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TOWN OF STRATFORD: NATURAL HERITAGE STUDY (DRAFT)

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1.0 INTRODUCTION

The Town of Stratford initiated the Stratford Natural Heritage Study in 2011, when it became evident that significant natural features *must* be preserved for the benefit of present and future generations. Stratford has recognized the need to attain solid background information in order to develop a strong policy for the protection of natural landscape such as old growth woodland, wetland, coastal/buffer zone, and rare or special species of flora and fauna.

According to the *Prince Edward Island Natural Areas Protection Act (2010)*, a natural area is defined as "a *parcel of land that contains natural ecosystems or constitutes the habitat of rare, endangered or uncommon plant or animal species...contains unusual botanical, zoological, geological, morphological or palaeontological features...exhibits exceptional and diversified scenery...provides haven for seasonal concentrations of birds and animals*". On P.E.I., there is a relatively small amount of protected land; in Stratford, however, there is none (Griffin, 2009). This demonstrates the serious need to identify the parcels and general areas in need of protection from development and urbanization. Collaboration and joint stewardship will also be required to ensure significant natural heritage is protected and enhanced.

The overall purpose of the Natural Heritage Study was to conduct an inventory and assessment of natural heritage features and areas within the municipal boundaries, and to provide recommendations for policies dealing with matters of natural heritage. The principal goals of the study are as follows:

1. to increase the understanding of Stratford's natural heritage features and systems;
2. to provide information and a frame of reference for the acquisition and preservation of natural areas and features;
3. to provide a framework for the development of enforcement of land-use planning policy; and
4. to encourage and facilitate private stewardship and public education.

The study provides a comprehensive overview of the town's natural heritage based on invaluable information gathered from forestry, environmental and wildlife experts and community residents. This input served to verify and enrich data accumulated throughout the study. Additionally, various stakeholders were involved in the process of identifying significant natural heritage features and areas; this was accomplished during multiple public meetings and kitchen table discussions through the Stratford Area Watershed Improvement Group.

This study was developed to serve as a guide to managing the area's natural heritage while maintaining environmental and economic sustainability. It is expected that this study will reflect the desires of Stratford; it will be, in essence, a living document designed to echo these needs and desires of the community and government as a whole.

2.0 STUDY AREA

The Town of Stratford, established in 1995, is located directly opposite Charlottetown on the Hillsborough River. The town of Stratford, once Southport, Bunbury, Cross

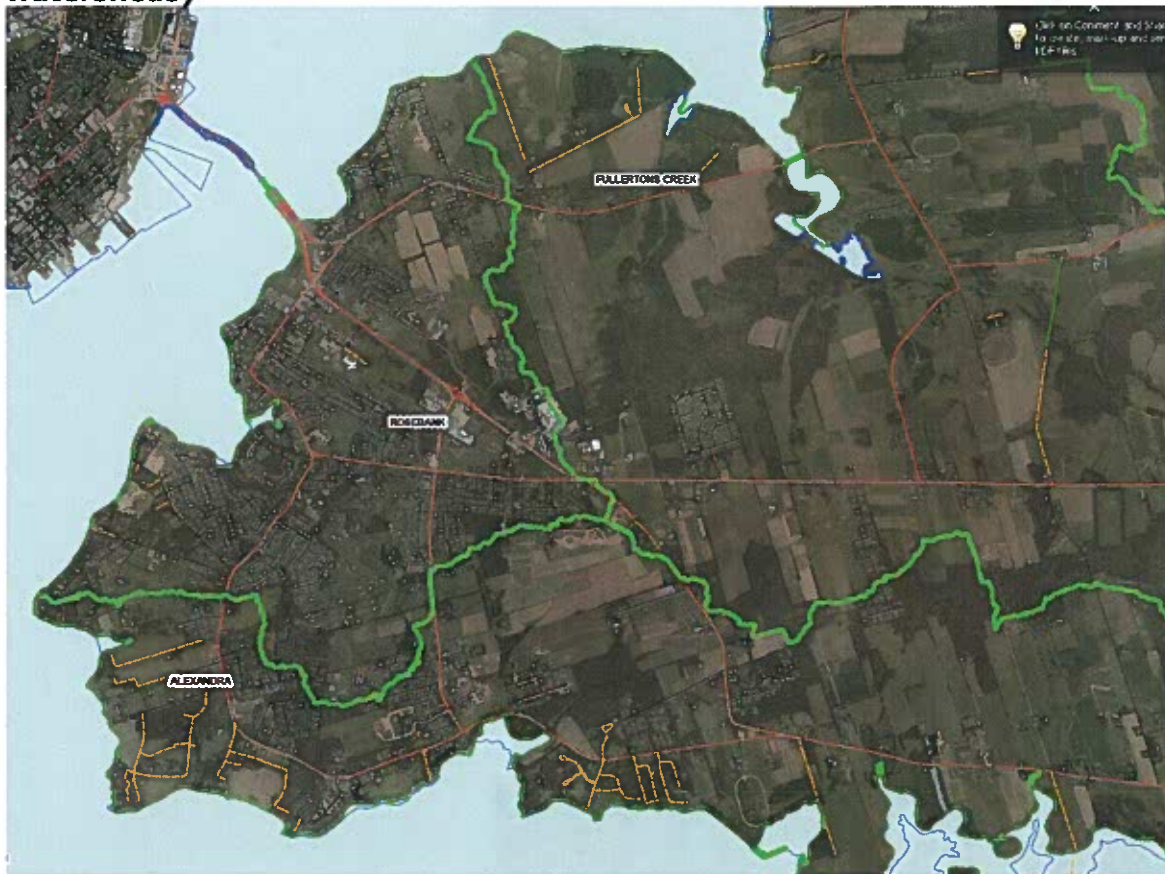
Roads, Keppoch-Kinlock and Battery Point, has a long and celebrated history; this dates back to the 1750's when several Acadian families settled in the Bunbury area. Although predominantly an agricultural region, other early activities relied heavily on Stratford's water resources, included ship building, brick making, a shingle mill and a dairy pasteurizing plant. Eventually, non-farm developments emerged in the vicinity of Ferry Point. The transportation and commercial focus of traffic changed with construction of the Hillsborough Bridge to a new location one kilometer northeast in 1905.

Figure 1 Town of Stratford



Topography and drainage is quite diverse. In the northern part of the Town the landscape is gently rolling with a poorly differentiated drainage system. The land falls generally from a high point on Mason Road north toward Fullerton's Marsh, west toward the Hillsborough River and south toward Stewarts Cove. There are no prominent streams in this area. The southern part of the Town has much more diverse topography and a well articulated drainage system with a number of streams and several prominent ravines. The most significant stream system is the Hatchery Pond system feeding into Stewarts Cove. Several other streams are evident in the Keppoch-Kinlock and Cross Roads areas feeding into Hillsborough Bay. The highest point of land is in Cable Heights in Cross Roads. A significant escarpment begins in the Keppoch-Kinlock area and runs for several miles to the east through Alexandra and Pownal. The shoreline is marked by prominent cliffs in the Keppoch area which become less pronounced to the north and east. A number of beaches are located along the shoreline, mostly at the mouths of streams and in coves.

Figure 2 Stratford (Alexandra, Rosebank and Fullerton's Creek sub-watersheds)



(DEEF, 2010)

The Town of Stratford was incorporated in 1995, and Stratford is now the fastest growing municipality on PEI, with an annual growth rate of approximately 2.5% and a population of more than 7000 persons (2009). The town is an assortment of agricultural land, forest stands, urban and commercial properties, and private residences. Stratford has become the third largest municipality; however, commercial and residential developments have affected water supply and quality, increased siltation levels and decreased woodland in the town and surrounding areas.

The following archived aerial photos demonstrate the level of development that occurred within the Pondsides region from 1935 to 2000:

Figure 3 Pondside Region, 1935



Figure 4 Pondsides Region, 2000



(Province of PEI, n.d.)

