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**Background Report, based on already compiled research, which will form the basis for the work of the Management Plan Working Group (MPWG)**

**Final Report**

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### Foreword<sup>1</sup>

As of June 2003, 754 sites of cultural and/or natural heritage of outstanding universal value have been inscribed on the World Heritage List. The World Heritage List includes sites such as:

- The Galapagos Islands, in Ecuador
- The Historic Sanctuary of Machu Picchu, in Peru
- Paris — the Banks of the Seine, in France
- The Acropolis, in Greece
- Stonehenge, in the United Kingdom
- The Great Barrier Reef, in Australia
- The Canadian Rocky Mountain Parks, in Canada

In an effort to manage its workload, the World Heritage Committee has set limits on the pace of inscription for countries that are already well represented on the World Heritage List. With thirteen World Heritage Sites, Canada is considered to be well represented. Therefore, the World Heritage Committee will limit the examination of future Canadian candidate sites to a maximum of one per year.

The World Heritage Committee has asked States Parties to update their Tentative Lists to reflect both the current criteria for inscription and the priorities outlined in the Global Strategy. As Canada's previous Tentative List was prepared in 1980, it was considered to be out of date. The process of updating the Tentative List provided an opportunity to identify Canadian sites that could be considered to meet the test of outstanding universal value and that respond to the priorities of the Global Strategy. It was also an opportunity to examine sites in the context of the conservation work that has been carried out in the past two decades, so that the very best candidates can be put forward for consideration.

It was decided at the outset of the Canadian exercise that the updated Tentative List should be based on sound science. In addition, stakeholder support was a key consideration. Any site nominated as a potential World Heritage Site would have to have the support of those responsible for the site as well as the respective provincial or territorial governments, and, where relevant, Aboriginal groups. This support would be based on an understanding of the implications of inscription.

In order to provide sound scientific information, research reports on natural and cultural heritage were prepared by two independent, internationally respected Canadian experts familiar with World Heritage policies and guidelines. The two research reports provide an assessment of potential Canadian sites in light of the World Heritage criteria and the priorities outlined in the Global Strategy. The sites assessed include those suggested by Canadians during the past two decades as potential candidates for the World Heritage List, as well as other sites that appear to meet the criteria for outstanding universal value.

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<sup>1</sup> Adapted from [http://www.pc.gc.ca/progs/spm-whs/index\\_e.asp](http://www.pc.gc.ca/progs/spm-whs/index_e.asp)

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### Canada's Tentative List for World Heritage Sites

This List culminates the work of the Minister's Advisory Committee, which was tasked with advising the Government of Canada on a new Tentative List for World Heritage Sites in Canada. This work is an integral part of the nomination process established by the UNESCO *World Heritage Convention* of 1972, under which thirteen Canadian sites have already been designated as World Heritage Sites.

UNESCO's *Operational Guidelines for the Implementation of the World Heritage Convention* state that Tentative Lists should consist of properties that have the potential to meet World Heritage criteria for outstanding universal value. Candidate sites must also manifest integrity and authenticity (as defined in the guidelines), and meet standards for legislative protection and management capacity.

Following this initial phase (as outlined above), Parks Canada, acting as Canada's State representative to the Convention, consulted with provincial and territorial representatives, interested national organizations, Aboriginal groups and key stakeholders across Canada. Overall, one hundred and twenty-five proposals for new sites were received. Proposals were also received for significant expansions to three existing World Heritage Sites: Canadian Rocky Mountain Parks, Wood Buffalo National Park and Nahanni National Park Reserve. As these proposals will be addressed by Parks Canada through another process, they do not figure on this List.

Canada's new Tentative List identifies natural and cultural sites that meet UNESCO criteria and requirements for inscription as World Heritage Sites. The Minister's Advisory Committee is also confident that there is stakeholder support for these proposals. Given that the World Heritage Committee will examine a maximum of one nomination per year, and not necessarily one for every country every year, the List is necessarily short<sup>2</sup>.

### List of Sites

- Áísinaí'pi (Writing-On-Stone)
- Atikaki/Woodland Caribou/Accord First Nations
- Grand-Pré
- Gwaii Haanas
- Ivavik/Vuntut/Herschel Island (Qikiqtaruk)
- Joggins
- The Klondike
- Mistaken Point
- Quttinirpaaq
- Red Bay
- Rideau Canal

The following provides a summary of the nomination proposal.

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<sup>2</sup> [http://www.pc.gc.ca/progs/spm-whs/itm3-/page2\\_e.asp](http://www.pc.gc.ca/progs/spm-whs/itm3-/page2_e.asp)

## Grand Pré

### Nomination proposal for World Heritage designation

#### Executive Summary<sup>3</sup>

<b>State Party</b>	Canada
<b>Province</b>	Nova Scotia
<b>Name of Property</b>	Grand Pré
<b>Geographical coordinates to the nearest second</b>	Lat. 45.1197 Long. -64.3072
<b>Description (to be replaced with a textual description of the boundaries of the nominated property)</b>	Situated on a shore of the Minas Basin with red-sided Cape Blomidon looming in the distance, Grand Pré is a storied rural landscape of gentle uplands where people live and an adjacent highly fertile agricultural dykeland. The area was known to the Mi'kmaq for millennia and figures in many legends. It fell to the Acadians, who lived harmoniously with the Mi'kmaq, a rare relationship between Europeans and Aboriginal people in colonial North America, to turn the salt marshes into highly fertile arable land. They did so in the late 17 <sup>th</sup> and early 18 <sup>th</sup> centuries, adapting techniques known in Europe to the challenging conditions at Grand Pré. The area is where scientists record some of the highest tides in the world. The end result, the most fertile land at that latitude in North America, is an exceptional example of the Acadian dyking tradition. Today's farmers work the same fields, bound by many of the same divisions or boundaries they had 250 years ago, and with an archaeological depth that contains numerous original features. With the tragic forcible removal of the Acadians from Grand Pré in 1755, the vacated area attracted settlers in 1760 from New England. Known as Planters, they became the new occupants and stewards of Grand Pré, establishing their community on the uplands and farming the dykeland much as the Acadians had done. The Planters and their descendants and successors, through to today, continued the fundamental tradition begun by the Acadians, of making their living in an area where the combination of wetland, dykeland and upland define the pattern of settlement. Roads, boundary divisions and property lines on the uplands speak to the continuity across time, and to an introduced grid that dates from the Planter period. Early in the 20 <sup>th</sup> century, Acadians returned to Grand Pré in symbolic fashion, erecting reminders of what their ancestors had accomplished and endured. In those two commemorated areas of old Grand Pré – where one finds a memorial church, archaeological vestiges, an evocative statue of Longfellow's Evangeline, ancient willows, flower beds and ponds encouraging reflection, and a poignant Deportation cross – one finds an outstanding example of how a place of tragedy has become a symbol for all humanity of hope, perseverance and pride.
<b>Justification</b>	Grand Pré is an enduring and inspirational cultural landscape, an outstanding example of a distinctive community-based approach to farming in 17 <sup>th</sup> and 18 <sup>th</sup> -century North America and through its 20 <sup>th</sup> -century memorials an exceptional example of a place of tragedy that has become a symbol for all humanity of hope, perseverance and pride.
<b>Criteria proposed</b>	(iii) The intact dykeland at Grand Pré is an exceptional example of the distinctive Acadian tradition of turning wetlands into highly fertile farmland.

<sup>3</sup> Draft prepared by Christophe Rivet and John Johnston, April 2<sup>nd</sup> 2009

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(v) The enduring settlement and land-use pattern on the Grand Pré dykeland and upland is an outstanding example of a distinctive 17th and 18th-century community-based approach to agriculture in North America.

(vi) Through its evocative memorials to a people who overcame a tragedy of forced migration, the Acadian Deportation, Grand Pré is a symbol of hope, perseverance, and pride for all humanity.

### Introduction

The UNESCO Advisory Board is the body responsible for preparing a dossier to submit to the World Heritage Committee to seek inscription of Grand Pré as a World Heritage Site. The Advisory Board has recently approved the boundary for the site and the Statement of Outstanding Universal Value (OUV). The next step is to prepare a Management Plan for the proposed UNESCO site boundary and any possible buffer zone areas.

The draft OUV, which has been the main initiative of the Board for the last several months, has identified the dyke area of Grand Pré as a focal point. Therefore, the dykes are a key component to any management plan for this potential World Heritage Site.

The main task assigned to the Contractor - Simeon Roberts, was to prepare a background report, based on already compiled research, which will form the basis for the work of the Management Plan Working Group (MPWG). The research for the background report has been compiled by the Kings Community Economic Development Agency (Kings CED) and was provided to the contractor in paper and/or digital format February 10<sup>th</sup>, 2009.

The 'Contract for Services' indicated the task of the Contractor "is to review the already compiled information and organize it into a comprehensive report" that addresses the following:

1. The risks to the dyke system, based on the research gathered and supplemented by any sources that the consultant may have at his disposal<sup>4</sup>.
2. The risks to the area in general including development, environmental and cultural pressures.
3. A review of maintenance issues for dykes and summaries of any reports regarding this issue.
4. The best practices of other similar sites that may be useful for Grand Pré.
5. The identification of any other issues that may be relevant when considering a management regime for Grand Pré.
6. The tools and practices used to monitor the condition of the dykelands.

The final report consists of the following parts, under the general title - **Background Report, based on already compiled research, which will form the basis for the work of the Management Plan Working Group (MPWG)**

- *Part 1: Scope*
- *Part 2: Risks to the dyke system*
- *Part 3: Risks to the area in general*
- *Part 4: Review of maintenance issues for dykes*
- *Part 5: Tools and practices to monitor the conditions of dykes*
- *Part 6: Best Practices and other relevant issues*

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<sup>4</sup> Copies of relevant materials are included in digital format on the supplied USB memory stick/CD.

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A summary table and bibliography are also included in sections 7 and 8.

The background report takes into consideration both the Proposed Outstanding Universal Value (OUV) criteria as documented in the final report to the Advisory Board prepared by Dr. A.J.B. Johnson, January 2009 which is summarized below, and the specifications as outlined in the Operational Guidelines (described under section 1 – scope).

### Outstanding Universal Value

The Proposed Outstanding Universal Value (OUV) criteria under which inscription is proposed are documented in the final report to the Advisory Board prepared by Dr. A.J.B. Johnson, January 2009 (p.26-30) and include the following:

(iii) to bear a unique or at least exceptional testimony to a cultural tradition or to a civilization which is living or which has disappeared.

*The intact dykeland at Grand-Pré is an exceptional example of distinctive Acadian tradition of turning wetlands into highly fertile farmland.*

(v) to be an outstanding example of a traditional human settlement, land-use, or sea-use which is representative of a culture (or cultures), or human interaction with the environment especially when it has become vulnerable under the impact of irreversible change.

*The enduring settlement and land-use pattern on the Grand-Pré dykeland and upland is an outstanding example of a distinctive 17<sup>th</sup> and 18<sup>th</sup> – century community-based approach to agriculture in North America.*

(vi) to be directly or tangibly associated with events or living traditions, with ideas, or with beliefs, with artistic and literary works of outstanding universal significance.

*Through its evocative memorials to a people who overcame a tragedy of forced migration, the Acadian Deportation, Grand-Pré is a symbol of hope, perseverance, and pride for all humanity.*

The Proposed Statement of Outstanding Universal Value is summarized as:

***Grand-Pré is an enduring and inspirational cultural landscape, an outstanding example of distinctive community-based approach to farming in 17<sup>th</sup> and 18<sup>th</sup> – century North America and through its 20<sup>th</sup> – century memorials an exceptional example of a place of tragedy that has become a symbol for all humanity of hope, perseverance and pride.***

## Summary of Research

### 1 Scope

The format for the nomination of properties for inscription on the World Heritage List (Operational Guidelines, Annex 5) provides the following guidelines/specifications:

#### ***Present state of conservation***

The information presented in this section constitutes the base-line data necessary to monitor the state of conservation of the nominated property in the future. Information should be provided in this section on the physical condition of the property, any threats to the property and conservation measures at the property.

