

# MONT SAINT-HILAIRE BIOSPHERE RESERVE

## PERIODIC REVIEW REPORT

2007 - 2008

The site visit for this periodic review was conducted between November 26 and 28, 2007. The reviewers spent time at McGill University and at the Nature Centre of Mont Saint-Hilaire to discuss topics and to obtain background documentation. We would like to thank Dr. Martin Lechowicz, Director of the Gault Nature Centre, McGill University, and Dr. Garry Peterson, Assistant Professor of Geography, at McGill University, Mr. Kees Vanderheyden, Director of the Mont Saint-Hilaire Nature Centre, Ms Geneviève Poirier-Ghys of the Mont Saint-Hilaire Nature Centre, Mr. Robert Roy, Director of the Regional Municipal County Vallée-du-Richelieu, and Mr. Bernard Morel, Urban planner at the City of Mont Saint-Hilaire. These people provided updated information required for the review and spent considerable time discussing associated topics. Although they commented upon a draft of this review, any errors or omissions remain with the authors.

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# MONT SAINT-HILAIRE BIOSPHERE RESERVE

## PERIODIC REVIEW REPORT 2007

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## BIOSPHERE RESERVE PERIODIC REVIEW - CANADA (2007)

### 1. MONT SAINT-HILAIRE BIOSPHERE RESERVE

Mont Saint-Hilaire Biosphere Reserve  
(Réserve de la biosphère du Mont Saint-Hilaire)

- a) *Please provide a location map, and a map of the zonation for the biosphere reserve (for ease of reference)*
- b) *Year designated: 1978*  
*Year of first periodic review: 1997*

#### **See Appendix 1 for map**

The core area of the biosphere reserve is the private property of McGill University. In 2004, this area was designated as a nature reserve on private property by the Government of Quebec (see below). McGill University is responsible for this property and considers the site an outdoor scientific laboratory for several types of research (see report). In 1972, the Mont Saint-Hilaire (MSH) Nature Centre was created and located within the reserve. It is responsible for undertaking monitoring, maintaining trails and ecological integrity of the core area, and conducting education and outreach activities with local residents and surrounding municipalities located in the zone of cooperation.

- c) *Changes or corrections to be made in the information for the UNESCO/MAB Biosphere Reserve Directory.*

In October 2004, McGill University designated 970.2 hectares of the reserve as a nature reserve on private land under the Natural Heritage Conservation Act (R.S.Q., c. C-61.01) as part of a conservation agreement reached between the University and the Ministère du Développement durable, de l'Environnement et des Parcs du Québec. Additionally, McGill University acquired 0.3 ha of land in the core area in 2003 (Appendix 1, Refer to ownership number 6). Please refer to « carte des milieux naturels protégés - Réserve de la biosphère MSH 2007 » [map of protected natural areas - Biosphere Reserve MSH 2007] on the CD provided.

- d) *Brief summary of the follow-up actions taken in response to each of the UNESCO recommendations from the first periodic review.*

Four recommendations were made by UNESCO in 1998.

The recommendations and follow-up actions are documented below.

**(i) Study the possibility of strengthening links to communities in the region.**

Since 1997, the Mont-Saint-Hilaire Biosphere Reserve has greatly improved its relations with the community, both with citizens and its primary partner, the City of Mont Saint-Hilaire, even participating jointly in acquiring new land around the perimeter of the mountain. The Nature Centre is responsible for managing these new zones, using funding granted from the City to complete its duties (\$7,000 in 2006-2007).

Research was conducted on the relationships between nature and rural life in the heritage villages located near the mountain: Saint-Charles-sur-Richelieu, Saint-Jean-Baptiste, and Saint-Denis-sur-Richelieu. The CD "Nature et Vie Rurale"[Nature and Rural Life] (included) illustrates the value of conservation and rural life to the character of the biosphere reserve. The Director of the Nature Centre indicated that making people proud of their local environment will encourage greater protection of the region.

This work enabled the Nature Centre to become a credible actor in the community. Festivities are scheduled for the 50<sup>th</sup> anniversary of the donation of the Gault house and the 30<sup>th</sup> anniversary of the biosphere reserve designation, which coincides with the 400<sup>th</sup> anniversary of Champlain's arrival in America.

**(ii) Explore means to reinforce legal protection of the core area and buffer zone.**

As noted in point 1c), McGill University designated 970.2 hectares of the reserve as a nature reserve on private land in 2006, under the Natural Heritage Conservation Act (R.S.Q., c. C-61.01). This new designation gave publicity to the region and strengthened the recognition of the ecological significance of the mountain.

Furthermore, in the 2006 development scheme, the RCM recognized the mountain as a non-agricultural zone and excluded it from the urban perimeter to give it a higher conservation status.

In the buffer zone, there has been the acquisition of properties for the purposes of conservation (See Section 2di). Two properties purchased by Nature Québec will be granted back to McGill. Additionally, a specific fund for the protection of natural areas was established last year. In 2006-07 about \$7,750 were collected from 200 partners. This fund now has at least \$50,000.

**(iii) Study the ecological impacts of human activities, especially tourism.**

The number of visitors doubled in 10 years, from 80,000 in 1997 to 170,000 in 2007, which had many impacts on the environment of the mountain. The following are a few of the measures implemented by the Centre in the past few years to limit these impacts:

**- Access to paths**

To limit access to the woodlands, the Nature Centre voluntarily narrowed the paths and remodeled them to form curved backs, which help keep walkers on the paths, rather than on the sides of the paths. Formerly a snowshoer's paradise, the paths reserved for snowshoeing were closed and are no longer marked out in order to limit access. Now, 27 km are marked out and 40 km are no longer marked. In addition, due to declining snow levels in the past few years, the Centre no longer rents snowshoes during mild spells.

The Centre has 688 volunteers who offer their services to plant trees and monitor paths. These volunteers are given free access to the site. For the past two years, visitors have been signing an agreement in which they agree to protect the environment and comply with signage.

**- Group limitations**

The number of groups is now limited to 200 visitors a day and institutions must sign an agreement to respect the environment. If they do not, the participants and institution may be barred from entering the site. The Centre also requires that an adult accompany each school group of 10. Delays are established between each group departure to prevent large groupings.

- **Limited access to the site within the urban perimeter**

The number of inflow areas in certain zones behind the main entrance has considerably reduced since the urbanization of these zones. Measures were also taken to limit access there.

An agreement between the City of Mont Saint-Hilaire, McGill University and firefighters allows night patrols of certain zones at fire risk and to restrict any night parties or campfires.

Other measures are listed in “**Appendix 2: Summary of Activities Relating to Biosphere Reserve Functions.**”

(iv) **Consider the possibility of a large cluster biosphere reserve, linking to other sites of conservation importance in the region.**

Although most of the scientific research has focused on the mountain, new research initiatives are beginning to focus at the landscape scale. Research conducted by staff at the Nature Centre on forest inventory and by researchers at McGill University relating to nutrient transportation, illustrates regional-level connections among water, agricultural production, woodlands, and environmental quality.

Moreover, rather than opting to integrate new protection zones within the reserve's territory, the Nature Centre's management chose to focus on educating the owners of land surrounding the reserve and municipalities and making them aware of the importance of preserving the remaining existing woodlands. That is why the Nature Centre characterized the entire region in 2003-2004 and produced a Conservation Atlas of Woodlands that included the region of Richelieu to Acton Vale, to integrate all forest corridors. This information was used by the RCM to reconstruct its development scheme and improve woodland protection. The data are available on CD ("Conservation Atlas of Woodlands") and were collected by Patrice Juneau, professor at the Université de Montréal, and Arold Lavoie, a botanist, who completed his Master's at UQAM. Over the next few years, the Centre wants to extend the existing forest corridors in its territory to the forest corridor that runs through the Lac-Saint-Pierre Biosphere Reserve from the Town of Contrecoeur, thus linking the two biosphere reserves.