The Town of Stratford has seen many changes over the course of almost a century. What was once a rural and agriculture-based community is now dominated by a residential and commercial landscape. Stratford views the identification of its natural

heritage as a critical component of good planning and as a cornerstone of sustainable and healthy community development. The municipality also views the preservation of natural heritage as an investment in the maintenance of the green infrastructure that provides valuable ecosystem services.

3.0 METHODOLOGY AND TIMELINE

3.1 Target Zones

The present study's main target zones were identified by the Town of Stratford:

1. Acadian forest;
2. salt water wetlands;
3. freshwater wetlands and ponds;
4. natural landscape (including significant plant communities);
5. buffer zones;
6. coastal zones; and
7. high slope areas.

Significant natural heritage features within each of the main categories will be identified using historical data, and data collected from provincial/federal professionals and databases. The identification of natural features within the town will include, when applicable and attainable, the following information:

1. Location (description and GPS coordinates);
2. General description;
3. Map;
4. Photograph;
5. Protection and urgency rank;
6. Important and/or vulnerable species; and
7. Recommendations and strategies for preservation.

Any significant natural areas that are not currently included under the main target zones will be also be identified.

In accordance with the Terms of Reference, the first aspect of the Stratford Natural Heritage Study involved the preparation of a study that would identify natural heritage features and areas. This included the obtainment and interpretation of aerial photography and relevant maps of the Stratford area, identification of appropriate federal/provincial guidelines related to the protection and preservation of natural areas; criteria was developed based on acts and regulations. A literature search was completed of similar literature and studies in municipalities across Canada and eastern United States.

Secondly, an inventory of relevant sites was conducted; inventory consisted of the location of heritage sites via historical and recent maps, kitchen table discussions, and information gathered from forestry, environmental and wildlife experts. Field work was also completed to verify information gathered during the inventory. It should be noted that additions to the site inventory ought to be updated on a regular basis in order to reflect the increasing number of sites in need for protection and acquisition.

Finally, the approved final report will be made available to the general public during an information session hosted by the Town of Stratford. This report will be distributed to stakeholders throughout the Town and province, and the information base will be made available to partners and interested parties for use in the development of their own conservation programs.

3.2 Management/Protection Ranking

The following general values indicate the rating that best describes the urgency to manage one or more elements at the site. The management and protection action should not be confused with the need for legal action, but rather the need for acquisition, stewardship or overall enhancement by the Town and local residents.

Values for Management/Protection are:

VERY HIGH – Action essential immediately

HIGH – Action essential within 1-3 years

MEDIUM – Action essential within 5-10 years

LOW - Already under protection/management (continued management required)

NO THREAT - Not needed; no current or anticipated threats

3.3 Timeline

April-May:

Obtain aerial photography and relevant maps

Develop criteria based on federal and provincial guidelines

Commence inventory of sites

June-July:

Review, update and standardize information on natural features within the Stratford municipality; this phase of the report will be coordinated with Dr. Vahid Ghomoshchi to ensure the information gathered is presented in a satisfactory template.

Utilize expertise among various governmental departments and community organizations to verify and enrich data accumulated throughout the study

Compile results from field study and update ARCVIEW map accordingly

Develop comprehensive list of natural heritage sites and, if possible, obtain landowners' permission for use in future studies and natural heritage preservation actions

Develop a comprehensive list of parcel identification numbers for properties with considerable natural heritage features

August -September:

Ensure database is available to partners in various conservation programs

Complete the Natural Heritage Report and prepare for review and publication

Public meeting/workshop

Develop a natural heritage policy framework for the Town of Stratford

3.4 Current Legislation

3.4.1 Buffer Zones

Since 1999, buffer zones have been used across PEI to protect watercourses and wetlands. In 2008, changes were made to simplify the legislation: a standard 15 metres was designated for buffers, regardless of slope or location. For freshwater streams, the buffer is measured from the edge of the sediment bed. Wetland buffers are measured from the edge of the wetland vegetation.

"In buffer zones you need a permit to:

- Alter or disturb the ground or soil
- Dump any material or objects of any kind
- Remove soil or rocks
- Build, repair or remove structures or obstructions of any kind
- Operate vehicles or non-agricultural equipment
- Cut down live trees and shrubs" (DEEF, 2009)

Grassed headlands are required at the head of row crops such as potatoes; all rows that end within 200 metres of a watercourse or wetland must have 10 metres of grass established at least the year before the row crop is grown OR at the edge of the buffer zone.

3.4.2 Wetland Policy

The objective of the wetland policy of Prince Edward Island is to promote conservation and protection of the Island's wetlands and to sustain their functions for present and future generations. The following process is observed where developments are proposed:

- "Avoidance: Development proposals will avoid wetlands. In cases where wetlands would be infringed upon, wetlands will be avoided or alternate sites chosen.
- Minimization: In the rare case where, after all avoidance options are exhausted and impacts on the wetland are unavoidable, potential negative impacts on the wetland will be minimized to the extent possible.
- Compensation: The developer (proponent) will compensate for any loss of wetland area, function and value resulting from development." (DEEF, n.d.)

Securement and stewardship are seen as prominent tools for the Department of Environment, Energy and Forestry with regards to wetland protection, and private ownership is to be maintained when possible.

4.0 ACADIAN FOREST

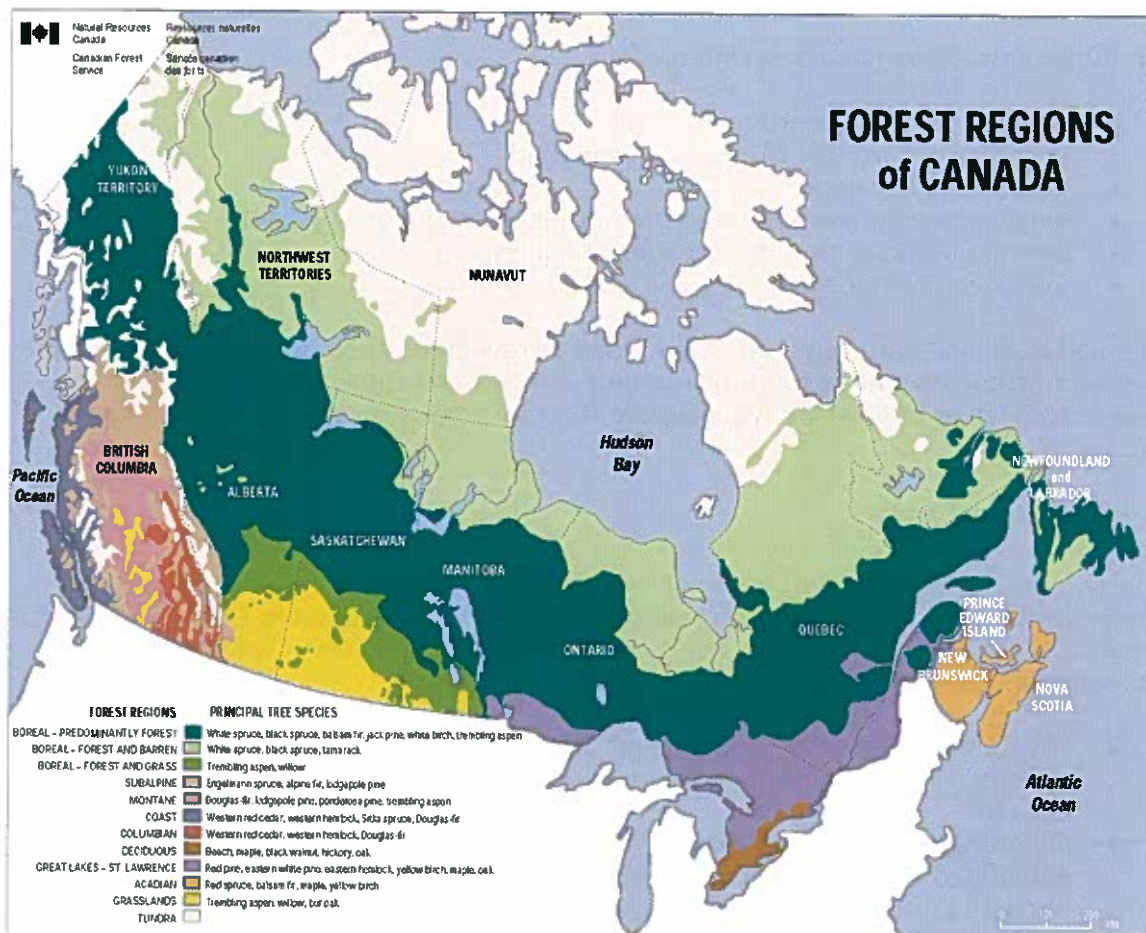
"The clearest way into the Universe is through a forest wilderness" John Muir