#### ***Factors affecting the property***

This section should provide information on all the factors which are likely to affect or threaten the Outstanding Universal Value of a property. It should describe any difficulties that may be encountered in addressing such problems.

- Development Pressures (e.g., encroachment, adaptation, agriculture, mining): Itemize types of development pressures affecting the property.
- Environmental Pressures (e.g., pollution, climate change, desertification): list and summarize major sources of environmental deterioration affecting building fabric, flora and fauna.
- Natural disasters and risk preparedness (earthquakes, floods, fires, etc.): Itemize those disasters which present a foreseeable threat to the property and what steps have been taken to draw up contingency plans for dealing with them, whether by physical protection measures or staff training.
- Visitor/tourism pressures: Describe the “carrying capacity” of the property. Can it absorb the current or likely number of visitors without adverse effects? An indication should also be given of the steps taken to manage visitors and tourists.
- Number of inhabitants within the property and the buffer zone: Give the best available statistics of the number of inhabitants living within the nominated property and any buffer zone.

#### ***Protection and Management of the Property***

This section of the nomination is intended to provide a clear picture of the legislative, regulatory, contractual, planning, institutional and/or traditional measures and the management plan or other management system that is in place to protect and manage the property and protective measures and with the practicalities of day-to-day administration and management.

- Ownership: Indicate the major categories of land ownership (including State, Provincial, private, community, traditional, customary and non-governmental ownership, etc.).

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- **Protective designation:** List the relevant legal, regulatory, contractual, planning, institutional and/or traditional status of the property. Provide the year of designation and the legislative act(s) under which the status is provided.
- **Means of implementing protective measure:** Describe how the protection afforded by its legal, regulatory, contractual, planning, institutional and/or traditional status actually works.
- **Existing plans related to municipality and region in which the property is located (e.g., regional or local plan, conservation plan, tourism development plan):** List the agreed plans which have been adopted with the date and agency responsible for preparation. The relevant provisions should be summarized. A copy of the plan should be included as an attached document.
- **Property management plan or other management system:** As noted in Paragraphs 132 of the Operational Guidelines, an appropriate management plan or other management system is essential and shall be provided in the nomination. Assurances of the effective implementation of the management plan or other management system are also expected. A copy of the management plan or documentation of the management system shall be annexed to the nomination. A detailed analysis or explanation of the management plan or a documented management system shall be provided.
- **Sources and levels of finance:** Show the sources and level of funding which are available to the property on an annual basis. An estimate could also be given of the adequacy or otherwise of resources available, in particular identifying any gaps or deficiencies or any areas where assistance may be required.

## 2 Risks to the dyke system

*In the Acadian land, on the shores of the Basin of Minas,  
Distant, secluded, still, the little village of Grand-Pre  
Lay in the fruitful valley. Vast meadows stretched to the eastward,  
Giving the village his name, and pasture to flocks without number.  
Dikes, that the hands of the farmers had raised with labour incessant,  
Shut out the turbulent tides.*

*“Evangeline”, Henry Wadsworth Longfellow*

The following risks to the dyke system are summarized under the following general headings:

### 2.1 Environmental Pressures

#### 2.1.1 Climate Change, Sea Level Rise and Coastal Erosion

There is a wealth of information on climate change in the literature. Many studies are technical in nature and a detailed review of these is beyond the scope of this project. In fact, a separate report could be written on the topic. However, it is possible to identify a number of key themes relevant to Nova Scotia, the Bay of Fundy and Grand Pré in particular.

Climate change and sea-level rise affect coastal settlements and infrastructure in several ways. Sea-level rise raises extreme water levels with possible increases in storm intensity portending additional climate impacts on many coastal areas. The degradation of natural coastal systems due to climate change, such as wetlands, beaches and barrier islands, removes the natural defences of coastal communities against extreme water levels during storms (Nicholls et al, 2007, p.333).

A report by the Intergovernmental Panel on Climate Change (IPCC, 2007) has predicted a sea level rise of 18-59 cm by the end of the century. Because our understanding of some important effects driving sea-level rise is too limited, such reports do not assess the likelihood, nor provide a best estimate or an upper bound for sea-level rise. The projections do not include either uncertainties in climate-carbon cycle feedbacks or the full effects of changes in ice sheet flow; therefore the upper values of the ranges are not to be considered upper bounds for sea-level rise. Model-based projections of global mean sea-level rise between the late 20<sup>th</sup> century (1980-1999) and the end of this century (2090-2099) are of the order of 0.18 to 0.59 m, but exclude the uncertainties noted above (Bates et al, 2008, p.28).

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Sea-level rise has accelerated in eastern North America since the late 19<sup>th</sup> century and further acceleration is expected. Many coastal areas in North America are also potentially exposed to storm-surge flooding. However, impacts from sea-level rise can be amplified by “coastal squeeze”<sup>5</sup> and submergence where landward migration is impeded and vertical growth is slower than sea-level rise. Superimposed on accelerated sea-level rise, the present storm and wave climatology and storm-surge frequency distributions have led to forecasts of more severe coastal flooding and erosion hazards (Field et al, 2007, p.623 and 630).

The processes shaping coastal environments are complex and while our understanding has improved significantly over the last 10 years, it remains far from complete (Nicholls et al, 2007, p.329). There is now a better understanding of flooding as a natural hazard, and how climate change and other factors are likely to influence coastal flooding in the future. However, the prediction of precise locations for increased flood risk resulting from climate change is difficult, as flood risk dynamics have multiple social, technical and environmental drivers (Nicholls et al, 2007, p.333)<sup>6</sup>.

A recently published report has indicated that Atlantic Canada will experience more storm events, increasing storm intensity, rising sea level, storm surges, coastal erosion and flooding (Vasseur, L., and Catto, N.R., 2008, p.121). The study also points out:

- Regional trends in seasonal temperatures for Atlantic Canada show an overall warming of 0.3 degrees Celsius from 1948 to 2005 with summers showing the greatest increase in temperature.
- Precipitation increased in Atlantic Canada by approximately 10% between 1948 and 1995, a trend that continued through the 1990s (op cit., p. 127).
- Although there are important micro- and meso-scale variations between climate projections...the Maritime Provinces are projected to experience increases in both mean annual temperature and precipitation. By 2050, there would be a 2 to 4 degrees Celsius increase in summer temperature, depending on model inputs and geographic location. Future warming of 1.5 to 6 degrees Celsius during winter can be anticipated.
- There is evidence of recent trends toward greater extremes and higher frequencies of events such as: winter cyclonic storms, tropical cyclones and other severe weather events...and flooding (op cit., p.131).
- The northern Atlantic Ocean has been undergoing an increase in hurricane frequency and magnitude since 1995.
- As sea level continues to rise, the frequency of higher storm surges will increase (op cit., p. 132).
- Sections of the Atlantic coasts are among the areas in Canada most severely threatened by a rise in sea level. Over the past century, sea level in the Atlantic region has risen approximately 30 cm. Continued sea level rise will amplify storm surges and flooding in the Atlantic region (op cit., p. 133-134).

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<sup>5</sup> Coastal squeeze occurs as the salt marsh and mudflats become trapped between the sea walls and the rising sea. The seawall prevents these habitats moving upwards and landwards within the changing tidal frame and so become reduced in their extent. [http://www.essex-estuaries.co.uk/climate\\_change.htm](http://www.essex-estuaries.co.uk/climate_change.htm)

<sup>6</sup> A number of suggestions for future research are provided under section 2.5.2. The Policy Document on the Impacts of Climate Change on World Heritage Properties, UNESCO, 2008 should also be consulted further.

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On March 16, 2009 Canada's environment minister announced that he will be looking into potential problems for major flooding along the Bay of Fundy coastline. Nova Scotia MP Bill Casey had raised concerns given that the United Nations Panel on Global Warming identified the Bay of Fundy as one of the most vulnerable in North America. The report said the area could be severely damaged due to rising sea levels resulting from global warming.

Scientists meeting in Copenhagen recently (March 2009) dismissed earlier IPCC estimates as too conservative, saying new data suggests that sea level rise could exceed one metre and is unlikely to be less than 50 cm. Research has concluded that together, future changes in sea level and ocean circulation will have a greater impact on the heavily populated north-eastern United States than estimated previously (Yin, J., Schlesinger, M.E., & Stouffer, R.J., 2009, p.262).

Though a comprehensive compilation of the research presented at the Copenhagen Climate Congress will be completed by June, and the results published in an academic book, as well in a 30-page executive summary<sup>7</sup> to be presented to politicians heading into the COP15<sup>8</sup> talks at the end of the year, at the closing session of the Congress a number of key messages were presented (McDermott, 2009), including:

- Recent observations confirm that, given high rates of observed emissions, the worst-case IPCC scenario trajectories (or even worse) are being realised. For many key parameters, the climate system is already moving beyond the patterns of natural variability within which our society and economy have developed and thrived. These parameters include global mean surface temperature, sea-level rise, ocean and ice sheet dynamics, ocean acidification, and extreme climatic events. There is a significant risk that many of the trends will accelerate, leading to an increasing risk of abrupt or irreversible climatic shifts.

In his book "The Maritime Book of Climate Change" (2008) Richard Zurawski provides an excellent technical overview of climate change and provides a number of future weather and climate scenarios (Chapter 6, p. 155-179) and one can summarize that climate change as predicted is not definite and planning for uncertainties is difficult and time consuming.

In the 20<sup>th</sup> century, the average temperature in Nova Scotia rose by half a degree Celsius. In the 21<sup>st</sup> century, we can expect it to rise another 2-4 degrees Celsius. Many scientists believe that the upper end of this range entails catastrophic, irreversible consequences. Over the last 100 years, the sea level rose 25 cm; it is likely to rise a further 60 cm or more by 2100. That means water levels may be almost a metre higher than they were in 1900. Extreme rainfalls that occurred only once every 50 years in the last century are likely to occur once every 10 years in this century. Storm surges that occurred only once in the 20<sup>th</sup> century may occur up to 10 times in the 21<sup>st</sup> century (Nova Scotia Climate Change Action Plan, 2009, p.5-6).

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<sup>7</sup> 12 March 2009: Copenhagen, Denmark: Following a successful International Scientific Congress Climate Change: Global Risks, Challenges & Decisions attended by more than 2,500 delegates from nearly 80 countries, preliminary messages from the findings were delivered by the Congress' Scientific Writing Team. The conclusions will be published into a full synthesis report June 2009. The conclusions were handed over to the Danish Prime Minister Mr. Anders Fogh Rasmussen today. The Danish Government will host the UN Climate Change Conference in December 2009 and will hand over the conclusions to the decision makers ahead of the Conference ([http://climatecongress.ku.dk/newsroom/congress\\_key\\_messages/](http://climatecongress.ku.dk/newsroom/congress_key_messages/)).

<sup>8</sup> Conference of the Parties. The first one was held in Berlin in 1995.

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A climate change forecast model concerning the Annapolis Valley was done by Timmer (2003). It is expected that under climate change conditions, the frequency and severity of storms will increase; sea level will rise amplifying the potential for floods, coastal erosion, and dyke overtopping; thaws will either come early and be extended or will come late and be paired with early frosts; and reductions in sea and river ice will accompany shifts in rainfall patterns that will alter growing seasons. The Annapolis Valley was found to be vulnerable to sea level rise, which would affect the dykes that protect the dykeland farms. Dykeland areas always experience erosion or flooding threats because land was gained while sacrificing the natural buffers against these threats: wetlands and salt marshes. Thus in a macrotidal estuary, where channels endlessly try to reach a dynamic balance, an encounter between the dykes and channels is practically impossible (Perry-Giraud, 2005, p.39).