Given these experiences, regional authorities now ask the Nature Centre to conduct technical studies needed for planning purposes. These requests contribute to the credibility of the Nature Centre as a bank of expertise.

This research will focus on the loss of woodlands to agricultural use. From 1992 to 2007, the region lost the equivalent of ten times the surface area of Mont Saint-Hilaire in forest.

Following the awareness actions undertaken by the Nature Centre, a Perimeter Committee was established in 2002 at the encouragement of the Mont-Saint-Hilaire municipality. It is chaired by a poultry farmer, Monique Lecours, and its mandate is to make property owners aware of the importance of woodlands. Forty recommendations were made and the Mont-Saint-Hilaire municipality adopted most of them. In conjunction with this work, the Nature Centre implemented a conservation fund to enable it to cover the management costs involved in transferring lands. To date, they have raised \$50,000.

Thus, some additional 58 hectares have been set aside since 1990 (which represents the addition of 18 private properties), of which 7 hectares were declarations of voluntary conservation. Around 3,000 trees were also planted over the past three years on many of these lands.

A second nature reserve on private land belonging to the City of Mont Saint-Hilaire is being recognized by the Ministère du Développement durable, de l'Environnement et des Parcs du Québec.

- e) *Other observations or comments on the above. The above efforts indicate a tremendous amount of work completed in the last 10 years.*

The periodic review conducted in 1997 also made the following recommendations for the upcoming decade:

- (i) developing a social science component for the work of the biosphere reserve;
- (ii) designing a monitoring program to help track changes in the 'integrity' or 'health' of the forest and aquatic ecosystems of the biosphere reserve;
- (iii) incorporating research results into information programs;
- (iv) developing a 'volunteer sector';
- (v) Strengthening the cross-disciplinary component in the research and education work conducted at Mt Saint Hilaire.

The Nature Centre has made great strides in developing a volunteer sector, with about 688 volunteers who contribute an estimated 1,700 hours of time during the year and about 4,200 members who contribute about 11% of the operating budget (see also Section 2c). Working with McGill scientists, there is also a stronger ecosystem monitoring program that aided in understanding the recovery of forests following the 1998 ice storm. Additionally, some efforts are being made to link research and education, particularly through the educational CDs that have been composed and in the knowledge translation undertaken by articles in the local newspaper that highlight research results.

There remains a need to nurture the emergence of both social science and cross-disciplinary research within the biosphere reserve and beyond the biosphere reserve where issues (such as water quality, forest protection) may be regional in scope. Authors of this report encourage researchers from McGill University to work with staff at the Nature Centre to ensure that research practices and results meet the educational goals and programs of the Nature Centre. More detailed comments are provided in Section 7.

## **2. SIGNIFICANT CHANGES IN THE BIOSPHERE RESERVE DURING THE PAST TEN YEARS**

- a) *Brief summary overview: Narrative account of important changes in the local economy, landscapes or habitat use, and other related issues. Note important changes in the institutional arrangements for governance for the biosphere reserve area, and changes (if any) in the coordinating arrangements (including the local biosphere reserve organization) that provide direction for the biosphere reserve. Note the role of local biosphere reserve organization in initiating or responding to these changes.*

The history of the use of the site and the development of the Nature Centre is provided in the 1997 report. As mentioned, the site contains a Nature Centre, Gault House (a well-appointed, stone building constructed in the early 1950s) dormitories and field labs, and recreational trails. McGill University owns the land that forms the core area of the biosphere reserve (the Gault Estate) while the Nature Centre maintains the trails, conducts research and outreach with local communities, and engages in outreach activities. In the last 10 years, the University has taken responsibility for education and research while the Nature Centre has taken responsibility for outreach.

In the late 1980s, the funding and administrative arrangements for the biosphere reserve were shaky. The Nature Centre had accumulated significant debt and the University had decreased its subvention to the Gault Estate substantially. By the mid-1990s, the administrative structure and the funding arrangement between the Nature Centre and the University were re-organized, including the appointment of a new academic Director of the Gault Estate and a new Director of the Nature Centre - both in 1995. These two appointees, serving in different capacities, undertook substantial measures to improve the financial and administrative capacity of the biosphere reserve.

Since 1997, the Mont-Saint-Hilaire Biosphere Reserve has greatly improved its relations with the community, both with citizens and its primary partner, the City of Mont Saint-Hilaire, even participating jointly in acquiring new land around the perimeter of the mountain.

The region of the Mont Saint-Hilaire biosphere reserve is experiencing a high degree of pressure from exurban development of Montréal. The number of visitors in the past decade has nearly doubled from 100,000 in 1997 to 170,000 in 2007. The biosphere reserve has invested time and money into acquiring basic inventory data and engaging visitors in conservation-related activities to make residents and visitors more aware of the biological and cultural significance of the region and to protect ecological and cultural assets.

*b) Updated background information about the biosphere reserve.  
The section numbers here refer to the Biosphere Reserve Nomination Form, February 2004 version.*

**(i)** Size and spatial configuration (¶ 7).  
Composition of core areas buffer zones and /or extent of transition area.  
See map, Appendix 1

**(ii)** Human population of the biosphere reserve (¶ 10).  
Most recent census data: (e.g. 2006)

Mont-Saint-Hilaire:	15,820
Saint-Jean-Baptistes:	2,875
Saint-Charles sur Richelieu:	1,808
Otterburn Park:	8,696
 Total of these municipalities around the mountain:	 29,199

**(iii)** Most recent 30 year climate normals for weather stations in the biosphere reserve (11.3).  
See Appendix 5.

**(iv)** Biological characteristics (¶ 12).

The site is one of eight Monteregian Hills in the St. Lawrence River lowlands, located about 32 kilometers east of Montreal. It is considered to be the most spectacular of the hills, with a set of seven rounded peaks, interior valleys, and a small 36 ha lake (Lac Hertel) in its centre. The vegetation cover is old growth deciduous forests and contains over 500 native plant species, 38 of which are designated rare and at risk. The reserve contains more than 200 bird species, including the peregrine falcon. There are unharvested forests with trees more than 500 years old, including two forest types that are endangered in Quebec. There are 15 species of herbs and two others known to be lost to development on the perimeter of the reserve since the 1960s. Over 340 minerals are found in the reserve, 42 of which are known nowhere else in the world. Finally, there are over 800 butterfly and moth species, 130 of which are considered rare. More details are provided in the First Review document of 1997 (Lechowicz 2007 “Gault Nature Reserve: A University Jewel” presentation to McGill University, October 21, 2007).

- (v) Development function (¶ 14). Note briefly here or refer to 4a, b, c below).

The region is primarily composed of agricultural land and small town development. The main crops grown are corn and soya, some of which provide food for intensive pork production. The region is a significant apple-growing area for the province as a whole. Small artisan production of food products and artistic works also feature in the area. There is also a quarry on the mountain and development pressures for housing surrounding the mountain. A new commuter train to/from Montréal makes this form of exurban development possible and increasingly desirable.

- (vi) Logistic support function (¶ 15). Note briefly here or refer to 5a, b, below).

The core area is an outdoor research laboratory owned by McGill University but also attracting researchers from other institutions such as Université du Québec à Montréal, Université de Montréal, Université de Sherbrooke, Institut Armand-Frappier, Concordia University, University of Saskatchewan, Shinshu University in Japan, and other partners in China.