Prince Edward Island belongs to the Acadian Forest Region, a region that encompasses all of the Maritime Provinces, areas of southern Quebec, and the

northern New England states. This forest region is closely related to the Great Lakes - St. Lawrence forest and to a lesser extent, the Boreal Forest

"The presence of Red Spruce is characteristic but not exclusive to the Acadian Forest region, as well as Yellow Birch, Red oak, Sugar Maple, White and Red Pine, American Beech and Eastern Hemlock. In low land areas, Black Spruce, Larch and Red Maple are common. Other species of note are White Spruce, White Elm, White Ash, White and Grey Birch, Eastern White Cedar, as well as poplars (Macphail Woods, n.d.).

Figure 5 Forest Regions



If left unaltered, a stand of Acadian forest would be an uneven, multi-aged and diverse conglomeration of trees; the average age would be 150 years or older. There would be a large number of standing and fallen dead and dying trees in varying stages of decay. Natural regeneration would occur within gaps in the canopy. Overall, the system would be self sustaining and would provide invaluable habitat for old-growth dependent wildlife; this would include den animals, nesting birds, and lichens.

There are very few stands of old-growth Acadian forest on Prince Edward Island; extensive logging and agriculture have decreased the amount of virgin or near-virgin forest to small patches across the Island. Additionally, a challenge to the restoration of Acadian forest is that of locating stands that have not been previously disturbed. Stands with the best potential for restoration or preservation are those located on

unploughed land; it would take hundreds to thousands of years to achieve the same goal on an old field and may not be a practical endeavor (Macphail Woods, n.d.). Although there are still several forest remnants within the municipality, they are at risk from encroachment and development.

Small blocks of woodland have a difficult time maintaining ecological integrity, and most stands suffer from species-impooverishment. There is economic value in forest retention in an urban area. In a study completed by the city of Indianapolis, Indiana, the value of approximately 120,000 city trees was estimated at a value of almost \$1000 per tree; the grand total of all annual benefits (environmental and aesthetic) was averaged at \$5,800,000 (Purcell, n.d.). This small example demonstrates how trees are truly a capital asset, requiring significant consideration in overall planning and development.

Municipal bylaws should be developed to address woodland conservation, fill regulation and landscaping guidelines. Any effort to increase forest diversity and preservation is a 'band-aid' solution unless the governing body establishes strict guidelines for development and private landowners.

Stratford's remaining forested areas are slowly being seen as an important natural resource, and the town possesses the ability to enhance and protect its remaining stands. It is this enhancement planning that will determine the health and long-term success of the Acadian forest in Stratford. "There are as many approaches to managing woodlots as there are woodlot owners. Some may wish to promote as many high-value trees as possible, some may wish to focus on wildlife habitat, and some may wish to simply leave the forest alone to enjoy" (Simpson, 2008).

4.1 Pondside Park Woodland

The land for Pondside Park was slowly acquired from surrounding properties throughout the early-mid 20th century. The area was also used as a shale pit, as shown in a site survey dated 1965. The property became the

site of a government fish hatchery; in 1994, the Community of Southport acquired the property from the Province. The park is used by residents for a variety of recreational activities.

The 0.6 km forest stand that sits behind Pondside Park is an ideal area to catch a glimpse of Stratford forests of the past. Located on a steeply sloped area, it would not have been farmed or impacted by shale pit activities. There is a strong historical component to this region, with remnants of the pens used for fox farming still visible along the nature trail.

Figure 6 Beech Drops



This is one of few locations within the Stratford municipality containing Beech trees, an indicator species of an Acadian forest stand; this stand also contains rarer species such as witch hazel, eastern hemlock and beech drops. This has been deemed a 'gem' by residents of the Stratford area; the presence of a rudimentary nature trail allows locals and visitors alike to travel back to a time of pre-development and pre-urbanization.

Figure 7 Pondsides Park Woodland (satellite)



Figure 8 Pondside Park Woodland



Table 1 Pondside Park Woodland -- Location and General Description

Location and Description	46°12'50.18"N 63°05'40.84"W	Remnant Acadian Forest Stand
PID	865550, 329193, 919662	
Management/Protection Urgency Ranking	LOW	
Important/Vulnerable Species	Beech, Hemlock, White/Yellow Birch, Sugar Maple, Red Maple, White Spruce, White Pine, Buttercup, Beech Drops, Witch Hazel	

Recommendations: This woodland is owned by the municipality and private landowners, including Fox Meadows Golf and Country Club. Encouragingly, both the town and the golf course have expressed an interest in maintaining this stand and keeping disturbance to a minimum. Large-scale education will be necessary to inform landowners of the benefits of old-growth forest in their local environment.

There is an increase in mountain bike usage of this trail; bikers are now creating an ad-hoc trail system in addition to the original path. This is destroying the natural habitat and groundcover of the area, and disturbing what was originally a relatively undisturbed ravine. It is necessary to educate trail users on the fragility of nature; signage would assist the town and private landowners in educating those who are biking in the area.

Diversification planting has begun in this forest stand; the continuation of enhancement will allow the woodland to slowly revert back to Acadian Forest, and will invite wildlife to visit or inhabit the area. The Town should look into the possibility of funding an extensive reforestation project in this region. Additionally, as

the goal is to protect the ravine and species that lie within, a stewardship program that would voluntarily increase the buffer zone to more than the legislated 15m would be extremely beneficial in decreasing runoff and tree-cutting. The town and the watershed group could offer free trees and tree planting to private landowners along the trail and tributary systems.

4.2 Park Lane Woodland

This small 4 acre property is located between Spinnacker Drive and Park Lane off Keppoch Road. This area is moderately sloped, physically restricting residential or commercial development. This is a region classified as almost pristine woodland, with Beech trees untouched by beech canker, and wildflowers that would rival a rural forest stand. The presence of standing and fallen deadwood offers exceptional habitat for a variety of woodland animals; the spring-fed stream is also attractive to wildlife in the area.

Figure 9 Park Lane Woodland



Figure 10 Park Lane Woodland



Table 2 Park Lane Woodland – Location and General Description

Location and Description	46°11'49.65"N 63°05'58.01"W	Remnant Acadian Forest Stand
PID	681411	
Management/Protection Urgency Ranking	VERY HIGH	
Important/Vulnerable Species	Beech, Hemlock, Yellow Birch, Sugar Maple, Red Pine, Wild Violet, Bunchberry, Wild Lily-of-the-Valley, Starflower, Buttercup	

Recommendations: This is a town-owned property, where there is ample opportunity for preservation and enhancement. Public land is often left to be managed and maintained by the municipality, but as this property is surrounded by private landowners, a system of management and a stewardship program are highly recommended.

This area and its residents would benefit from a nature trail throughout this forest stand, and if the municipality would agree to leave this woodland as is, members of the community and watershed group could maintain the trail in the long-term. This would increase the value of the public land and greatly increase the community's knowledge of 'what's in their backyards'. Only when people know the value of nature do they make the effort to maintain and preserve it.

4.3 Stewart's Woodland Restoration Project

Protection of Stratford's forests and the preservation of local flora and fauna are the keys to conserving ecosystem biodiversity. For over 25 years, Clive Stewart has been actively involved in restoring the health of his forest stand. A long-time resident of the Stratford community, Clive has spent countless hours planting native species throughout a significant portion of his 60+ acres of land.