*...there are so many variables that it's really difficult to identify areas that would flood...the worst floods in Truro have been a combination of a number of factors...ice dams, shifting tidal sediment, dykes, and storm surge are all wildly unpredictable and how these variables interact is also difficult to understand*

*(Ecology Action Centre, 2007, p.20).*

Flooding in the Annapolis Valley typically occurs when high tides, storms, and snowmelt all combine to create abnormally high tides that overwhelm the dykes (Timmer, 2003). Winter ice accumulations in Minas Basin are also significant. Shorefast ice thicknesses of 3-4m are common. Wind and tidal currents cause grounding of pack-ice within the intertidal zone, which in turn causes ice gouging and sediment erosion (Perry-Giraud, 2005, p.8). Although this ice cover protects the intertidal flats against wave action, the ice is continuously fragmented and mobilized by the tides, and can heavily scour tidal flats by disturbing the sediment surface and subsequent resuspension, as well as by ice-rafting.

There has been a 15 m rise of high water level in the Minas Basin over the past 5,000 years; however uncertainty remains if the height of the marsh has increased or decreased (Bleakney, 2004, p 195-108). The very tides that created the Acadian culture are, day by day, eroding shorelines at an astonishing rate, and thereby removing forever marsh-entombed artifacts that bear witness to those unusual dykeland communities of 300 years ago (Bleakney, 2004, p.171). The effect of rising sea levels has been to bury and preserve the old dykes at many locations, but at other sites shore erosion has reduced them or even removed them entirely (Bleakney, 2004, p.108).

The dykes are sinking over the years, very slowly but they are going down maybe by the millimetre (Robert Palmetier, Dec 18: pers comm.). The higher the dykes get the lower the land gets relative to sea level (pers.comm., John Shaw, Dec 4, 2008).

Boot Island was affected by a severe storm October 30, 1913 and provided the impetus for the families residing there to move to the mainland in 1914. It used to protect east Grand-Pré and it no longer does (Lindsay Carter, Jan 8: pers. comm.). The island is now a wildlife preserve and posted with No Trespassing signs. The Canadian Wildlife Service has kept records of shore erosion at Boot Island from 1990 to 2000, and the ten year average has been a startling 3ft 10 inches. Boot Island is now half the size it was in 1760 (Bleakney, 2004, p.138-140).

While storm surges present a significant threat, increased rainfall can also lead to flooding as the aboiteaux only function when the tide is out. Consequently, if a heavy rainfall event occurs in conjunction with an incoming tide, water will collect on the marshes for up to eight hours until it is released with subsequent flooding (Hennessey and Dollin, 2007, p.12).

Wind severity is an issue of high concern as high winds on the Bay of Fundy accelerate wave activity. Increased wave activity contributes greatly to foreshore erosion, exposing the dykes directly to wave activity and

subsequently increasing the vulnerability of their structural integrity. While rock is generally used to protect the dykes, strong wave activity can move the rocks, once again exposing the dykes to erosion.

Drought is also a concern as it impedes the functionality of the aboiteaux as they tend to silt up during times of low precipitation.

### 2.1.2 Hurricanes and Tidal Surge

Since 3-4,000 years ago there has been a gradual increase in macrotidal amplitudes (tidal amplitudes of 50ft (15 m) in the Minas Basin), rising sea levels worldwide and land submergence in Nova Scotia (Bleakney, 2004, p.11).

Parkes et al (1997) have highlighted the vulnerability of the upper Bay of Fundy to storm-surge flooding caused by a tropical cyclone. The highest risk is posed by an intense storm tracking up the Gulf of Maine during a run of perigean spring tides.

Breaching of dykes occurred with the Saxby Gale of 5 October 1869, when the entire 3,000 acres was flooded. Tidal levels topped dyke walls by 0.9 - 1.8 m. Dyke walls also become especially vulnerable when extreme perigean spring tides coinciding with the peak tides of the 18.6-year lunar nodal cycle are accompanied by storms. It should be noted however, that Fundy tides provide considerable protection of the shoreline and dykes from storm surges.

Studies have utilized LiDAR and GPS technology to model storm surges (Port Williams and studies by Saint Mary's University – Dr. Danika van Proosdij of the Avon River Estuary) and although they shed light on the potential impacts it is difficult to draw comparisons to the Grand-Pré area. Most importantly, it has been suggested that there is no money to build up the dykes to protect against a storm surge (Lindsay Carter, Jan 8: pers. comm.).

Uncertainty about the local impacts of climate change can be a barrier to action. Incomplete knowledge of disaster safety options further constrains adaptive behaviour. Climate change information must be available in a form that fits the needs of decision-makers (Field et al, 2007, p.638).

It has already been noted that there is a lack of specific climate change information available on the Grand-Pré area. Consideration of geological factors, rate of sea-level rise, amounts of coastal erosion, wave climate and tidal regime can allow calculation of the sensitivity to sea-level rise of shoreline segments. There is evidence in the literature that assessments have been completed for all of Atlantic Canada on a broad regional scale, and more detailed assessments have been conducted for specific segments of the coastline (Vasseur and Catto, 2007, p.137), however no specific reference to the Grand-Pré area has been found.

A long-term erosion rate is a useful guide for the establishment of set-back limits and indicates where specific structures are in danger. The absence of long-term monitoring of coastal erosion, however, means that present erosion rates may not serve to indicate the magnitude of previous (or future) events. In addition, as the majority of the erosion is caused by individual storms, hazard assessment requires consideration of the probability of the maximum impact of a particular storm, rather than only monitoring and dealing with the small, incremental removal of sediment on a daily basis (Vasseur and Catto, 2007, p.139).

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Further research could profitably focus on areas where additional confidence would help facilitate decision-making. Better understanding of potential impacts and processes is needed to reduce uncertainties in the science base. Specific examples of knowledge gaps and opportunities for further study include the following:

- Establish better baselines of actual coastal changes, including local factors and sea-level rise, and the climate and non-climate drivers, through additional observations and expanded monitoring. This would help to better establish causal links between climate and coastal change which tend to remain inferred rather than observed, and support model development.
- Improve the predictive capacity for future coastal change due to climate and non-climate drivers, through field observations, experiments and model development.
- Develop a better understanding of the adaptation of the human systems in the coastal zone (Nicholls, 2007, p.346).
- A number of coastal communities<sup>9</sup> have already embarked on detailed terrain mapping projects to predict the areas that would be flooded by storm surges of different heights. With Geographic Information System (GIS) software, accurate terrain data and a computer, it is now possible to "virtually flood" digital maps of an area with a surge of any size desired, at any stage of the tide. This modelling exercise can quickly highlight any problems likely to occur in a real flood. Such mapping exercises are also helpful in showing where floodwater might be trapped behind dykes, thus prolonging the flooding (Percy, 2001). Kings County has already developed extensive digital geographic data, including LiDAR for the Grand-Pré area, so there is an opportunity to possibly partner with the Nova Scotia Community College (Centre for Geographic Sciences, Applied Geomatics Research Group) to undertake such modelling, including identification of vulnerable areas. Dr. Hong Li, Assistant Professor in the Department of Plant and Animal Sciences at the Nova Scotia Agricultural College has also announced a Graduate Student Assistantship (M.Sc) in GIS Spatial Modelling/Dykeland Management Zones for summer/fall 2009. This research<sup>10</sup> will map current dykeland cultivation status, quantify dykeland potential and suitability for crop production, and create dykeland management zones for Wellington Marsh and Habitant Marsh in Nova Scotia. The study will include assessing physical, chemical and biological characteristics of targeted dykeland soils and creating GIS databases. The applicability of this research should be further examined with reference to the Grand-Pré area.

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<sup>9</sup> For example Charlottetown, Prince Edward Island as noted in Webster et al; 2004, p. 64.

<sup>10</sup> In conjunction with Dalhousie University.

### 2.1.3 Vulnerabilities

Kosloski (2007)<sup>11</sup> reports that “basic inventory mapping was completed for the County of Kings and included topography, slope, shoreline, bedrock geology, surficial geology, and soil type maps”. Although there is some confusion here, it is assumed that it refers to the comprehensive digital Geographic Information (GIS) data sets that have been developed by the County of Kings which include LiDAR data for the Grand-Pré area.

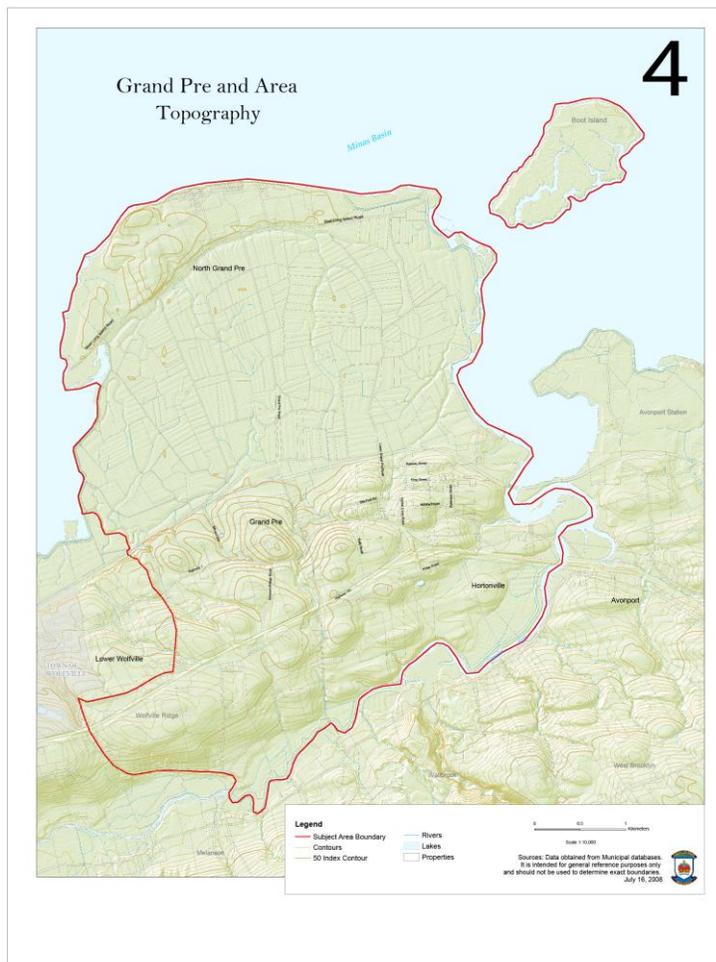


Figure 1 - Topography - LiDAR

<sup>11</sup> This report is “in association with the Ecology Action Centre” and is not referenced as the Master of Planning thesis.

A vulnerability assessment was performed and results highlighted a number of different socio-economic and environmental vulnerabilities within the coastal zone. Figure 9 in the report shows vulnerabilities in Grand-Pré area (although the map is not very clear in the report). The coastal zone delineated was limited to the hazard zone, 1 km landward from the high water mark. This report needs to be further assessed.

## 2.2 Disturbance

Throughout the period of Acadian dyke construction, relative sea level continued its inexorable rise and continues to this day. Tidal marsh meadows rise in conjunction and consequently old abandoned dykes become buried, whereas functional walls must be raised ever higher over time, thereby entombing earlier walls. Therefore, considerable archaeological material lies beneath the fields and marshes, waiting to be located and described (Bleakney, 2004, p.170).

On May 19, 2006 a machinery operator made a surprising discovery while excavating a drainage ditch within the Grand-Pré Marsh. A recovered portion of the culvert sluice (with clapet) was transported to the National Historic Site and “this humble object is perhaps the oldest piece of timber architecture in the province”. The Executive Director of the Park was impressed the excavator operator “had the foresight to realize what it was. A lot of people would have just thrown it aside” or it could have been damaged beyond repair (Fowler, 2006, p.3-24). The landowner had agreed to allow access to the site.