To date, the volume of research still weighs in favour of the natural sciences. In the early years, research focused more on physical and biogeography, while in the last 10 years more research has been conducted in ecology. Much of the research has focused on the core area, especially on understanding patterns of biological diversity and animal behaviour. There is also research that examines the geological history of the mountain. Three studies in the last 10 years focused directly in the social sciences, examined the opportunities and challenges of forming an apple producer association, appraising the socio-economic values of orchards, and developing ways to improve the economic viability of orchardists through increasing value-added production.

Recently, research has been initiated at the landscape-scale that will incorporate both the social and natural sciences. For example, one study examining the flows of phosphorus in two river valleys uses the biosphere reserve as a point of reference. Studies of the effect of climate change on forest ecosystems will also incorporate social and natural sciences. Another study of ligniculture (or forest plantations) examines the value of different tree types and contributes to a regional examination of forest management practices in southern Quebec. The ice storm of 1998 provides an opportunity to compare ecological recovery on the mountain with other nearby mountains. Interest in ecological and social resilience will likely take place that incorporate social and natural science perspectives.

Presently, there are 25 on-going research projects involving professors from McGill, with 11 new projects this past year alone. In total, there have been 587 published research papers and 140 theses completed by researchers in the reserve (see Appendix 4). This past year, nine courses from four universities used the site for their fieldwork.

- (vii) Institutional aspects (¶17) Changes (if any) in hierarchy of administrative divisions.

Refer to 6 below

Please refer to 1d above

The region is now situated geographically and politically within the Montreal Urban Community. Regulations of the Community now apply to activities within the reserve area.

- c) *The biosphere reserve organization and/or biosphere reserve associated group(s). Comment on the following topics that are of special interest in the experience of the Canadian network.*

- (i) Cooperation plan up-dated, including vision statement, goals and objectives, either current or for the next 5-10 years.

Individual cooperation plans were developed by most biosphere reserves (including MSH) in Canada on the occasion of the 2002 World Summit in Johannesburg. Additionally, the Nature Centre has established its own development plan for 2003-2006 and again, for 2007-2010. The most recent plan describes the vision, mission and values of the Centre. These elements reflect the three main functions of a biosphere reserve. The plan also establishes specific objectives to carry out its mission. Each objective sets out realistic targets or accomplishments for the coming three years. Appendix 2 reviews the actions taken over the last eight years.

- (ii) Budget and staff support including approximate average annual amounts (or range from year-to-year); main sources of funds; special capital funds (if applicable); number of full and/or part-time staff; in-kind contribution of staff, facilities or equipment; volunteer contributions of time or other support.

The overall budget for the Nature Centre was \$1,040,624 for 2007. This is more than double the budget of \$437,383 in 2000. More than 50% of the funds are from entry fees (about 42%) and memberships (11%). Additionally, special project funding from municipal, corporate, provincial and federal sources make up 38% of the budget. These latter funds are not recurring, but reflect individual projects for which the Centre receives specific subventions or contracts. In the last year, municipalities have begun to use the technical services provided by the Nature Centre staff because of their quality and expertise.

There are 12 full-time, year-round staff people, 6 of whom are devoted to conservation and 5 of whom are devoted to management. There are 15 people hired as patrol people in the summer and part-time during the winter. With students, the total staff during the summer months numbers 35. There are about 688 volunteers who contribute an estimated 1,700 hours of time during the year.

- (iii) The biosphere reserve's communications strategy including different approaches and tools geared towards the community and/or towards soliciting outside support.

The Director of the Biosphere Reserve has considerable media experience, a strong marketing orientation, and a deep commitment to integrating the work of the Nature Centre with communities in the surrounding region. With these skills and commitment, the biosphere reserve has successfully reached out beyond its core area to its neighbours in the zone of co-operation. Several communication efforts have been undertaken including:

- Membership with a newsletter to 4,200 people that is published once a Month via e-mail;
- Publishing two articles per Month in the regional newspaper, *L'oeil Régional*, relating to national and regional issues;
- Establishing special events and activities that attract local residents e.g. fall storytelling, Christmas songs and tales;
- Marketing of local products in the Nature Centre;
- Annual photo contest;
- Writing “VIP” letters about five times per year to decision makers in the region about activities of the Nature Centre;
- Producing annual reports, brochures, etc.;
- Sitting on local council committees, such as environmental, planning, and cultural committees of the city of Mont St Hilaire;
- Engaging volunteers;
- Participating in the establishment and work of the Perimeter Committee (see other section).

Of particular significance is the launching of a new website that illustrates the natural and cultural history and wealth located in the biosphere reserve. This website was designed by three people working for 18 months who went out into the communities to document ecological and social characteristics of the area and factors contributing to change. The site tells the stories of these people and places, includes local lore and the results of scientific information. The final product is inspired and inspiring. The production of the website required the researchers to draw on the linkages with the community while its publication will likely strengthen those linkages.

[www.museevirtuel.ca/Exhibitions/Hilaire/flash-en/index.html](http://www.museevirtuel.ca/Exhibitions/Hilaire/flash-en/index.html)

- (iv) Strategies for fostering networks of cooperation in the biosphere reserve that serve as connections (“bridging”) among diverse groups in different sectors of the community (e.g. groups devoted to agricultural issues, local economic development, tourism, conservation of ecosystems, research and monitoring).

Please see section 1d (i) and 1d (iv) above. See also Appendix 2 and Appendix 3.

- (v) Particular vision and approaches adopted for addressing the socio-cultural context and role of a biosphere reserve (e.g. promotion of local heritage resources, history, cultural and cross-cultural learning opportunities; cooperation with First Nations groups; reaching out to recent immigrant groups, etc.).

The Nature Centre places strong emphasis on the link between nature and culture to develop a feeling of belonging within the biosphere reserve. The following are some of the cultural initiatives undertaken in the past ten years: photo contests, Christmas celebrations, stories and legends, etc. (Appendix 2). In a Masters' thesis completed in 2003 entitled « Étude du concept de la Réserve de la Biosphère » [Study of the biosphere reserve concept], Ludyvine Milien suggested the concept of « Territoire de Nature et de Culture » [Land of nature and culture] to define the biosphere reserve that is directed more toward cooperation between the stakeholders. These thoughts were echoed by the director of the Nature Centre in an essay on the issue in 2007 and influence the reserve's strategic orientations (Appendix 4).

The City of Mont-Saint-Hilaire is trying increasingly to integrate a more cultural approach to the biosphere reserve. For example, the motto of the City of Mont-Saint-Hilaire is: « Ville de nature, de culture et de patrimoine » [City of nature, art and heritage].

Additionally, please see section 1d(i) and 1d(iv) above. See also Appendix 2 and Appendix 3.

- (vi) Obstacles encountered by the biosphere reserve or challenges to its effective action.

Increasing numbers of visitors have challenged the biosphere reserve to address conservation issues. The large number of people poses challenges for environmental protection and visitor engagement. See Section 1diii above for measures taken.

The word, “reserve” suggests a protected area wherein human activities are prohibited because they affect the integrity of the natural environment. There has been some resistance by residents and local administration to engage with the reserve for fear that it may restrict their use of resources and their livelihoods.

Additionally, staff at the MSH Nature Centre, have found that there is so much information about the environment that people cannot absorb it all. Staff attempt to reach out by engaging people as volunteers. Finally, the environmental movement as a whole has been characterized by a fatalistic mentality that inhibits the actions people might otherwise take to protect their natural heritage.

