

Fish Habitat Banking in Canada: Opportunities and Challenges

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FISH HABITAT BANKING IN CANADA:
OPPORTUNITIES AND CHALLENGES

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ABSTRACT

A review of existing habitat banks and habitat banking programs uncovers many advantages of habitat banking and also some issues and challenges with existing habitat banking programs. The potential for habitat banking to enable a more flexible, effective, efficient, transparent and predictable harmful alteration, disruption or destruction (HADD) Authorization process; enable a more timely administration process to meet habitat protection requirements under the *Fisheries Act*; and provide better habitat compensation outcomes for government agencies, the public and industry highlights the value of increasing the use of habitat banking as a compensation tool for HADD Authorizations in Canada. The report concludes with a series of recommendations to establish a path forward for the advancement of fish habitat banking in Canada.

RÉSUMÉ

L'examen des habitats de réserve existants et des programmes relatifs à ce sujet a permis de faire des constations intéressantes, incluant des avantages mais aussi des défis. L'utilisation des habitats de réserve permet d'établir un processus plus flexible, efficace, décisif, transparent et prévisible d'autorisation pour la détérioration, la destruction ou la perturbation (DDP) de l'habitat du poisson. D'une part, ceci permet d'établir un procédé administratif plus opportun afin de répondre aux exigences de protection d'habitat en vertu de la Loi sur les pêches. D'autre part, ceci permet de fournir de meilleurs résultats de compensation d'habitat pour les organismes gouvernementaux, le public et l'industrie, et donc accentue la valeur d'augmenter l'utilisation des habitats de réserve comme outil de compensation pour des autorisations de DDP au Canada. Le rapport conclut avec une série de recommandations afin d'établir une direction future à l'avancement du processus des habitats de réserve du poisson au Canada.

1.0 BACKGROUND ON THE FISHERIES ACT, 1985

Canada's *Fisheries Act, 1985*⁽¹⁾ (herein referred to as "the Act"), administered by Fisheries and Oceans Canada⁽²⁾ (DFO), provides powers and authorities to regulate the impacts of development projects on fish habitat in all of its freshwater and marine fisheries. These powers and authorities together with those for regulating harvesting of fish support the delivery of the federal government's Constitutional responsibility for the conservation and protection of freshwater and marine fisheries resources⁽³⁾.

Section 34 of the *Act* defines fish habitat as "spawning grounds, and nursery, rearing, food supply and migration areas on which fish depend directly or indirectly in order to carry out their life processes." Section 35 (1) states that "No person shall carry on any work or undertaking that results in the harmful alteration, disruption or destruction of fish habitat" (commonly referred to as a HADD). Section 35 (2) provides that "No person contravenes subsection (1) by causing the alteration, disruption or destruction of fish habitat by any means or under any conditions authorized by the Minister or under regulations made by the Governor in Council under this Act". Prior to issuing a subsection 35 (2) authorization, DFO officials must ensure that an environmental assessment is conducted under the *Canadian Environmental Assessment Act, 1992*⁽⁴⁾ or other environmental assessment processes in the North^(5,6,7,8) and that the Duty to consult Aboriginal groups^(9,10) and the requirements of the *Species at Risk Act, 2002*⁽¹¹⁾ are met.

Guidance on the issuance of subsection 35(2) authorizations is to be found in a policy framework beginning with the 1986 Policy for the Management of Fish Habitat (herein referred to as "the Habitat Policy", DFO 1986). This policy establishes that impacts of human activities on fish habitat will be governed by the principle of "No Net Loss of Productive Capacity of Habitats" (NNL). Further guidance on the use of compensatory measures to achieve the NNL principle is provided in the Practitioners Guide to Habitat Compensation for DFO Habitat Management Staff (herein referred to as the "Habitat Compensation Guide") (DFO 2002) and the Practitioners Guide to Writing and

¹ Fisheries Act.1985. R.S.C, c.F-14

² Department of Fisheries and Oceans Act. R.S., 1985, c. F-15

³ The Constitution Act. 1982

⁴ Canadian Environmental Assessment Act. 1992. c. 37

⁵ Yukon Environmental and Socio-economic Assessment Act. 2003. c. 7

⁶ Mackenzie Valley Resource Management Act. 1998. c. 25

⁷ Nunavut Land Claims Agreement Act.1993. c. 29

⁸ Inuvialuit Final Agreement. Retrieved from http://www.wmacns.ca/pdfs/1_IFA.pdf

⁹ Haida Nation vs. British Columbia. 2004. SCC 73

¹⁰ Taku River Tlingit First Nation vs. British Columbia. 2004. SCC 74

¹¹ Species at Risk Act. 2002. c. 29

Authorization for the Habitat Protection Provisions of the Fisheries Act (herein referred to as the “Authorization Guide”) (DFO 2010).

Applying the no net loss principle

The Habitat Policy states that the conservation of fish habitat will be guided by the NNL principle. This principle is intended to guide departmental officials in balancing unavoidable losses of fish habitat with replacement of fish habitat on a project-by-project basis so that reductions to Canada’s fisheries resources due to habitat loss or damage may be prevented. The Habitat Policy describes that the NNL principle should not be interpreted as a statutory requirement to be met at all costs and in all circumstances. It further states that fisheries management objectives and plans, either a fish stock-specific or a geographic area basis will be the major consideration for deciding where to apply this guiding principle and what off-setting proposals would be acceptable to achieve NNL.

The Habitat Policy outlines procedures to apply the NNL principle. The procedures define the hierarchy of preferences to achieve a NNL of productive capacity where the fisheries resources and its supporting habitat are put at risk by a proposed development project. It defines that the preference is to avoid any loss or harm at the site of the proposed project site through redesign, use of alternative location or through mitigation techniques. Only after it proves impossible or impractical to maintain the same level of the productive capacity of fish habitat would compensation measures be explored to offset loss or harm to fish habitat resulting from the project. Compensation is defined as: “The replacement of natural habitat, increase in the productivity of existing habitat, or maintenance of fish production by artificial means in circumstances dictated by social and economic conditions, where mitigation techniques and other measures are not adequate to maintain habitats for Canada’s fisheries resources.” The costs associated with defining and implementing compensation measures is the responsibility of the project proponent. The procedures also states that DFO will apply the NNL guiding principle to achieve its conservation goal using existing project regulatory review and environmental assessment processes in accordance with six steps: Notification, Examination, Public Consultation, Decision, Audit and Enforcement. The decision step also includes guidance on appeals for persons that believe they have been aggrieved by a decision made by departmental staff.

Building on the principles and procedures of the Habitat Policy, the Habitat Compensation Guide was published in 2002. The guide provides guidance in applying fair and consistent decisions on compensation in order to achieve a NNL of productive capacity of fish habitat consistent with the Habitat Policy while recognizing the need for local discretion. The guide provides further guidance on hierarchy of compensation options, including exceptions to the compensation hierarchy. It provides guidance on basic considerations for habitat compensation, including determining the amount of compensation required; monitoring, enforcement, financial security, restoration of orphaned sites; habitat banking; measures of last resort (artificial propagation, deferred compensation and restoration of contaminated sites); and authorizing compensation.

Challenges with habitat compensation in Canada

One of the problems with the current system of habitat compensation in Canada is that there is a need for consistency between DFO regional offices resulting in regional differences in how compensation is applied and implemented. The Canadian case studies examined in Section 4 confirm these regional differences in the implementation of habitat banking in Canada.

Since the Habitat Policy was introduced in 1986, several thousand compensation projects have been undertaken in Canada (Harper and Quigley 2005). Unfortunately poor record keeping and low levels of compliance monitoring has made it difficult to determine whether or not past compensation practices in Canada have achieved the NLL goal (OAG 2009; Harper and Quigley 2005).

A 2009 report by the Auditor General (OAG 2009) found a number of systemic deficiencies within DFO's habitat management program that must be addressed to advance a well-coordinated and effective habitat banking program in Canada. Some of the key findings of this report include:

- Lack of monitoring of compliance and evaluation of effectiveness;
- Lack of accountability in habitat management agreements; and
- Habitat loss or gain is not being measured.

These issues are not unique to Canada as they have also been identified as key challenges in habitat compensation programs in the US. Addressing these existing deficiencies within Canada's habitat management program is critical to the future success of an expanded habitat banking program in Canada. The approach to habitat banking outlined through the recommendations in Section 7 of this report represents an opportunity to address these deficiencies by establishing a clear and robust system for the establishment, monitoring and evaluation of habitat banks.

Path forward

As part of its cycle for evaluating existing policies, DFO is undertaking a review of the Habitat Compensation Guide and revising it to address implementation issues and consider new thinking with respect to fish habitat compensation. DFO has expressed a strong desire to advance the use of habitat banking as a compensation tool for HADD Authorizations (P. Leblanc, pers. comm.) An important element of the review will be to consider developments and experiences with the concept of fish habitat banking and to develop further guidance on its application as an integral part of a new operational policy on fish habitat compensation.

2.0 HABITAT BANKING

The concept of habitat banking was first introduced in the US in the mid-1980's to compensate for losses of wetland habitat to new developments. Since the introduction of habitat banking for wetlands (termed "mitigation banking" in the US), the practice, termed conservation banking, has expanded to include compensation for losses of species at risk habitat in the US. The first habitat bank in Canada was constructed in 1993 in the North Fraser Harbour in Vancouver. In recent years, various countries around the world have begun developing similar habitat banking programs and numerous habitat banks are now operational internationally (Madsen *et al.* 2010).

The habitat compensation option most often employed in Canada is the creation of in-kind habitat following the authorization of a HADD (Harper and Quigley 2005). As outlined in the Habitat Policy, this typically occurs on a project by project basis. Developers are required to restore, create or enhance the productive capacity of fish habitat either on or off-site through a number of potential management interventions such as stream restoration, controlling invasive species, or removing and replacing man-made physical barriers such as dykes or culverts.

Habitat banking is a compensation tool that holds strong potential to provide more predictable and effective outcomes from fish habitat compensation in Canada. Habitat banking has the potential to assist DFO in meeting the goals and objectives outlined in the Habitat Policy by addressing fisheries management objectives (FMO) at a landscape scale. A streamlined and formalized habitat banking program has the potential to reduce workloads for DFO habitat management practitioners at the regional level since the concept of habitat banking promotes fewer large compensation projects as opposed to many smaller compensation projects. Habitat banking can also help DFO to address deficiencies identified by the Office of the Auditor General of Canada (OAG 2009) by providing better evidence of net gains in productive capacity of fish habitat by conducting up-front compensation that provides positive habitat outcomes in advance of impacts to fish habitat. The Canadian public also stands to benefit from an effective habitat banking program through an improved capacity for meeting FMO's.

Although habitat banks have been established in several Canadian provinces (Nova Scotia, Quebec, Manitoba, Alberta, and British Columbia), the practice is not widely used as a compensation option for HADD Authorizations. Canada currently lacks a well defined, formalized process for establishing and operating habitat banks.

The Habitat Compensation Guide identifies habitat banking as one option to compensate for a HADD Authorization. The Habitat Compensation Guide simply defines habitat banking as:

"the completion of compensation prior to a subsection 35(2) Authorization being issued where a proponent creates or improves habitat for future use as compensation"

The Habitat Compensation Guide describes several key elements of habitat banking including:

- proponent creates or improves fish habitat for future use as compensation;
- does not pre-approve a HADD;
- location and design must be pre-approved by DFO;
- on-site compensation must be explored first before using a habitat bank;
- habitat bank must be evaluated immediately prior to use a compensation (comparison of before conditions with current habitat); and
- use of credits must be documented clearly to avoid double crediting.

Although the Habitat Compensation Guide describes some elements of habitat banking and provides a basic definition, a more comprehensive definition of habitat banking along with a standard framework that can be applied consistently at the regional level will strengthen the habitat banking component of the Habitat Compensation Guide. Following a review of international habitat banking programs, recommendations for updating the definition and description of habitat banking in the Habitat Compensation Guide will be proposed.

2.1 PURPOSE AND OBJECTIVES

Due to the potential for habitat banking to provide better outcomes for habitat compensation and the positive outcomes already achieved through habitat banking initiatives in Canada and internationally, DFO has expressed a strong desire to advance the use of habitat banking as a compensation tool for HADD Authorizations (P. Leblanc, pers. comm.). Habitat banking also holds great potential to compensate for development impacts on “species at risk” habitat as has been demonstrated through similar programs in the US. The purpose of this study is to propose a rationale and path forward for the advancement of habitat banking as a key tool in compensating for development impacts in Canada.

The objectives of the study are to:

1. Establish a clear definition and description of habitat banking by drawing from international definitions of habitat banking to build on the existing description in the Habitat Compensation Guide;
2. Review existing habitat banking initiatives in Canada and internationally;
3. Identify the advantages of habitat banking over other compensation strategies based on Canadian and international experience;
4. Identify the issues and challenges with existing habitat banking initiatives in Canada and internationally;
5. Identify lessons learned from existing habitat banking initiatives in Canada and internationally; and
6. Propose recommendations on how to advance the practice of habitat banking in Canada.

3.0 GENERAL OVERVIEW OF EXISTING PROGRAMS AND HABITAT BANKING CONCEPTS

The concept of habitat banking has been applied in various contexts around the world to compensate for ecological impacts associated with development. Various terminology has been used to define similar concepts in different countries. The use of different terminology can create confusion when trying to compare and evaluate the various initiatives. This section explores the existing programs in Canada and internationally; examines the terminology used to describe habitat banking; uncovers the common elements of different habitat banking initiatives occurring around the world; and seeks an appropriate description of habitat banking for Canada.

3.1 CANADA

Although habitat banking has been a compensation option in Canada for over 20 years, it has rarely been used as compensation to fulfill the NNL requirements of the Habitat Policy when compared to project-by-project compensation. The majority of habitat compensation in Canada occurs on a project-by-project basis with compensation completed after development impacts occur. With growing interest in habitat banking from both industry and government agencies, there is a desire to bring the subject to maturity with a consistent approach that can be applied across Canada.

Existing habitat banking programs in Canada have been established by collaboration between project proponents and regional DFO offices. Project proponents that have utilized habitat banking in Canada have primarily included government agencies such as provincial transport authorities with minor participation by private industry.

As outlined in DFO's Habitat Compensation Guide, habitat banking involves the creation or improvement of habitat to be used as future compensation. Habitat banks can be developed through the restoration of "orphaned sites" for which DFO provides guidance in the Habitat Compensation Guide. The Habitat Compensation Guide defines an orphaned site as a site where there is no known owner or responsible party, the activity that caused site degradation occurred within an outdated legal or policy framework, or the owner/responsible party is no longer in business and cannot be held accountable for restoration. DFO specifies that non-orphaned sites (i.e. sites where habitat degradation has occurred and there is a responsible party)

Habitat Banking in Canada

- First habitat bank established in BC in 1993.
- Habitat banks established in BC, Alberta, Manitoba, Ontario, Quebec, New Brunswick and Nova Scotia.
- Majority of experience in Québec and Nova Scotia with 25 and 10 habitat banks created respectively.
- Documentation of habitat banking rules and requirements is highly variable between regions.
- Several industries are currently in discussions with DFO to establish habitat banks.
- Still not widely used as a compensation option, especially with private industry.

should not be eligible for habitat banks since the responsible party should conduct restoration under the “polluter pays” principle. Orphaned sites represent an excellent opportunity to conduct restoration in advance of HADD authorization that can be used as credits towards future projects. In addition to the restoration of orphaned sites, habitat banks could be established in areas of low fish productivity where creation or enhancement activity is undertaken to increase the productive capacity of fish habitat.