Other issues include<sup>12</sup>:

- Damage to the land caused by motor bikes, ATVs and trucks.
- Difficulty of working on dykes when there is non-dyke activity happening. Walking trails can also interfere with agriculture.

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<sup>12</sup> Some of these are highlighted in section 3.3 - land-use conflicts.

### 2.3 Changes in Agriculture



Figure 2 – Aerial Map

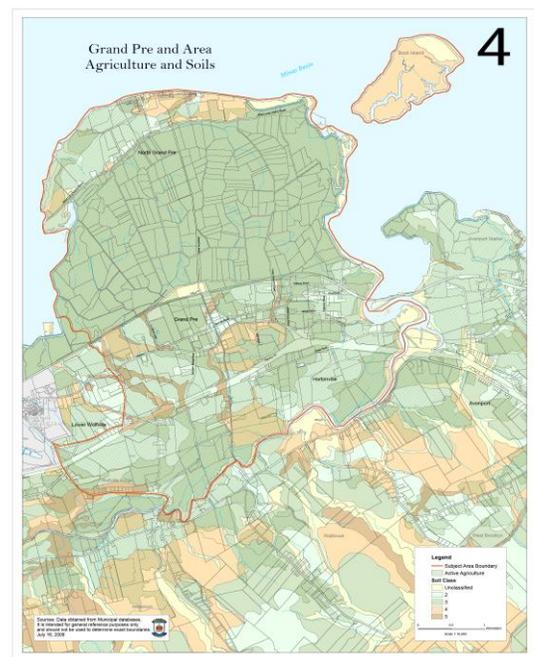


Figure 3 – Agriculture and Soils

Robinson (2005) provides an excellent overview of agriculture and the local economy of Kings County. Much of the land in Grand-Pré and Area is used for active agriculture including the cultivation of vegetables, fruits, and cereal grain. There are also several large and intensive livestock operations (Grand-Pré and Area Community Plan 2008: Community Profile, November 10, 2008, p. 8).

GPI Atlantic in an extensive survey of agriculture in Kings County concluded that participating farmers had an average of 29 years of farming experience...this knowledge base is a valuable asset to agriculture in Kings County. However, the average farmer is getting older and there are fewer and fewer younger farmers who are willing to farm (GPI Atlantic, Agriculture in Kings County: Real Values and Real Progress. Part III – Report of the Preliminary Farmer Survey and Statistical Review, July 18, 2000, p. 192). There may be a need to encourage future generations to consider agriculture, and the next generation of farmers will need to be trained and mentored. It remains unclear as to the relevance of this to Grand-Pré and hence it is suggested that an agricultural inventory/survey be undertaken to gain a greater appreciation of the status and future of agriculture in the area.

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One of the key elements in the OUV is the settlement pattern and field/farm structure. It remains unclear as to the extent this has changed through time due to mechanization, etc. Again, property mapping comparisons could be undertaken together with air photo interpretation to confirm this. A baseline for monitoring purposes could also be established through this process.

It is noted however, that one of the goals in the Municipal Planning Strategy seeks to reduce fragmentation of farmland (Grand-Pré and Area Community Plan 2008: Community Profile, November 10, 2008, p. 8) and may include consolidation into land units large enough to be economic entities for progressive, mechanized farm enterprises. This could involve land purchase, or expropriation, or both, by the province (Hilchey, 2005, p.50). This may become apparent in areas where farmers no longer live or where land has been abandoned. The report notes one farmer who is interested in purchasing and developing a thousand acres of a single marsh body (although it is not clear where this is located). If such a farmer were to purchase land from other farmers, the implications of such land consolidation could have an impact on the land use pattern and field divisions in the Grand-Pré dykelands and potentially affects its OUV.

The report also notes:

*There are not many farmers left in the neighbourhood. Some have retired; others have gone into other businesses. The restrictions on the sale of farm land have caught these farmers between a rock and a hard place. They can't sell lots from their property for non-agricultural development. They would have to sell a big enough piece so that it would be kept in agriculture. So it's impossible to raise any capital from the sale of property. Given the farmer's disability, this restriction makes it impossible to relieve their financial distress and they're stuck. (op cit, p. 198.)*

The report concludes that the long term viability of farming in Kings County is based on: work and employment capacity (people power); return on investment (economic capacity); resource base capacity and environmental quality; organizational capacity and community infrastructure. (GPI Atlantic, Agriculture in Kings County: Real Values and Real Progress. Part III – Report of the Preliminary Farmer Survey and Statistical Review, July 18, 2000, p. 202) and that:

*The only source of stability and adequate income seems to come from either quota systems for poultry and dairy or farmers that direct market organically grown food (GPI Atlantic, Agriculture in Kings County: Real Values and Real Progress. Part III – Report of the Preliminary Farmer Survey and Statistical Review, July 18, 2000, p. 212). Although it is uncertain whether selling food locally or beyond our borders is better for farm viability (op cit, p. 219).*

A study by Robinson (1999) also indicates that Kings County agriculture is perhaps more resilient than other agricultural counties. Farm entrepreneurs<sup>13</sup> have also been identified as a key agricultural resource and a source of ongoing economic strength and adaptability for the local Kings County economy.

The existence of dykelands depends on continued management and maintenance of the dykes and water control structures, as well as proper stewardship of the land within. Shifts in the public view of the importance of agriculture could lead to reductions in resources dedicated to dykeland maintenance and loss or alteration of dykeland systems (Stewart et al, 2003, p.39).

There is a risk that farmers may stop farming in the area if there is no money in it for them (Robert Palmeter, Dec 18: pers comm.). Farming is certainly on a downturn in the Annapolis Valley (Lindsay Carter, Jan 8: pers. Comm.) and we continue to see dramatic losses in the hog, chicken and beef sectors. The extent to which this is impacting Grand-Pré needs to be further investigated. However, most of the farms are mostly dairy and poultry which seem

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<sup>13</sup> One who “shifts economic resources out of an area of lower and into an area of higher productivity and greater yield” (Robinson, 2005, p.13).

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to be doing well right now. The land is well maintained, there are lots of crops and ecosystems and the land is kept properly fertilized. But there is evidence the land is increasingly drying out (pers. comm.. John Shaw, Bedford Institute of Oceanography, December 4, 2008.).

The following issues were also identified:

- In 2000, the new Marshland Act came out so now they need to really keep an eye on people to make sure no one is filling in any land or building on the land (Lindsay Carter, Jan 8: pers. comm.).
- Recent ventures in community shared agriculture such as Taproot Farms (Canard, Greenwich and Medford) could be beneficial to the local area.
- There may be opportunities for Agricultural Biomass Availability for Bioenergy Applications (Main, 2008).
- The dykelands are classified as Environmental Open Space (01) and there are pockets of Agricultural (A1) land to the north of the proposed boundary and to the south of the hamlet of Grand-Pré. Although the Municipal Planning Districts and Land Use Bylaws offer protection of these lands (especially in the agricultural district), there may be opportunities for high soil classifications to be protected especially within the 01 zone.
- Considering the maintenance costs of the dykes and aboiteau, the profitability of agricultural activities is limited at the present time. It has been suggested that sod production may represent the sole, profitable practice suited to dykelands (Atlantic Farmers Council, 2002, p.22).

The overwhelming risk is therefore that agriculture becomes a non-viable entity in the area and this leads to dramatic changes in the landscape. This could then lead to a situation where dyke maintenance is no longer required. Conversely, if dykeland maintenance is not continued this would put at risk the viability of agriculture in the area.

As a large portion of the research literature is specific to Nova Scotia and Kings County, it is recommended that further research be undertaken on agriculture specific to the Grand-Pré area. This could involve community meetings with landowners and farmers and more detailed land use surveys (crops grown, numbers of livestock, opportunities, challenges, viability assessment, etc.).

### 2.4 Costs of Dyke Maintenance

Up to 15 years ago when the Provincial Government took over dyke maintenance, land owners used to undertake this expensive undertaking themselves. The job of maintaining (especially re-facing) the dykes is difficult to do every year with the government typically bringing in big excavators and lots of equipment. It is also very expensive, costing tens of thousands of dollars every year (Robert Palmeter, Dec 18: pers comm.).

The budget is \$1.1m per year from the Province and has not changed since Lindsay Carter – responsible for the maintenance and up keep of the dykes in the Kings County area started (1986), even though maintenance costs have increased a lot (Lindsay Carter, Jan 8: pers. comm.) It takes about 30 years for the dykes to settle, so each dyke is topped up about every 30 years (Lindsay Carter, Jan 8: pers. comm.).

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With rising costs every year and without budget increases, less work every year has been completed. This year will be the first year the Provincial Government does not have any money to do regular work on the dykes. They will not be rocking to protect the dykes this winter like they usually do. There is only about \$600k for ground work. The Provincial Government also needs to save a lot of money for emergency situations. There are new opportunities for infrastructure funding but they have never been considered for funding yet (pers. comm. Ken Carlo, NS Agriculture, January 19, 2009).

Lack of government funding is therefore a critical issue. It is hard to say if the government will continue to support them and this is compounded by human resource challenges. For example, the engineer who was the supervisor of land protection retired and they never replaced him (Lindsay Carter, Jan 8: pers. comm.). Retirement is creating additional challenges as record keeping has not been done consistently (Ken, Brad and Lindsay are a wealth of knowledge and are all close to retirement as well (pers. comm. Ken Carlo, NS Agriculture, January 19, 2009).

It was also noted that “it is too expensive to make them high enough for no chance of flooding, will never happen” (pers. comm., John Shaw, Bedford Institute of Oceanography, December 4, 2008).

As noted above, if the dykes are not maintained the risks associated with agricultural sustainability will be severely compounded.

## 2.5 Natural Disasters and Risk Preparedness<sup>14</sup>

### 2.5.1 Earthquakes and Tsunamis

The Joggins Fossil Cliffs nomination includes reference to the following: “Earthquakes and/or tsunamis are not anticipated threats to the nominated property. The eastern coast of Canada is a passive continental margin with one of the lowest number and intensity of seismic events experienced globally. An exceptionally rare earthquake of magnitude 7.2 occurred off the coasts of Nova Scotia and Newfoundland in 1929. Recorded earthquakes in the Bay of Fundy region have not exceeded magnitude three; although an historic earthquake estimated to have been of magnitude five occurred south of the region in the Passamaquoddy Bay area in the nineteenth century. No tsunami has been measurably felt at Joggins in historic times.” (Joggins Fossil Cliffs, Nomination Document, 2007,p.81).

This should be confirmed in relation to Grand-Pré. No references were found in the literature review to substantiate this.

### 2.5.2 Risk Preparedness

The Joggins Fossil Cliffs nomination includes reference to the following: “A specific Emergency Response Plan for the Joggins Fossil Cliffs has been developed in co-operation with the Cumberland Emergency Measures Organization and local officials. In the case of storms and tidal surges, meteorological and tidal forecasts will be monitored continuously...and staff will take proactive action to evacuate any visitors at the site well in advance of approaching severe storms.” (p.81). It also notes: “As required by the Emergency Measures Act of the province of Nova Scotia (1990), the Cumberland Emergency Measures Organization and Emergency Measures Bylaw set out the mandate of the Municipality of the County of Cumberland to plan for and respond to disaster situations” (p.82).

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<sup>14</sup> A section on hurricanes and tidal surges is included under section 2.1.2.

Given the increased risk of storm surges in the Grand-Pré area compared to Joggins, it will be necessary to further document this issue in the nomination dossier.