Clive has seen dramatic changes in local landscape over the years, and has been very concerned about the loss of virgin forest in Stratford. His woods are thriving, and boast a variety of wildlife in the midst of an ever-enlarging municipality.

Figure 11 Stewart's Woodland



Table 3 Stewart's Woodland – Location and General Description

Location and Description	46°12'03.86"N 63°04'22.47"W	Natural Heritage Site of High Biodiversity
PID	299099	
Management/Protection Urgency Ranking	LOW	
Important/Vulnerable Species	Red Oak, Yellow Birch, White Ash, Red Pine, Red Maple, Sugar Maple, White Pine, Buttercup, Bunchberry, Ground Hemlock	

Recommendations: Mr. Stewart has demonstrated a keen interest in enhancing and protecting this particular aspect of the local environment; with the creation of the trail system throughout this forest stand, he will allow local residents to view his legacy for years to come. Not only is he committed to increasing the biodiversity of the forest, but is creating a tool for environmental education and community stewardship. These trails are well-used within the community by neighbours and community groups interested in learning more about forests within Stratford.

Recommendations include the continued support of private landowners such as Mr. Stewart; this can include the donation of materials by the town or watershed group, and public recognition for stakeholder initiative. Environmental stewardship is a key tool in the long-term protection and enhancement of natural heritage on private and public land. Local landowners keenly interested in pursuing long-term enhancement such as Mr. Stewart should be both encouraged and rewarded for their endeavors.

5.0 SALTWATER WETLANDS

"Estuaries are a happy land, rich in the continent itself, stirred by the forces of nature like the soup of a French chef" Stanley A. Cain

Although surrounded by water and beautiful coastlines, salt marshes are rare ecosystems on PEI; covering only 1-2% of the Island. A major biodiversity target, they are scattered across the province in small pockets. There is salt marsh within the town's boundaries, limited to the base of Stewart's Cove, Kinlock Creek, Burke's Creek, and Henry's Creek tributaries (Griffin, 2009). Salt marshes are among some of the most productive places in the world, as nutrients from salt marshes are

Figure 12 Smooth Cordgrass



transported by the tides and provide a food source

for fish and shellfish. Migrating shorebirds also occupy these areas; they rich feeding grounds for species such as Canada Geese, Willet, Nelson's Sharp-tailed sparrow, and Spotted Sandpiper. Plants in a saltwater wetland have evolved mechanisms designed to cope with the influx of salt water, allowing several species to thrive in this tidal region; species can include Saltwater Cordgrass, Saltmarsh Bulrush, and Sweet Grass (Griffin, 2009). Salt

marshes are also habitat for several species of fish, including mudgudgeons and smelts.

Tidal flats can be seen in all salt marshes within the town. "Mudflats are the first stage of development of salt marshes. (They) are composed of very fine sediment and...can extend out from the non-grassy areas of marshes where there is a large supply of sediments" (FAO, 2010). Historically, these have been areas of refuse dumping, and large amounts of glass can still be seen, especially in Stewart's Cove salt marsh (Curley, 2011).

Salt marshes are beneficial to have in an urban area; every effort must be made to preserve these ecosystems for future generations of humans and wildlife. Changes at a municipal level are needed i.e. by-law creation to protect areas adjacent to salt marshes, and the development of new zoning regulations to prohibit development

around or on wetlands. Prince Edward Island has created a Wetland Policy (refer to this report's methodology) to regulate the use and development of all lands in proximity of wetlands and buffer zones, thus are taking a strong role in ensuring there is no net loss of wetlands within their town limits (Curley, 2011). However, the enforcement is lacking on the Island, and more are required to ensure the wetland policy is strictly followed. Additionally, there is a serious need to allow wetlands to migrate inland as sea level rise is having a dramatic effect on current salt marshes.

Figure 13 Stratford Salt Marshes (highlighted in pink)



(DEEF, 2010)

Wetlands in urban areas are under extreme stress, even though they are prized for their recreational value. PEI wetlands were often seen as wasteland, and were infilled for residential and commercial development and agricultural activities. When wetlands disappear, the benefits derived from them are lost. In urban areas, wetland removal can result in problems with increased runoff after storms because the wetlands are not there to soak up storm water; this is often seen within the Town of Stratford. Additionally, salt marsh maintenance is considered a means of providing one solution to coastal defense, which has become a serious concern along Stratford.

Historically, salt marshes were used to gather shellfish, but uses have grown to include recreational purposes, and remain vital ecosystems in need of preservation (Curley, 2011).

5.1 Stewart's Cove Salt Marsh

This 3.5 hectare salt/brackish marsh is located in a heavily populated residential area. The nearby beach and parks are well used by members of the community, and is in close proximity to Glen Stewart and Stratford Elementary schools. This is the foot of the Pondsides tributary system, which supplies the town with approximately 200,000 gallons of water per day (Ramsey, 2011).

Figure 14 Stewart's Salt Marsh



Figure 15 Salt Marsh and Tidal Flats



Table 4 Stewart's Cove Salt Marsh – Location and General Description

Location and Description	46°13'11.07"N 63°06'20.08"W	Salt and Brackish Marsh
PID	804310, 804302, 805317, 328906, 850107, 823039, 328922, 572115, 463877, 467209, 471193, 471235, 465856, 329201, 527879, 568923, 1013770, 566570	
Management/Protection Urgency Ranking	HIGH	
Important/Vulnerable Species	Blue Heron, Willet, <i>Polygonum ramosissimum</i> (rare)	

Recommendations: The development that surrounds this wetland has been virtually completed; however, public education and care will be necessary for the long-term preservation of these mudflats and salt marsh. The Town of Stratford currently owns the headwaters of the northern tributary; a partnership with the Stratford Area Watershed Improvement Group is highly recommended for future tree planting and headwater protection. Buffer zones should be replanted and, with permission, lengthened beyond the mandatory 15m. Even an expansion to 20m would greatly decrease the impact of runoff and siltation.

Additionally, any remaining undeveloped land should be acquisitioned by the Town, which would prevent any future development on that property. The purchased parcels of land could be enhanced and used as an educational model for residents. With such close proximity to educational institutions, this would be a model wetland to carry out field trips for students and parents alike.

5.2 Bellevue Cove Salt Marsh

This 10 hectare marsh is located on the southern side of the Stratford municipality, and is the entrance to the Kinlock Creek tributary system. This beautiful area is the salt marsh pinnacle in Stratford, and is home to a variety of flora and fauna not seen in nearby areas.

Figure 16 Bellevue Cove Salt Marsh



Figure 17 Bellevue Cove Salt Marsh and Mudflats



Table 5 Bellevue Cove Salt Marsh – Location and General Description

Location and Description	46°13'11.07"N 63°06'20.08"W	Salt and Brackish Marsh
PID	800268, 289389, 289926, 299479	
Management/Protection Urgency Ranking	VERY HIGH	
Important/Vulnerable Species	Blue Heron, Willet, Nelson's Sharp-tailed Sparrow	

Recommendations: This area is under immediate threat from continued development along Kinlock creek, which empties directly into Bellevue cove (Beacon Hill and Stonington subdivisions). With so few productive wetlands within the Town of Stratford, it is imperative that every effort be made to protect and preserve this salt marsh. The local watershed group, the Stratford Area Watershed Improvement Group, would be an ideal partner with the municipality in the acquisition and stewardship of Bellevue; this also presents an opportunity for community-based educational events, and community 'buy in' to the advantages of local conservation. Private landowners, when truly educated on the value of type of natural heritage, can be very strong advocates of conservation; additionally, they may be willing to sell or lease this land to the town to protect it from further development and degradation.