Typically, a Memorandum of Understanding (MoU) is established between the Proponent and the regional DFO office outlining the specific terms of the habitat bank. MoU’s vary greatly between DFO regions with some including detailed descriptions of habitat bank objectives, performance standards and monitoring requirements while others are more general providing few details in the documentation.

The majority of habitat banking experience in Canada comes from Québec and Nova Scotia. A total of 25 habitat banks have been created or proposed in Québec by a variety of proponents. The majority of the Québec based habitat banks (13) have been created or proposed by Transports Québec (MTQ). Other habitat banks have been created by various Port Authorities, Makivik Corporation (a non-profit organization owned by the Inuit of Nunavik), Hydro Québec, the Canadian Coast Guard, Transport Canada, Parks Canada, and Développements Lanak Inc. (a private residential land developer in Québec). A variety of habitat creation, enhancement and restoration projects have been undertaken to establish the many habitat banks in Québec. DFO in Québec have developed a template for habitat banking agreements that can be found in Appendix A.

The Nova Scotia Department of Transportation and Infrastructure Renewal (NSTIR) have established ten habitat banks to compensate for impacts associated with transportation projects (TAC 2006; Madsen *et al.* 2010). Two of these habitat banks will be explored as case studies in Section 4. NSTIR were awarded the 2006 Transportation Association of Canada Environmental Achievement Award for their habitat banking initiatives (TAC 2006). The habitat banking initiatives undertaken by NSTIR involve restoring larger areas than required for individual projects and banking the excess area as credits to be applied to future projects.

Other habitat banks in Canada have been established by Canadian Forces Base Gagetown, Shell Canada, the City of Burnaby, and the Vancouver Fraser Port Authority in consultation with DFO and other local land use authorities. In B.C., banked habitat credits have been purchased by the Vancouver Airport Authority and the Richmond Airport Vancouver rapid transit line at a cost of \$150/m² (Madsen *et al.* 2010, DFO 1996).

The Ministry of Transport in Ontario (MTO) has used a compensation strategy called “compensation consolidation” to compensate for fisheries impacts from road projects. Compensation consolidation involves providing compensation for several small HADD’s associated with a single project at a single location. Highway projects, like most linear developments, often require crossing several watercourses. The MTO approach of

compensation consolidation proposes that providing small amounts of compensation at each water crossing will result in nominal gains in productivity. Alternatively, undertaking a larger compensation project at one location will provide greater overall gains in productivity (MTO 2006). MTO (2006) describes habitat banking as similar to compensation consolidation with the only difference being that habitat banking is used to compensate for several projects instead of just one. MTO (2006) proposes that habitat banking can, in some cases, occur following project impacts, however, this does not fit the true meaning of habitat banking as described in the literature. There are no known examples of MTO using habitat banking as a compensation option for any projects to date (C. Mitton-Wilkie, pers.comm.). The first official habitat bank in Ontario is currently being developed by Toronto and Region Conservation Authority with construction scheduled for spring 2011.

There are currently a number of developers in the mining, hydroelectric and land development sectors in Canada that are negotiating habitat banking agreements with various DFO regional offices in B.C., Saskatchewan, Manitoba and Ontario.

Researchers in Canada are working on advancing the practice of habitat banking in Canada through several initiatives. A Graduate Student at the University of Manitoba is currently completing a Master's Thesis which includes a feasibility study of habitat banking in Canada. This Thesis is scheduled for completion in the spring/summer of 2011. SENES has had preliminary discussions with this student to discuss her results and found that many of the findings of her research are closely aligned with the findings in this report.

Another research initiative called HydroNet is based out of the University of Montreal and is a collaboration between several Universities across Canada. HydroNet is funded by through the National Science and Engineering Research Council (NSERC), DFO, Manitoba Hydro, BC Hydro, Nalcor and the University of Montreal. HydroNet seeks to provide metrics of productive capacity of fish habitat and develop Habitat Quality Models for fish species through new research initiatives and has potential to help address some of the issues and challenges with quantifying fish habitat banking credits and debits in Canada. SENES has had preliminary discussions with Dr. Daniel Bosclair (Scientific Director of HydroNet) and Shannon O'Connor (HydroNet's Network Manager) to explore opportunities for HydroNet's research projects to strengthen the scientific basis of habitat banking in Canada.

3.2 UNITED STATES

The concept of “*mitigation banking*” was first introduced in the US in 1984 by the US Army Corps of Engineers (USACE) when the first wetland mitigation bank was established in Louisiana. The USACE and the US Environmental Protection Agency (EPA) officially sanctioned the use of mitigation banking by issuing Memorandums of Agreement and guidance documents in the early 1990’s that clarified agency expectations for the establishment of mitigation banks.

Mitigation banking is a compensation tool used to satisfy requirements for NNL of wetlands required under Section 404 of the *Clean Water Act* and applies to wetlands and other aquatic resources. In 1995, final guidance on the use of mitigation banks was issued jointly by the EPA, USACE, US Fish and Wildlife Service (FWS), National Resources Conservation Service (NRCS) and the National Marine Fisheries Service (NMFS) (USACE 1995).

According to the Federal guidance, “the objective of a mitigation bank is to provide for the replacement of the chemical, physical and biological functions of wetlands and other aquatic resources, which are lost as a result of authorized impacts. Using appropriate methods, the newly established functions are quantified as mitigation “credits”, which are available for use by the bank sponsor or by other parties to compensate for adverse impacts (i.e., “debits”).” The majority of mitigation banks in the U.S. quantify debits and credits based on acreage of habitat destroyed or created.

The EPA website (<http://www.epa.gov/owow/wetlands/facts/fact16.html>) outlines four key components of a mitigation bank:

1. The bank site: the physical acreage restored, established, enhanced, or preserved;
2. The bank instrument: the formal agreement between the bank owners and regulators establishing liability, performance standards, management and monitoring requirements, and the terms of bank credit approval;
3. The Interagency Review Team (IRT): the interagency team that provides regulatory review, approval, and oversight of the bank; and
4. The service area: the geographic area in which permitted impacts can be compensated for at a given bank.

A unique aspect of the US system is that it allows for third party development of credits (i.e. independent of the developer and regulator). A habitat banking organization will

Habitat Banking in the US

- US have the most advanced habitat banking program in the world.
- First “mitigation bank” established in Louisiana in 1984.
- “Mitigation banking” introduced first to address NNL policy for wetlands.
- “Conservation banking” introduced in mid-1990’s to address impacts to species at risk.
- US system allows for third party habitat banking where independent “habitat bankers” sell credits to industry and government.
- Estimated 797 mitigation banks and 96 conservation banks in the US (Madsen *et al.* 2010).
- Concept of “restoration banking” being explored to address future liabilities such as oil spills

acquire land and establish a habitat bank through the restoration, creation, enhancement, or preservation of a target natural resource value. The independent habitat banking organization enters into an agreement with government regulators to establish, maintain and monitor the habitat bank. The habitat banking organization is responsible for meeting performance criteria outlined in the habitat banking agreement.

A schedule for releasing habitat banking credits is also outlined in the agreement and is typically tied to the achievement of performance criteria. Typical third party habitat banking agreements in the US allow for the early release of some credits prior to the achievement of performance criteria (e.g. 20%) to cover some of the costs initial bank establishment. Performance criteria vary based on the ecological values that are present at a given bank site can include hydraulic conditions, vegetation composition, phytoplankton and zooplankton presence, invasive species presence and fish species presence. Performance criteria are defined based on the desired ecological outcomes for a given site. Once a third party habitat bank is established and functional, credits are sold to developers who need to compensate for impacts to similar values that have been restored, created or enhanced in the habitat bank.

The cost of habitat banking credits is “typically set at a market rate based on costs of production and available alternatives” (Carroll *et. al.* 2008). Conservation credits in the US are typically priced slightly higher than costs of other compensation options due to the associated benefits such as reduced permitting costs, timely implementation and severance of liability (Carroll *et. al.* 2008). The US system is also the most market-like compensation program in the world with pricing based on the scarcity of the banked resource (i.e. wetland or species credits) (Madsen *et al.* 2010). If a wetland mitigation bank is located in an area under significant development pressure with few other options for compensation, then the market price for credits from the wetland mitigation bank will be high due to demand for a scarce resource.

By allowing for third party habitat banking in the US there are numerous participants in the creation of credits including environmental consultants, engineers, lawyers, private mitigation bankers, non-profit organizations, and government agencies. Third party habitat banks are created by adequately trained environmental professionals (e.g. biologists, environmental engineers, etc.) instead of developers who often lack the expertise and resources to effectively plan and manage habitat compensation projects.

As of 2009, Madsen *et al.* (2010) documented a total of 431 active wetland and stream mitigation banks in the US with an additional 182 banks pending approval. There are an additional 88 wetland and stream mitigation banks that have completely sold out their credits, 36 that were classified as inactive and 60 where status is unknown.

At the same time Federal Agencies were issuing guidance on the use of mitigation banks, the State of California and the FWS issued an official policy on conservation banks. The term “*conservation banking*” was used by the Government of California to distinguish non-wetland mitigation banks and applied to credit banking for work involving the protection and enhancement of habitat for species at risk. In 2003, the

FWS issued national guidance for the establishment, use and operation of conservation banks (FWS 2003). Since conservation banks focus on species rather than wetlands there is growing interest in fish habitat banking under this program (Carroll *et al.* 2008).

As of 2009, there were a total 77 active, 4 inactive, 20 pending, and 19 sold out conservation banks in the US (Madsen *et al.* 2010). The majority of these conservation banks (82) are in the State of California.

One of the major criticisms of conservation banking in the US is the use of habitat preservation as a primary means to establish conservation banks. Instead of undertaking habitat restoration, enhancement or creation activities to establish credits, habitat banks are established by placing conservation easements or other development restrictions on existing high quality habitat. This system allows habitat losses to be compensated through preserving existing habitat, but there is still a net loss of habitat since no new habitat is gained. This problem is magnified in cases where the protected habitat is in no immediate or long-term threat of being developed.

Stahl *et al.* (2008) propose a new type of habitat banking initiative in the US termed “restoration banking” that would apply to a wide range of environmental liabilities such as the release of hazardous substances or oil spills. The concept centres on the quantification of ecological liability through the natural resource damage assessment (NRDA) process under the Comprehensive Environmental Response, Compensation and Liability Act and the Oil Pollution Act.

Companies are required by law to clean up releases of hazardous substances with the cost of clean-up covered by the party responsible for the spill. Once all clean-up activity has been completed, the NRDA process determines the residual impact. Although a company has taken all reasonable steps to clean-up the release, they are still required to compensate for any residual impacts under the Comprehensive Environmental Response, Compensation and Liability Act and the Oil Pollution Act. This is where restoration banking has the potential to play a role.

Following the initial clean-up of a hazardous substances release, an NRDA is conducted by Federal authorities to determine the loss of ecological or human services that have occurred as a result of the release. This quantification of ecological harm is then translated into an appropriate amount of restoration that would be required by the responsible party (this restoration is in addition to all spill remediation work that has occurred). Currently, restoration projects that compensate for residual losses from spills occur after the environmental liability has occurred. Restoration banking would allow companies that need to compensate for residual losses from environmental liabilities (i.e. the impact of spill events after all reasonable clean-up efforts have occurred) to purchase credits from an existing restoration bank to fulfill their legal obligations. The major difference between restoration banking and the current system of compensation is that restoration occurs in advance of the environmental liability and the credits from that restoration work can be applied to a future liability (Stahl *et al.* 2008).

Terminology from the US

Mitigation Banking: *“the restoration, creation, enhancement and, in exceptional circumstances, preservation of wetlands and/or other aquatic resources expressly for the purpose of providing compensatory mitigation in advance of authorized impacts to similar resources”* (US ACE and EPA).

Conservation Banking: *“a parcel of land containing natural resource values that are conserved and managed in perpetuity through a conservation easement by an entity responsible for enforcing the terms of the easement for specified listed species and used to offset impacts occurring elsewhere to the same resource values on non-bank lands”* (US FWS).

Restoration Banking: *“the creation of credits for undertaking proactive restoration activities where credits can be applied to an existing liability, held for use against a future liability or traded or sold to others”* (Stahl et al. 2008).

3.3 AUSTRALIA

In 2008, the Government of New South Wales in Australia developed a program called the Biodiversity Banking and Offsets Scheme or “BioBanking” to address the effects of agricultural and urban development on ecological values including species at risk (DECC 2007). BioBanking is designed to create a market in biodiversity credits that gives land owners and developers an incentive to protect biodiversity values.

Similar to conservation banking in the US, BioBanking focuses on ecological values related to species at risk. Key elements of the BioBanking system include:

- Landowners establish BioBank sites on private land by improving habitat or increasing habitat or populations of a threatened species in perpetuity;
- Biodiversity credits are created through the application of the Biodiversity Assessment Methodology that measures the improvement of biodiversity values;
- The Biodiversity Assessment Methodology also measures the impact of the proposed development that will require the compensation credits;
- Landowners can sell their credits to developers to provide income and fund the future management of the BioBank site;
- Performance of the BioBank sites is monitored by the Department of Environment, Climate Change and Water (DECC).

Habitat Banking in Australia

- BioBanking program established in 2008 to address development impacts on ecological values and species at risk.
- Landowners establish bank site by improving habitat and receive credits that can be sold to developers to offset impacts.
- Use Biodiversity Assessment Methodology to measure impacts and credits.
- Currently undergoing two year follow up review.

The BioBanking program is currently undergoing a review that was planned to commence after the first two years of operation. Several proposed changes to the Biodiversity Assessment Methodology are currently undergoing a public review process.

Terminology from Australia

BioBanking: “enables 'biodiversity credits' to be generated by landowners who commit to enhance and protect biodiversity values on their land through a biobanking agreement. These credits can then be sold, generating funds for the management of the site. Credits can be used to counterbalance (or offset) the impacts on biodiversity values that are likely to occur as a result of development. The credits can also be sold to those seeking to invest in conservation outcomes, including philanthropic organizations and government” (DECC).

3.4 UNITED KINGDOM

The concept of habitat banking is gaining increasing support in the UK as a means to address development impacts on biodiversity values (Bex *et al.* 2010; Hill 2010; Briggs *et al.* 2009; Hill and Gillespie 2009; Latimer and Hill 2007). The British government is currently advancing plans to use habitat banks as a tool to of compensate for development impacts in the UK (Vidal 2009).

The Environment Bank is a private organization in the UK that was established in 2007 to provide a mechanism for creating, managing and enhancing habitats and landscapes by working with developers and landowners. The Environment Bank is a strong advocate for developing a habitat banking system in the UK and has established the Thames Headwaters Conservation Credits project as the UK's first habitat bank. The Environment Bank is working with UK government agencies to adopt similar policies to those used in the US to guide a national habitat banking program.

Although habitat banking is still in its infancy in the UK, there is a great deal of support for its use in the future (Vidal 2009). Much of the work being done in the UK draws from US examples to guide program development.

Habitat Banking in the UK

- UK just beginning to explore the use of habitat banking.
- The concept is gaining increased political support.
- First habitat bank in UK is the Thames Headwaters Conservation Credits project.
- Using the US system as a model to expand the program.

Terminology from the UK

The Environment Bank describes **habitat banking** as:

“an economic strategy which allows conservation actions such as creation, restoration or enhancements, intended to compensate and mitigate for the unavoidable impact to biodiversity caused by development projects, to ensure no net loss of biodiversity.”

3.5 EUROPEAN UNION

The Environmental division of the European Commission (EC DG ENV) is also actively exploring the viability of habitat banking as a policy instrument to compensate for environmental damage under the European Union (EU) Environmental Liability Directive (Ozdemiroglu *et al.* 2009). Similar to “restoration banking” described by Stahl *et al.* (2008), habitat banking under this framework would primarily apply to the remediation of environmental damage from incidents such as oil spills or chemical releases.