Participants in the Changing Climate, Changing Coasts: Report from the June 6<sup>th</sup> 2007 Learning Circle on Climate Change Impacts and Adaptation in Nova Scotia (Ecology Action Centre, Coastal Communities Network and the Coastal Coalition of Nova Scotia) had a number of suggestions to improve flood preparation strategies. One such suggestion related to the need to have an emergency plan in place. This would include information on risk levels for different areas (i.e. priority areas) and an evacuation strategy<sup>15</sup>. Another suggestion to improve floodplain preparation was an expansion of the Municipal Act's provincial interest statement on floodplains.

An increase in sea level along with a possible increase in the frequency and intensity of storms could lead to increased coastal erosion, flooding, storm damage, and property loss. Storm surges and floods are predicted to overtop or break through dykes around the Bay of Fundy. It will put increasing pressure on coastal defences such as dykes, dams, and other barriers. This will increase the risk of flooding in coastal regions. Many of the salt marshes around the Bay of Fundy have been dyked and converted for agricultural and other uses. These dykes will become more and more costly to maintain as sea level rises. One method of adapting to the inevitable sea level rise is to restore those lands back to their original state as salt marshes (Marlin et al, March 2007, p.6)<sup>16</sup>. This issue is elaborated upon below.

## 2.6 Marsh Restoration

In the Bay of Fundy, human activities have had impacts on coastal marshes. It is estimated that 85% of the Bay's original salt marshes have been lost to dyking, infilling and tidal restriction (Singh et al, 2007). There are opportunities and constraints for salt marsh restoration. As sea level rises there are four adaptation strategies to consider: i) resettlement of coastal communities, ii) raising and reinforcing coastal defences, iii) restoring coastal ecosystems by removing specific defences, or iv) realigning and amending the current defences, which would involve a combination of the previous two. The converted salt water marshes or "dykelands" remain some of the region's most fertile agricultural land, yet much of it today is underutilized. Given these statistics and the urgency to prepare for sea-level rise, it makes sense to consider opportunities for marsh restoration (Singh et al, 2007).

There are more and more examples in the literature which argue that salt marshes are an important and characteristic component of the Bay of Fundy coastal ecosystem...because they fulfil such an important number of ecological functions, including filtering of pollutants, wildlife habitat, and carbon sinks. They are also sources of biodiversity. They offer self adaptation to sea level, flood control, and cost effective human protection (op cit, p.8). They also act as a buffer between the land and the sea. They mitigate a significant portion of the destructive energy, or erosion, associated with floods and storm surge events.

Relative to hard coastal defences like sea walls and dykes, salt marshes offer a cheap and cost effective tool for human protection (op cit, p.8). Aside from the initial cost of dyke realignment or removal, salt marshes have the potential for self-maintenance and even expansion in perpetuity with little or no monetary input. However, salt marsh restoration is not seen as a priority yet; it is not in the forefront of the public mind<sup>17</sup> (op cit, p.63). It should

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<sup>15</sup> This is further noted in the final section of this report when best practices from other UNESCO sites are outlined.

<sup>16</sup> The Ecology Action Centre undertook a study on salt marsh restoration specific to Kings County 4 years ago. However, this reference was not available for review as part of this research.

<sup>17</sup> A successful salt marsh restoration has been undertaken at Cheverie Creek, in nearby Hants County.

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be noted that there have been few discussion papers on Canadian wetland policy, especially salt marsh policy. Furthermore, while there are some “foggy” jurisdictional issues in the coastal zone, there are no policies that truly prohibit salt marsh restoration (op cit, p. iii).

It could therefore be argued that maintaining the status quo with respect to dykes and coastal defences is no longer a sustainable option in the Canadian Maritimes. Nor is it viable to build ever-higher and ever-stronger defences to hold back the sea in perpetuity. The Ecology Action Centre would like to see some dykes destroyed and some marshlands restored (Lindsay Carter, Jan 8: pers. comm.) and there are groups who believe some dykes should be removed. “It’s a lost cause. The dyke has its own ecosystem and it would all be ruined”. (Robert Palmetier, Dec 18: pers comm.).

However, salt marsh restoration as an option not only can serve as an adaptation to sea-level rise, but can also contribute to long-term mitigation of climate change. The course of action needed to undertake restoration can be as simple as realigning a dyke further inland or expanding the size of existing drainage culverts to restore normal tidal flushing. The time to seriously consider this adaptation option has now arrived (Singh et al, 2007).

The importance of this issue cannot be underestimated, especially if funding for dyke maintenance and/or changes in agriculture occur. Pressures from environmental groups may be able to take advantage of this situation.

### 2.7 Visitor Pressure

Dr. Brian VanBlarcom has completed a survey and economic study during the summer of 2008 and compared this to the statistics of visitors to the Grand-Pré National Historic Site. Preliminary estimates (January 2008) of the economic impact of visitors to Grand-Pré National Historic Site on Kings County show that the Park averaged 51,300 visitors per year over the decade from 1998 to 2007 (assuming 90% were from outside of Kings County). The final analysis and report will be ready in April 2009.

An economic impact study has also been completed by Mount St. Vincent University (MSVU). As part of this broad international initiative, a seminar<sup>18</sup> was held at MSVU last summer to discuss global issues on tourism management and policies at World Heritage Sites (WHS). As a result of this forum, an international group of researchers, tentatively called the World Heritage Tourism Research Network (WHTRN)<sup>19</sup> intends to pursue a collaborative and comparative research agenda on WHS, globally.

Both of these studies will require further review to determine if additional issues of interest can be identified. Surveys completed outside the Historic Site will also need to be included in the analysis as it is likely the OUV will include both areas.

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<sup>18</sup> UNESCO World Heritage Sites, Cultural Heritage and Tourism – Global Initiatives, Management and Policy Issues: A Collaborative Research Working Seminar. July 28-31, 2008. Halifax, Nova Scotia.

<sup>19</sup> <http://faculty.msvu.ca/whctr/index.html>

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A number of issues are outlined in later sections of this report<sup>20</sup>, but it is worth noting that:

- Landowners don't want tourists walking all over the dykes (Robert Palmetier, Dec 18: pers comm.).
- Pressures are created by walking on the dykes. It does damage to the land when people walk on them. Also dyke maintenance personnel have to be able to do their jobs without interruption (Lindsay Carter, Jan 8: pers. comm.), added pressure from visitors can therefore create potential areas of conflict. It has been noted that experiments are underway in Wolfville with a resistant, or at least resilient, rubber top coating made of chips from car tires (Bleakney, 2004:177).
- There may be a need to identify opportunities for meeting places and parks in the area which could lead to potential conflicts.

### 2.7.1 Carrying Capacity of the Nominated Property

### 2.7.2 Natural Heritage Carrying Capacity

### 2.7.3 Perceptual Carrying Capacity

No evidence in the review of research was referenced to the above criteria. The Joggins nomination dossier (p.82-83) provides some excellent examples which can be referred to. For example, the report notes:

- Carrying capacity is defined as “an acceptable level of visitor density that the property can sustain without causing destructive effects to the physical environment or decreasing the quality of the visitor experience.” Although this definition excludes the assessment and monitoring of impacts on the economic and socio-cultural environment of adjacent communities, the Joggins Research Institute will participate in community development and monitoring initiatives as increased visitation has potential to have both positive and negative impacts on the nearby communities.
- It is expected that elevated foot traffic will have little or no effect on the beach fauna. Sensitive areas will be protected by congestion management and visitor dispersal, education on preserving the beach ecology, and possible path arrangements.
- While projected visitation to the property is not anticipated to adversely affect the fossil resource or the local ecology, visitor impact will be persistently monitored and evaluated to protect them both and to maximize the quality of visitor experience.

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<sup>20</sup> Section 3.3

### 3 Risks to the area in general

#### 3.1 Development Pressures

The Community Profile (November 2008) for Grand-Pré and Area (defined by the Federal Heritage District including the communities of Grand-Pré, North Grand-Pré, Hortonville, and a portion of Lower Wolfville) reveals that:

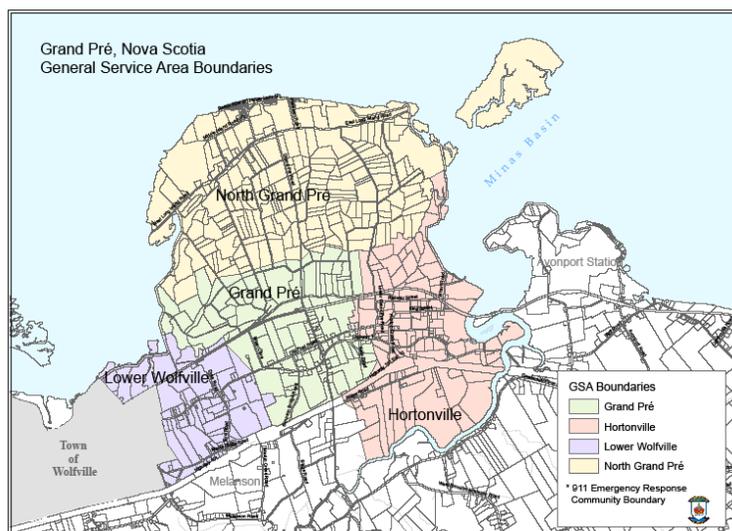


Figure 4 – General Service Area Boundaries

- The past 30 years has witnessed a population increase of 20% (from 485 in 1981 to 585 in 2008) and new units have been introduced at an average rate of four each year, mostly single detached dwellings. This does not include seasonal cottages of which there are 65 in the survey area.
- A Municipality of Kings Land Use Survey projects growth rates of 2-5 units/annum.
- Between 1996 and 2006 population in the 0-40 range has decreased while the 40-60 range has increased reflecting an aging baby boom generation and outmigration of the younger population; an increase in the 20-24 group perhaps due to the presence of Acadia University and work opportunities in the Grand-Pré service area; and a declining 60-64 cohort likely due to retirees choosing to relocate.

Development pressures are expected to increase with the completion of twinning of Highway 101. The stretch of provincial Highway #101 from Avonport to Coldbrook, which the province has called a twinning priority, is still undergoing an environmental review and a federal-provincial cost sharing agreement is not in place. The projected date for completion of twinning to Coldbrook is 2017, provided that other priorities do not delay the work until 2022 (reported in the Chronicle Herald, Mar 16, 2009). Some sections between Windsor and Grand-Pré have already been completed though. A recent open house (March 24, 2009) noted there was a “political push” to complete twinning by 2014 and that the Hortonville exit to Highway #1 was to be modified by the inclusion of a stop sign at the conclusion of the off vamp from the Highway #101.

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Other development pressures have been identified as:

- Ownership of the dykeland has been identified as an issue. It has been suggested that the crown owns some land and recently Natural Resources has been taking claim of some land outside the dykelands (the salt marshes, rivers, etc.) (pers. comm. Ken Carlo, NS Agriculture, January 19, 2009). However, it is not clear from these remarks if it refers specifically to the Grand-Pré area or not. This should be further explored.
- There are opportunities for new agricultural related commercial growth in Hortonville, along Highway 1 and near the Highway 101 interchange.
- There may be opportunities to increase the number of families in the area by providing access to more single unit, two-unit, and multi-unit dwellings.

The main issue for further consideration therefore remains. How can residential and commercial growth occur in the community while preserving the existing character? It was noted that there have been many newcomers to the area (especially since the 1980s). So with the potential of new development close to Highway 101, the question remains – where to place new houses?