A wooded buffer zone along the edge of the wetland would assist in slowing any siltation into the creek and wetland from the developing subdivision. Additionally, the properties adjacent to the marsh could be acquired or managed by the Town of Stratford for a large buffer zone (in addition to the mandatory 15m). Land acquisition would also prevent any further development in the area. Nelson's Sharp-tailed sparrows nest in the grasses directly adjacent to wetlands; the destruction of

this habitat means the loss of the bird species in the area. Preservation of this type of habitat is essential.

5.3 Burke's Creek Salt Marsh

Burke's creek straddles the eastern border of the Stratford municipality; this 14 hectare salt marsh is located adjacent to the rifle range and Tea Hill Park, one of the most highly used parks within the Town. Although not currently under serious threat from development, this wetland is surrounded by current/retired agricultural land.

Figure 18 Burke's Salt Marsh



Table 6 Burke's Creek Salt Marsh – Location and General Description

Location and Description	46°11'31.21"N 63°03'13.06"W	Salt and Brackish Marsh
PID	289926, 299479, 800250, 800268, 289389	
Management/Protection Urgency Ranking	MEDIUM	
Important/Vulnerable Species	Blue Heron, Nelson's Sharp-Tailed Sparrow, Willet, mudgudgeons, smelts	

Recommendations: This salt marsh is the largest tract of wetland located within the Town of Stratford; for this reason, it is an essential component of the overall ecosystem, and should be allowed to flourish without influence or disturbance. As with the other wetlands in the area, the Town should consider purchasing as much land around the area as possible in order to expand the buffer zones and further

decrease the chance of degradation and human intrusion. These extended buffer zones could be extensively tree planted to provide additional stability and protection; this could be done by the Stratford Area Watershed Improvement Group or through various provincial programs.

Active farmland could be retired, and through the assistance of the town or watershed group, farmers could apply for reimbursement through the Department of Environment, Energy and Forestry's Alternative Land Use Services program (ALUS). ALUS activities eligible for payment include the establishment of native trees in buffer zones, expansion of buffer zones, establishment of non-regulated grassed headlands, the taking land out of production for soil conservation structures, and the retirement of high sloped land (PEI Department of Agriculture, 2010).

5.4 Henry's Creek Coastal Marsh

This 1.6 hectare wetland is a small salt marsh located to the north of Burge Lane, off Keppoch Road. The characteristics of this marsh changes with the alteration of the outlet (sand berm); it is for this reason that it may not be classified as a true salt marsh, but rather a coastal marsh or barrier beach pond. This area, although not heavily developed due to high-sloped land at the headlands of Henry's Creek, has nevertheless been altered by residential expansion. It is for this reason that protection from development and modification is essential.

Figure 19 Henry's Creek Coastal Marsh



Figure 20 Henry's Creek



Table 7 Henry's Creek Coastal Marsh – Location and General Description

Location and Description	46°12'19.84"N 63°07'11.43"W	Salt and Brackish Marsh
PID	482471, 1001510, 329672, 802272	
Management/Protection Urgency Ranking	HIGH	
Important/Vulnerable Species	Blue Heron, Willet	

Recommendations: The municipality owns the headwaters and part of the estuary of this tributary; this should remain undeveloped. If there are small tracts of land available for the town to purchase, it would be beneficial to do so. It is recommended that the entire surrounding buffer zone be diversified with native trees and shrubs in order to help reduce the risk of runoff from Keppoch Road, as well as to slow the movement of water and promote infiltration into the ground.

As with Burke's Creek, the ALUS program may be applicable to this region, with the presence of a large tract of agricultural land adjacent to the system.

This is an area in need of special consideration, with high sloped land at the head of the tributary and the presence of several homes in the vicinity; any stormwater systems should be re-examined in order to ensure that proper measures have been taken to avoid runoff into the creek and salt marsh. With the recent completion of the Stratford Stormwater Management Plan, this region should be considered a priority for upgrades and maintenance.

6.0 FRESHWATER WETLANDS/PONDS

"If there is magic on this planet, it is contained in water" Loran Eisely

At first glance, wetlands often do not appear to be significant or important; however, they provide vital habitat for a wide variety of plants and animals such as ducks, frogs, and cattails. Wetlands have many faces; they can range anywhere from a small roadside marsh to a large multi-hectare bog. A wetland is "any area of land that is regularly covered or soaked with water for part or all of the year" (DEEF, 1998).

Wetlands develop in low-lying areas, and are often found by rivers and streams. Although ponds and their marshy areas tend to be small in size, they are very productive ecosystems in need of protection and preservation and are sites rich in nutrients that are covered in water throughout the year. They are inhabited by cattails, rushes and pondweeds, and can easily be identified by these common aquatic plants. Swamps, fens and bogs were also found in abundance on Prince Edward Island, but have declined dramatically due to infilling and subsequent development.

Figure 21 Hatchery Pond



Most ponds on Prince Edward Island were impoundments made for commercial or recreational purposes; incredibly, approximately 250 ponds were created on waterways to power various types of mills such as grist (Curley, 2011). As man-made ponds can impact fish passage and water temperatures, most deteriorated ponds and dams will not be allowed to be repaired. Natural ponds; however, can contain a myriad of species, often contain rare plants, and

should be repaired, maintained and protected whenever possible.

It is evident wetlands provide both food and protection for many species of wildlife. Even with a shift to an urban environment, Stratford residents can still witness the daily activities of wood ducks, black ducks, muskrats, garter snakes, blackbirds, and blue herons. Wetlands not only feed and house adult fauna, but act as nurseries for the young of many species; "wetlands are safe places to start out life" (DEEF, 1998).

As with salt marshes, the single most serious threat to wetlands is that of land use. The draining or infilling of wetlands still occurs, regardless of the tightened legislation and increasing fines issued by the provincial government. Poor land use practices adjacent to wetlands can also have a severe impact on the area.

Figure 22 Freshwater Wetlands/Ponds (highlighted in blue)



Table 8 Freshwater Wetlands

Name	PID	Type	Size (Ha)	Management/Protection Urgency Ranking
Burke's Creek	299479, 800250, 289926	Freshwater Marsh	4.4	HIGH
Tea Hill	603274	Freshwater Marsh	0.6	MEDIUM
Kinlock Creek	289355, 1025865, 299503, 560722, 299099	Open Water	2	VERY HIGH
Jordon's Pond	566570, 529297, 1013770, 568923, 568923, 493767, 493775, 458034	Open Water	2.6	HIGH
Hatchery Pond	329193	Open Water	1.1	VERY HIGH
Moore's Pond	329045, 865550, 1017136, 1018571	Open Water	1.2	HIGH

Stratford Rd/Kinlock Rd	329060, 613299	Freshwater Marsh	0.8	VERY HIGH
Jenkins Pond	289637, 528174	Open Water	0.4	MEDIUM
Duffy Rd*	190074, 190124	Open Water	7.2	HIGH
Trans Canada Highway	190090, 328039	Freshwater Marsh		HIGH
Fullerton's Creek (federal)*	000000	Freshwater Marsh	20.4	HIGH

*Please note, part or all of these wetlands are currently located just outside of the municipal border; however, due to their significant size and biological productiveness, they were included in this list

Figure 23 Freshwater Wetlands and Ponds





Effects of development and climate change are visually evident in ponds and streams. Siltation, increases in temperature, and declining biodiversity have all been witnessed by Stratford residents and experts alike. Anoxic events, identified by greenish discolouration of water, little or no dissolved oxygen in the water, and a strong 'rotten egg' smell, are becoming more common on Prince Edward Island (Province of PEI, 2008).

When wetlands are lost or their functions compromised, the natural ability to filter and purify runoff is decreased; the loss of wildlife habitat and the decline of carbon sequestration impacts all who dwell within the ecosystem.

Recommendations: According to the Nature Conservancy's *PEI Coastal and Forest Natural Area Conservation Plan* (2009), silt from agriculture and development imperils wetlands and ponds, except in areas heavily forested or those located in remote locations. While properties in the vicinity of freshwater ponds on PEI are not in as high demand as those along the coast, they are becoming more popular. This demonstrates the importance of planting grasses, trees and shrubs in areas adjacent to freshwater wetlands. An extensive Master Planting Plan for all properties listed is essential for long-term wetland stability and resistance from surrounding activities.