The key elements of habitat banking as described by Ozdemiroglu *et al.* (2009) include:

- A mechanism to achieve NNL, or preferably a net gain, of biodiversity including species composition, habitat structure and ecosystem services;
- Pooling of resources or actions to compensate for biodiversity damage;
- Multiple causes of biodiversity damage are compensated at one site through a single larger project; and
- Compensation occurs before any damage to biodiversity losses and is stored as credits.

Habitat Banking in the EU

- Similar to UK, the EU is currently exploring the use of habitat banking as a compensation option.
- EU concept could apply to future environmental liabilities such as oil spills or chemical releases.
- Several EU policies under which habitat banking could apply are being explored.

The EC DG ENV is currently undertaking research to determine the value of applying a habitat banking program in Europe to protect biodiversity; however no active habitat banking programs currently exist outside of the pilot program occurring in the UK (refer to Section 3.4). Duke (2010) identifies a number of other EU policies under which habitat banking could make a significant contribution to environmental protection.

Terminology from the EU

Ozdeniroglu *et al.* (2009) describe **habitat banking** in the UK as:

“a system for delivering biodiversity offsets where actions to compensate for significant residual adverse impacts happen without ex ante connection and can be stored. The storage of offsets facilitates the fungibility of units

of compensation, in particular allowing different parts of one offset site to compensate for biodiversity impacts arising from different activities or project developments in the past or future”

Dodd (2007) presents a definition for **habitat banking** applicable to the EU Habitats Directive as:

“the advanced provision of habitat with the intention of selling ‘credits’ in the habitat to developers to provide compensatory measures.”

3.6 KEY ELEMENTS OF HABITAT BANKING

The following key elements of habitat banking have been extracted from the Canadian and international programs described in the preceding sections.

- Restoration, creation or enhancement of habitat **in advance of ecological impacts** to provide compensation for future impacts;
- Restoration occurs for large habitat patches that can be used to compensate several smaller habitat losses (or a single equivalent loss);
- Development impacts are quantified as “debits”;
- Re-establishment of habitat functions through restoration are quantified as “credits”;
- Rigorous, clear and consistent method for evaluating debits and credits;
- Credits are awarded for restoration work that can be bought, sold or traded to proponents looking to compensate for development impacts;
- Credits are applied to losses of similar habitat;
- Restoration of habitat may occur offsite from development impacts;
- Where habitat banks are created by third party habitat bankers in the U.S., restored land is protected in perpetuity through conservation easements or other title restrictions; and
- Habitat banking requires an agreement between the responsible regulatory authority (e.g. DFO) and the party establishing the habitat bank that clearly outlines:
 - The geographic area that can be serviced by the habitat bank (e.g. catchment/watershed);
 - Method for assessing credits;
 - Baseline, as-built and long-term monitoring requirements;
 - Performance standards (i.e. ecosystem function following restoration) to determine both when credits can be released and long-term expectations for functional attributes;
 - Long-term management and adaptive management requirements for the bank site;
 - Liability issues;
 - Terms of credit approval; and
 - Contingency plans.

These key elements of habitat banking will be revisited in the recommendations section.

4.0 HABITAT BANKING CASE STUDIES

4.1 BAY OF BEAUPORT TIDAL MARSH HABITAT BANK (QUÉBEC)

A habitat banking agreement between DFO and MTQ was established in November 2010 to construct a habitat bank in the Bay of Beauport near Québec City (DFO 2010). The agreement follows a standard habitat banking agreement format developed by DFO in Québec (DFO 2008, Appendix A).

MTQ proposes to construct tidal marsh habitat at an old landfill site along Mill Creek. The habitat bank is intended to provide nursery and feeding areas for several fish species including yellow perch, walleye and Atlantic tomcod. Habitat banking credits would be used to compensate for HADD authorizations for future MTQ projects.

The creation of tidal marsh habitat will involve the excavation of marsh banks and removal of contaminated sediments to total approximately 2.4 ha of marsh habitat. Within the excavated area, MTQ will add 200 mm of clean clay loam to encourage the establishment of native aquatic vegetation. Native herbaceous and shrub species will be planted in upland areas of the marsh and aquatic species will be planted in low areas. A breakwater will be constructed to protect the downstream portion of the marsh. All construction work is scheduled for completion in October 2011.

Bay of Beauport Tidal Marsh Habitat Bank – Summary

- Involves construction of tidal marsh habitat at an old landfill site along Mill Creek.
- Requires excavation of contaminated material and placement of clean fill to promote marsh vegetation establishment.
- Habitat banking agreement is in place between DFO and MTQ that follows the standard template developed by DFO in Quebec (Appendix A).
- Method of measuring habitat value not specified in the agreement with discretion left to DFO.
- Conditions of credit use found in the agreement conform to existing DFO policy on habitat banking.

The habitat banking agreement between MTQ and DFO includes the following requirements:

- A detailed report outlining the final constructed features shall be submitted to DFO within 90 days of the completion of construction including photos of constructed features and as-built plans;
- MTQ shall establish a monitoring program acceptable to DFO to ensure that the ecological objectives are achieved and to assess the actual value of habitat available to offset any future HADD (details of DFO's expectations for the monitoring program are not included in the agreement however standard monitoring agreements for compensation projects in Quebec involve three rounds of monitoring conducted over a period of five years with metrics related to species composition, vegetation establishment and survival, sediment deposition,

fish movement, velocity, temperature and depth included as relevant to project objectives) (see Appendix A);

- Submit to DFO a protocol for monitoring the effectiveness of the site before December 31, 2011;
- Quantify the effectiveness of habitat on three occasions over a period of five years (the first, second and fifth year) following construction;
- Effectiveness monitoring should include measures of:
 - The physical stability of habitat improvements (e.g. signs of instability, scour, erosion and maintaining healthy material added.); and
 - The integrity and development of plant cover established within the marsh (e.g. assessing the survival, density, vitality and recovery across the marsh).
- Present a full written report outlining the results of monitoring, including data, photos or videos, the relevant documents as well as recommendations for corrective action where appropriate. This report must be provided within three months of each assessment.

The habitat banking agreement includes the following conditions for the use of habitat banking credits:

- The existence of a habitat bank does not guarantee that any future HADD will be approved;
- The decision to authorize a HADD will be taken regardless of the existence of a habitat bank;
- In accordance with Habitat Policy (DFO 1986), MTQ must first seek to avoid or mitigate the HADD of fish habitat for future projects before proposing the use of the habitat banking credits as a measure of compensation;
- The DFO Hierarchy of Compensation Options must be followed when considering using habitat bank credits. Any measure of compensation that can be implemented on-site or near the site should be evaluated before using a habitat bank located elsewhere;
- Determining the actual value of habitat bank credits and its use as measure of compensation for a HADD remains, at all times, the responsibility of DFO and will be determined in light of the results of monitoring or assessments that have been made;
- The amount of habitat bank credits necessary to offset any HADD will be determined according to the principle of NNL of productive capacity of fish habitat (DFO 1986);
- Before considering the habitat bank as compensation, DFO can at any time require an assessment of the condition of the habitat bank during or after the required monitoring period;
- In the event that the compensation objectives are not met to the satisfaction of DFO at the end of each monitoring period, MTQ will, at its own expense, undertake remedial actions required to achieve the objectives; and
- DFO may require that the terms of the monitoring protocol, including its duration, be amended to assess the effectiveness of remedial measures.

4.2 CHEVERIE CREEK SALT MARSH RESTORATION PROJECT (NOVA SCOTIA)

The Cheverie Creek Salt Marsh Restoration Project is a collaborative effort between the Nova Scotia Department of Transportation & Infrastructure Renewal (NSTIR) and DFO's Small Craft Harbours Branch. The NSTIR approach to habitat banking involves the restoration and enhancement of historically damaged salt marsh and coastal marine habitat by replacing culverts, dyke breaching, shoreline armouring/stabilization and channel dredging (CB WES 2010a).

The Cheverie Creek habitat bank was constructed in the fall of 2005 to restore the natural hydrology and fish passage to a tidal river that was impacted by a tidally restrictive culvert. The project goal was to enhance existing salt marsh habitat and increase the extent of salt marsh. NSTIR contracted a firm that specializes in coastal wetland habitat restoration to oversee the implementation and monitoring components of the habitat bank. The restoration work included replacement of a tidally restrictive culvert with an appropriately sized and positioned structure to eliminate tidal restrictions. Habitat credits were measured based on the area of marsh flooded during high tide events as a result of culvert replacement. A total of 43 ha of habitat credits have been awarded to NSTIR and DFO's Small Craft Harbours Branch for this project.

Baseline monitoring of the site was initiated in 2002 (3 years before construction) and continued until 2005 to understand the existing ecological conditions at the site and provide data against which project outcomes can be compared. Baseline data collection is critical to enable the evaluation of restoration success.

A six year monitoring program has been established for the project based on an existing regional monitoring protocol (Neckles *et al.* 2002). The monitoring program includes monitoring of a reference site against which monitoring results from the restoration site can be compared. The reference site provides data that shows desired functional attributes at an undisturbed site that are used as a comparison to evaluate restoration success.

Cheverie Creek and Lawrencetown Lake – Summary

- Involved replacement of tidally restrictive culverts to restore natural hydrology and fish passage that resulted in the creation of 43 ha of habitat credits.
- Issue of restored habitat protected in perpetuity not established.
- 3 years of baseline data collection prior to project initiation provides "before" conditions to compare success.
- Use of third party specialist to monitor long-term performance.
- Use of established regional monitoring protocol allows for data sharing with other projects.
- Use of reference sites to understand desired outcomes based on undisturbed condition of similar habitat.
- Monitoring program uses broad array of ecological indicators to measure ecosystem function.
- Resulted in partnerships with NGO that has assisted in the identification

The monitoring program looked at a variety of ecological indicators including geospatial attributes (digital elevation model, habitat mapping); hydrology (hydroperiod, water table depth, water quality); soils and sediments (pore water salinity, soil characteristics, sediment accretion and elevation); vegetation; nekton; and benthic and other aquatic invertebrates to evaluate success.

The 2009 monitoring report (Bowron *et al.* 2009a) which includes results from the third year of monitoring concludes the following:

- Physical and biological conditions present at the restoration site and the changes that have been observed over the initial three years of post-restoration monitoring, as discussed in this report, are proceeding along an acceptable restoration trajectory;
- Installation of the larger culvert in 2005 continues to aid development of new marsh habitat at the site and the enhancement of existing habitat conditions;
- The marsh is being completely flooded (43 ha) with salt water on spring high tide events and with the increased frequency and extent of tidal flooding, there is an increase in availability and accessibility of the marsh surface for fish; and
- The changes observed for depth to ground water, pore water salinity levels, accretion rates, soil characteristics and the vegetation community are all indicative of a positive response to the restoration activity.

The Cheverie Creek habitat bank is an excellent example of how habitat banking can work in Canada. NSTIR was awarded the 2006 Transportation Association of Canada Environmental Achievement Award for the Cheverie Creek project and other habitat banking initiatives that they were undertaking. Habitat banking by NSTIR has proven to provide a multitude of economic, social and community benefits in addition to the ecological benefits outlined above. These benefits include:

- Shorter HADD application and approval process resulting from work with NGO's to identify potential habitat banking candidate sites and receiving NGO support up-front;
- Lower risk of non-compliance with the Fisheries Act since compensation outcomes are known up-front before impacts occur;
- Establishment of close working relationships with regulators, NGO's, local communities and schools, Canadian Universities and local landowners to establish support for their projects; and
- Construction and monitoring costs of \$5/m² for habitat banking projects compared to \$20-\$50/m² for implementing many small scale compensation projects under the project by project compensation system.

4.3 LAWRENCETOWN LAKE SALT MARSH RESTORATION PROJECT (NOVA SCOTIA)

Another habitat bank established by NSTIR is the Lawrencetown Lake Salt Marsh Restoration Project. The purpose of the project is to restore the natural hydrology and

fish passage to the site which was impacted by the presence of a former trail bed and a tidally restrictive culvert. The goal was to enable the re-establishment of salt marsh habitat conditions similar to the salt marsh habitat currently found in the Lawrencetown Lake system. The restoration would allow for NSTIR to bank habitat credits for future use as compensation for road projects that would impact similar habitats (CB WES 2010b).

The Lawrencetown Lake Salt Marsh habitat bank was established in November, 2007. The project involved the installation of an appropriately sized and placed culvert within the trail bed in order to restore a more natural tidal regime to the site. Habitat credits were measured based on the area of marsh flooded during high tide events as a result of culvert replacement which totaled 1.78 ha for this project.

Baseline monitoring of the site was initiated in 2006 and continued through the 2007 field season. A five year long-term monitoring program has been established for the project based on an existing regional monitoring protocol (Neckles *et al.* 2002). The monitoring program includes monitoring of a reference site against which monitoring results from the restoration site can be compared. This project used the same indicators of success as the Cheverie Creek project.

The 2009 monitoring report (Bowron *et al.* 2009b) which includes results from the first year of monitoring concludes the following:

- Observed changes in physical and the biological components of the system are indicators of positive responses to intervention and that the site is progressing along an acceptable restoration trajectory;
- Salt marsh habitat conditions present within the site prior to restoration are improving and expanding and fish passage and usage of the site has improved; and
- A five-year monitoring program will confirm the type and amount of change that has occurred as a result of the project (Bowron *et al.* 2009b).

The same benefits identified for Cheverie Creek have been realized for the Lawrencetown Lake project.

4.4 NORTH FRASER HARBOUR HABITAT COMPENSATION BANK (BC)

In 1990, the North Fraser Harbour Commission (NFHC) (now part of Port Metro Vancouver) created an environmental management plan for the Fraser River Harbour that would facilitate a proactive approach towards harbor development and environmental management (DFO and NFHC 1990). Development in the Fraser River Harbour often requires HADD Authorizations under section 35(2) of the Fisheries Act so the environmental management plan included a provision for the establishment of a habitat bank to compensate for development impacts within the harbor.

The North Fraser Harbour Habitat Compensation Bank was established in May of 1993 (DFO and NFHC 1993). The purpose of the habitat bank was to create new intertidal marsh habitat adjacent to natural fringe marsh habitat in the North Fraser Harbour to be used as compensation for future developments in the harbour. The project involved the conversion intertidal mud and sand flats to intertidal marsh habitat with the primary criteria for success being the establishment of intertidal marsh vegetation. Restoration activities included installation of a rock berm adjacent to natural fringe marsh habitat to create appropriate hydraulic conditions for the establishment of intertidal marsh habitat and transplant appropriate vegetation species to promote establishment of plant cover (mainly sedge species).

Credits for the project were made available once habitat was determined to be viable and stable based on monitoring results. This was estimated to be 1-3 growing seasons following planting. Developers then applied to the Fraser River Environmental Management Plan Environmental Review Committee to use credits against their proposed developments. According to their agreement with DFO, NFHC was required to notify DFO of planned habitat banking transactions and DFO must endorse all transactions through a final approvals process. Habitat banking credits can only be used within the same habitat management unit as identified in the Fraser River Environmental Management Plan. Credits are purchased directly from NFHC by developers with the price of credits being set by NFHC. Credits from the bank can be used for compensation where 1m² of marsh credits purchased from the bank can be used to compensate 1m² of destroyed marsh at a development site.