The relationship between McGill University and the Nature Centre has shifted towards a stronger model of partnership throughout the years. The reviewers encourage continued collaboration on all functions of the biosphere reserve – conservation, sustainable development, and logistics – rather than separating the responsibilities for these functions between the partners. The upcoming celebrations of the 30<sup>th</sup> Anniversary of the biosphere reserve and the 50<sup>th</sup> Anniversary of the Gault bequest could serve as opportunities for joint activities in the community.

*d) Comment on the following matters of special interest in the experience of the Canadian network as it relates to this biosphere reserve. Refer to other Sections below where appropriate.*

- (i)** Effectiveness of management plans of government agencies and other organizations in the biosphere reserve. Brief note about plans that have been completed or revised in the past 10 years.

In 2006, the RCM restricted the zoning, and excluded the mountain from the urban perimeter, calling this area a “non-agricultural zone.” This action is significant because it effectively maintains strict conservation for this area.

Since 2002, the Nature Centre has worked with the Mont St-Hilaire, Acton Vale and St Jean-Baptiste to acquire new protected areas through private donation or purchase.

- (ii)** Continued local involvement of the work of a biosphere reserve.

See above.

- (iii)** Appropriateness of the current zonations.

Current zonations are appropriate. New lands in the buffer zone are being acquired by municipalities and Nature Conservancy for protection purposes.

- (iv) “Sustainability” as a deliberate guiding theme for programs in the biosphere reserve.

Please see Appendix 2.

- (v) Particular scientific work linked with national and international programs (e.g. EMAN, EuroMAB, IUCN – World Conservation Union).

Since 1997, scientists at McGill University have used research funds to establish a variety of permanent plots within the reserve to gather data on biodiversity and ecosystem functions. These include: 1) two 1-ha plots that are part of the international SI/MAB network for monitoring biodiversity change, 2) eight smaller EMAN (Environment Canada) plots for monitoring biodiversity change, 3) a monitoring network in the West Creek drainage for hydrological conditions and aquatic invertebrate biodiversity, 4) a network of automated stations for monitoring microclimatic conditions throughout the reserve, and 5) some 200 quadrats representing all the forest types in the reserve. As data are accumulated from these sites, they may stimulate new teaching and research initiatives at the reserve.

- (vi) Issues arising from multiple cross-scale relationships inherent in the social-ecological systems (e.g. forests, marine systems; links of key local corporations to global economy; government activities across different levels of federal, provincial, and local jurisdictions).

Please see Section 1d above.

- (vii) Strengthening collective capacities for the overall governance of the biosphere reserve (e.g. organization of new networks of cooperation, partnerships).

Improved collaborations with the municipalities are evident in the participation of the Nature Centre on municipal committees, the establishment of the Perimeter Committee in 2002, and even the new lease between McGill University and the Nature Centre.

- (viii) Continued justification for a biosphere reserve.

There are strong efforts to maintain the three functions of a biosphere reserve.

### 3. THE CONSERVATION FUNCTION

*(This refers to programs that seek to protect biodiversity at landscape and site levels and/or ecological functions that provide ecosystem goods and services in the biosphere reserve. While actions to address this function might be focussed on core areas and buffer zones, ecosystem dynamics occur across a range of spatial and temporal scales throughout the biosphere reserve and beyond.*

- a) *Significant changes (if any) in the main habitat types identified for the biosphere reserve, including natural processes or events, main human impacts, and/or relevant management practices. (The comparison is with the situation described some ten years ago. Refer to habitat types identified in the section on “Significance for Conservation of Biological Diversity” in the first periodic review form, or ¶ 12 in the nomination document).*

The ice storm of January 1998 changed many biophysical aspects of the landscape. New research has been conducted to understand local impacts, resilience, and opportunities for restoration. Improvements in environmental protection have been undertaken through new zoning practices within the reserve (to restrict snowshoeing outside of the trails) and engaging people in restoration activities. Additionally, the municipalities have also been more involved in establishing new zoning for environmental protection at the perimeter of the mountain. The municipalities have also integrated new practices for lawn cutting and riparian management.

- b) *Describe the main conservation programs that have been conducted in the biosphere reserve during the past ten years as well as current on-going ones. Note their main goals and the scope of activities, e.g. biotic inventories, species-at-risk, landscape analyses, conservation stewardship actions. Cross reference with other Sections below where appropriate.*

Please see Appendix 2

- c) *Conservation links to, or integration with, sustainable development issues (e.g. stewardship for conservation on private lands used for other purposes).*

Please see Section 1(d) and Appendix 2

- d) *Other comments/observations from a biosphere reserve perspective.*

#### 4. THE SUSTAINABLE DEVELOPMENT FUNCTION

*(This refers to programs that address sustainability issues at the individual livelihood and community levels, including economic trends in different sectors that drive the need to innovate and/or adapt, the main adaptive strategies being implemented within the biosphere reserve, and initiatives to develop certain sectors such as tourism to compensate for losses in other markets, employment, and community well-being over the past ten years or so).*

- a) *Briefly describe the prevailing trends over the past decade in each main sector of the economic base of the biosphere reserve, e.g. agriculture, renewable resources, non-renewable resources, manufacturing and construction, tourism and other service industries etc.*

The apple-growing industry is an important component of the biosphere reserve. New practices include improved marketing through local sales and with a contract to provide apples to McGill University. Additionally, the growers have collectively introduced improved environmental practices such as spraying pesticides on the same day to reduce the amount of pesticides used by 60%.

There are now more pork producers in the region but they have limited space to dispose of manure. In order to protect local woodlands, the local authorities now limit the spreading of the manure and the use of woodlands to do so.

The Perimeter Committee also involves agricultural producers, the quarry owners and other entrepreneurs in determining zoning requirements at the foot of the mountain. This has helped to gain support for the establishment of a protected corridor immediately adjacent to the mountain.

- b) *Community economic development initiatives. Programs to promote comprehensive strategies for economic innovation, change, and adaptation, and the extent to which they are being implemented within the biosphere reserve. Local business or other economic development initiatives. Are there specific “green” alternatives being undertaken to address sustainability issues? Relationships (if any) among these different activities.*

The marketing of local products in the Nature Centre is one initiative that gains local support. The marketing of apples to McGill was also a major initiative. Discussions around the Foyer Savoie illustrate a new development mentality in the community whereby the presence of a natural reserve is considered a contribution to overall sustainability in the region.

- c) *Community support facilities and services. Programs in/for the biosphere reserve that address issues such as job preparation and skills training, health and social services, and social justice questions. Relations among them and with community economic development.*

Many of the summer jobs are available at the Nature Centre for students. There is a training component associated with these opportunities. Additionally, research opportunities with McGill University may also focus on specific training.

## **5. THE LOGISTICS FUNCTION**

*(This refers to programs that enhance the collective capacity of people and organizations in the biosphere reserve to address conservation and development issues. Much of it may be directed towards the research, monitoring, demonstration projects, education and training that are needed to deal with the specific circumstances of the biosphere reserve. To be effective they should be open to learning and the exchange of experience with other biosphere reserves and international programs of cooperation).*

- a) *Describe the main research institutions in the biosphere reserve, or conducting work in the biosphere reserve, and their programs. Comment on organizational changes (if any) in these institutions over the past ten years as they relate to their work in the biosphere reserve. Summarize the main themes of research and monitoring undertaken over the past ten years under the general categories of transdisciplinary syntheses (research and scholarship), and for topics that come under the standard abiotic, biotic, and socio-economic categories. List specific topics with reference citations under these headings, and provide a list of the full citations alphabetically by lead author at the end of Section 5, or in a separate Appendix.*

The Mont Saint-Hilaire Biosphere Reserve is a major research site for McGill University and is also used for research by other universities. McGill University owns the Gault estate which is the core area of the biosphere reserve. It has established an agreement between McGill and the Nature Centre for the allocation of responsibilities and revenues (as described above).