At present, the province allows wetland infilling (under permit), although fines will be issued when infilling occurs. Unfortunately, there have been cases within the Town of Stratford where it was more profitable to pay the heavy fine and continue development. This should not be allowed to persist, as large developers and agriculturalists may simply choose to pay rather than re-devise or re-locate a subdivision or farmland. *Wetland avoidance* (development designed to avoid wetlands entirely) should always be the only acceptable procedure in the Town of Stratford, and should be much more emphasized. The town's planning department should implement zoning designations for wetlands (both salt and fresh), thus allowing developers to avoid wetland areas completely. The concept of cluster developments is that, in exchange for open/green space, development is permitted

on smaller lots that under conventional zoning (WSDE, 1988). This type of development should be encouraged within the town.

"A new informal method of land use planning has started with the community watershed improvement groups" (Griffin, 2009). The local watershed group serves to re-forest and protect vulnerable areas within the town limits; continued support for the group will only benefit the community and its freshwater systems. Education goes hand in hand with these recommendations, and an educational field day designed to help the community understand different classifications of wetlands would go a long way in realizing the important part they play in the environment.

6.1 Freshwater Springs

Most natural streams and ponds begin as springs, "where groundwater flows upward through fractured bedrock and begins to flow...." (DEEF, 2006). Springs are located throughout Island watersheds, feeding streams, rivers, ponds, wetlands and lakes. Springs are vital sources of freshwater, and are habitat hotspots for fish, birds and various other types of wildlife. The water temperature is often relatively constant, ranging from 8-10°C; this is a cool refuge for fish in the summer, and a warm place to reside during the long winter months.

Figure 24 Freshwater Spring, Stratford (Alexandra Rd)



Recommendations: There are several significant springs in Stratford, notably on private property located adjacent to Fullerton's Creek South, and along the Burke's Creek Salt Marsh. Springs, although located across PEI, are not always visible. Those that are visually apparent are especially important in an area of declining water quality and quantity. During the Stratford Area watershed group's Buffer Zone Assessment, several natural springs were identified

and logged. As with the need to design and zone wetland areas for protection, so should there be protected zoning designated for noteworthy springs.

7.0 NATURAL LANDSCAPES

"I am not a lover of lawns. Rather would I see daisies in their thousands...than the too-well-tended lawn"
W.H. Hudson

The Town boasts a variety of natural landscapes; this includes high sloped areas, Acadian Forest woodland and unploughed forest stands, salt and freshwater marshes, ponds, tributaries, and beaches. With such a diverse amalgamation of scenery, there is a wide assortment of natural heritage within its 5200 acres; much of this heritage is at risk from development, encroachment, and/or climate change.

Residents on Prince Edward Island have a very strong association with land and water, and “generally exhibit an acute sense of place” (Novaczek *et al.*, n.d.). There are many aspects of one’s community that are important to them, from sites for gatherings to areas with particularly beautiful views. The identification and protection of these natural landscapes in Stratford is vital for the well being of the community itself.

Figure 25 Pondside Park is a valued area in Stratford



Nature cannot be ‘faked’.

Although people in urban areas will seek out nature in any form that is available to them, they are able to differentiate between a natural landscape and one that has been fabricated. Allowing for areas to remain green and relatively undisturbed will give a greater sense of health and happiness to the community. More and more towns and cities are looking at ecological solutions to maintain a sense of well being of their constituents. In

fact, it has been noted that people who have access to nature are healthier overall than those who do not (Maller *et al.*, 2005).

Because Stratford has a variety of landscapes, and often together in one setting, there are several ways to view and enjoy them if permitted by public and private landowners.

7.1 Trails

Trails are an ideal way to view natural landscapes with minimal intrusion and alteration to the environment. Trails provide a variety of environmental benefits; trails and greenways help improve air and water quality, and when properly constructed can help minimize erosion and filter pollution cause by development and road runoff.

Figure 26 Pondside Trail

The Stratford Trail is a great way to enjoy the town of Stratford, and to connect various places in the town; however, there is a need for nature trails towards the health of the community and ecosystem. Pondside Park is an example of a rudimentary trail, designed to immerse a pedestrian in nature and to view old growth trees and many forms of wildlife. More trails of this type are needed in Stratford. This allows residents and visitors to truly witness natural landscapes in Stratford.



Recommendations: Clive Stewart, private landowner, has created a vast network of private nature trails throughout his forest stand. This type of stewardship and trail

care should be encouraged by the town; funding from the municipality would serve as an incentive for private landowners with a large tract of land to develop a trail system for use by the local community. The Stratford Area Watershed Improvement Group could also be available to help with maintenance and litter control.

Keppoch Estates Limited (KEL) has a remnant trail surrounding the 'Pollywog Pond' and old tributary system. There is interest within the community to resurrect the trail and allow the community to view nature in amongst growing subdivisions and infrastructure. The watershed group has offered to manage this project, should the KEL board agree to proceed with trail development.

7.2 Lookouts

Lookouts are a minimally invasive way to safely view natural landscape. These are used throughout the province; a key example is that of Cavendish Provincial Park. It

Figure 27 Simple lookout over water



would allow residents and tourists to witness the stunning views of the Hillsborough Bay and Northumberland Strait. There are several locations within Stratford where lookouts could be constructed to view woodland stands, wetlands, ponds and coastlines.

Table 9 Natural Landscape – Example of Locations for Lookouts

Location	PID	Private/Public	GPS	Type of Lookout
End of Spruce Lane	Old Roadway	Public	46°12'00.35"N 63°07'02.57"W	Coastal
Pondside Park	329193	Public	46°12'55.89"N 63°06'02.81"W	Pond*
Bellevue Cove	800268, 289389, 289926, 299479	Private/Public	46°13'11.07"N 63°06'20.08"W	Woodland Salt Marsh
Jenkins Pond	289637, 528174	Private	46°12'55.10"N 63°03'03.89"W	Pond

*Please note: there is an existing old dock at Hatchery Pond; this could be removed to make way for a larger and more stable lookout

Recommendations: As lookouts provide wonderful views, and the mere sight of nature is therapeutic to those in both urban and rural settings, construction in any number of locations throughout Stratford would be beneficial to the community. Any private property should be acquired by the Town of Stratford, or a partnership or

financial incentive established with private landowners to maintain a long-term lookout. For the publicly owned properties, funding should be built into the municipal budget to design, implement and maintain structures.

Overall Recommendations: Community leaders and governing bodies must understand the importance of the value placed on places and 'things' in order to develop appropriate adaptation strategies. The first step is to go out into the community and recognize the areas that residents feel strongly about and would like to see protected for present and future generations. The Social and Cultural Values Mapping project, a four year project implemented by the UPEI Institute of Island Studies, will seek to approach Stratford residents to identify valued areas. This project is extremely important, as the community members themselves will be the force guiding the municipality towards the acquisition, rezoning and/or protection of parcels of land. "In other words, they will be making a contribution to the resilience and long-term social well-being of their communities" (Novaczek, n.d.).

Attaining adequate information from landowners and the general community is a time intensive activity. In order to determine what natural heritage 'matters to Stratford', it will require extensive discussion among residents and visitors alike. Due to the necessity of continuous community input, this will be an ongoing section of the Stratford Natural Heritage Study.

8.0 BUFFER/RIPARIAN ZONES

"He who plants a tree plants a hope" Lucy Larcom

Buffer zones are transitional areas that occur between uplands and wetlands, streams or rivers; this region acts as a natural filter for surface water. Buffers occur in a wide variety of forms, including grassy or shrub buffers, grassed waterways and forested riparian areas. Buffers, when large and properly maintained, also provide vital habitat for plants and animals. These areas are prime candidates for increased biodiversity planting, which brings a wider range of flora and fauna to the region.