Residents within the Hamlet of Grand-Pré and throughout Grand-Pré and Area supply their own water using sand-point or drilled wells driven into the sediment or bedrock below their property. A sewer line extends from Wolfville to service the Hamlet of Grand-Pré only. There is a sewage pumping station to the north of the Grand-Pré National Historic Site along the Grand-Pré Road with sewage being pumped to Wolfville where it is disposed. All other properties outside the service area have on-site septic fields (Grand-Pré and Area Community Plan 2008: Community Profile, November 10, 2008: p. 23). With possible development come challenges to deal with the increase in population in terms of services and water supply. Water usage and demand are growing concerns and there may be additional pressures such as:

- Some concerns have been raised in the community<sup>21</sup> that the aquifer will become a large concern because the water system may not be able to handle new growth. A designated wellfield in the area could protect water quality and more accountability on water usage may help to protect a sufficient water supply for the future. However, no direct corroborating evidence for this was identified in the literature.

In addition, there are further issues which could potentially impact the quality of life in the area and its cultural character:

- There are very few pedestrian links between the 4 communities, such as sidewalks and trails (Community Profile, 2008:29). Additions could make walking and hiking in the community safer and more enjoyable for everyone.

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<sup>21</sup> When the community was consulted there was an overwhelming response favouring regulations to protect the supply and quality of groundwater in the area [CWB].

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- Signs and billboards also play an important role in navigation through the community and in the overall character of the community. An appropriate design standard for signs and billboards could help visitors find their way around and enhance the rural and historic character of the community<sup>22</sup>.
- Car and truck traffic can pose a threat to personal safety. There is a need to identify areas where traffic and road issues cause danger for pedestrians. Intersections are major problems for pedestrian safety. Speed limits on local roads may also be an issue, e.g., coming across the dykeland the speed limit changes quite suddenly, which can be dangerous.
- Certain views of the surrounding landscape and of the heritage places in Grand-Pré enhance the rural and historic character of the area. Providing both physical and visual access to monuments, heritage places, the surrounding rural landscape is vital to sustaining the historic and rural setting. The agricultural landscape also offers a “postcard image”...“provided that certain views are maintained within the pastoral rural character of the area.” (Community Profile, 2008, p.15).



Figure 5 - View planes to Blomidon (p.344 t12-7.pdf)

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<sup>22</sup> When the community was consulted there was an overwhelming agreement that bylaws should be established to regulate the look of signs and billboards in the community [CWB].

### 3.2 Heritage and Cultural Preservation



Figure 6 – Heritage Areas and Open Space

There are several provincial heritage properties located within the Hamlet of Grand-Pré. The Nova Scotia Heritage Property Act (1980) which is subject to provincial regulations includes:

- Covenanter Church
- Jeremiah Calkin House
- Samuel Reed House
- Robert Leard House

There are also:

- The Grand-Pré Heritage Conservation District
- The Federal Rural Historic District of Grand-Pré was established in 1995 to commemorate the cultural significance of the landscape (Canada's first)

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- The Grand-Pré National Historic Site designated in 1961
- Commemorative monuments
  - Horton's Landing – Deportation cross and Planters
  - Covenanters' Church (designated as National Historic Site)
  - Acacia Villa School
  - Sir Robert Laird Borden
  - J.F Herbin
  - H.W. Longfellow
  - The Attack at Grand-Pré

In 1995, the Grand Pré Heritage Conservation District was established because of the strong and long-standing community commitment to protect and enhance the historic environment. The District encourages new development to be architecturally compatible with existing 18<sup>th</sup>, 19<sup>th</sup>, and 20<sup>th</sup> century buildings. The District enhances the attractiveness of Grand Pré as a tourist destination and complements economic opportunities based on heritage conservation and cultural tourism<sup>23</sup>.

Properties located within the *Area Eligible for Conservation District Inclusion* are recognized as contributing to the heritage character of the Hamlet and may be included in the heritage conservation district upon approval of both the owner and Council (op cit., p. 17).

These will need to be reviewed to see if there is a need to preserve or expand them. For example, it may be appropriate to establish some basic architectural guidelines that can be put in place<sup>24</sup>. It is important to note that when the community was consulted [CWB] there was support for regulations to conserve the character of the Historic District and that any new buildings should be architecturally compatible with existing historic buildings. However, there was no consensus as to whether large traditional houses in the historic district could be converted into two-unit or multi-unit dwellings while maintaining their historic and architectural integrity.

It has been noted that "There's less community spirit. There are many people moving into an area with non-farming backgrounds who don't share the same values as local farmers" (GPI Atlantic, Agriculture in Kings County: Real Values and Real Progress. Part III – Report of the Preliminary Farmer Survey and Statistical Review, July 18, 2000, p. 198).

It is also apparent from the research that the area possesses cultural values of tranquillity, peacefulness, and pride. Quite often one reads of "sentiments of place" of being a "sacred and spiritual area", a "cultural tapestry". The extent to which this can be measured or assessed remains problematic however.

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<sup>23</sup> Grand Pré and Area Community Profile, 2008, p. 17.

<sup>24</sup> These could be further considered in the context of the recently released Heritage Strategy for Nova Scotia 2008-2013: A Treasured Past A Precious Future.

A number of monuments have been noted in the area (especially in and around Hortonville and the old town) and these speak to the history of the local area and help to signify it as a spiritual centre. The Acadian road and field patterns have also been noted (OUV., p. 28) with a seigneurial system “evidence of which is still visible in the form of narrow lots on the upland that persisted throughout the Acadian occupation, were subsequently retained by the Planters when they arrived in the 1760s, and still evident today”, especially north of the Old Post Road. The Management Plan Working Group will need to address maintenance of these landforms and their integrity and further explore criteria surrounding commemorative monuments and better understand why this area has not been affected or been densified.

### 3.3 Land Use conflicts

During public consultations<sup>25</sup> a number of private landowners have raised concerns and many of these have also been noted in the literature. For example:

- Odour (manure smells). It has been noted that one farmer doesn't spread manure in Grand-Pré near residences because of sensitivity to community concerns (GPI Atlantic, Agriculture in Kings County: Real Values and Real Progress. Part III – Report of the Preliminary Farmer Survey and Statistical Review, July 18, 2000: p. 198).
- In the 1980s the miles of dirt roadways atop dyke walls were “discovered” by joggers, cyclists, nature lovers, dog walkers, drivers, ATVs, 4WDs, and snowmobiles. The consequent amount of abrasion alarms government and farmers, and gates are installed to exclude power vehicles (Bleakney, 2004, p.177).
- Private landowners have expressed concerns about farm safety and potential liability related to people not staying on top of the dykes especially when farm equipment and machinery is in use. This could also cause erosion of grass on the dykes. The Department of Agriculture has also noted that it is sometimes difficult to undertake dyke maintenance work when tourists are present especially as there many areas in the dykelands that are not gated<sup>26</sup>. Therefore, the question remains if the level of protection is high enough in these areas.
- Walking could be encouraged on the dykelands (in trails along the dykes not on top as it would cause erosion). If trails were designated on top of the dykes then crushed rock would need to be layered or a broadwalk developed. Appropriate signage would also be required.
- As there will be a potential for expanded tourism potential<sup>27</sup> including the possible development of trail systems, the potential for conflict arising between tourists, landowners and the environment will be exacerbated. When the community was asked if it wanted public paths throughout the area, the types of paths they would like to see were trails, crosswalks, sidewalks and board walks [CWB]. Also, when asked what areas should be available or improved for public access heritage places and wildlife habitat were

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<sup>25</sup> Valuable information has also been obtained as part of the “community workbook” process. A draft summary report has been prepared and once the final report has been made public it should be reviewed in the context of the management planning process. A few highlights from the preliminary results are noted and referenced as [CWB].

<sup>26</sup> The location of existing gates should be confirmed and potential locations for future gates should also be determined.

<sup>27</sup> Refer to section 3.5.

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noted as being important [CWB]. This will be a significant issue for the Management Working Group to address.

- In the 1990s farmers become annoyed by the increase in car traffic and parking on their private roads that access their fields, the development of a business park, and proposals for dykeland nature trails create further frictions, as yet unresolved (Bleakney, 2004, p.177). These issues have also been stated as management concerns by Lindsay Carter (pers.comm.).
- Conflicts between heritage and agriculture – farm vehicles might be diverted around a heritage area.
- Tourism related businesses are found throughout the community alongside farm and light industrial uses such as intensive livestock operations and auto repair shops. These businesses may not be compatible with one another but provide diversity and support the local economy.

### 3.4 Wind Turbines

The Marsh Body has recently been approached regarding a proposed wind farm development. This could be in direct conflict with the principles of a UNESCO designation (Meeting report, Grand-Pré Marsh Body, October 23, 2007). It was noted that further information about the proposed wind farm development should be obtained.

In Nova Scotia there is a mix of zoning bylaws that apply to wind turbines. Individual research into what rules and regulations apply to the proposed site is necessary as every town and municipality is different. For example, the Town of Pictou has created a specific setback for the “Domestic Wind Turbine” of one times the height of the turbine. The Municipality of the County of Guysborough issued an RFP for Consulting services - Creation of a Municipal Bylaw for wind farm development (Dec 18, 2008). The Planning Advisory Committee of the Municipality of the County of Kings (March 28, 2006) also received a report from Dalhousie University planning students on small scale wind turbines and it was indicated that a specific policy must be created in the Municipal Planning Strategy. A further review was conducted by Larry Hughes and Aaron Long (May 26, 2006). The Union of Nova Scotia Municipalities also undertook a report on Model Wind Turbine By-Laws and Best Practices for Nova Scotia Municipalities, Project No. 1031581 (Jacques Whitford, 2009).

This should be confirmed in relation to Grand-Pré. No references were found in the literature review to determine if this was an issue or not. A related question might be: Are there certain designated areas of the community where such turbines might be applicable?

### 3.5 Expanded Tourism Potential

As noted above (section 3.3) a number of potential land use conflicts have been identified. These will become intensified if the Grand-Pré area attracts greater numbers of tourists in the future. For example, the following references<sup>28</sup> have noted the potential of expanded tourism<sup>29</sup>:

- A meeting with County Council (February 19, 2008) indicated that after a presentation by the Major of Lunenburg, Nova Scotia could market all three UNESCO sites together. This potential could greatly increase the number of potential visitors to the area.
- A Bay of Fundy Star Generator Potential Research Project (RMA Tourism, 2007) has identified the Grand-Pré Historic Site as a Star Generator with projected visitation of 35,000 linking the Bay of Fundy into a unified product, along with: redesign of the Fundy Ecotour, development of North and South Discovery centres, development of a major anchor attraction. Reference was also made to Apple Landing, a new private agri-tourism facility adjacent to Grand-Pré (apple cider distillery/vinegar production) as another project. No further information was available on this.
- A Self-Guided Memory Walk of the Annapolis Valley (Grand-Pré Trail) has also been outlined by the Société Promotion Grand-Pré - "This guide is for people who want to deepen their understanding and appreciation of Acadian history by exploring the Annapolis Valley of Nova Scotia through Acadian eyes".
- The Nova Scotia Strategy for Sustainable Coastal Tourism Development, (2007) in its strategic vision "...There will be an unparalleled and authentic experiential tourism industry based on both the cultural and natural components of our coastline which satisfies the body, mind and soul and encourages return visits" (p.9). Specifically:
  - Activity 4.3.2. (p.23) notes: "seek opportunities to raise awareness of coastal development issues with coastal landowners/developers as it relates to tourism use";
  - Activity 4.4.1 "Advocate for a provincial government process to develop an Integrated Coastal Zone Management Plan for Nova Scotia to protect and maintain tourism values on coastal land";
  - Activity 4.4.2 "Advocate for incorporating a Statement of Provincial interest for coastal ecosystems into the Municipal Government Act and for improved land use regulation at the municipal level as an important step in planning sustainable coastal tourism development";
  - Activity 4.4.3 "Advocate for the protection of strategic coastal crown land and access routes and the acquisition, protection and remediation (if necessary) of private coastal land with tourism values by the provincial government, private landowners and non-government groups that have legal sanction to assist landowners in placing protection easements on properties";

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<sup>28</sup> Additional work is being undertaken such as the development of a coastal management plan, by students at Dalhousie University. Such research should be further explored in the context of future work of the Management Plan Working Group.