According to information on the Gault Nature Reserve Website (<http://www.mcgill.ca/gault/sainthilaire/>), research on the mountain has a long history. Publications have included information on the natural dynamics of the mountain ecosystem, plant and animal populations, and patterns of diversity.

Studies of the geology and the mineralogy of the mountain are also significant, including the discovery of new mineral species. Finally, the juxtaposition of a primeval forest in the reserve and the urban and agricultural development of surrounding lands have established conditions for interesting research in landscape ecology (Please see Appendix 4).

- b) *Environmental/sustainability education. Note the main educational institutions (“formal” – schools, colleges, universities, and “informal” – services for the general public) in the biosphere reserve, or conducting work in the biosphere reserve. Describe their programs, including special school or adult education programs, as these contribute towards the functions of a biosphere reserve. Comment on organizational changes (if any) in institutions and programs that were identified in the biosphere reserve ten or so years ago (e.g. closed down, redesigned, new initiatives). Note programs of UNESCO Associated Schools where applicable, and contributions towards the UN Decade of Education for Sustainable Development (2005-2014).*

The Nature Centre provides most of the work in environmental/sustainability education. Please see Appendix 3.

- c) *Other comments/observations from a biosphere reserve perspective.*

## **6. GOVERNANCE AND “CIVIL SOCIETY” CONTEXT FOR THE BIOSPHERE RESERVE**

*(Local biosphere reserve groups have to work within extensive overlays of government bodies, business enterprises, and a “civil society” mix of non-government organizations and community groups. These collectively constitute the structures of governance for the area of the biosphere reserve at any given time. Success in carrying out the functions of a biosphere reserve can be crucially dependent upon the kinds of collaborative arrangements that evolve among sets of these other organizations. A key role for the local biosphere reserve group is to learn about the governance system they are in and explore ways to enhance its collective capacities for fulfilling the functions of a biosphere reserve.)*

- a) *What is the overall framework for governance in the area of the biosphere reserve? Identify the main components and their contributions to the biosphere reserve.*

See Sections 1b, 1d, and Appendix 2

The biosphere reserve is governed by a board composed of 12 members. Five members are selected by McGill and seven members are selected by the Nature Centre and are chosen from community residents. Dr. Martin J. Lechowicz, Professor of Biology at McGill University, is the director of the Gault Nature

Centre while Mr. Kees Vanderheyden is the Director of the Mont Saint-Hilaire Nature Centre. This arrangement has been secure for several years; however, a new agreement between McGill and the Nature Centre will be signed and made effective June 1, 2008 – May 31, 2018. This agreement allocates responsibilities for the site (e.g. for infrastructure, outreach) between McGill and the Nature Centre and determines the sharing of revenues from visitors' entrance fees and memberships between the two bodies (35% McGill; 65% Nature Centre). Over the past decade, there has been a movement from an organization (Nature Centre) focused on its own programs on the mountain towards a partnership with adjacent municipalities. Additionally, the arrangement between McGill University and the Nature Centre has moved away from a landlord-tenant relationship towards a stronger partnership model as described previously.

## **7. CONCLUSIONS**

The first periodic review in 1997 noted that the biosphere reserve was a “site” reserve, and that it was too small to carry out all functions of the biosphere reserve. Nevertheless, since 1997, there has been significant outreach by the Nature Centre towards the local communities in the buffer and transition zones. Consequently, all three functions –conservation, sustainable development, and logistical provisioning – are indeed being met in the biosphere reserve region. During this time, efforts by the Nature Centre to participate in regional planning, to provide outreach and education, and to provide local producers and planners with usable knowledge that promote nature conservation and sustainable development have made significant changes in how local municipalities view the biosphere reserve and view their roles in advancing conservation and sustainable development.

For example, the municipality of Mont Saint-Hilaire has created a new Division of Environment and Parks that integrates the green practices of the Nature Centre in the municipality. This Division addresses concerns about invasive species, cutting of lawns near riparian areas and has encouraged the conservation of particular sites on private lands. At the level of the RCM, planners no longer have to explain to politicians why it is important to protect woodlots. They also see that protection of water courses and riparian areas are important emerging issues. The municipalities are now viewed as leaders in “green” development. This “green” orientation is given prominence in Mont St-Hilaire that boasts a new logo with the peregrine falcon and a new motto “City of art, nature, and heritage”.

When some lands around the perimeter were being investigated for possible acquisition for protection purposes, there was concern about ‘locking out development’. Thus, the Perimeter Committee was born to examine the whole perimeter of the mountain. This committee consulted broadly and consequently, lands have been identified as having high ecological values and are slowly being acquired by non-governmental organizations and the municipalities.

When municipal officials were asked by the reviewers if having a biosphere reserve was an advantage, they responded with an unqualified “yes, definitely”. In recent years, they have drawn on the expertise of the Nature Centre to assist them in identifying conservation needs. Individual staff people sit on local boards relating to “environment” and “culture”. When the municipality of Mont St-Hilaire has acquired land for conservation purposes, it has granted funds to the Nature Centre to manage it. The relationship between the Nature Centre and the local municipalities appears positive and credible.

Furthermore, the work in the last ten years has ensured that the biosphere reserve has a clear mandate, the contributors are financially viable, and the connections between the local communities and the core areas are more closely coupled.

The level of outreach and joint collaboration between the Nature Centre and the surrounding communities provide a wonderful opportunity for McGill University to engage local residents. As University researchers move from site-specific research towards landscape-level research, they will benefit from nurturing these connections with communities. Researchers at the University would be well advised to work closely with the Nature Centre to establish research programs that continue to contribute to the community capacity and engagement that have been established through the efforts of the Nature Centre staff. There have been some communication problems, but these should be resolved by engaging researchers who speak French.

Below, the reviewers make some observations and recommendations. Some of these recommendations follow issues raised in the 1997 report, some are specific to the current situation:

1. The social science (and transdisciplinary) component of research programs is emerging gradually. Some work on the marketing of local apples was done recently. Additionally, research now begun on the transport and fate of nutrients in water courses incorporates concern for the health of aquatic ecosystems and may introduce a social science component. New research related to social-ecological resilience may soon follow. For example, a recent collaborative agreement has been established between UNESCO/MAB and the new Stockholm Resilience Centre. One of the researchers at McGill University is part of the Resilience Alliance. He is keen to establish a new research program in the region that is in keeping with the themes of resilience and sustainability. The reviewers encourage development of this kind of research, building on and contributing to the community capacity and engagement that has been established largely by the work of the Nature Centre.

2. The Director of the Nature Centre has taken specific studies and translated the results into usable language for residents. Additionally, the creation of the CDs and the website are means by which the research results are incorporated into information and outreach programs. However, researchers at McGill should work more closely with Nature Centre staff to determine how researchers may contribute more directly to knowledge translation and exchange with local residents. This observation was made in 1997; we reiterate the importance of a close association as these efforts will assist researchers conduct their work in the future, particularly as they move to conduct research at the landscape scale.
3. The relationship between McGill University and the Nature Centre has shifted towards a stronger model of partnership throughout the years. We encourage continued collaboration on all functions of the biosphere reserve – conservation, sustainable development, and logistics – rather than separating the responsibilities for these functions between the partners. The upcoming celebrations of the 30<sup>th</sup> Anniversary of the biosphere reserve and the 50<sup>th</sup> Anniversary of the Gault bequest could serve as opportunities for joint activities in the community.
4. The perimeter surrounding the biosphere reserve must continue to be protected to increase the conservation zones around Mont Saint-Hilaire.
5. The association between nature and culture favours the integration of sustainable development practices within the reserve and gives meaning to the biosphere reserve concept implemented by UNESCO since Seville in 1995. The Mont Saint-Hilaire reserve should share its reflections on the biosphere reserve concept as "Land of nature and culture" with other Canadian reserves to develop the concept in Canada (Appendix 3).