A five year monitoring period was initiated by the NFHC following bank establishment with annual reports submitted to DFO for review. The banking agreement with DFO also required annual inspections to occur after the five year monitoring period to ensure that the credits remain viable. If monitoring results indicated that credits were no longer viable due to unacceptable performance of the habitat, the proponent would have the opportunity to implement design changes to address the problems. Further monitoring would likely be required to ensure that design changes result in habitat improvements. The assessment indicators used to determine project success included stability of physical works, plant cover (80%) and any other criteria to be used at the discretion of DFO. Any remedial works required to maintain the integrity of the site were the responsibility of NFHC.

North Fraser Harbour – Summary

- Involved conversion of intertidal mud and sand flats to intertidal marsh.
- Vague description of performance standards in MOU leaves uncertainty with achieving outcomes.
- Lack of productivity/function based performance standards.
- Most US-like habitat bank in Canada since the bank is established by the harbor commission and credits are sold to developers.
- Service area restricted to the management unit within which the proposed development will occur as outlined in the Fraser River Environmental Management Plan.

4.5 NORTH SASKATCHEWAN RIVER HABITAT BANK (ALBERTA)

The City of Edmonton is responsible for managing numerous stormwater outflow sites that drain into the North Saskatchewan River. Following spring runoff and major storm events, stormwater outflow areas along the banks of the North Saskatchewan River sometimes require armouring and bank stabilization work to address bank erosion issues. These projects occur on a fairly regular basis (several annually) and often require HADD authorization from DFO.

In 2005, the City of Edmonton proposed the creation of a sturgeon spawning reef in the North Saskatchewan River that could be used as a habitat bank to compensate numerous small HADD authorizations. DFO recognized that creating numerous small sturgeon habitat areas to provide one-off compensation for each small HADD would not work so there was much greater potential habitat value in the creation of a larger spawning reef. The total area of the sturgeon spawning reef was 945 m² while each of the individual HADD authorizations were in the range of 15-20 m².

North Saskatchewan Habitat Bank – Summary

- Creation of sturgeon spawning reef to compensate for small HADD's related to bank stabilization works.
- DFO recognized greater value in creation of larger habitat area compared to one-off compensation for each HADD.
- Credits were based on habitat area created with DFO determining compensation ratios based on a qualitative assessment of the productivity of habitat lost compared to productivity of the new reef.
- Cost of constructing the reef was \$460/m².
- No documented monitoring of effectiveness.
- No documented performance standards.
- Service area within 10 km of habitat bank.

The project involved placing approximately 700 tons of specially sized limestone boulders in the river using a 230-ton crane equipped with a real time survey grade GPS system. Commercial divers were used to inspect the rock to ensure that the proper reef configuration was achieved. The cost of creating the reef was approximately \$435,000 (~\$460/m²).

Habitat banking had never been used for compensation in this region prior to this project and the project was considered “unofficial” with no formal habitat banking agreement was established between the City of Edmonton and DFO for this project (M. Janowicz, pers. comm.). A tracking system was established and administered by DFO in Edmonton to document the withdrawal of credits from the habitat bank. The habitat created by the sturgeon spawning reef was considered to be highly valuable habitat compared to lower quality habitat that was impacted by City projects so DFO generally agreed that 1 m² of habitat from the habitat bank was worth 2-3 m² of habitat destroyed (where destroyed habitat was qualitatively assessed as lower quality). Ultimately the decision on how much credit would be withdrawn for a given project was at the

discretion of DFO. Credits were applied to stormwater outflow armouring sites on the North Saskatchewan River generally within 10 km of the habitat bank.

The City was required to monitor the installation of habitat features during construction and the year following construction to ensure that the physical work was not destroyed by physical processes. The City was not required to conduct any habitat productivity monitoring. It is unknown if any formal monitoring was conducted in subsequent years, thus it is unknown if the habitat has had the desired effect on sturgeon spawning.

4.6 PIPESTONE CREEK HABITAT BANK (MANITOBA)

Pipestone Creek is located in the Rural Municipality of Sifton in southern Manitoba. Pipestone Creek is considered a Class A watercourse containing numerous sport fish species such as northern pike, yellow perch and walleye. Fish habitat in the area is considered high quality for spawning and possibly rearing for certain species. The surrounding land use in the vicinity of Pipestone Creek is primarily agriculture. The riparian area along a reach of Pipestone Creek had become degraded due to cattle trampling along creek banks and cattle waste entering the creek.

In 2006, DFO's Manitoba District Office entered into an agreement with the West Souris River Conservation District (WSRCD) to establish habitat banking credits for fish habitat improvement work in Pipestone Creek (DFO 2006). Habitat improvement involved fencing the riparian areas along a section of Pipestone Creek to exclude cattle from accessing the area. The installation of fencing to limit cattle access to the creek would allow riparian vegetation to re-establish resulting in reduced bank erosion and improved water quality.

Pipestone Creek – Summary

- Involved fencing riparian habitat to restore degraded areas from cattle access.
- No monitoring requirements specified in the Terms of Compensation.
- No performance standards specified in the Terms of Compensation.
- No monitoring undertaken for the project.
- Inconsistent determination of service area compared to BC and Alberta.

Habitat banking credits for Pipestone Creek are administered by the DFO Manitoba District, Dauphin Office. Credits were established by measuring the footprint of the area excluding cattle access measured from the fence to the water's edge which totaled 29,040 m². To date there have been no attempts to measure the effectiveness of the natural recovery of riparian vegetation within the fenced area. The agreement stipulates that until a measure of effectiveness is conducted, a conservative value of 10:1 is assigned to the restored habitat. This means that of the 29,040 m² of fenced area, 2,904 m² of habitat banking credit can be applied to future compensation. There is no explanation in the agreement as to why a value of 10:1 was selected besides stating that the value is "conservative". The agreement states that the quality of habitat will be taken into account when WSRCD requests use of the credits and the quality of restored

habitat will be compared to the habitat for which a HADD request is made, but there is no indication of how this habitat assessment will be done. The agreement also stipulates that the service area for the credits must fall within the area of responsibility of the West Souris Conservation District.

Similar to the agreement between Shell and DFO for the Yarrow Creek habitat bank (see below), the habitat credits for Pipestone Creek can only be used for projects that have undergone a screening level environmental assessment under CEAA and cannot be used for any project subject to a Comprehensive Study under CEAA.

4.7 YARROW CREEK RESTORATION PROJECT (ALBERTA)

Yarrow Creek is a small tributary of the Oldman River in southwestern Alberta. Yarrow Creek contains numerous species of trout as well as mountain whitefish. Fish habitat is considered high quality for spawning and possibly rearing and over-wintering habitat.

DFO's District office in Lethbridge Alberta identified a road crossing that includes a set of two culverts as a barrier to fish movement since the culverts were perched above the outflow. The road was owned by Shell Oil who agreed to discuss options on how to address the issue of fish passage at this site with DFO. Through these discussions, DFO and Shell established an agreement that would allow Shell to establish habitat banking credits in exchange for undertaking a voluntary fish habitat improvement project. DFO and Shell established an agreement that outlined the specific terms of use and administration for the habitat bank (DFO 2005).

The habitat improvement project in Yarrow Creek was undertaken in August, 2004. It involved the removal of two perched culverts in Yarrow Creek, replacing them with a clear span bridge that would allow fish passage. Two v-weirs were also placed in the stream to provide additional habitat enhancement. In exchange for the removal and replacement of these perched culverts Shell was given habitat banking credits that could be used to compensate for future impacts to fish habitat that may result from Shell operations. Credits were calculated based on the total footprint of the existing culvert structures with credits totaling an area of 198 m².

Yarrow Creek – Summary

- Involved replacement of hanging culvert with a clear span bridge to restore fish passage.
- No monitoring requirements specified in the Terms of Compensation.
- No performance standards specified in the Terms of Compensation.
- No monitoring undertaken for the project.
- Inconsistent determination of service area compared to BC.
- Service area applies to jurisdiction of DFO's Lethbridge District Office.

The banking credits are administered by the Lethbridge District office and are intended to be used within the jurisdiction of DFO's Lethbridge District office. The "Terms of Compensation" (DFO 2005) did, however, allow for the use of banked credits elsewhere

in Alberta at the discretion of the responsible DFO Habitat Manager. The use of compensation credits could only apply to projects that have undergone a screening level environmental assessment. Banked habitat credits could not be applied to compensation for projects that are subject to comprehensive study or panel review under the Canadian Environmental Assessment Act.

According to the “Terms of Compensation” (DFO 2005), the quality of habitat created will be taken into consideration and compared against the quality of habitat proposed for destruction at the time of application. Although this implies some type of measurable performance standard for the bank there are no details in the agreement outlining what the performance standards are. There is also nothing in the agreement that refers to a monitoring program to document habitat improvement over time. Neither DFO nor Shell conducted any follow-up monitoring for this project likely because Shell has not attempted to use the credits to date (R. Creasey, pers. comm.). DFO in Lethbridge has indicated that Shell is free to use the credits at any time although some type of evaluation of habitat quality would be necessary to determine credit value (T. Olson, pers. comm.). The habitat banking agreement between Shell and DFO has no defined process for conducting and evaluation of habitat credits.

Paradis Wetland – Summary

- Involved restoration of degraded wetland and conversion of upland areas to wetland.
- High demand for credits in the service area presents good opportunity for credit sales.
- Provided revenue from an otherwise undevelopable site.
- Demonstrates good corporate environmental stewardship.
- Resulted in mutual benefits for Chevron and the local drainage board.

4.8 PARADIS WETLAND MITIGATION BANK (LOUISIANA)

A wetland mitigation bank in Paradis Louisiana provides a good example of direct industry involvement in the emerging habitat banking market in the US (Bayon *et al.* 2006). The Paradis wetlands include 28 km² of lush wetland habitat in southern Louisiana. The land is owned by Chevron and served as a drilling area for oil production for over 60 years. By 2001, Chevron determined that the wells had been tapped out and began exploring other options for generating revenue from the land. Due to the elevation of the site (approximately 2 m below sea level) it was deemed too weak to support structures which severely limited development options.

Chevron decided to establish a wetland mitigation bank at Paradis where restoration undertaken by Chevron would be banked as wetland mitigation credits and sold to developers in the area that needed to compensate for impacts to similar wetland habitat. In 2005, Chevron received approval to enhance wetland functions at the existing wetland area and convert adjacent upland areas into functional wetlands. The restoration work involved the planting of Cypress and bottomland hardwood trees in the

existing wetland areas and installing culverts in spoil banks in upland areas that will hold and gradually release water creating new wetland habitat.

The wetland credits created through this project are measured as 1 credit per wetland acre created/restored. Due to the high demand for credits from developers in this region, Chevron will sell single credits for \$20,000 - \$25,000. With approximately 7100 acres of land in the Paradis wetland mitigation bank, Chevron expects to gross over \$150 million from this wetland mitigation bank.

The creation of the Paradis wetland mitigation bank has had a number of benefits to the local drainage board, the general public and Chevron including:

- Positive outcomes for the local drainage board who benefits from increased water retention in the Paradis wetland reducing pressures on their pumping stations;
- Positive outcomes for the public through the creation and enhancement of wetland resources;
- Positive outcomes for Chevron through an ability to generate revenue from otherwise undevelopable land; and
- The ability to demonstrate good corporate environmental stewardship by creating and improving wetland habitat.

**Kimball Island and Fremont Landing
– Summary**

- Involved habitat improvements through various in-channel and riparian restoration activities.
- First examples of banking focusing on fish habitat in the US
- Baseline data collection and use of reference sites allowed for effective monitoring of desired outcomes.
- Use of a phased credit release system where some credits are released early to cover construction costs with remaining credits held until performance standards are met.

4.9 KIMBALL ISLAND MITIGATION BANK (CALIFORNIA)

Kimball Island mitigation bank, established in December 1997, was the first mitigation bank that included fish credits in the US. The bank is a 109 acre restored tidal marsh located in the San Joaquin Delta in Sacramento County (Carroll *et al.* 2008). The Kimball Island mitigation was created by a third party mitigation banker (i.e. not a project proponent or government agency) and is an example of how mitigation banking in the US has created new market opportunities for private companies in the field of habitat restoration. The restoration work undertaken by the third party mitigation banker creates a product (i.e. mitigation credits) that can be sold for profit.

The purpose of the Kimball Island Mitigation bank was to re-establish the diverse aquatic, wetland, and riparian habitats that were once prevalent in the San Joaquin Delta, including riverine aquatic bed, riparian forest, tidal perennial marsh, and shaded riverine aquatic. The goal for fish habitat was to establish functional habitat conditions for Chinook salmon and delta smelt (NMBA 2007).

Restoration planning for Kimball Island involved on-site data collection and analysis of functional attributes at nearby reference sites that would be used to guide desired restoration outcomes based on existing natural sites. The restoration activities undertaken to develop the bank include widening of existing ditches, excavating new channels, creating channel side berms, removing non-native vegetation and planting riparian vegetation (Wildlands and Sierra View Landscape 1997).

Fish credits are Chinook salmon and delta smelt habitat credits authorized by the National Oceanic and Atmospheric Administration's National Marine Fisheries Service (NMFS) and the US Fish and Wildlife Service (USFWS) and approved by the USACE Sacramento district mitigation bank review team. Credits were sold for numerous small footprint projects in the Upper San Francisco estuary and there is a general consensus that the habitat restored on the larger footprint of the bank site is of far greater value than many small compensation projects. All credits from this bank were sold as of 2006. The majority of credits sold were used as mitigation for development projects affecting the federally listed delta smelt.

Five years of monitoring show that performance goals have been met and that target species are using the habitat. The assessment indicators and performance standards were not specified in the documents reviewed for this project.

4.10 FREMONT LANDING SALMON CONSERVATION BANK (CALIFORNIA)

The Fremont Landing Salmon Conservation Bank, established in October 2006, is another example of fish habitat banking that has occurred in the US. The site is a 100 acre river floodplain on the Sacramento River. The purpose of the bank was to enhance floodplain wetland, riparian and aquatic habitat for special status species including Chinook salmon, Pacific salmon and steelhead (The Conservation Fund 2010).

Restoration activities for the project involved physical contouring and planting of native vegetation to restore riparian habitat and allow connectivity of fish habitat that is currently cut off under low flow conditions. The project also involved the enhancement of shaded riverine aquatic habitat by planting riparian vegetation and the placement of large woody debris.

A phased system of credit release was developed by the California Department of Fish and Game to provide adequate funding for construction of the bank. Credit release was staged as follows:

- 15% of credits available upon site approval;
- 35% of credits available upon approval of as-built drawings;
- 35% of credits available upon attainment of the year 2 performance standards; and
- 15% of credits available upon attainment of the year 5 performance standards (Wildlands 2009).

Some credits have been made available based on the credit establishment criteria above however it is unknown if any credits from this site have been sold at this time. Available credits are for three federally listed salmon populations and their critical habitat. Credits are also available for effects on non-listed anadromous fish and their habitat. Although there is reference to performance standards in the documentation reviewed for this project, the specific performance standards are not known.

4.11 LESSONS LEARNED FROM EXISTING HABITAT BANKS

- Lesson 1:** Effective baseline and long-term monitoring program allows for a scientifically defensible determination of habitat bank success.
- Lesson 2:** Use of established regional monitoring protocol allows for data sharing with other projects.
- Lesson 3:** Monitoring programs that incorporate a broad array of ecological indicators allows for measurement of ecosystem function.
- Lesson 4:** Use of third party specialists is effective means of fulfilling long-term monitoring requirements.
- Lesson 5:** Habitat banking programs that engage the public and local stakeholders can result in the establishment of new partnerships and increased support for habitat banks.
- Lesson 6:** Precedent for third party habitat banking similar to the US system has been established in Canada with the North Fraser Habitat Bank where credits are sold by the habitat bank owner to developers.
- Lesson 7:** There is a high degree of variability in the terms of habitat bank establishment in different Canadian jurisdictions including the service area boundaries for various habitat banks.
- Lesson 8:** The success of a habitat banking program is driven by demand for credits.
- Lesson 9:** Habitat banking can generate an alternative revenue option for landowners.
- Lesson 10:** Habitat banking can demonstrate good corporate environmental stewardship.
- Lesson 11:** Establishing a phased credit release system where some credits are released early to cover construction costs with remaining credits held until performance standards are met allows habitat bankers to cover costs while still ensuring desired outcomes are achieved.

