- AECOM and Hydro-Québec Production. 2015. *Aménagement hydroélectrique de la Toulnostouc : suivi environnemental 2014 en phase exploitation : suivi des plantations*. Montréal, Hydro-Québec. 25 p. and app.
- AECOM and Hydro-Québec Production. 2015. *Dérivation partielle Manouane. Bilan 2004-2014 du suivi environnemental en phase d'exploitation. Reproduction de la ouananiche et intégrité des aménagements*. Montréal, Hydro-Québec. 48 p. and app.
- AECOM, Poly-Géo and Hydro-Québec Production. 2015. *Dérivation partielle Manouane : suivi environnemental 2014 en phase d'exploitation. Retour de la totalité du débit*. Montréal, Hydro-Québec. 145 p. and app.
- AECOM, Tecsub Inc. and Hydro-Québec Production. 2015. *Aménagements hydroélectriques de la Chute-Allard et des Rapides-des-Cœurs. Suivi environnemental 2014 en phase exploitation. Suivi des frayères aménagées pour l'omble de fontaine*. Montréal, Hydro-Québec. 87 p. and app.
- Angers, Virginie and Hydro-Québec TransÉnergie. 2015. *Revue de littérature sur les mesures de biodiversité reconnues en maîtrise de la végétation dans les emprises de transport d'électricité*. Montréal, Hydro-Québec. 70 p.
- Biofilia, Waska Ressources and Hydro-Québec Production. 2015. *Centrales de l'Eastmain-1-A et de la Sarcelle et dérivation Rupert. Suivi 2015 de la qualité de l'eau des rivières Rupert et Nemiscau*. Montréal, Hydro-Québec. 58 p. and app.
- Consortium Otish and Hydro-Québec Production. 2015. *Centrales de l'Eastmain-1-A et de la Sarcelle et dérivation Rupert : suivi de la petite faune 2014 : suivi environnemental en phase exploitation. Rapport d'étude*. Montréal, Hydro-Québec. 54 p. and app.
- Consortium Otish and Hydro-Québec Production. 2015. *Centrales de l'Eastmain-1-A et de la Sarcelle et dérivation Rupert. Suivi de l'original 2014 : suivi environnemental en phase exploitation. Rapport d'étude*. Montréal, Hydro-Québec. 34 p. and app.
- Cree Nation of Nemaska and Hydro-Québec Production. 2015. *Eastmain-1-A and Sarcelle Powerhouses and Rupert Diversion. Voluntary lake sturgeon catch registry along Rupert River. Cree Nation of Nemaska. 2010 Program. Final report*. Montréal, Hydro-Québec. 15 p.
- Cree Nation of Nemaska and Hydro-Québec Production. 2015. *Eastmain-1-A and Sarcelle Powerhouses and Rupert Diversion. Voluntary lake sturgeon catch registry along Rupert River. Cree Nation of Nemaska. 2011 Program. Final report*. Montréal, Hydro-Québec. 13 p.
- Cree Nation of Nemaska and Hydro-Québec Production. 2015. *Eastmain-1-A and Sarcelle Powerhouses and Rupert Diversion. Voluntary lake sturgeon catch registry along Rupert River. Cree Nation of Nemaska. 2012 Program. Final report*. Montréal, Hydro-Québec. 15 p.
- Englobe and Hydro-Québec Production. 2015. *Aménagement hydroélectrique de la Romaine-2 : étude des émissions de gaz à effet de serre du réservoir. Résultats été 2015*. Montréal, Hydro-Québec. 38 p. and app.
- Englobe and Hydro-Québec Production. 2015. *Centrale Mercier. Suivi environnemental 2015 en phase exploitation. Analyse du régime thermique*. Montréal, Hydro-Québec. 31 p. and app.
- Englobe and Hydro-Québec Production. 2015. *Centrale Mercier. Suivi environnemental 2015 en phase exploitation. Fraie du doré jaune*. Montréal, Hydro-Québec. 48 p. and app.
- Environnement Illimité and Hydro-Québec Production. 2015. *Centrales de l'Eastmain-1-A et de la Sarcelle et dérivation Rupert. Suivi des communautés de poissons et de la dynamique des populations dans les biefs Rupert. Rapport d'étude 2014. Version finale*. Montréal, Hydro-Québec. 61 p. and app.