**REVIEWED BY:**

**Hélène Gignac**

Centre de transfert technologique  
en écologie industrielle

**Maureen Reed**

University of Saskatchewan

Reviewers on behalf of the Canadian Biosphere Reserves Association  
for submission to the Canadian Commission for UNESCO  
January 21<sup>st</sup>, 2008

**Appendix 1: Map** (See CD entitled: « Milieux Naturels protégés Mont Saint-Hilaire »)

**Appendix 2: Summary of Activities Relating to Biosphere Reserve Functions**

Source: Kees Vanderheyden, Overview “Mont Saint-Hilaire Biosphere Reserve” 2000-2008

A. In Conservation:

1. The mountain and its perimeter:

- **2005 - 2007, Control strategies** for the increasing use of the mountain and regular patrols to prevent illegal entries, which are harmful to the environment.
- **2006 Valley commitment** to make visitor-members partners in conservation, particularly near an "illegal" entry.
- **Volunteer program** to protect nature. More than 700 volunteers help return the woodlands to their natural state, conduct clean-up efforts and patrols and provide services during special events.
- **Group visits to the mountain.** 2007: Special policies for group visits because groups can harm the environment and disturb the peace.
- **Management of five** physical exercise clubs: three walking clubs, a yoga club and a stroller fitness club.
- **1996 - 2000, Activities for Seniors** (Golden Wednesdays) for four years, followed by walking clubs and yoga clubs.
- **Eco-practices** by supervisors at the Biosphere Reserve: use of 100% recycled paper, use of bio-diesel fuel for vehicles, use of low-emission vehicles on the land.
- **Sales to visitors** of organic, local and fair trade drinks and food. Since 2004, Pricing policy.

2. In the area:

- **"Voluntary Conservation" and stewardship program** since 2000 to protect the foothills and land around the mountain through awareness and information activities, conservation servitudes, purchases and assignments. NB: 8 hectares in 2007.
- **"Funds for Protection of the Natural Areas"** to finance administration (notaries, surveyors, etc.).
- **Workshops with public servants and policy makers** to reparcel the forest corridors in cooperation with regional municipalities and land owners. As of 2008.

B. Regional cooperation and sustainable development:

- **In 1999, creation of a boutique of local products** and promotion of regional apple growing and agriculture to support green economy in the Biosphere Reserve.
- **Since 2003, cooperation with the municipality of Saint-Hilaire:**
  - Recommendations for protecting the perimeter of the mountain following the "Perimeter Committee" and urban planning by-laws
  - "Environment Committee" to advise the city
  - Development of a Wildlife sanctuary in the Dieppe Valley
  - Development of retention ponds in the sunfilled woodlands
  - Reparcelling of forest corridors in the area
  - Tree policy
  - Eco-advisory project
  - "Notable trees" project
- In 2004, production of a "**Regional Conservation Atlas of Woodlands**" CD for municipal administrations, land development experts and citizens concerned with the environment. Detailed inventory of woodlands and evaluation of their ecological wealth. Conservation proposals. Used by the RCMs and municipalities.
- Planting **windbreaks** to block the wind and prevent farmland from drying out.
- In 2006-2007: « **Nature et ruralité** »["**Nature and rurality**"] CD, a detailed study of the natural, cultural, historical, economical and social assets of the three municipalities of Saint-Jean-Baptiste, Saint-Charles and Saint-Denis, to highlight their natural, heritage, cultural and agricultural assets and to promote the protection of natural heritage.
- **Regional meetings** with the Vallée du Richelieu RCM, as well as consultants from Mont Saint-Hilaire, Saint-Jean-Baptiste, Otterburn Park, Beloeil, Saint-Charles and Saint-Denis.
- **Index of natural areas.** Through funding from the Réseau des milieux naturels protégés (RMN) [protected natural areas network], the Nature Centre is currently creating an index of the lands protected by non-governmental stakeholders in three administrative regions in Quebec.
- **Characterization of farmland in the Vallée du Richelieu RCM.** Our region is primarily farmland. This zone is under significant pressure from residential and industrial development. It is important to know the farmland zone fully and reflect on the sustainable use of these lands. The Nature Centre is working with the Vallée-du-Richelieu RCM to characterize this farmland zone. This tool will be useful for land area managers.
- **Inventory of notable trees** in MSH, Otterburn Park, Saint-Jean-Baptiste and Saint-Charles. This project indexed 723 notable indigenous trees and protected two majestic witnesses of the forests of old.
- **Regional cooperation.** We took an inventory and description of the woodlands of the Acton RCM to guide decision-makers in their land development plans. We will also index the private protected natural environments in the region and centre of the province.

### C. Communication – Education – Culture

- **Monthly electronic newsletter** in French and in English
- **VIP letter** five times a year for regional decision-makers in business, industry, education and culture.
- **Website** of the Nature Centre with regular updates.
- **Seminars** in schools and associations.
- **1995, Studies of visitors' attitudes** toward the mountain, education on the environment, purchase of products in the orchards surrounding the Saint-Hilaire mountain.
- **Since 1996, monthly series** in local media on the flora, fauna, and attitudes toward the mountain environment (110 features to date). Since 2002, 55 monthly features on local and international environmental issues.
- **Since 1996, Cultural initiatives** to promote nature appreciation: annual photo contests, story evenings, Christmas celebrations, participation in the cultural show « A flanc de culture » [on nature's side], special historical visits for members.
- « **Histoire de la Montagne** » [**history of the mountain**] by historian Pierre Lambert.
- **Story collecting** from the mountain, by Pierre Lambert.
- Participation in « **Cercle des conteurs du Mont Saint-Hilaire** » [**Mont Saint-Hilaire story-tellers' circle**].
- **Since 2000, Nature discovery workshops** on the mountain with the Croque-Science children's group.
- **2 bird watching clubs.**
- **Academic studies** by McGill University on amphibians, chipmunks, spring-time plants, the mountain's hydrological systems, the impact of hailstorms and frost on the forest and fauna and the promotion and viability of apple growing around the mountain.
- In 2007: creation of a « **Vitrine de la Réserve de la Biosphère** » [**window into the Biosphere Reserve**] at Mont Saint-Hilaire.
- **Annual photo contest** on regional features (used in the City of Mont-Saint-Hilaire calendar).