5.0 EVALUATION OF HABITAT BANKING

The review of existing habitat banking initiatives both in Canada and internationally highlights the value of habitat banking as a compensation option in Canada. The following subsections offer a more comprehensive definition of habitat banking in Canada, identify the advantages of habitat banking, the issues and challenges that have been identified in various jurisdictions and the lessons learned from existing programs.

5.1 ADVANTAGES OF HABITAT BANKING

There are numerous advantages of habitat banking over traditional one-off habitat compensation schemes (Table 5.1).

Table 5.1: Advantages of Habitat Banking

Advantages of Habitat Banking
1. More efficient HADD application processes
2. Risk management
3. Ensure restoration success
4. Reduced criticism of habitat compensation program
5. Creation of larger habitat patches
6. Strategic placement of habitat
7. Elimination of temporal habitat losses
8. Evaluation of new restoration techniques
9. Consolidation of restoration resources
10. Creation of market value for restoration
11. Reduced cost of compensation
12. Revenue opportunities for land owners

1. More efficient HADD application process

Habitat banking has potential for reduced HADD application processing times. The current system of HADD authorizations typically involves the following activities:

- Identifying a site to carry out compensation within or near the area of impact;
- Development of a compensation proposal;
- Obtaining all necessary environmental permits to undertake the compensation project;
- Design and engineering requirements to undertake compensation; and
- Implementation and long-term monitoring of the compensation project.

Depending on the complexity of the proposed compensation program, a typical HADD authorization can take anywhere from several months to several years to be processed. Although these same activities are required to establish a habitat bank, efficiency is achieved since one habitat bank can often compensate for numerous small HADD authorizations which would significantly reduce the number of compensation projects that need to be reviewed by DFO. Instead of having to go through this process for each

small HADD authorization, a proponent or third party habitat banker would get approval for one larger habitat bank. NSTIR has experienced shorter HADD application and approval times by establishing large habitat banks that can compensate several smaller HADD's (TAC 2006).

Although habitat banking can reduce permitting requirements for numerous small HADD's, there may still be opportunities to increase the permitting efficiency for larger restoration/enhancement projects that would qualify as habitat banks. Permitting efficiency will be important to promote and expand the use of habitat banking in Canada.

2. Risk management

The current system of in-kind habitat compensation following project impacts presents several risks for both developers and DFO. First, developers are responsible for the outcomes of their habitat compensation projects. If it is determined by DFO that the habitat compensation did not adequately replace the productivity lost from development, the developer can face charges under the Fisheries Act. Habitat banking involves the completion of compensation in advance of development impacts. Most habitat banking schemes require the achievement of performance standards before credits can be applied to a habitat loss. Taking this approach means that the success of restoration is known before habitat is lost and the risk of a failed compensation project is significantly reduced. Under the US model, the responsibility for the long-term viability of a habitat bank is shifted away from the developer when credits are purchased from a third party bank.

A second risk for developers is the potential for cost overruns with compensation projects. Many developers are poorly equipped to implement and manage restoration projects often resulting in unforeseen costs. Where third party habitat bankers are involved in a habitat banking system, developers are not responsible for the implementation, management or monitoring of restoration projects. Instead, a third party establishes a habitat bank through a banking agreement with the responsible authority and is responsible for management and monitoring of the site with their costs covered through the sale of credits. The developer can buy credits from the third party habitat bank to compensate for the impacts of their project without the burden of implementation, management and long-term monitoring of a compensation project. The case of Fremont Landing Salmon Conservation Bank in California is a good example of how risk has been shifted away from the developer to the bank owner (Wildlands 2009; The Conservation Fund 2010). Developers in the Sacramento area can purchase credits from Wildlands Inc. (the third party habitat banker that created the Fremont Landing Salmon Conservation Bank) to compensate for impacts from their project. Wildlands is responsible for the management and maintenance of the habitat bank with their costs covered through the sale of credits.

From a regulatory perspective, DFO is responsible for implementing Canada's Habitat Policy which requires>NNL of productive capacity of fish habitat. DFO has been criticized for not fully implementing the habitat policy and failing to ensure>NNL of

productive capacity (Harper and Quigley 2005; OAG 2009). Habitat banking presents an opportunity to reduce certain risks of DFO not fulfilling their mandate of implementing the Habitat Policy since habitat is created before a HADD is authorized.

3. Ensure restoration success

Most habitat banking schemes only allow for the full release of credits once performance standards have been achieved. The achievement of performance standards indicates that the restoration or enhancement work has been successful in achieving desired outcomes.

Under traditional compensation schemes, restoration or enhancement is often done after the impact has occurred. Habitat compensation in Canada has been criticized for a lack of follow-up monitoring to determine if desired outcomes from compensation have been achieved. In some cases, the actual impact incurred is greater than initially predicted. This can result in compensation projects that do not adequately mitigate the impact.

With the release of habitat banking credits tied directly to the achievement of desired restoration outcomes and ongoing monitoring, the success of restoration is ensured before project impacts occur. Habitat banking also provides an incentive to confine impacts to predicted levels since there is a simple mechanism to require developers to obtain additional credits if impacts are greater than predicted. Habitat banks offer assurances that habitats will be protected, restored and managed into the future (Madsen *et al.* 2010; Bowron *et al.* 2009a/b; Carroll *et al.* 2008).

4. Reduced criticism of habitat compensation in Canada

OAG (2009) outlines several deficiencies in the current fish habitat compensation program in Canada. The development of an effective habitat banking program in Canada could help to address some of this criticism since outcomes are known up front and the success of habitat banking hinges on a detailed monitoring and site management program. The expanded use of habitat banking would reduce oversight pressures on DFO staff since it requires less effort to monitor several large bank sites instead of numerous small scale compensation projects.

Also, when restoration outcomes are known in advance of impacts to fish habitat, DFO habitat management practitioners will have a strong foundation to base decisions on HADD Authorizations.

5. Creation of larger habitat areas

One of the advantages of habitat banking is that higher ecological values can be achieved by creating larger habitat patches compared to smaller patches created by one-off compensation projects. Compensation can be difficult to achieve within a single development site and fish habitat banking can focus on large connected habitats that many species require to fulfill life history requirements. Single areas of large habitat will often result in better outcomes for species than many small, disconnected habitat patches (TAC 2006, Carroll *et al.* 2008, Briggs *et al.* 2008, Madsen *et al.* 2010).

6. Strategic placement of habitat areas

An effective habitat banking program should be closely connected to existing watershed and other landscape level management plans including FMO's. Habitat banks can then be strategically placed and sized in areas that are most beneficial to focal species and other FMO's. This may result in better outcomes for species even if banked habitat is not in the immediate vicinity of development impacts.

7. Eliminate temporal habitat loss

Under a traditional habitat compensation scheme where compensation occurs after a loss of habitat occurs there is a temporal loss of habitat even if the compensation is successful. For example, a project occurs in the summer of 2010 that results in a loss of fish habitat. The HADD authorization for the project required compensation of equivalent habitat. The compensation project was undertaken in 2011, and after 5 years (2016) the productive capacity of the habitat compensation project was equivalent to the productive capacity of the initial habitat loss. In this scenario, there is a 6 year temporal reduction in the productive capacity of fish habitat even though the HADD was successfully compensated.

Under a habitat banking scheme where restoration outcomes are achieved before credits are released, there is no temporal loss of habitat, and in some cases there would be a temporal gain in habitat from the time restoration outcomes are achieved to the time credits are applied to a development impact.

8. Evaluation of new restoration techniques

One of DFO's strategies, as outlined in the Habitat Policy, is to evaluate the effectiveness of fish restoration techniques. Habitat banking provides testing grounds for new techniques in habitat restoration that can be refined through an adaptive management approach. The science of ecological restoration is still relatively new and often the actual outcomes of different restoration treatments are not known until well after the project has been completed. A well defined and executed monitoring program allows for habitat banks to serve as testing grounds for new and different restoration treatments. The Society for Ecological Restoration (SER 2004) identifies an adaptive management approach to restoration as key to the advancement of restoration ecology practice. Habitat banking offers an excellent opportunity to feed information into the broader knowledge base of restoration ecology through an adaptive management approach.

9. Consolidation of restoration resources

Habitat banking typically involves restoration of larger areas of habitat that can be used to compensate several or many smaller projects impacting similar habitat. Focusing restoration efforts at fewer large sites allows for the consolidation of scientific, financial and regulatory resources. In addition to creating larger habitat patches, this consolidation of resources reduces the cost of compensation and alleviates pressure on regulators to follow-up on numerous smaller sites.

10. Creation of economic value for restoration

Habitat banking establishes economic value for habitat creation and restoration through credits that can be bought, traded or sold. This opens the door for private investment into restoration programs that are traditionally funded through the public sector. In theory, this could increase the amount of habitat restoration activity occurring in Canada since there is an opportunity to profit from a restoration project.

11. Reduced cost of compensation

Instead of having to plan and implement numerous small habitat compensation initiatives for individual projects, developers can create or purchase credits from a larger habitat bank. Under the US model, where habitat banking credits are purchased from a third party habitat bank, the developer is not involved in long-term management and monitoring of the site with the associated cost implications (Carroll *et al.* 2008). Instead, monitoring costs are incorporated into the cost of purchasing a credits.

Where developers create habitat banks for their own projects there are also potential cost savings. The NSTIR has created several habitat banks in Nova Scotia that have proven to provide significant cost savings to the proponent. Construction and monitoring costs for NSTIR's habitat banks are in the order of \$5/m² compared to \$20-\$50/m² for smaller individual projects undertaken as one-off offsets (TAC 2006). When resources are pooled at a larger habitat banking site there are cost savings associated with the need to undertake one monitoring program instead of numerous small monitoring programs (Wilcove and Lee 1999).

12. Revenue opportunity for land owners

Habitat banking provides a mechanism for landowners whose land may otherwise be undevelopable to gain economic benefits by establishing a habitat bank. The Paradis wetland mitigation bank owned by Chevron in Louisiana is an excellent example of this (Bayon *et al.* 2006). Chevron improved wetland function and created new wetlands in existing upland habitat on land that they owned that was unsuitable for other types of development. Chevron was awarded wetland mitigation credits for their restoration and enhancement work which were then sold to other developers in the area looking to compensate for impacts from their projects. Through habitat banking, Chevron was able to generate revenue from their land by improving wetland function and creating new habitat.

Habitat banking also gives landowners an alternative to using their land for consumptive purposes. Habitat banking can increase the amount of economic benefit from recovery efforts reaching local landowners and communities.

5.2 ISSUES AND CHALLENGES WITH HABITAT BANKING AND IMPLICATIONS TO CANADA

By reviewing the existing habitat banking programs that are occurring both in Canada and internationally we uncover some of the issues and challenges that habitat banking has faced to date. The key issues and challenges are summarized in Table 5.2.

1. Habitat Bank Establishment Process

One of the criticisms of the existing habitat banking program in Canada from organizations that have tried to establish habitat banks is that there is no clear process for establishing and running a habitat bank. The process for establishing a habitat bank can be

very cumbersome with some participants deciding that it is easier to deal with compensation on a project by project basis. Due to the numerous advantages to habitat banking over project by project mitigation outlined in Section 5.1, the process for habitat bank establishment should be clarified and streamlined to encourage proponents and third parties to establish habitat banks.

Lesson for Canada

- Develop a clear, streamlined process for establishing habitat banks.

Table 5.2: Habitat Banking – Issues and Challenges

Habitat Banking - Issues and Challenges
1. Habitat bank establishment process
2. Valuation of habitat banking credits
3. Inadequate project documentation
4. Inadequate performance standards
5. Lack of monitoring
6. Improvement of the productive capacity of habitat
7. Geographic service areas of habitat banks
8. Development in pristine environments
9. Long-term bank management
10. Stakeholder engagement
11. Agency oversight
12. Faulty engineering
13. Preservation as a banking option

2. Valuation of habitat banking credits

Calculation of habitat banking credits has been a key challenge for both regulators and developers involved in habitat banking. A common criticism from developers is that there are regional differences in the way that credits are calculated (Madsen *et al.* 2010). In both Canada and the US, habitat banking programs are authorized through regional offices of the responsible authority (e.g. DFO, US ACE, US FWS, etc.). Staff at different regional offices may use different techniques to calculate habitat banking credits which will result in inconsistent credit valuation.

Through discussions with various regional DFO practitioners and a review of existing habitat bank agreements it is evident that credit valuation in Canada is primarily driven by DFO discretion at a regional level. A more standardized approach to credit valuation should be established to ensure a level playing field for all participants in habitat banking and compensation programs in general.

Lessons for Canada

- Need to establish a clear method for establishing credits values that can be applied across Canada.
- Need to establish an equivalent method for determining required offset amounts.
- Establish general methods that can be applied to a range of habitat types across Canada.
- Credits amounts should focus more on productivity and ecosystem function than on equivalent land area.
- Utilize new research initiative through HydroNet to develop a standardized system for measuring habitat banking credits.
- Credit values should be tied to a habitat banks

HydroNet is a new national research network funded through the National Science and Engineering Research Council (NSERC), DFO, Manitoba Hydro, BC Hydro, Nalcor and the University of Montreal. HydroNet seeks to provide metrics of productive capacity of fish habitat and develop Habitat Quality Models for fish species through new research initiatives. HydroNet holds great potential to inform a modern, standardized process for calculating habitat banking credits and debits based on defensible, productivity based metrics.

In addition to ensuring credit valuation is tied to increases in productive capacity, there should also be a relationship between a habitat banks contribution to meeting FMO's and the associated value of credits. The contribution of a habitat bank to meeting FMO's should be reflected in the value of a credit.

3. Inadequate Project Documentation

Different forms of habitat banking have been occurring in the US and Canada for over 20 years. Unfortunately, inadequate documentation of project activities has resulted in a limited ability to learn from the experience of many of these banking programs (Madsen *et al.* 2010; R. Creasey pers. comm. 2010; Carroll *et al.* 2008; Kenney 2006; Bayon *et al.* 2006; Tabatabai and Brumbagh 1998). Project documentation is a critical component of an adaptive management approach where new restoration techniques can be tested and refined based on experience. Lack of project documentation has

been an ongoing criticism of the existing fish habitat management program in Canada (Harper and Quigley 2005, OAG 2009).

To facilitate the adaptive management approach introduced in Section 5.1, there must be clear documentation of all project activities including baseline monitoring, restoration design, implementation, management, long-term monitoring and performance standards. Without this information it is impossible to identify what works and what does not so future projects can build upon the knowledge base.

Lessons for Canada

- Habitat banking program in Canada must include a detailed process for project documentation that allows for an adaptive management approach.
- Use example from NSTIR in Nova Scotia as an example of effective project documentation.
- Use of third party to conduct monitoring and reporting.

4. Inadequate Performance Standards

Establishing meaningful and appropriate performance standards for habitat banks is critical to determining if desired outcomes have been met. Performance standards should be established in advance of restoration activities so desired outcomes are clear from the outset (SER 2004).