<sup>29</sup> These should be further explored and a better estimate of future tourism derived as a basis for the Management Plan.

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- Activity 4.4.4 “Work with other departments and non-governmental groups to secure strategic coastal crown land, private coastal land with tourism values, and watershed areas that are part of the tourism product or which impact the quality of the tourism product and not impacted by detrimental watershed activities”.
- Kings County Trail Survey: A consultant study - “Vision and Strategic Plan for Trails” was awarded to EDM Limited. Residents of Kings County, and the Towns of Berwick, Kentville and Wolfville have been responding to a survey (deadline for completion was February 27, 2009). This will need to be reviewed to determine potential impacts on the Grand-Pré area.
- On the recommendation of the trails committee, The Municipality recommended staff investigate the feasibility of the potential development of a public trail between Kentville and Hantsport along the Windsor-rail line (Minutes, Municipal Council, October 7, 2008). Some have also suggested that the railway should be kept intact and trains should run along it again. Any further information on this as it comes available will be useful for further development of the Management Plan.

#### 4 Review of maintenance issues for dykes

*In a few cases dykes are not being maintained to their full extent around the Bay of Fundy, on the basis that the economics do not justify it. There also appears to be some perception that allowing the dynamic nature of the tide to play its role helps the overall dynamic nature of the system and that it is not necessarily best to try and control it. Only where it is necessary to defend property from the risk of flooding are measures being put in place*

*(Barker, 2006:35).*

Maritime Dykelands the 350 Year Struggle (1987) details current trends in dyke and aboiteau construction (p.97-104) and can be summarized as:

- Elevations of dykes are maintained so that their height is around 0.5m above predicted maximum tide elevations. Most dykes measure between 1 and 2.5m in height (Perry-Giraud, 2005, p.5; NSAF, 2001; Ross, 2002; Robinson et al, 2004).
- From the early 1970s to today there have been some changes in techniques and materials used in preserving and extending the dykelands in Nova Scotia. These changes are attributed to the advancements in technology in the areas of equipment and materials. However, the basic methodology remains the same.
- One of the most significant advancements has been the use of high-density polyethylene pipe in lieu of the old wooden sluices. The first plastic pipe was installed in 1979. The use of the plastic pipe will reduce the need to repair and replace the sluices. In addition, the smoothness and roundness of the pipes allows for better flow. Another intuitive idea that allowed for more generous pipe flow was the use of a flared entrance, instead of a square one. This cost efficient design can increase flow by a factor of 1.5.

There are 5 district aboiteau superintendents in Nova Scotia reporting to a Dykeland Engineer in the Department of Agriculture. Reconstruction is usually accomplished one of two ways: The first and most simple is to reline an existing aboiteau. The second is called a surface excavation and involves replacing everything.

Some of the problems associated with dykeland construction include:

- **Soil Stability:** Dykeland soils can be generally described as a silty clay loam type. Soils in this group typically have high water tables and a very low rate of water transmission, creating a high moisture content. Due to these characteristics the marsh soils are inherently unstable. Working with unstable soils cannot only impede the pace of work but in some extreme cases make it impossible. Potential problems include the use of heavy machinery and achieving the desired depth before the excavated area begins to collapse.
- **Time Restrictions:** Time restrictions can be viewed on a yearly or daily basis. Dykeland and aboiteau construction is usually carried out between the months of June to October. Although, critical repairs are completed whenever needed and rock work is done during the winter. As for daily restrictions, the tide can limit possible downstream work time in some areas to as little as a couple of hours a day.

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- Location: In addition to determining how much time there is to work on a structure, its location can also prove to be a more or less difficult place for machinery to work and manoeuvre.
- Cost: Cost can influence many decisions during the design of aboiteaux structures. For example:
  - Relining vs. Surface excavation
  - Surface excavation vs. Tunnelling
  - Type of gate (e.g. bronze vs. Stainless steel)
  - Number of aboiteaux structures for a given location (i.e. cost vs. benefit analysis)

Perry-Giraud, 2005 (p.40) provides research on the Cornwallis estuary where riprap was used only near the most threatened dykes, where protection was greatly needed. The study utilized aerial photographs and GIS analysis (along with other geographic data sources) and produced images like the following:

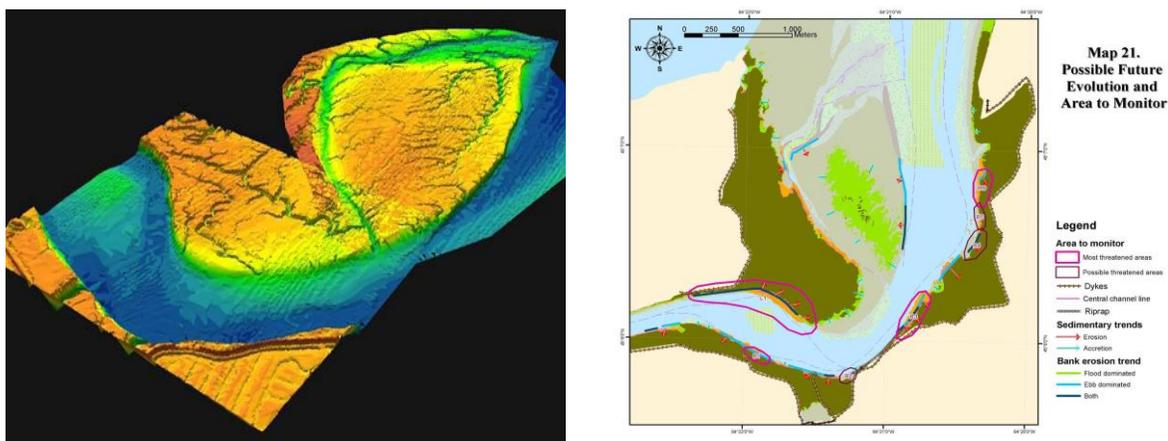


Figure 7 and 8 GIS Maps of the Cornwallis Estuary (p.28 & 63)

Unfortunately, as noted earlier there are no definitive studies such as this that can be used in the Grand-Pré area. However, the methodology used may be able to be applied to Grand-Pré and assist with the development of maintenance/monitoring protocols.

In the future, the report goes on to suggest that if more precise studies on currents and sedimentary dynamic in the estuary are combined with this study, highlighting the most threatened areas, an impact assessment of the protections could bring long term solutions against erosion. Thus, optimum protection could be found with minimum impacts on hydrodynamics, sedimentary processes and surrounding habitats (by preserving sedimentary, chemical or biological exchanges between the estuary and its banks). In this way, the use of alternative techniques like bio-engineering (soft-engineering) is advised, which use live material (sometimes associated with classic protection) to strengthen the bank (Polster Environmental Services Ltd., 2003). The report recommends that specialized studies be carried out for an optimum application of this kind of engineering adapted to a macrotidal environment.

### 5 Tools and practices to monitor the conditions of the dykelands

This section of the report remains as one of the least developed due to the lack of specific and detailed references provided in the background materials. It should therefore be subject to additional research. However, a number of points can be outlined<sup>30</sup>:

- The height of the tides, a dyke's exposure to wind, and the direction of the prevailing winds determine the height of the dykes. Hank Kolstee (NS Land Protection Services) says that "dyke elevations are checked every five to eight years and when considerable sections are below a particular elevation a decision is made to top the dyke." Dyke heights are being looked at more closely now because we are approaching the peak of the 18-year tide cycle. Regular maintenance ensures the height of the dykes is appropriate relative to changes in sea level. Predicting tides and the management of the dykelands are challenging jobs and the dykes need to be monitored closely for damage (Ecology Action Centre, 2007, p.20).
- There is a need to set up a monitoring regime for assessment of coastal erosion. Municipal data collection on storm events should be encouraged. Some suggestions on this have already been noted (section 2.1.2) as there might be an opportunity to model future "Saxby type events" in cooperation with the Nova Scotia Community College's Applied Geomatics Research Group.
- Lindsay Carter observes the dykes all year round and has a crew working 6-7 months of the year. They do maintenance of the dykes. They check aboiteaux (they used to be all wooden and now they are lined with plastic and concrete (pers. comm., meeting with Lindsay Carter, January 8, 2009.) and the land is profiled every five years but documents are "hard to get a hold of". The profiles look mainly at 2 things, critical elevation and construction elevation. When the dykes reach critical elevation they look into topping them up (about every 30 years due to settling). They put rock in the winter to protect them. They need to check the dykes when the tides are out. They try to keep grass on as it protects them. They do drainage every year and receive a lot of phone calls from farmers about drainage (pers. comm., meeting with Lindsay Carter, January 8, 2009).
- New Brunswick has recognized that many salt marshes have been dyked and drained, but as sea level continues to rise, it will become more and more costly to maintain dykes. It suggests society will have three options – reinforce, realign, or remove the dykes and allow salt marsh to return. Salt marshes act as buffer areas which naturally absorb the impact of wave action and flooding. The goal of this project was to develop a tool that communities can use to assess a local dyke for possible salt marsh restoration. Of relevance here, the report briefly summarizes research activities, provides the process required to assess dykes including research, stakeholder consultations, and public education campaigns. A dyke assessment tool is presented and includes a list of criteria broken into two categories – characteristics of the dykeland and characteristics of the dyke. The importance of stakeholder consultations is emphasized (Table 1, page 6), a dyke assessment process is outlined (Figure 1, page 7), and a dyke assessment tool is summarized in Table 2, p.10-12. In terms of characteristics of the dyke (Part 2, page 13), it recommends the height of the dyke with respect to relative sea level be measured (indicating vulnerability to sea level rise). This could be undertaken by LiDAR (light detection and ranging) technology or by professional engineers. Digital elevation models could then be used to model sea level rise.

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<sup>30</sup> Additional suggestions have also been made in section 2.1.2.

- Condition and width of the dyke needs to be assessed (op cit, p. 14). Identification of weak spots, signs of erosion, water flow, absence of grass or other cover, maintenance history, frequency of repairs, reoccurring weak spots, past breaches – need to be assessed by reference to archival records and local historians. Widths can also be measured by hand, at both top and bottom, by taking measurements along the length of the dyke (Marlin, A, Ollerhead, J, and Bruce, D, March 2007. A New Brunswick Dyke Assessment Framework: Taking the First Steps, New Brunswick Environmental Trust Fund, Coastal Wetlands Institute, Rural and Small Town Programme).
- The 2001 Management Plan for the Louisbourg National Historic Site identifies coastal erosion and sea level rise as a threat to archaeological resources. Monitoring changes in the coast plays an important role in the protection of cultural resources at Louisbourg. Since 2002, there has been a coastal walking survey every spring to identify cultural resources exposed along the eroding shoreline banks. When new archaeological resources are identified they are documented, photographed, and entered into a database. Whether or not newly discovered artefacts are removed from the site depends on how vulnerable they are to erosion (Ecology Action Centre, 2007, p.24).
- Archaeologists (Rob Ferguson, Parks Canada; Katie Cottleau-Robbins, Department of Tourism, Culture and Heritage and David Scott, Dalhousie University) began working on an archaeological survey of the dykelands in August 2008 getting “core” samples, drilling holes, scanning with radars and taking samples. They are looking for better evidence of the presence of Acadian dykes. This includes an interpretation of information derived from deeds and maps and could form the basis of a baseline inventory.