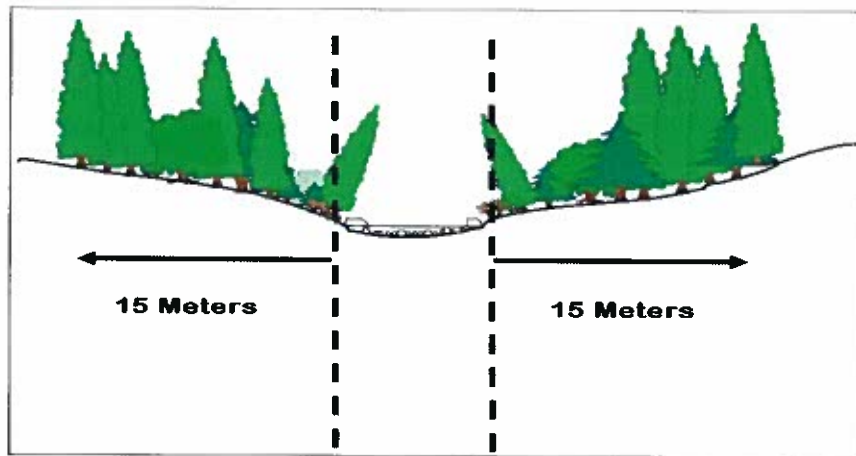
Buffer zones are also beneficial for soil loss by wind and water erosion. "Sedimentation has been an ongoing issue on Prince Edward Island, and sediment is a leading contaminant in local watercourses... In agricultural areas, erosion can introduce sediments into the water. Buffer zones provide a layer of protection against these intrusions into the Island's waterways" (SAWIG WMP, 2011). When properly maintained, buffers can remove up to 97% of sediments that enter the system

In addition to soil erosion reduction, buffer zones slow the movement of pesticides, phosphorous and nitrogen into waterways and wetlands. By slowing stormwater discharge and water from severe storm events, buffer zones allow water to infiltrate the ground, thus recharging groundwater. In a municipality where water resources are becoming an issue and new wellfields are being proposed, increased groundwater recharge is tremendously important (SAI Platform, 2010).

One Prince Edward Island, provincial regulations state that *"no person shall, without a license or a Buffer Zone Activity Permit, and other than in accordance with the conditions thereof, engage in or cause or permit the engaging in any of the following*

activities within 15 metres of a watercourse boundary or a wetland boundary" (DEEF, 2008).

Figure 28 Buffer Zone Protection on PEI



There is a large number of ponds and streams where mandatory buffer zones are in place; according to the Stratford Area Watershed Improvement Group, there is approximately 32 kilometers of buffer in Stratford and adjacent areas. This demonstrates the need for significant protection measures to ensure these valuable strips of land continue to provide natural benefits to the watercourse, wetlands and the community. In those areas not treed, cooperative tree planting plans could be implemented within the municipality.

Although residents are slowly becoming aware of the necessity of buffer zones, there are many challenges associated with the long-term maintenance of these areas. Lack of buffer zone incentive programmes, poor implementation of public education, and private ownership are roadblocks to buffer zone adoption. Additionally, lack of municipal by-laws and enforcement on both municipal and provincial levels can seriously impede riparian sustainability. According to a report released by the Government of British Columbia, encroachment pressures are so significant that almost 50% of the buffers in one wetland area were so altered they no longer served to protect the wetland itself. The same report noted that 100% of the buffers were converted to some degree into lawn or turf (Government of British Columbia, 2005).

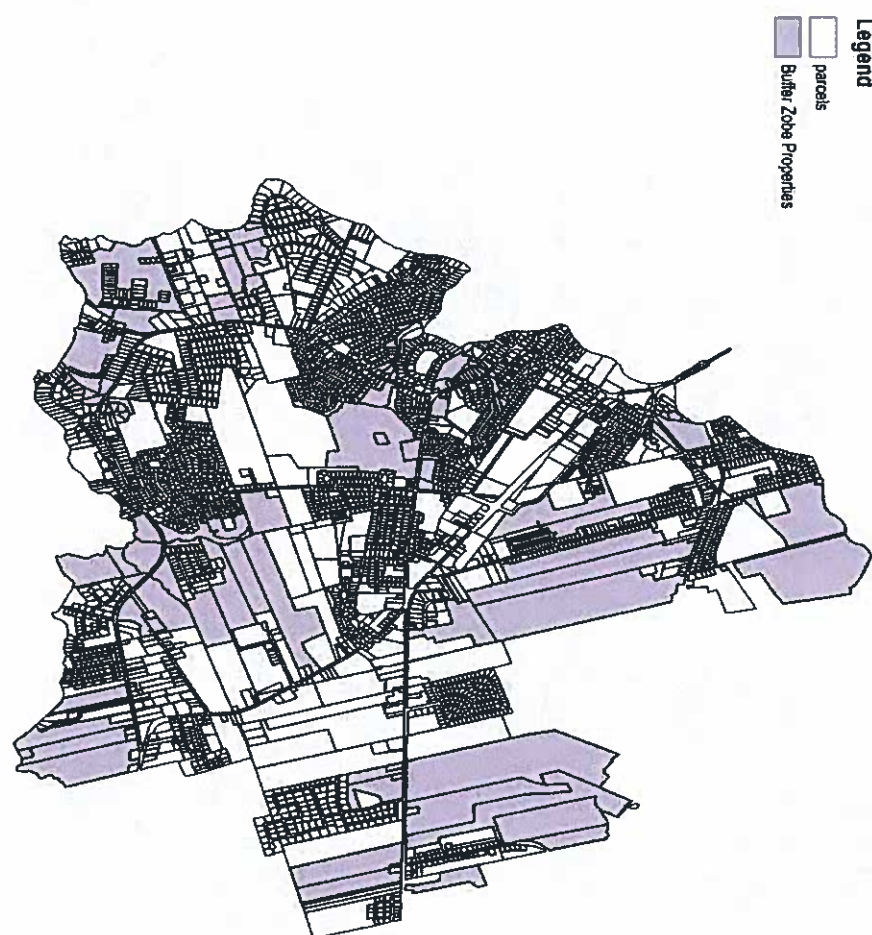
Trees, shrubs and grasses all provide benefits when planted in a buffer zone; however, they are effective in different ways, and it is important to examine each area individually when planning to enhance and diversify a buffer. Riparians are most effective "when they include a native grass...along with deep rooted trees and shrubs along the stream, (swale, pond, or coastline)" (SAI Platform, 2010).

The following is a table outlining the benefits associated with various types of vegetation:

Table 10 Efficiency of Different Vegetation Types (modified from SAI Platform, 2010)

Benefit	Vegetation Type		
	Grass	Shrub	Tree
Stabilize bank erosion	low	high	high
Filter nutrients and contaminants	high	low	low
Beneficial to aquatic life	low	medium	high
Enhance wildlife	low	medium	high
Aesthetics	low	medium	high
Flood/Severe weather event protection	low	medium	high

Figure 29 Properties Enclosing Buffer Zones within the Town of Stratford



Town of Stratford
July 2011

*Please note: buffer zone designations were assigned using physical maps; they are to a small degree subjective, and will be updated accordingly

The above map demonstrates the large number of properties located adjacent to streams, ponds, marshes and wetlands within the town boundaries. It is these parcels of land that should have extensive tree planting along their buffer zones; landowners can now find out from the Planning Department whether their property includes a buffer/riparian zone.

Figure 30 Buffer Zones of Stratford



Recommendations: With such a significant land area assigned to buffers within Stratford, there is great potential for the town to implement riparian zone education

and preservation. The Stratford government is in a position to develop and pass by-laws that would augment existing buffer zone legislation.