For many mitigation banks in the US, determination of success is either difficult or impossible because management plans for banking sites often lack ecologically defensible and measurable performance standards (Tabatabai and Brumbaugh 1998). This situation not only creates challenges when trying to evaluate whether or not desired outcomes have been achieved, but also makes it difficult implement effective management interventions to address deficiencies.

Lessons for Canada

- Establishment of meaningful, measurable and scientifically defensible performance standards necessary for successful habitat banking program.
- Achievement of performance standards must indicate productive/functioning habitat.
- Performance standards should include a broad array of indicators such as hydrology, vegetation, water quality, wildlife, habitat and soil.
- Performance standards can be established by monitoring reference ecosystems to determine desired conditions of various ecosystem attributes.

A study of wetland mitigation banks by the Ohio EPA concluded that performance standards were not adequate to ensure functional habitat was created. In some cases, wetland mitigation banks were able to demonstrate that they had achieved the established performance standards even though the created wetlands were of minimal habitat value (Kenney 2006). Although performance standards did exist in some of these cases, the standards were not adequate indicators of ecosystem function.

5. Lack of Monitoring

Three of the advantages of habitat banking identified in Section 5.1 (“ensure restoration success”; “evaluation of new restoration techniques”; and “reduced criticism of habitat compensation in Canada”) rely on an effective long-term monitoring program for all habitat banks. A well designed monitoring program provides data that is used to measure performance standards and ultimately evaluate project outcomes. For any ecological restoration project monitoring should include some level of baseline monitoring, construction or as-built monitoring and long-term performance monitoring. Monitoring programs should be tailored to local ecological conditions and desired outcomes and should include a mechanism to revise monitoring requirements as conditions change over time (Tabatabai and Brumbaugh 1998).

Unfortunately, a lack of effective monitoring has plagued habitat banking and habitat compensation in general. Due to poor project documentation described above, there is a lack of information on the monitoring programs that have been established for many habitat banks. Experience from the US has shown that there is currently a lack of Agency resources to monitor banks effectively (Tabatabai and Brumbaugh 1998, Kenney 2006). Similar criticism has been directed towards DFO under the existing habitat compensation program in Canada (Harper and Quigley 2005, OAG 2009). It is likely that many past habitat banks and other compensation programs in Canada and the US have not included any formal monitoring program to measure project outcomes. The Yarrow Creek habitat bank in Alberta did not have any monitoring requirements to determine project outcomes.

Lessons for Canada

- Effective monitoring is essential for verifying NNL and communicating outcomes to public and stakeholders.
- Habitat banks established by NSTIR provide good examples of effective monitoring.
- Monitoring should measure relevant parameters related to hydrology, soils and sediments, vegetation, nekton and benthic and other aquatic invertebrates (see NSTIR).

6. Improvement of the productive capacity of habitat

One of the key challenges with habitat restoration is to create habitat conditions that result in a net benefit to the target species or ecological community. One of the problems with the existing system of fish habitat compensation in Canada is that it is often not known if habitat created as compensation is equivalent to habitat loss (Harper and Quigley 2005). This lack of knowledge is primarily due to the problem of insufficient monitoring and inconsistent approaches to measuring gains or losses in productive capacity of fish habitat.

Wetland mitigation banking in the US is plagued by the challenge of creating wetlands that function at an equivalent level to the natural wetlands that are lost to development. Wetland mitigation banking in the US has been heavily criticized for restored wetlands failing to fulfill the same ecological functions as those that were destroyed (Tabatabai and Brumbaugh 1998; Wilcove and Lee 2004; Kenney 2006). Carroll *et al.* (2008) raise

similar concerns for fish banks in the US questioning whether they produce superior habitat that effectively replaces habitat and functions lost to development.

Often compensation in Canada is described in terms of a ratio between habitat created and habitat lost. Simply measuring compensation as equivalent areas of land (e.g. 1 hectare created for 1 hectare lost) is inadequate to determine the achievement of NLL goals as it does not consider differences in productive capacity of equivalent land areas nor does it consider regional FMO's. A standard approach to measuring productive capacity that is guided by regional FMO's will strengthen the validity of habitat banking credits as a means of confirming no-net-loss of fish habitat. New research being conducted through HydroNet will likely inform the development of new tools that can be used to measure productive capacity in habitat banks.

7. Geographic service areas of habitat banks

As described in section 6.1, habitat banks should be closely tied to landscape level conservation plans and regional FMO's (e.g. The Great Lakes Conservation Blueprint for Aquatic Biodiversity). Conservation plans may identify areas that would be good candidate sites for restoration but are not necessarily in close proximity to a strong credit market. In these cases, consideration should be given to the value of restoration work in low demand areas (Bayon *et al.* 2006). If the establishment of a habitat bank in an area that is not close to a credit market presents high conservation value and contributes to achieving regional FMO's then a banking agreement could be created that allows for an expanded service area. This would create incentive for a developer to conduct restoration work in an area of high conservation value while ensuring a market for credits exists. Since bank location is driven by demand for credits it is

Lessons for Canada

- Need to establish a scientifically defensible method for measuring gains and losses of productive capacity to ensure NNL is achieved.
- Draw from existing research on measuring productive capacity (e.g. Jones 1996; Minns 1997; Minns 2003) to establish a standard approach.
- Harper and Quigley (2005) found many compensation programs in Canada rely on qualitative methods to measure productive capacity. Qualitative measures should be verified with quantitative data.
- Utilize new research such as the work being done through HydroNet to establish consistent approaches to measuring productive capacity.

Lessons for Canada

- Ensure habitat banking policy is flexible enough to allow for habitat banks to be established in ecologically significant areas while still ensuring there is demand for credits.
- Demand for credits is critical to the success of habitat banking.
- Habitat banks will not be created if credits cannot be used.
- Adopt a flexible approach to determining habitat bank service areas to maximize conservation outcomes and meet FMO's.
- Ensure habitat bank credits are applied in a geographically relevant area to protect affected species and habitat types.

important to build flexibility into banking agreements so banks can also be located in areas that are biologically significant for the species of concern.

It is also important that habitat banks are relevant as offsets to the impacts for which they are intended to compensate. Unlike carbon credit markets where offsets can occur across broad geographic areas since carbon emission impacts are global in nature, habitat compensation must occur in close enough proximity to the impacts so that the affected species and habitat types are not lost at a local level. The service area of habitat bank credits should be considered within a watershed context and account for the scarcity of the species and habitat type that is impacted at a local level when determining the appropriate geographic distance for applying habitat bank credits.

8. Development in pristine environments

Many natural resource developments in Canada are occurring in pristine environments where there are few opportunities for habitat restoration, enhancement or creation near the site. For example, northern mining project often occur in areas that have experienced little to no historic human disturbance that can be restored or enhanced. This creates challenges for developers looking to undertake compensation projects since there is a lack of candidate sites due to a low density of historic human disturbance. In such cases, a review of regional FMO's should occur to determine the most appropriate candidate sites for compensation to occur. This is an example of where flexibility should be incorporated into the determination of geographic service areas for habitat banks to allow for banks to be created in appropriate areas to fulfill FMO's while servicing the developments that will create a market for these banks.

Lessons for Canada

- Ensure that rules for habitat banking allow for developments in pristine environments to contribute to a market for habitat banks that achieve FMO's

9. Long-term bank management

Ongoing management of habitat compensation projects is a significant concern for industry, regulators and other stakeholders. Long-term management of compensation projects is required to ensure that the habitat created continues to function as a compensation for habitat that was destroyed. This same issue extends to habitat banks. Long-term management requires ongoing funding to facilitate any required maintenance activities. Some mitigation banks in the US have been criticized for having inadequate endowment funds to support essential land maintenance activities causing some banks to fail from an ecological perspective (Carroll *et al.* 2008).

Lessons for Canada

- Failure to achieve desired outcomes at a large habitat bank site is more significant than failure of a smaller compensation project.
- Must build effective long-term management process into habitat banking agreements to ensure bank sites are successful.

The owner of the Fremont Landing Salmon Conservation Bank in California was required by the regulator to establish a dedicated, non-wasting, interest-bearing account, with the understanding that the interest accruing from the endowment fund will be used exclusively for management of each banking site. An endowment deposit is collected with the sale or conveyance of each conservation credit until the endowment is fully funded. The endowment fund is required to be held in trust by an approved party.

10. Stakeholder engagement

Wetland mitigation banking in the US has been criticized by the public and other stakeholders for lacking an effective stakeholder engagement process that seeks input from a range of interests. Stakeholder engagement is important for restoration projects to ensure that everyone who may be affected by a project understands the goals and objectives of the project (Carroll *et al.* 2008). NSTIR has indicated that their involvement with local stakeholders including NGO's and local school groups has helped to gain public support for their banking projects. Working with NGO's has also helped NSTIR to identify potential restoration projects that the NGO's are interested in to develop as habitat banks.

Lessons for Canada

- Allow for public and stakeholder involvement in the establishment of habitat banks to build support and aid project selection.

Some groups in the US have criticized habitat banking initiatives for making it easier to get regulatory approval for habitat destruction. The reality is that very few development applications are rejected in the US regardless of whether or not a habitat bank exists (Bayon *et al.* 2006). Supporters of habitat banking argue that by establishing a price for habitat destruction through a habitat credit market, there is a clear incentive for developers to avoid costly habitat losses. Establishing an effective stakeholder engagement process as part of a habitat banking program will facilitate open dialogue around these concerns and help to build support for habitat banking initiatives.

11. Agency oversight

Habitat banking in the US has created a new market of buyers, sellers, business plans, market analysts, land managers and ecologists. Review agencies require ecologists to conduct site visits, accountants to review funding proposals and lawyers to write and review banking agreements. Review agencies in the US not only lack adequate expertise outside of biology, but lack adequate budgets to implement effective oversight programs to ensure effective implementation of management plans (Carroll *et al.* 2008). Similar criticism has been directed towards DFO in Canada related to

Lessons for Canada

- Ensure adequate agency resources and expertise is available to oversee habitat banking program.
- Ensure agencies hold banks to high enough standards to ensure desired outcomes are achieved.
- Ensure consistent agency oversight between DFO regional offices.

compensation programs under the current Habitat Policy (OAG 2009, Harper and Quigley 2005).

Another problem that has been identified in the US is that regulators are not holding banks to high enough standards resulting in habitat banks achieving required performance standards (as set by EPA and US ACE) but the habitat created is not productive. In cases where it is clear that habitat is not functioning as intended, regulators are not calling the banks on this lack of function (ten Kate *et al.* 2004, Kenney 2006). One of the problems in the US is that there is not enough staff support within the responsible agencies to perform an adequate level of compliance monitoring. The success of habitat banking requires the regulatory agency to verify that an adequate level of compliance with the banking agreement has occurred. The inability of regulators to hold banks to adequate standards has eroded public confidence in the ability of habitat banks to effectively compensate for development impacts

Federal agencies in the US such as the US ACE and EPA are managed regionally through independent regional offices. DFO in Canada is managed in a similar fashion. In both the US and Canada there are regional differences in the interpretation of federal regulations such as the fish habitat policy. Regional differences in how regulations are interpreted create confusion and sometimes an unfair advantage for proponents in different regions. Problems have been encountered in the US with habitat banking programs in different regions being subject to different regulatory requirements (Madsen *et al.* 2010).

12. Faulty engineering

Often it is difficult to predict the outcomes of restoration projects due to the unpredictable nature and inherent variability in ecological systems. Wetland restoration often involves the use of engineering controls such as levees and dykes to control water input and output from the managed wetland area. Achieving the proper hydraulic conditions is critical to establish a functional wetland so proper design of engineering controls is of critical importance to the success of a wetland restoration project.

Kenney (2006) notes that several failed wetland mitigation banks in the US are the result of faulty engineering controls. It is important for any restoration project to ensure proper design and construction of engineering controls to maximize the achievement of desired outcomes.

Lessons for Canada

- Ensure proper engineering of habitat enhancement interventions to maximize the achievement of desired outcomes.

13. Habitat preservation as a means to create banking credits

One of the options for habitat banking in the US is the preservation of existing high quality habitat through a conservation easement or other protective measures. Using land preservation as a habitat banking mechanism has received a great deal of criticism as it represents a potential net loss of habitat (Brown and Lant 1999). If banks are focused on acquisition of existing habitat instead of restoration of lower quality habitat then there is high likelihood of net loss of habitat since no new habitat is created in place of habitat lost to development. If the protected land was not in immediate danger of development then there is a net loss of habitat (Carroll *et al.* 2008).

Lessons for Canada

- Use of preservation as a means to create banking credits will open the program to criticism.

5.3 LEGAL ISSUES

Although habitat banking has not been widely used in Canada, it is not constrained by the *Fisheries Act* itself. As was reiterated by the Federal Court in a December 2010 decision,¹² the regulatory scheme under the *Fisheries Act* is highly discretionary. Indeed, “sections 35 and 36 of the *Fisheries Act* prohibit only unauthorized destruction of fish habitat,”¹³ and delegate to the Minister of Fisheries and Oceans Canada broad discretion to authorize such activities while managing the fisheries as a national resource.¹⁴

It is likewise true that nothing in the current policy scheme guiding this authorization-discretion constrains the use of habitat banking. The guidelines and policies discussed in Section 1.0 of this report make it clear that authorizations should seek to meet the policy goal of “no-net-loss of productive capacity” but that off-site creation or improvement of fish habitat can be used to compensate acceptable habitat destruction. Additionally, the policy explicitly identifies habitat banking as a compliance option.

The only possible constraint on the development of a fully mature banking system — one in which third parties are incentivized to establish and operate habitat banks that generate profit by selling credits to developers — is the Compensation Guide’s reference to banks having to be created by “proponents” (DFO 2002). The reality of Canadian law, however, is that policy and guidelines may not restrain the choices available to a discretionary decision-maker. Administrative agencies, in other words, may not issue binding policies. In consequence, policy and guidelines can be ignored and altered by the discretionary decision-makers.¹⁵ In fact, as referenced in Section 3.1

¹² David Suzuki Foundation et al. v. Canada (Minister of Fisheries and Oceans, Minister of the Environment), 2010 FC 1233

¹³ *Id.*

¹⁴ *Id.*

¹⁵ *Pezim v. British Columbia*, [1994] 2 S.C.R. 557; *Maple Lodge Farms Ltd. v. Canada*, [1982] 2 S.C.R. 2.

of this report, there are already examples in Canada of credits being purchased from a third-party despite this limited definition of habitat banking. At any rate, insofar as this may be a constraint on the development of a mature habitat banking system, it is addressed by Recommendation 1 of Section 7 of this report.

Given that nothing in the *Fisheries Act* or attendant policy constrains the use of habitat banking, the question is better articulated as whether the regulatory scheme sufficiently enables habitat banking. It would appear that it does not.

The literature on habitat banking makes it clear that the primary driver in the development and operation of habitat banking systems is the regulatory conditions created by government agencies (Carroll et. al 2008). In a very real sense, governments create the demand for and determine the supply of habitat credits, whether proponent or third-party generated. Without laws requiring mitigation and compensation for the destruction of fish habitat, there would be no demand for habitat restoration outside of altruistic motivations (which do not require government involvement at all). And the supply is determined by whether the agency accepts the mitigation as an off-set for the specific habitat destruction. It is fair to say that, in Canada, the regulatory conditions under the *Fisheries Act* have generated a high demand for fish habitat credits, but the conditions for establishing a sufficient supply have yet to materialize.

The primary threat to the success of a mature habitat banking system comes from uncertainty. At its simplest, a habitat bank is merely off-site restoration or creation of fish habitat in advance of the regulatory requirement for habitat compensation. Habitat banking requires proponents to make often substantial financial investments in reliance on future benefits. Like any financial investment, the level of risk and uncertainty associated with accruing the future benefit is the controlling factor.