- Environnement Illimité and Hydro-Québec Production. 2015. *Centrales de l'Eastmain-1-A et de la Sarcelle et dérivation Rupert. Suivi environnemental en phase exploitation. Dérive larvaire de l'esturgeon jaune dans la rivière Rupert (secteur à débit réduit). Bilan du suivi 2010-2014. Version finale.* Montréal, Hydro-Québec. 62 p. and app.
- Environnement Illimité and Hydro-Québec Production. 2015. *Centrales de l'Eastmain-1-A et de la Sarcelle et dérivation Rupert. Suivi environnemental en phase exploitation. Utilisation des frayères naturelles d'esturgeon jaune dans la rivière Rupert : bilan du suivi 2010-2014. Rapport final.* Montréal, Hydro-Québec. 66 p. and app.
- Environnement Illimité and Hydro-Québec Production. 2015. *Centrales de l'Eastmain-1-A et de la Sarcelle et dérivation Rupert. Suivi de l'esturgeon jaune au PK 207 de la rivière Eastmain en 2013 et 2014. Rapport final.* Montréal, Hydro-Québec. 41 p. and app.
- Environnement Illimité, Hydro-Québec Production and Hydro-Québec Équipement et services partagés. 2015. *Dérivation partielle de la rivière Portneuf. Suivi environnemental 2013 en phase exploitation. Dynamique sédimentaire de l'estuaire de la rivière Portneuf. Rapport final.* Montréal, Hydro-Québec. 93 p. and app.
- Génivar Inc., Waska Ressources and Hydro-Québec Production. 2015. *Centrales de l'Eastmain-1-A et de la Sarcelle et dérivation Rupert : suivi environnemental en phase exploitation : suivi du déroulement de la fraye du doré jaune, des meuniers et du grand corégone aux frayères des PK 216 et 281 de la rivière Rupert : bilan du suivi 2010-2014.* Montréal, Hydro-Québec. 53 p. and app.
- Hydro-Québec. 2015. *Bilan des réalisations en biodiversité – 2014.* [Online]. Montréal, Hydro-Québec. [ <http://www.hydroquebec.com/developpement-durable/pdf/activites-biodiversite-2014.pdf> ], (March 7, 2016).
- Hydro-Québec. 2015. *Rapport sur le développement durable 2014 = Sustainability Report 2014.* [Online]. Montréal, Hydro-Québec. [ [http://www.hydroquebec.com/publications/fr/docs/rapport-developpement-durable/rdd\\_2014.pdf](http://www.hydroquebec.com/publications/fr/docs/rapport-developpement-durable/rdd_2014.pdf) ; [http://www.hydroquebec.com/publications/en/docs/sustainability-report/rdd\\_2014\\_en.pdf](http://www.hydroquebec.com/publications/en/docs/sustainability-report/rdd_2014_en.pdf) ], (March 7, 2016).
- Hydro-Québec, Conception des aménagements de production, hydraulique et géotechnique. 2015. *Complexe de la Romaine : état de référence de la couverture de glace dans la zone de l'embouchure de la rivière Romaine.* Montréal, Hydro-Québec. 45 p. and app.
- Hydro-Québec Équipement et services partagés et Hydro-Québec Production. 2015. *Complexe de la Romaine. Bilan des activités environnementales 2014.* Montréal, Hydro-Québec. 148 p.
- Hydro-Québec, Géomatique and Hydro-Québec Production. 2015. *Dérivation partielle de la rivière du Sault aux Cochons. Suivi environnemental 2014 en phase exploitation : stations hydrométriques.* Montréal, Hydro-Québec. Several pages.
- Hydro-Québec Production. 2015. *Aménagements hydroélectriques de la Chute-Allard et des Rapides-des-Cœurs. Bilan des activités environnementales 2014.* Montréal, Hydro-Québec. 56 p.
- Hydro-Québec Production. 2015. *Aménagement hydroélectrique de la Péribonka : bilan des activités environnementales 2013.* Montréal, Hydro-Québec. 55 p.
- Hydro-Québec Production. 2015. *Complexe de l'Eastmain-Sarcelle-Rupert. Bilan des activités environnementales 2014.* Montréal, Hydro-Québec. 151 p.
- Hydro-Québec TransÉnergie. 2015. *Poste Saint-Jean à 315-25 kV et ligne d'alimentation à 315 kV : étude d'impact sur l'environnement.* Montréal, Hydro-Québec. 5 vol.
- Hydro-Québec TransÉnergie and Hydro-Québec Équipement et services partagés. 2015. *Intégration de la production éolienne au réseau de transport : ligne à 230 kV du parc éolien Mesgi'g Ugju's'n. Évaluation environnementale.* Montréal, Hydro-Québec. 76 p. and app.
- Kaweshekami Environnement Inc., AECOM and Hydro-Québec Production. 2015. *Centrales de l'Eastmain-1-A et de la Sarcelle et dérivation Rupert. Suivi des frayères aménagées aux PK 203 et 207 de la rivière Eastmain : suivi 2014.* Montréal, Hydro-Québec. 48 p. and app.
- Kaweshekami Environnement Inc., AECOM and Hydro-Québec Production. 2015. *Centrales de l'Eastmain-1-A et de la Sarcelle et dérivation Rupert. Suivi des juvéniles d'esturgeon et d'autres espèces cibles : suivi environnemental en phase exploitation : rapport d'étude 2014.* Montréal, Hydro-Québec. 69 p. and app.
- Maxxam Analytiques Inc. and Hydro-Québec Production. 2015. *Rapport du contrôle de la qualité 2014 : analyses de la teneur en mercure dans la chair de poissons.* Montréal, Hydro-Québec. 22 p. and app.