## Our partners:

- Association of Citizens of Mont-Saint-Hilaire
- Au coeur du yoga
- Caisses Desjardins de la Vallée-du-Richelieu
- Cardio Plein Air
- Centre Local de Développement de la Vallée du Richelieu
- Nature Conservancy of Canada, Quebec Region
- Croque-Sciences
- Member of Parliament Yves Lessard
- Members of the Provincial Parliament of Borduas riding Pierre Curzi and J-P Charbonneau
- École Au Fil de l'eau
- École Casavant
- Fondation de la faune du Québec
- EJLB Foundation
- Fondation Hydro-Québec pour l'environnement
- Forêt Québec – Progr. mise en valeur des ress. du milieu forestier, Volet II
- Government of Canada – Habitat Stewardship Program for Species at Risk 2006-2007
- Government of Canada, Human Resources Development (Summer job)
- Government of Canada, EcoAction 2005-2006,
- Government of Canada, Virtual Museum of Canada, Katimavik
- Ministère du développement durable, de l'environnement et des parcs du Québec - Programme de conservation du patrimoine naturel en milieu privé
- Acton Vale RCM
- Vallée du Richelieu RCM – Rural pact
- Polyvalente Ozias Leduc
- Regroupement des milieux naturels (RMN)
- Réseau À-vie-forme
- McGill University Gault Nature Reserve
- Table de concertation jeunesse de la Vallée-du-Richelieu
- City of Otterburn Park
- City of Mont Saint-Hilaire

### **Appendix 3: Note on the Biosphere Reserve and its relation to culture**

Source: Kees Vanderheyden, personal communication, 2007

#### A path to expanding the concept of "Biosphere Reserve"

A new issue that is too often underestimated, even forgotten completely: the cultural issue. In an environmental outlook, the biological character of spaces is always put first. But with the evolution of mindsets and the extent of the development of the globalization phenomenon came an awareness of the complex ensemble of elements that come into play in the land protection process: culture. Culture is an essential element that results from the awareness of emphasizing socio-environmental values. Geography is a search for a feel for the land.

[Translation] "Geography discovers the singular status of the social sciences: for those who wish to go beyond surface regularities and banalities, there comes a moment when they must consider peoples' values, the way they think and dream, and the importance they bestow on the various aspects of the environment in which they live." (Claval, 1984, in Gumuchian, 1991, p.55).

The cultural issue is decisive because nature cannot be considered independently of any representation, be it spatial, social or cultural. That is why culture plays an essential role; it's what gives it a specific viewpoint and interpretation. The natural system is defined only through its relation to culture, which gives it a specific sense. It is impossible to consider nature without symbolic or affective dimensions. It is true that an individual is strongly influenced by personal culture.

It can translate itself into structures such as a theatre or a library, or cultural activities such as shows, exhibitions or festivals. Behaviours and thought are influenced by the lessons and intellectual activity that stem from one's heritage. Spatial practices are as much a part of culture as language or religion and allow one to develop a feeling of belonging to a collective area.

#### Toward a "Land of Nature and Culture" (LNC)

Developing nature-culture ties is the best way to give culture the place it deserves among land considerations. But the term "Biosphere Reserve" does not clearly reflect this tie. That is why we should develop the concept of "Land of Nature and Culture" (LNC).

The objective is to constantly align the two forces, culture and nature, with Mont Saint-Hilaire, to create a common spatial representation of the Mont Saint-Hilaire Biosphere Reserve.

Mont Saint-Hilaire is part of a region that is set apart by its plains and hills, which give it a distinctive landscape. The region's history focuses on Mont Saint-Hilaire as a unique place. Regional artists and writers have often showcased it in their works (Ozias Leduc, Paul Emile Borduas, Ernest Choquette etc...). It is in the best interests of the territory's potential to develop a genuine feeling of belonging that is directly linked to the Biosphere Reserve. The LNC does not want to replace the biosphere reserve concept, but only perfect it.

A synergy must be established among the territory's strengths (agricultural, touristic, industrial, ecological resources) and its human resources (the cultural wealth of local populations). To enable this project to have the necessary outreach to allow it to develop a sense of being part of the biosphere reserve, it must be adapted into the territory's development strategies through creation of a specific "Land of Nature and Culture" program.

### **By way of CONCLUSION**

The Mont Saint-Hilaire Biosphere Reserve enjoys various roles that result from the multi-scaled nature of the concept. Several conceptual elements enter into play in biosphere reserves.

- Firstly, the idea of biodiversity, the concept's central element, seems to be an obvious reference. The protection of biological diversity is one of the driving forces of the concept that justified the naturalist approach of the early years.
- As the concept evolved, sustainable development came to the forefront, which gave the concept a more human approach. However, the imprecision often associated with sustainable development did not permit a clear direction toward consideration of all the environmental, economic and socio-cultural issues.
- Skills development appears to be a solution in terms of education, relative to the environment and local development, that could provide the entire human aspect that the concept claims can meet the territory's various issues.

Biodiversity protection is largely recognized and accepted by the stakeholders. As for sustainable development, it is measured in concrete actions because it seems too vague to stakeholders, even though they sometimes refer to it. Skills development seems to be the way to establish concrete objectives for sustainable development through environmental education and local development projects.

Therefore, it is important to bring the stakeholders to a common vision of the concept. To do so, a way must be found to agree on common references. These references are based on the socio-cultural aspects that contribute to an increased sense of belonging to the Mont Saint-Hilaire Biosphere Reserve area. It is essential to highlight the cultural aspect. It can play an important role in uniting the region that is crucial to developing genuine cooperation between the stakeholders.

By focusing on the nature-culture link, we hope to develop a sense of belonging to the biosphere reserve. This will give real meaning to the territory for the stakeholders, based on cultural values common to all.

The "Land of Nature and Culture" concept focuses more on cooperation between the stakeholders and can follow the first step, the "Cooperation Plan".

The idea of promoting the cultural character of the biosphere reserve is gaining in popularity. The City of Mont-Saint-Hilaire tries to integrate a more cultural approach to the biosphere reserve. For example, the motto of the City of Mont-Saint-Hilaire is: "City of nature, art and heritage." The city's cultural magazine, *i*, in its first issue in September 2003, included an article on the Mont Saint-Hilaire Biosphere Reserve. Each year, the city's annual calendar includes photos of the mountain. The Nature Centre's annual photo contest suggests the same themes. They contribute to bringing the territory together.

In conclusion, the biosphere reserve concept can effectively negotiate land development procedures considering that it must be recognized in the RCM's development scheme and in urban planning by-laws. To consider all of the area's issues, it is necessary to establish genuine cooperation between all area stakeholders and the local population, who thus develop a sense of belonging. The biosphere reserve concept is beginning to make a name for itself, so that name should be kept. The LNC proposes itself as a definition of what a biosphere reserve can be today, not a new concept to replace it.

In the case of the Mont Saint-Hilaire Biosphere Reserve, there has been a more or less parallel evolution of the concept and its application, despite certain gaps between theory and practice.

Lastly, it is up to local and regional stakeholders to make humans coexist with their environment and move forward. How can divergent opinions and area representations be bridged if not through cultural evolution?

NB:

This text reflects the opinions of supervisors of the Biosphere Reserve. Excerpts were taken from the Ludyvine Milien work entitled: « Étude du concept de la Réserve de la Biosphère » [study of the biosphere reserve concept].