In the context of the *Fisheries Act*, the first threat to certainty: science and biology and whether the use of habitat banking increases or decreases the certainty that “no-net-loss of productive capacity” can be achieved. But perhaps just as importantly, and easier to address, is regulatory uncertainty. Without clear and sufficient policy, regulatory uncertainty will continue to constrain investment in the creation of habitat banks.

Briefly, there are two different types of policy making in Canada: (1) formal legislation and regulations and (2) informal guidelines, policies, and directives. Legislation and regulations provide the highest degree of certainty as they both articulate the government power to be exercised (as granted by the Constitution) and constrain it. Government decision-makers are bound by the parameters of these laws. Informal guidelines, policies, or directives are held not to be 'law' and cannot be treated as binding (unless legislatively mandated to bind decision-makers) and yet cannot be ignored. Every administrative agency has the authority to make policy in this way (Woolley 2008). International examples of successful habitat banking initiatives indicate that they can take either form.

The Australian (New South Wales) example briefly addressed in Section 3.3 of this report relies on formal legislation, and provides a high degree of structure for biodiversity banking vis-à-vis species at risk. While the entire BioBanking program is born of several pieces of legislation, Part 7A of the *Threatened Species Conservation Act*, 1995 No. 101, provides the authority for the program as it relates to species at risk (Madsen et. al. 2010). This legislation establishes a biobanking scheme inclusive of: the necessity for a biobanking assessment methodology and the principles to which it must adhere; the necessary elements of biobanking agreements; the method of registering agreements; procedures for enforcing the agreements; and, the rules governing the trading and transfer of credits. Further details are then determined in associated regulations.

The US example of conservation banking is markedly different. While it is a highly developed system and the most market-like program in the world, there is no 'law' *per se* expressly authorizing or structuring the system. Conservation banking is used by the US Fish and Wildlife Service to protect species under the *Endangered Species Act*. The parameters of this scheme are established in an 18-page memorandum entitled "Guidance for the Establishment, Use, and Operation of Conservation Banks." As set-out in Section 3.2 of this report, this program has nonetheless met with considerable success in terms of the number of mitigation banks established.

Finally, there is one associated but theoretically simpler factor in the certainty equation. It is not enough that public law or policy enables the use of biodiversity or habitat banking—private law has a significant role to play in the establishment of specific banks. The necessary content of the legal agreement between the bank owner and the regulator will involve significant issues of corporate, property and contract law and must be negotiated anew for each banking site. At this level, there are certain features of Canada's legal system that become important. While a full examination is beyond the scope of this report, two features are worth briefly noting.

The first is that terrestrial habitat and wetlands have the benefit of a much clearer property right regime than aquatic habitat. Common law has long held that title to non-navigable, non-tidal waters extends to the middle of the water body, but ownership rights to tidal and navigable waters are determined by legislation at the provincial level. The property regime of marine waters is additionally complex. In US case-studies, the profit motive of property owners has been a significant driver for the success of both wetland (or stream) and Conservation banking, but this profit incentive is lacking where the habitat is government owned¹⁶. Additionally, in the US context, the Fifth Amendment ensures that no government legislation or regulatory decision can render property economically idle without just compensation. This constitutional right would limit the government's ability to prohibit development of private lands to protect species

¹⁶ About 89% of Canada's land area (8,886,356 km²) is Crown Land, which may either be [federal](#) (41%) or [provincial](#) (48%); the remaining 11% is privately-owned. V.P. NEIMANIS. "[Crown Land](#)". *The Canadian Encyclopedia: Geography*. Historica Foundation of Canada. <http://www.thecanadianencyclopedia.com/index.cfm?PgNm=TCE&Params=A1ARTA0002049>. Retrieved 2011-02-07

at risk, were it not for the possibility of generating value as a habitat bank. This regulatory incentive is absent in the Canadian context.

From a legal perspective, then, it can be said that while habitat banking has not been widely used in Canada, its use is not constrained by the *Fisheries Act* itself, and it is already partially enabled by policy. The limiting factor would appear to be the level of uncertainty within government that banking is an effective tool, and the corollary uncertainty for proponents seeking compliance with the *Fisheries Act* that they can rely on such a system for future gains. While law cannot address the first factor of this uncertainty, international examples have demonstrated that well-constructed laws or policy can sufficiently overcome the regulatory uncertainty that hinders the development of mature banking systems.

6.0 CONCLUSION

The concept of habitat banking is being widely adopted around the world with the policies and practices underpinning its application quickly evolving. Habitat banking programs in Canada and internationally have produced positive outcomes for compensating development impacts. When compared to project-by-project habitat compensation there are numerous economic, ecological and social benefits that result from an effective habitat banking program. Benefits include a less onerous HADD application process for DFO and proponents, economies of scale with larger restoration sites through the consolidation of financial and scientific resources, creation of new markets and associated economic spin-offs, reduced risk to developers and agencies, creation or restoration of larger habitat patches, placement of compensation within a larger conservation planning framework (FMO's), improved understanding of restoration techniques, improved stakeholder relations and reduced compensation costs. Habitat banking represents a means of reducing the regulatory burden for both regulators and proponents associated with regulatory reviews and authorizations under the *Fisheries Act* while achieving better results for the protection and conservation of fish habitat. The potential for habitat banking to enable a more flexible, effective, efficient, transparent and predictable HADD Authorization process, enable a more timely administration process to meet habitat protection requirements under the *Fisheries Act* and provide better habitat compensation outcomes for government agencies, the public and industry highlights the value of increasing the use of habitat banking as a compensation tool for HADD Authorizations in Canada.

The review of existing habitat banking programs in Canada and internationally has revealed several drivers of successful habitat banks:

- Establishment of economically and ecologically relevant service areas so that there is an adequate market for credits once a bank has been established;
- Development of a formal standardized approach to habitat banking that can be applied consistently across regional boundaries;

- Requirements for project documentation that facilitates long-term learning and adaptive management drawing on experiences from past projects;
- Formal monitoring requirements included in habitat banking agreements that utilizes existing monitoring protocols relevant to the habitat type and location, and ensures an adequate monitoring period to measure the achievement of performance standards;
- Meaningful performance standards that include a range of productivity/ecosystem function attributes such as, hydrology, vegetation, water quality, wildlife, habitat and soil;
- Relationship between the achievement of performance standards and the release of credits;
- Utilization of an adaptive management approach that uses the scientific method to test and evaluate different habitat restoration, enhancement or creation techniques and includes contingency plans for unforeseen events;
- Utilize the expertise of specialists in habitat restoration, enhancement or creation to design, implement and monitor habitat banks;
- Establish appropriate service areas so the best candidate sites for restoration, enhancement or creation can be developed as habitat banks; and
- Start with a well defined conservation strategy for species and ecosystem types of concern so habitat banks can be established on the most ecologically beneficial sites.

The review of existing habitat banking programs in Canada and internationally has also revealed challenges with habitat banking that can be improved upon to produce more successful banking programs:

- Unclear and inconsistent methods for calculating credits;
- Cumbersome habitat bank establishment process;
- Inadequate project documentation;
- Inadequate performance standards;
- Lack of monitoring;
- Inability to improve the productive capacity of habitat;
- Lack of long-term bank management and associated funding;
- Lack of demand for habitat credits;
- Faulty engineering;
- Lack of stakeholder engagement; and
- Ineffective agency oversight.

In order for habitat banking programs to continually improve in Canada, there are several critical elements that should be present. First, a standardized, streamlined process should be developed that simplifies habitat banking and can be applied in all jurisdictions. To be successful, this standardized, streamlined process should include a common approach to service area determination, methods for measuring credits and debits, standard requirements for monitoring (baseline, as-built and performance), clear performance standards, and adaptive management and contingency planning. Second,

existing deficiencies with the existing habitat compensation program in Canada as documented by Harper and Quigley (2005) and OAG (2009) should be effectively addressed. The deficiencies outlined in these documents closely align with many of the problems that have caused some habitat banking programs in the US to face criticism. Finally, a successful habitat banking program should sustain an adequate level of regulatory certainty that will promote investment in habitat banking initiatives with an acceptable level of risk to investors.

DFO endorses a collaborative approach to planning the actions necessary to establish a sound habitat banking policy and the tools necessary for implementing the concept of fish habitat banking in Canada (P. Leblanc, pers. comm.).

7.0 RECOMMENDATIONS

Based on the our review of existing habitat banking programs and case studies we believe that habitat banking holds great potential to serve as an effective tool for habitat compensation in Canada. Habitat banking has numerous advantages over traditional project-by-project compensation including reduced costs for compensation, a more streamlined permitting process and potential for better biological outcomes. There are, however, a number of issues and challenges with the development of a habitat banking program that need to be considered before moving forward with a formal habitat banking program. The following recommendations are proposed to assist in the formation of a habitat banking program that maximizes the known advantages and minimizes the issues and challenges that have been encountered with existing habitat banking programs.

- 1. Revisit the existing definition of habitat banking in DFO's Habitat Compensation Guide and revise to provide a more comprehensive definition of habitat banking.***

The existing definition of habitat banking provided in the Habitat Compensation Guide is:

“the completion of compensation prior to a subsection 35(2) Authorization being issued where a proponent creates or improves habitat for future use as compensation”

The key elements of habitat banking uncovered through the review of existing habitat banking programs in Canada and internationally are listed in Section 3.6. From the key elements and the information drawn from the case studies in Section 4 we propose a more comprehensive definition of habitat banking in Canada:

“the creation, enhancement or restoration of habitat prior to a subsection 35(2) Authorization being issued in exchange for habitat credits that can be bought, sold or traded to compensate impacts to habitat offsite”

The proposed definition builds on the existing definition in the Habitat Compensation Guide by:

- Removing reference to the proponent as the only possible creator of a habitat bank, opening the door for third party habitat bankers;
- Referring to the types of activity that can be undertaken to establish a habitat bank (creation, enhancement or restoration of habitat);
- Referring to the creation of credits that can be bought sold or traded; and
- Clarifying the offsite nature of habitat banks.

2. *Revisit the description of habitat banking in the Habitat Compensation Guide and revise to include key aspects of habitat banking.*

Key aspects of habitat banking include:

- Restoration, creation or enhancement of habitat in advance of ecological impacts to provide compensation for future impacts;
- Restoration, creation or enhancement occurs for large habitat patches that can be used to compensate several smaller habitat losses (or a single equivalent loss);
- Development impacts are quantified as “debits”;
- Re-establishment or improvement of habitat functions consistent with FMO’s through restoration, creation or enhancement are quantified as “credits”;
- Rigorous, clear and consistent method for evaluating debits and credits;
- Credits are awarded for restoration work that can be bought, sold or traded to proponents looking to compensate for development impacts;
- Credits are applied to losses of habitat in a manner consistent with FMO’s;
- Restoration, creation or enhancement of habitat may occur offsite from development impacts; and
- Habitat banking requires an agreement between the responsible regulatory authority (e.g. DFO) and the party establishing the habitat bank that clearly outlines:
 - The geographic area that can be serviced by the habitat bank (e.g. catchment/watershed)
 - Method for assessing credits
 - Baseline, as-built and long-term monitoring requirements
 - Performance standards (i.e. ecosystem function following restoration) to determine both when credits can be released and long-term expectations for functional attributes
 - Long-term management and adaptive management requirements for the bank site
 - Liability issues
 - Terms of credit approval
 - Contingency plans

The revision of terminology in the Habitat Compensation Guide could also consider explicit reference to the use of third party habitat bankers similar to the US system. Although it is clear from Canadian case studies that habitat banking can be successful with proponent based habitat banks, there may be opportunities to increase habitat banking opportunities by opening the door to third party banking. The precedent for third party habitat banking has been established in BC with the North Fraser Habitat Bank. Currently the Habitat Compensation Guide only refers to habitat banks created by proponents looking to compensate for impacts from their own projects. Allowing for third party habitat banking could create new markets for private enterprise and allow proponents who are poorly equipped to manage and monitor ecological restoration projects to shift this responsibility to a third party.

Another advantage to allowing third party habitat banks relates to long-term monitoring and management of habitat banks. Long-term monitoring and management of restoration projects can be a costly process that industry is often poorly equipped to undertake. Evidence from habitat banks in the US shows that the use of third party habitat banks can result in effective long-term monitoring programs without industry bearing the burden of monitoring and managing habitat bank sites. Third party habitat banks are responsible for the long-term monitoring and management of habitat bank sites with the costs of these activities incorporated into the cost of purchasing habitat credits. This approach allows for the burden of long-term monitoring and management to be shifted away from industry while minimizing monitoring requirements from DFO practitioners since monitoring reports can be submitted by the habitat bank organization. Potential issues and challenges with opening the door to third party habitat banks in Canada would require further study before this type of banking system could be adopted.

3. Develop a standardized, streamlined and flexible process for establishing a habitat bank that can be applied consistently across Canada.

This could come in the form of a new practitioners guide specifically for habitat banking that outlines the general process for establishing a habitat bank. This would include an outline of the key components of a habitat bank. Wetland mitigation banking policy in the US identifies four key components of a bank:

- **The bank site:** the physical area restored, established, or enhanced;
- **The bank instrument:** the formal agreement between the bank owners and regulators establishing liability, performance standards, management and monitoring requirements, methods for establishing credits, the terms of bank credit approval and release and contingency planning;
- **The Interagency Review Team:** the interagency team that provides regulatory review, approval, and oversight of the bank; and
- **The service area:** the geographic area in which permitted impacts can be compensated for at a given bank.

In addition to describing the key components of a habitat bank, this document should also describe the key drivers of a successful habitat bank including:

- Ensuring a marketable service area that serves ecological and economic objectives
- Detailed monitoring and documentation to feed an adaptive management process
- Use of established monitoring protocols that allow for measurement of relevant performance standards
- Use of measurable performance standards specific to the site's ecological conditions
- Connection between the achievement of performance standards and the release of credits. There can be an initial release of credits to cover the cost of construction with remaining credits held until performance standards are met.
- Adopt an adaptive management approach that clearly defines how management will be revised if performance standards are not met.
- Utilize landscape scale conservation strategies and FMO's to identify priority areas for locating habitat banks.

The common elements within the banking instrument (e.g. performance standards, monitoring, long-term management, credit establishment, etc.) should be better defined in policy literature to facilitate a standard, formal approach to habitat banking that can be applied across Canada. There will be site specific differences in performance standards and monitoring requirements for each bank site but the broad requirements should be similar nationwide.

A Graduate student at the University of Manitoba is currently completing her Master's Thesis on habitat banking. Her research has included the development of a process model to guide habitat banking in Canada. This student's work should be reviewed to determine its applicability to the development of a standardized approach to habitat banking in Canada once it is completed in the spring/summer of 2011.

An appropriate level of flexibility within a standardized streamlined approach to habitat banking will be necessary to accommodate the different types of project impacts, habitats and development contexts that are encountered across Canada.