### 6 Best practices and other relevant issues

- It is recommended that the Joggins Management Plan (termed a model by the evaluating panel) be used as a template for further development of the Grand-Pré Management Plan. Of all the reference materials consulted, it is by far the most comprehensive and well presented.
- It is appropriate to mention that Nova Scotia's Climate Change Action Plan, Toward a Greener Future (Discussion Paper, 2009) has two main goals: reducing our contribution to climate change by reducing our greenhouse gas emissions and preparing for changes to our climate that are already inevitable. Actions to be implemented by 2013 include:
  - An adaptation research and development fund to help Nova Scotia prepare for the effect of a changing climate (p.11)
  - Manage new challenges – preserving heritage sites from weather damage and erosion (p.30)
  - Develop statements of provincial interest on adaptation by 2010 to provide guidance on land-use planning. This is a formal tool, established under the Municipal Government Act, to protect the province's interest in such areas as land use, water resources, and community planning (p.31)
  - Begin work on a provincial vulnerability assessment and progress report on adaptation to climate change in Nova Scotia. This report, which will be updated biannually, will provide updates on the latest climate research, review critical information gaps, and provide policy direction for the province (p.31)
  - Release a Sustainable Coastal Development Strategy by 2010. A major part of the strategy will focus on strengthening our resiliency to climate change impacts along our coast (p.32)
  - Take sea-level rise into consideration and place priority on considering coastal wetlands in preparing a policy to prevent net loss of wetlands. The Environmental Goals and Prosperity Act requires that this policy be developed by 2009 (p.63)
- An RFP was released by NS Agriculture and Fisheries (August 5, 2008) to develop a State of the Nova Scotia Report for delivery in January 2009.
- On November 22, 2007, the provincial government clearly stated its role in the development of a coastal management framework to be released by 2009 and reinforced the belief that the coastal zone is directly related to quality of life in Nova Scotia. "Our coastal areas are essential to our economy, our environment and our heritage. Our government will ensure that a coastal management framework is in place within two years". This statement is a success for climate change and coastal zone stakeholder's province wide who have been lobbying for provincial action to protect vulnerable coastal zones in Nova Scotia. A Provincial coastal management framework will provide municipalities with the guidance they desire and encourage action in protecting vulnerable coastal zones from the impacts of climate change (Kosloski, 2008, p.41).
- Kosloski (2008) noted that there was no policy protecting the integrity of coastal zones or the safety of individuals living in the coastal zone. Current policies under section 4.2 Natural Environment could be modified to include climate change and shoreland districts. e.g., a coastal zone could be identified as

being a significant natural feature which could eventually lead to the requirement for completion of an environmental impact assessment.

- At a recent community liaison meeting (February 12, 2009) it was noted that Dalhousie University Master of Planning students (Julia Reimer, Hailey Steiger and Sabrina Hood) have been preparing a Coastal Management Plan for Grand-Pré and area.
- In New Brunswick a Coastal Areas Protection Policy creates a regulation under the Clean Environment Act – the Coastal Designation Order (CDO) which is linked to the existing land use planning process. It identifies a series of zones and protected areas. Zone A is found between the Higher High Water Large Tide (HHWLT) and the Lower Low Water Large Tide (LLWLT) where fewer development activities would be acceptable. Zone B (noted below in the following figure) “30 metres landward of the limit of Protected Area A” which is a development buffer allowing only limited activity. A zone C – areas beyond zone B form a transition from coastal to inland areas. This zoning approach – core, buffer and transition, is the same approach used by the UNESCO Biosphere Reserves.

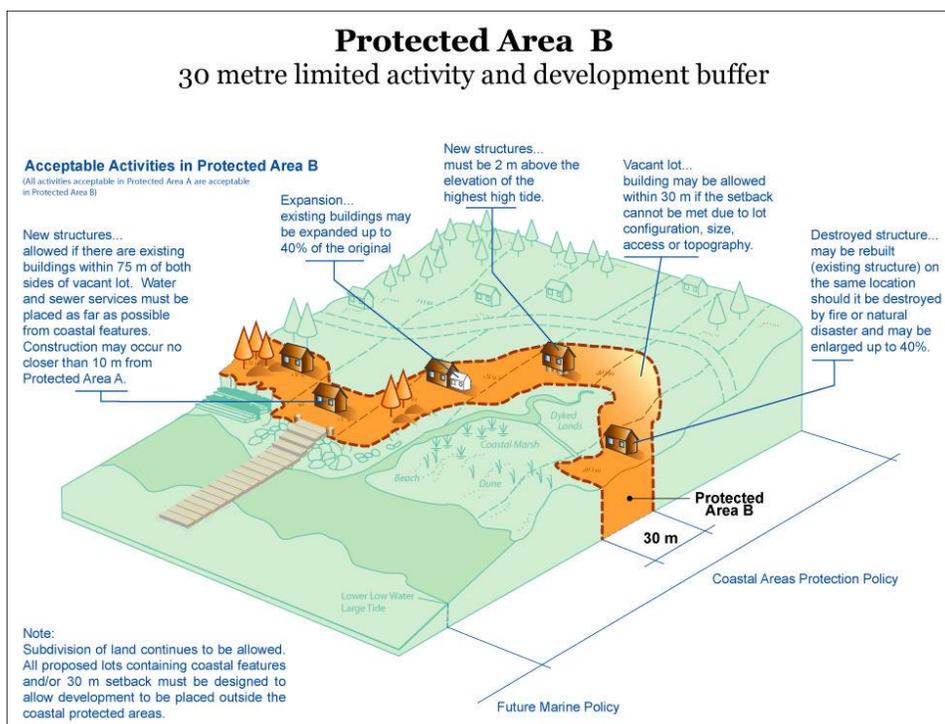


Figure 9 – New Brunswick Coastal Areas Protection Policy

*Acceptable Activities In Zone A are noted as:*

- The maintenance or enhancement of the coastal feature, e.g. sand fencing or planting native dune grasses to protect sand dunes.
- Acceptable erosion control structures.
- Development associated with access and interpretation for educational or research purposes.
- A development or undertaking to protect a coastal feature while providing approved public or private access to a shoreline, e.g. a boardwalk.
- On coastal marshes that have been historically dyked for agricultural purposes:
  - Carry out agricultural practices.

- Construct agricultural storage buildings for activities related to the use of that land, e.g. hay storage (provided no hazardous materials are stored).

*Note: the intent would be to minimize structures that would be damaged by flooding during storm surges. This would also reduce the investment that would need to be considered when determining whether to allow a dyked coastal marsh to revert to a natural eco-system.*

- Allow dyked marshlands to naturally revert to salt water marshes by removing control structures and subject to review the conversion of dyked marshlands to freshwater marshes<sup>31</sup>.
- Threats to wildlife species in the area (coyote, fox, eagles, hawks, peregrine falcons, sandpipers, frogs, toads, muskrats, owls, mice, bobolinks, merlins, crows, herring gulls, great black-backed gulls, plovers, horned larks, snow buntings, etc.) can be considered as being directly related to the OUV<sup>32</sup> because they constitute part of an overall ecosystem. Special areas such as wetlands and significant habitats could be identified and an approach made to the municipality for protection of special areas. For example, when the community was asked if there were areas that should receive (or add) protection, wildlife habitat and watercourses/wetlands were noted [CWB]. The Canadian Shorebird Conservation Plan<sup>33</sup> has as its main goal to “Sustain the distribution, diversity, and abundance of shorebird populations within Canada and restore populations of declining, threatened, and endangered species”. In the context of future work of the Management Plan Working Group, further information should be obtained concerning the distribution, status, and trends of shorebird populations and of the factors affecting shorebird population dynamics, ecology, and migration systems. This should also be extended to address other wildlife and natural habitats in the area.
- The Pico Island nomination (p.25) indicates that “the management plan sees the landscape as a living working landscape where the only chance of sustaining the complex field patterns..is through trying to ensure that the distinctive wine-making traditions which created the landscape can be made relevant in the present time”.
- The Le Morne Cultural Landscape assessment indicates that: if the site is to be managed as a cultural landscape the combined work of man and nature needs to be defined, preserved, presented, and interpreted for the visiting public. The management plan should include detailed sub-plans which identify actions and resources and be extended to address the marine environment of the buffer zone. It also noted that indicators needed to be developed especially relating to visual integrity.

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<sup>31</sup> Note: Activities that require operation in Zone A (such as commercial fisheries, transportation etc.) or infrastructure or development deemed to be in the public interest would be considered for exemption under the policy, providing appropriate analysis had been undertaken.

<sup>32</sup> The second criterion – human interaction, concerns the relationship between wetlands, uplands and the dykeland.

<sup>33</sup> [http://www.cws-scf.ec.gc.ca/publications/spec/cscp/cont\\_e.cfm](http://www.cws-scf.ec.gc.ca/publications/spec/cscp/cont_e.cfm) also includes a number of relevant appendices.

- The Kuk Early Agricultural Site nomination dossier indicates:
  - Local heritage officers monitor day-to-day activities
  - There is a local heritage committee which is a forum to resolve management issues
  - Monitoring is multi-layered: day-to-day monitoring of land-use activities, biannual assessments, comprehensive social mapping and land-use assessments every 5 years, scientific and technical assessments every 10 years
  - Emergency management activities are monitored in the event of unforeseen climatic or land-use threats
  - Baseline data are generated during archaeological investigations
  - Assessments will not require archaeological investigations but will focus on monitoring the environment in areas adjacent to known archaeological remains. There are 5 control areas.
- The Beemster Polder Site nomination dossier indicates:
  - It is the task of the...to permanently, i.e., day and night, monitor the status of the water and the dykes
  - They also monitor the permits which have been granted pursuant to a zoning plan which can serve as a key indicator.
- The Dresden Elbe Valley nomination dossier indicates:
  - A flood alarm system
  - The control of visitor flow and the landscape friendly introduction of secondary facilities (car parks, etc.) are main factors for gentle, environmentally-friendly tourism.
  - Monitoring – extensive registration work was carried out.
  - Changes in land-use are registered at intervals of 5-10 years (using air photo interpretation)

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- The Chief Roi Mata's Domain nomination dossier and evaluation indicates:
  - A cultural Tourism Strategy with strategies to minimize visitor impact on the cultural integrity (restrictions on movement, guides)
  - Key indicators for measuring state of conservation include: records stored digitally, duplicate hard copies, site inspections, visit after a natural disaster or any unforeseen event that may pose a threat to the property.
  - Community guides are being trained and a campaign of awareness has been initiated
  - The proposed buffer does not include the whole view shed
  - In response to an increase in visitors, a program of monitoring has been initiated with a number of fixed monitoring points identified
  - The basis for financing the monitoring and management of the site is worrisome
  - It is highly desirable that the customs and cultural elements that are developed be authentic to local culture and place
  - Resources – including staffing levels, expertise and training are important, especially expertise in archaeological landscape management
  - Monitoring plan – designated monitoring sites are visited on an annual basis and more regularly by tour guides and landowners.

## 7 Summary Table

Potential Issue/Threat	Reference in Text	Need for Additional Study
Climate Change, Sea Level Rise and Coastal Erosion	p. 3-7	p.7 -8
Hurricanes and Tidal Surge	p. 7	p.7-8
Vulnerabilities	p.9	p.9
Disturbance	p.10	
Changes in Agriculture	p. 11-13	p.13
Costs of Dyke Maintenance	p.13-14	
Natural Disasters and Risk Preparedness	p.14-15	p.14-15
Earthquakes and Tsunamis		
Marsh Restoration	p.15-16	
Visitor Pressure	p.16-17	p.17
Carrying Capacity		
Development Pressures	p.18-20	p.18-20
Heritage and Cultural Preservation	p.21-23	p.21-23
Land Use Conflicts	p.23-24	p.23-24
Wind Turbines	p.24	p.24
Expanded Tourism Potential	p.25-26	p.25-26
Maintenance Issues	p.27-28	p.27-28
Monitoring	p.29-30	p.29-30
Best Practices and other relevant issues	p.31-35	p.31-35

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