- Milieu Inc. and Hydro-Québec Production. 2015. *Centrale de la Rivière-des-Prairies. Suivi de la dévalaison de l'alose savoureuse et évaluation d'une barrière sonore, 2015*. Montréal, Hydro-Québec. 22 p. and app.
- Milieu Inc. and Hydro-Québec Production. 2015. *Suivi des passes migratoires à anguille de la centrale de Beauharnois et du barrage de Chambly 2015*. Montréal, Hydro-Québec. 71 p. and app.
- Québec, Ministère du Développement durable, de l'Environnement et de la Lutte contre les changements climatiques and Hydro-Québec Équipement et services partagés. 2015. *Complexe de la Romaine. Compensation des impacts résiduels du projet sur les milieux humides. Comptabilisation de la valeur économique des milieux humides en Minganie. Finale*. Montréal, Hydro-Québec. 103 p. and app.
- Québec, Ministère du Développement durable, de l'Environnement et de la Lutte contre les changements climatiques and Hydro-Québec Équipement et services partagés. 2015. *Complexe de la Romaine. Compensation des impacts résiduels du projet sur les milieux humides. Plan de conservation des milieux humides de la Minganie. Finale*. Montréal, Hydro-Québec. 191 p. and app.
- The Crees of the Waskaganish First Nation and Hydro-Québec Production. 2015. *Centrale de l'Eastmain-1-A et de la Sarcelle et dérivation Rupert. Voluntary anadromous cisco catch registry 2011 program. Crees of the Waskaganish First Nation. Final report*. Montréal, Hydro-Québec. 24 p. and app.
- The Crees of the Waskaganish First Nation and Hydro-Québec Production. 2015. *Centrale de l'Eastmain-1-A et de la Sarcelle et dérivation Rupert. Voluntary anadromous cisco catch registry 2012 program. Crees of the Waskaganish First Nation. Final report*. Montréal, Hydro-Québec. 25 p. and app.
- The Crees of the Waskaganish First Nation and Hydro-Québec Production. 2015. *Eastmain-1-A and Sarcelle Powerhouses and Rupert Diversion. Voluntary lake sturgeon catch registry along Rupert river, 2011 program. Crees of the Waskaganish First Nation. Final report*. Montréal, Hydro-Québec. 13 p.
- The Crees of the Waskaganish First Nation and Hydro-Québec Production. 2015. *Eastmain-1-A and Sarcelle Powerhouses and Rupert Diversion. Voluntary lake sturgeon catch registry along Rupert river, 2012 program. Crees of the Waskaganish First Nation. Final report*. Montréal, Hydro-Québec. 16 p.
- UQTR, Département de géographie and Hydro-Québec Production. 2015. *Aménagements hydroélectriques de la Chute-Allard et des Rapides-des-Cœurs. Suivi environnemental en phase exploitation. Stabilité des berges. Rapport final*. Montréal, Hydro-Québec. 30 p. and app.
- Waska Ressources, WSP Canada and Hydro-Québec Production. 2015. *Centrales de l'Eastmain-1-A et de la Sarcelle et dérivation Rupert. Suivi environnemental du cisco anadrome. Rapport d'études : printemps 2014*. Montréal, Hydro-Québec. 42 p. and app.
- WSP Canada and Hydro-Québec Équipement et services partagés. 2015. *Ajout d'équipements : poste du Bout-de-l'Île. Suivi environnemental des aménagements faunique et floristique de l'emprise Nord (an 1). Version finale*. Montréal, Hydro-Québec. 33 p. and app.
- WSP Canada and Hydro-Québec Équipement et services partagés. 2015. *Aménagement de milieux humides : énoncé d'envergure pour le banc d'emprunt de l'Étang du Loup (P-6) et le site de l'Étang aux Bouleaux (P-15). Rapport final*. Montréal, Hydro-Québec. 44 p. and app.
- WSP Canada and Hydro-Québec Équipement et services partagés. 2015. *Poste au nord de Blainville à 315-25 kV et ligne d'alimentation à 315 kV. Suivi des espèces floristiques à statut particulier et des espèces floristiques exotiques envahissantes. Rapport final*. Montréal, Hydro-Québec. 25 p. and app.
- WSP Canada and Hydro-Québec Production. 2015. *Aménagement hydroélectrique Sainte-Marguerite-3. Suivi environnemental 2014 en phase exploitation. Suivi des teneurs de mercure dans la chair des poissons. Version finale*. Montréal, Hydro-Québec. 46 p. and app.
- WSP Canada, Uanan Experts Conseils and Hydro-Québec Équipement et services partagés. 2015. *Complexe de la Romaine. Étude environnementale en phase projet. État de référence de la population de saumon atlantique : suivi 2014. Version finale*. Montréal, Hydro-Québec. 45 p. and app.

## **ON THE WEB**

- [CHERLOC to access environmental studies](#)
- [Fondation Hydro-Québec pour l'environnement](#)
- [HYDRO-QUÉBEC – Protecting biodiversity](#)
- [Romaine Complexe – Respecting the environment \(In French only\)](#)
- [Sustainability Report 2015](#)

---

[www.hydroquebec.com](http://www.hydroquebec.com)

---

*Ce document est également publié en français.*  
This is a translation of the original French text.  
2016E0177-A