4. Establish Regional Consistency - Habitat bank credit and debit valuation.

Habitat banking in Canada should include a fair and consistent method for determining the amount of habitat banking credits that should be awarded for a restoration or enhancement project. Habitat banking credits should be based on the improvement of site productivity, ecosystem function and should take into consideration FMO's. A clear and consistent approach to measuring habitat banking credits should be applied across Canada so that credits can be compared regionally. There are a variety of habitat models (de Kerckhove *et al.* 2008) that could be used to quantify changes in

productivity which could then be translated into habitat banking credits. Examples of models that could be considered at this time include:

- Defensible Methods (Minns *et al.* 1997)
- HAAT Model
- Habitat suitability index
- Habitat productivity index
- Index of biotic integrity

The method that is used to measure gains in productivity and function to establish credits could also be used to estimate losses in productivity and function resulting from development activity (i.e. debits). Preliminary discussions with the HydroNet team at the University of Montreal have indicated that research through the HydroNet program will be very useful to the development of a standardized approach to credit valuation through measures of productive capacity. SENES has had preliminary discussions with Dr. Daniel Bosclair (Scientific Director of HydroNet) and Shannon O'Connor (HydroNet's Network Manager) to explore opportunities for HydroNet's research projects to inform quantification and valuation methods related to habitat banking. Ongoing coordination with HydroNet's research team should occur to ensure that the most recent science for measuring productive capacity is incorporated into the valuation of habitat banking credits.

5. Establish Regional Consistency - Habitat bank service area limits.

One of the challenges with habitat banking is defining an appropriate service area for a habitat bank that fulfills requirements for NNL of habitat, allows for restoration and enhancement work in the most ecologically beneficial areas and establishes a viable market for habitat banking credits. A technical review should be conducted to explore opportunities to fulfill all three of these objectives through Canada's habitat banking program.

As discussed in Section 5, habitat banking should utilize regional, landscape and watershed scale conservation plans and FMO's to determine the most appropriate locations for habitat banks. Since bank location is driven by demand for credits it is important to build flexibility into banking agreements so banks can be located in areas that are biologically significant for the species of concern. A study of regional conservation plans and FMO's should be conducted to determine the most ecologically beneficial areas to conduct habitat restoration, creation and enhancement work. This could then be cross referenced against planned and future developments to determine the most viable locations for habitat banks.

Some examples of questions that need to be addressed through this review include:

- How far away from the impact can a habitat bank be located?
- How should service area be delineated (e.g. watershed boundary, location of development, etc.)?

- Can larger service areas be considered for habitat banks make significant contributions to meeting FMO's?
- If the habitat bank will serve FMO's, how should differences in species and habitat between debits and credits be dealt with?

6. *Establish Regional Consistency - Monitoring protocols and performance standards.*

As discussed in Section 5, habitat banking should utilize established monitoring protocols to guide the baseline and long-term monitoring of bank sites. A study of existing regional monitoring protocols that are appropriate for different habitat types across Canada should be conducted to establish a list of monitoring methods that can be used for different habitats. Using existing monitoring protocols will help to establish regional consistency with monitoring requirements for habitat banks. This review would also seek to define a method for establishing relevant performance standards for a variety of habitat types.

7. *Revisit the hierarchy of compensation options in the Habitat Compensation Guide and revise to ensure that the policy supports the most ecologically beneficial compensation options.*

If off-site compensation through a habitat bank has higher ecological value than on-site compensation then it should be encouraged through the hierarchy of compensation options.

8. *Review other compensation options that could be used to compensate for impacts when habitat creation, enhancement or restoration is not appropriate.*

Some impacts to fish species cannot be adequately addressed through the creation, enhancement or restoration of habitat. For example, losses of pelagic fish species that have plankton based food webs can be difficult to compensate through the creation of habitat. Artificial propagation is an example of an alternative compensation option that could be used to address impacts to pelagic fish species. Artificial propagation programs are currently occurring for American eel (listed as a species of special concern under COSEWIC) by Ontario Power Generation and Hydro Quebec. Other power plants in the Great Lakes region of the US have also taken this approach. Other options for compensating impacts to these species outside of habitat creation, enhancement or restoration should be explored.

9. *Investigate the use of habitat banking to fulfill mitigation requirements under other policy and legislation.*

In addition to the *Fisheries Act*, there is other federal, provincial and municipal policy and legislation to which habitat banking could apply. Conservation banking in the US is used to compensate for impacts to species at risk under state endangered species

legislation. Further investigation of other policy instruments to which habitat banking could apply should be explored. Some examples of other applications for habitat banking include:

- Mitigation requirements under the *Canadian Environmental Assessment Act, 1992*;
- Mitigation requirements under the *Species at Risk Act, 2002*;
- Mitigation requirements under provincial environmental assessment legislation;
- Mitigation requirements under provincial species at risk legislation;
- Mitigation requirements under the *Migratory Birds Convention Act, 1994* (e.g. for direct impacts to migratory birds by industry); and
- Mitigation under NNL to wetlands policy.

10. Address current deficiencies with the habitat compensation program identified by OAG (2009) and Harper and Quigley (2005).

Until these deficiencies are addressed, there is little opportunity for a successful habitat banking program in Canada. Deficiencies include:

- Poor record keeping;
- Low levels of compliance monitoring;
- Lack of accountability in habitat management agreements; and
- Habitat losses and gains not measured.

Habitat banking has the potential to ease the burden of addressing these issues by reducing the number of compensation projects that need to be tracked by DFO. By establishing large restoration, creation and enhancement projects that will compensate for multiple smaller HADD Authorizations, there will be fewer small sites that require record keeping and compliance monitoring. Habitat banking will also reduce the number of sites that require habitat gains to be measured which will reduce workloads on DFO habitat management staff. Although the issues identified by Harper and Quigley (2005) and OAG (2009) are challenges that can exist with or without a habitat banking program, addressing these issues is less onerous when habitat banking is practiced on a broad scale across Canada.

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Appendix A: Habitat Banking Agreement Template – DFO Québec



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**HABITAT DE RÉSERVE
PROCÉDURES ET CONDITIONS D'OPÉRATION**

**PROJET DE RÉTABLISSEMENT OU D'AMÉNAGEMENT,
SITE, COURS D'EAU**

**PROPOSÉ PAR
PROMOTEUR**

MOIS 2008



1. MISE EN CONTEXTE

Le ministère des Pêches et des Océans du Canada (ci-après appelé MPO) est responsable, en vertu de la Loi sur les pêches (LP), de la protection des habitats du poisson, qui sont essentiels pour le maintien des pêcheries commerciales, de subsistance ou récréatives et du respect du principe d'aucune perte nette de la Politique de la gestion de l'habitat du poisson (1986). En vertu de ce principe, les pertes inévitables d'habitats du poisson doivent être compensées (MPO, 1986).

Le promoteur [mettre nom du promoteur] a pris l'initiative de proposer un projet d'habitat de réserve. D'une manière générale, un habitat de réserve est une méthode de compensation mise en place avant qu'une détérioration, une destruction ou une perturbation (DDP) de l'habitat du poisson inévitable ne soit autorisée. Le promoteur responsable de la DDP de l'habitat du poisson crée ou améliore un habitat de poisson dont il peut, après acceptation par le MPO, se servir ultérieurement comme mesure de compensation.

Le présent document établit la nature ainsi que les conditions de réalisation et d'opération de l'habitat de réserve.

2. DESCRIPTION DE L'HABITAT DE RÉSERVE

- 2.1. Un habitat de (indiquer les fonctions et les espèces visées par le projet d'aménagement d'habitat de réserve) sera (aménagé, créé, etc... choisir le bon verbe) à titre d'habitat de réserve du poisson à [municipalité/cours d'eau] plus précisément au site ayant les coordonnées géographiques suivantes : [spécifier les coordonnées géographiques (latitude/longitude; datum, NAD 83 de préférence sinon le préciser. Si jamais l'information est en UTM, préciser le datum et le numéro du fuseau) du projet d'habitat de réserve].
- 2.2. L'aménagement permettra d'indiquer les gains ou la résolution d'un problème (décrire les gains ou l'origine ou la cause du problème. Par exemple : Cette nouvelle structure permettra la libre circulation des poissons entre le fleuve et la plaine d'inondation en tout temps).
- 2.3. Les termes de ce projet sont basés sur les renseignements contenus dans le(s) document(s) suivant(s). La description la plus récente prévalant sur la plus ancienne :
 - 2.3.1. Courriel du DATE adressé à M. XYZ (MTQ) de Mme ZYX (affiliation). Réponses aux questions/commentaires du MPO concernant le projet d'habitat de réserve de l'île du Survenant. X pages.
- 2.4. Les travaux d'aménagement d'habitat de réserve à réaliser comportent notamment les éléments ci-dessous :
 - 2.4.1. description du travail à accomplir;
- 2.5. État de référence (au besoin)



- 2.5.1. Le promoteur [mettre nom du promoteur] devra établir un état de référence de [endroit, cours d'eau, habitat] afin [but visé par l'état de référence].
 - 2.5.2. L'état de référence devra comprendre [ce que l'on mesure] (ex. : variables à mesurer, etc.), des photographies ou vidéos ainsi que toute information pertinente.
 - 2.5.3. Le promoteur [mettre nom du promoteur] devra soumettre au MPO le protocole de l'établissement de l'état de référence avant le [date].
 - 2.5.4. Le promoteur [mettre nom du promoteur] devra soumettre au MPO un rapport écrit complet documentant [but visé par l'état de référence], comportant les données, les photographies ou vidéos et les documents pertinents avant le [date].
 - 2.5.5. Dans le cas où l'information présentée remettait en question, de l'avis du MPO, la pertinence de [nom du projet d'habitat de réserve], le projet pourrait être refusé.
- 2.6. Les objectifs suivants devront être atteints:
- 2.6.1. XX
- 2.7. Tous les travaux d'aménagements de l'habitat devront être exécutés avant le [date] (section nécessaire uniquement si l'on prélève immédiatement une DDP de l'habitat du poisson).
- 2.8. Les plans et devis finaux des aménagements devront être soumis au MPO avant le [date, seulement si actuellement non disponible].
- 2.9. Le promoteur [mettre nom du promoteur] est le seul responsable de tous les aspects de la conception, de la sécurité et de la qualité d'exécution de tous les travaux et activités d'aménagements mentionnés dans le programme d'habitat de réserve.
- 2.10. Un rapport écrit détaillant les travaux réalisés sera présenté au MPO dans les 90 jours suivant la réalisation du projet d'habitat de réserve. Ce rapport inclura toute information pertinente permettant de documenter les aménagements dont :
- 2.10.1. les caractéristiques des habitats aménagés dont, sans s'y limiter, (la localisation, la superficie, la profondeur, la vitesse d'écoulement, la granulométrie, le dénivelé, la rupture de pente, la distance à franchir et les débits) ;
 - 2.10.2. des photographies ou des vidéos des sites aménagés (avant et après les travaux) ;
 - 2.10.3. des plans tels que construits ; et
 - 2.10.4. etc...



3. CONDITIONS SE RATTACHANT AU SUIVI DU PROJET D'HABITAT DE RÉSERVE

- 3.1. Le promoteur [mettre nom du promoteur] devra mettre en place un programme de suivi agréant au MPO, afin de s'assurer que les objectifs définis en 2.6 ont été atteints et d'évaluer la valeur effective de l'habitat de réserve disponible pour compenser une éventuelle DDP de l'habitat du poisson. Plus particulièrement, le promoteur [mettre nom du promoteur] devra :
 - 3.1.1. Présenter au MPO le protocole de suivi de l'efficacité de l'aménagement avant le [date]..
 - 3.1.2. Évaluer, sans s'y limiter, les paramètres suivants à un minimum de x reprises, pendant [mois, période de l'année ou période associée à la fonction visée par l'aménagement], pendant une période de X années soit en 200X, 200X et 200X :
 - 3.1.2.1. [par exemple, caractéristiques physiques de l'habitat aménagé].
 - 3.1.2.2. [par exemple, la stabilité physique de l'habitat aménagé].
 - 3.1.2.3. [par exemple, utilisation de l'habitat aménagé par le poisson].
 - 3.1.2.4. etc
 - 3.1.3. Présenter au MPO un rapport écrit complet faisant état des résultats du suivi, comportant les données, les photographies ou vidéos, les documents pertinents de même que les recommandations de mesures correctrices le cas échéant. Ce rapport devra être fourni au plus tard X mois ou semaines suivant chaque évaluation.

4. CONDITIONS D'UTILISATION DE L'HABITAT DE RÉSERVE

- 4.1. Un habitat de réserve ne peut en aucun cas être utilisé afin de compenser une détérioration, destruction ou perturbation de l'habitat du poisson non autorisée en vertu de la Loi sur les pêches.
- 4.2. L'existence d'un habitat de réserve ne constitue en aucun temps une autorisation de modifier un habitat du poisson en vertu du paragraphe 35 (2) de la Loi sur les pêches.
- 4.3. L'existence d'un habitat de réserve ne garantit pas qu'une quelconque DDP de l'habitat du poisson future sera autorisée.
- 4.4. La décision d'autoriser une DDP de l'habitat du poisson sera prise sans tenir compte de l'existence d'un habitat de réserve. Conformément à la Politique de la gestion de l'habitat du poisson (MPO, 1986), le MPO cherchera d'abord à éviter ou atténuer les DDP de l'habitat du poisson des futurs projets du promoteur [mettre nom du promoteur] avant d'approuver l'utilisation de l'habitat de réserve comme mesure de compensation.



- 4.5. Toutes les mesures compensatoires devront être explorées avant de recourir à l'habitat de réserve. Le recours à l'habitat de réserve sera pris en considération à la demande du promoteur. La hiérarchie des options de compensation du MPO doit être suivie lorsqu'on songe à utiliser l'habitat de réserve. Toute mesure de compensation que l'on peut mettre en place sur les lieux de la DDP ou à proximité doit être évaluée avant que l'on se serve d'un habitat de réserve situé ailleurs.
- 4.6. La détermination de la valeur effective de l'habitat de réserve et son utilisation comme mesure de compensation d'une DDP de l'habitat du poisson demeure en tout temps la prérogative du MPO et sera établie à la lumière des résultats des suivis ou des évaluations qui auront été réalisés.
- 4.7. L'ampleur du prélèvement de l'habitat de réserve nécessaire pour compenser toutes DDP de l'habitat du poisson occasionnées sera déterminée par le MPO selon le principe d'aucune perte nette de capacité de production de l'habitat du poisson énoncé dans la Politique de la gestion de l'habitat du poisson (MPO, 1986).
- 4.8. Avant de considérer l'habitat de réserve comme mesure de compensation, le MPO peut en tout temps exiger qu'une évaluation de l'état de l'habitat de réserve soit réalisée pendant ou après la période initialement prévue au suivi de l'aménagement.
- 4.9. Si le promoteur [mettre nom du promoteur] a pris l'initiative, sans consulter le MPO, de bonifier l'habitat de réserve, ce gain supplémentaire ne sera pas considéré et ne pourra servir à compenser une DDP de l'habitat du poisson ultérieure.
- 4.10. Advenant le cas où les objectifs de compensation ne sont pas atteints à la satisfaction du MPO à la fin de chacun des suivis se rattachant aux objectifs énoncés à au point 2.6, le [promoteur] devra réaliser ou faire réaliser avec une diligence raisonnable, d'une manière correcte et selon les règles de l'art, à ses propres frais et à la satisfaction du MPO, les modifications nécessaires pour atteindre les objectifs. Le MPO pourra exiger que les modalités du protocole de suivi, incluant sa durée, soient modifiées afin d'évaluer l'efficacité des mesures correctrices. Le [promoteur] devra également réaliser, si nécessaire, des aménagements compensatoires additionnels, incluant un programme de suivi, pour compenser les pertes résiduelles et ainsi atteindre le bilan d'aucune perte nette d'habitat du poisson.

5. RESPECT DES LOIS

Aucune disposition de la présente ne soustrait le [promoteur] à aucune de ses autres responsabilités en matière de respect de la législation en vigueur ; il incombe au [promoteur] de voir à ce que les autres ministères et organismes fédéraux ou provinciaux ayant des responsabilités en matière d'application réglementaire soient consultés.



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