## **Appendix 4: Research Conducted in the Biosphere Reserve 1998-2007**

**This list was provided from the website of McGill's Gault Nature Reserve.**

**It can be located at:** <http://www.mcgill.ca/gault/research/>

### **Studies in Progress**

- **Examining runoff generation beyond a headwater basin in a temperate forested watershed.**

### **April James, Nigel Roulet, Department of Geography, Global Environmental and Climate Change Centre (GEC3)**

Runoff generation refers to the physical processes by which water travels through the landscape, moving through the subsurface or over the ground surface, ultimately arriving at the stream channel. These physical processes vary in both space and time. It is this variability that leads to difficulties in modelling storm response, contaminant transport and nutrient fluxes. Runoff generation has been well studied in headwater basins, but little research has examined how it changes across scale, or with increasing basin size. At Mont Saint-Hilaire, eight drainage basins, varying in size from 7 to 150 ha, have been established in a nested framework to examine the influence of scale on runoff generation and stream water chemistry. Monitoring of hydrometric and geochemical evidence of storm runoff across the nested basins has been collected during 12 spring-summer-fall storms. The wetness or dryness of a basin can alter the flowpaths of water and the mechanisms by which it is delivered to the stream channel. Prior to each storm, moisture conditions were assessed for two representative basins, using spatial surveys of shallow soil moisture. The soil moisture surveys provide evidence of the level of hydrologic connectivity prior to each storm. Assessing the hydrologic connectivity across scale requires a link between our detailed surveys on representative basins and the larger basins. This link is investigated using a description of basin topography. The local hydrology of a basin is strongly influenced by its topography. Generally, areas within a basin that variable saturated are located in valley bottoms or more local depressions. Because of this link between the hydrology of a basin and its topography, we can attempt to use terrain-based indices to indicate the governing and active hydrologic processes (e.g. TOPMODEL). We use a high-resolution LIDAR-derived DEM of each basin to test for a relationship between soil moisture patterns and terrain-based indices. The combination of spatial surveys of shallow soil moisture and observation of temporal runoff generation gives a more complete story of hydrologic connectivity. Illustrating when terrain-based indices indicate hydrologic connectivity will lead to more accurate modeling of storm response. With this study, we hope to contribute to the understanding and prediction of runoff generation across scales that challenge our current-day models.

- **Evaluation of the ecological potential of fragmented woods in southern Quebec for birds: a step in the constitution of functional ecological network.**

**Vincent Carignan**, PhD candidate, Université du Québec à Montréal

The landscape in southern Quebec has deeply been modified by intensive forest management for agricultural and urban development and is still ongoing. Those transformations placed constrain to the reproduction and the movement of several deep forest bird species. My Ph.D. research has the following objectives: 1) describe the fragmentation effects on birds communities in general and particularly on species sensitive to fragmentation; 2) based on those previous results, identifying wood lot habitat who significantly contribute to maintaining bird population representative of undisturbed habitat; 3) propose a functional ecological network based on a methodological approach who incorporates this knowledge, and who would enable the sustainability and the dispersion of bird population in residual mature forest of The Saint-Lawrence-Valley. The study site covers the Montreal Metropolitan Community (MMC), the Monteregian region and the lower Laurentian region. In that zone, birds have been identified on 350 sites in mature maple forest using the listening station and signing pass methodology. Those methodologies were conducted to take stock of the bird community associated with each wood lot under study and to establish the nesting status of indicator species to the forest fragmentation phenomena (Ovenbird, Black-throated Blue Warbler, Wood Thrush, White-breasted Nuthatch, Scarlet Tanager, Pileated Woodpecker). This research project has a strong potential to produce final and concrete results that may be applied in ecosystemic management by integrated socio-economical reality of the study zone without compromising the ecological viability of a habitat network to protect.

- **Multiple scale diversity measures in a forest ecosystem.**

**Raphaël Proulx & Lael Parrott**, Complex Systems Laboratory, Université de Montréal, Département de géographie, 520 chemin Côte Ste-Catherine, Montréal (QC), Canada H2V 2B8

Current measures of biodiversity have limited ability to account for temporal and spatial dynamics. Such difficulties may result from scaling inconsistencies among common diversity measures, which are individual, species or community oriented. This study aims to 1) seek for a more appropriate field measure of diversity through a comparative study of biological and numerical indices, and 2) track variations in diversity along natural scale gradients. To incorporate spatial considerations in our sampling design we will use a cubic structure of 1.5 meters wide, divided into 64 sub-units of 0.05 m<sup>3</sup>. Biological (size estimates of each individual in each plant species) and numerical (digital image analysis) indices will be calculated for 50 stations on Mont St-Hilaire (Québec). The scale gradient will be created by varying the sampling frequencies and the dimensions of our cubic structure. We hypothesise that: 1) there is a correlation between biological and numerical diversity indices, 2) there is a relation between diversity and scale, and 3) the correlation strength between biological and numerical indices is a function of scale. Our results may lead to the development of more sensitive indicators of ecological integrity.

- **Effect of various food resources assembling on the food search behaviour of the Forest tent caterpillar (*Malacosoma disstria* Hbn.)**

**Julie Drouin (Université du Québec à Montréal)**

The behavior of a phytophagous insect is influenced by its resources. From a dietary perspective, this influence will be different depending if an insect is a generalist or a specialist. Observations made in laboratory on a generalist Lepidoptera, the forest tent caterpillar (*Malacosoma disstria* Hbn.), are conducted to understand the effects of different leaves assembling on the feeding pattern. A recreation of trees model on which leaves have been put have been use to allow the observation of the insect. It is known that the caterpillar show preference for some host. Based on that information, a first series of observation were conducted in the summer of 2003. Four different structures were simulated in order to create a heterogeneous gradient in function of the quality and the quantity of the food resources. Two structures were homogenous, one constituted of Trembling Aspen and the other constituted of Sugar Maple leaves. The two other structures, heterogeneous, were constituted, in equal part of Trembling Aspen and Sugar Maple leaves for one, and the other of Red Maple, Trembling Aspen and Sugar Maple. The feeding behaviour was not different on heterogeneous structure when compared to the homogeneous Trembling Aspen. However, its behaviour was influenced when the unique resources were Sugar Maple leaves. On this resource, the caterpillars were spending more observation time in moving while the caterpillar feeding on Trembling Aspen were spending more observation time in resting. A second series of observation will be done in summer 2004 to verify the effect of different leaves assembling on the feeding strategy when the Sugar Maple leaves is in bigger proportion than the Trembling Aspen, more specifically on the time budget allowed to feeding, moving and resting period.

- **Diversity and host-association of saproxylic gall midges (Cecidomyiidae: Diptera) in Quebec beech-sugar maple forests.**

**Duncan Selby, McGill University**

The environment created by decomposing wood supports a great diversity of insects in mature forests. Although much research has focused on surveying forests for dead wood (saproxylic) Coleoptera species, Diptera are often more abundant in dead wood than Coleoptera. Recent surveys of saproxylic insects in Ontario have found that over half of the Diptera collected belong to the family Cecidomyiidae, the gall midges, but the specimens have not been identified to species. This lack of species-level identifications limits our ecological knowledge of the saproxylic gall midges because different midge species occupy different trophic groups. Murray (2002) also found that different tribes of the Cecidomyiidae emerged from logs in different stages of decomposition. My study has three objectives: to determine the species richness and abundance of saproxylic gall midges in the mature hardwood forest of Mont Saint-Hilaire, Quebec, and to determine associations of these flies both with dead tree species and with logs in different stages of decay. Emergence traps placed over logs will collect gall midges from dead wood of the two dominant tree species on Mont Saint-Hilaire, beech (*Fagus grandifolia* Erhr.) and sugar maple (*Acer saccharum* Marsh.). Each trapped log will be in one of two distinct stages of decay.

The associations of gall midge species with the different host-trees and decay stages will be examined and the effect of interaction between the host-tree and decay stage treatments will be tested.

- **Arthropod long-term biodiversity monitoring**

### **Christopher Buddle, Department of Natural Resource Sciences, McGill University**

Our laboratory group has initiated long-term biodiversity monitoring plots at Mont Saint-Hilaire (McGill University's Gault Nature Reserve). At three different sites, and at three times of the year, we intensively collect various arthropod groups, including spiders, ants, and beetles. This work will continue on a yearly basis, with the hope of using the data to help us understand how large scale environmental changes (e.g., global warming) might be influencing terrestrial invertebrates in the unique forests of Mont Saint-Hilaire.

### **Studies Completed 1998-2007**

**Note that “GO” refers to articles that are directly available on-line.**

### **Scientific Papers**

#### **2007**

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