There is ample opportunity for the Town to serve as a model jurisdiction, with enforceable regulations that would reinforce provincial legislation. It should be the intention of the council, through the use of by-laws, to establish requirements for additional setbacks from areas deemed to be environmentally sensitive. A continued partnership between the Town of Stratford and the Stratford Area Watershed

Figure 31 Illegal Buffer Zone Practices in Stratford



Improvement Group will inevitably result in extensive long-term enhancement and diversification planting within the region's buffer zones. There is considerable knowledge and expertise within the Stratford watershed group, and all employees within the Planning Department, Public Works & Utility, and the

Recreation Department should inform the watershed group when an application for development or land alteration is submitted. The watershed group has identified and listed all buffer zone properties for anticipated future consultation and advisement.

Key parcels of land located within the 15m buffer zone, determined to be of ecological significance, should be acquired by the Town of Stratford for protection from development and alteration. As this would be a long-term project and investment, these areas would be identified by a combination of the municipality, the watershed group and the province of Prince Edward Island. Other methods of protection are possible, such as covenants and stewardship programs. These tools each possess their own set of values; for example, private stewardship allows the private landowner to retain his/her own property, but is not made available to the public unless expressly permitted.

Planting incentives, tax breaks, public activities, and free tree programs, sponsored by the town and watershed, will also aid in enrichment.

9.0 COASTAL ZONE

"Even the upper end of the river believes in the ocean." William Stafford

The Stratford/Hillsborough coast is very diverse, with sandstone cliffs, bluffs, salt marshes, sandstone outcrops and brackish ponds. As an Island, P.E.I. is especially vulnerable to the effects of coastal actions. Not only is P.E.I. located between two active straits, but it is composed almost entirely of sandstone, making it especially susceptible to erosion. Several processes are present at the coast, including wave, wind and

Figure 32 Erosion in Stratford



tidal action. These all significantly contribute to erosion, and carry away debris for deposition in another location.

In addition to the natural processes altering PEI's coastal region, climate change is having an increasingly evident effect on Stratford's coastline. Predictions of climate change directly relevant to this environment include:

- 1) Sea Level Rise – Global sea level rise, 17cm in the 20th century, is expected to reach 18-59cm in the 21st century. This is a clear example of the changes in sea levels, and expresses the urgent need for coastal communities to prepare for this occurrence.

Figure 33 Hurricane Hannah (2008)



- 2) Less Ice Cover During Winter Season – Although a specific

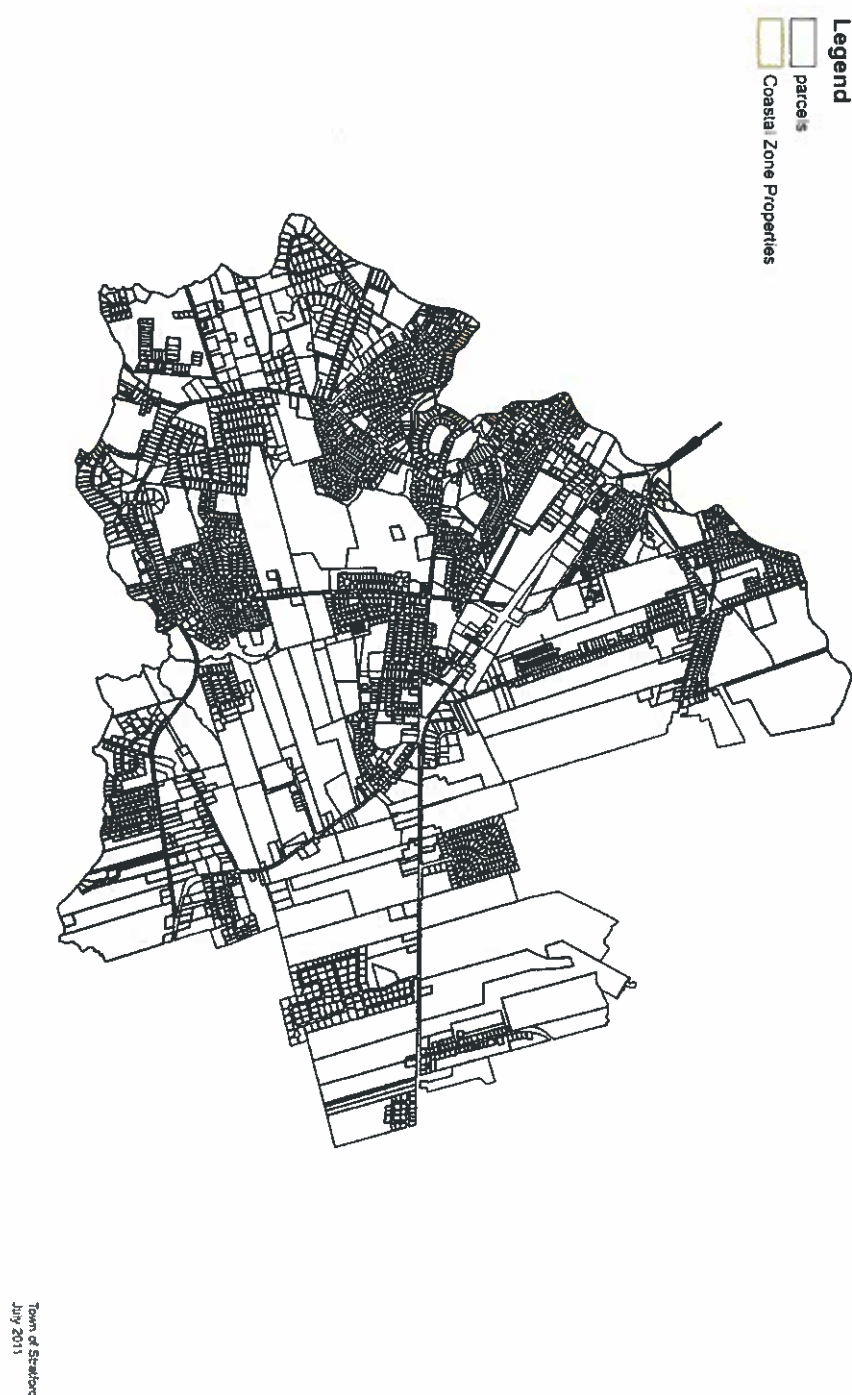
trend has not been calculated, anecdotal evidence and personal

communication with members of the community have all pointed to less ice cover during the winter months.

- 3) Increase in Frequency and Intensity of Storms – Recent hurricanes, storm surges and winter storms are becoming more frequent and extreme. This is having a dramatic effect on both coastal and inland regions of Stratford. 2008's Hurricane Hannah demonstrated the need for infrastructure upgrades.

These changes all result in "higher rates of retreat of cliffs and bluffs, landward migration and/or submersion of salt marshes..." (O'Carroll, 2010). According to the monitoring taking place at Tea Hill Park through the provincial government, the erosion rate of the shoreline ranged from 0.2-0.70metres/year; since the measurements began in 1984, the shore retreated over 13 metres. This represents a significant loss of coastal land in Stratford. Local residents are seeing their properties being slowly eroded away, and the municipality has much public infrastructure in close proximity to the shore; this includes streets, wells, stormwater and wastewater systems.

Figure 34 Properties Located Adjacent to Coastal Zone



Recommendations: vulnerability, risk and priority assessment for climate change adaptation has already begun with the Coastal Erosion and Shoreline Classification Project (2010), as well as the Climate Change Municipal Adaptation Plan (2010). These are well-written and comprehensive documents aimed at beginning the

process of municipal adaptation in anticipation of increasing effects of climate change. As the coastline is the primary area affected by climate change processes, it is only prudent that these documents are actively used for future planning and implementation within the municipality.

As the coastal region of Stratford is highly populated, there is potential for much damage to residential dwellings and infrastructure. The municipal government must begin to impose stronger limitations to growth within the coastal zone; this can be accomplished by developing additional setbacks from coastal and low-lying areas. As recommended by the Climate Change Municipal Adaptation Plan (2010) it is recommended that the town

“examine the zoning map and determine if there are opportunities to work with landowners (to) rezone residential or commercial properties for conservation if it appears they will be ...threatened by coastal erosion or sea level rise and storm surge”.

It is advantageous to both landowner and municipality when little to no further development occurs in these regions, as the cost to repair/replace infrastructure in areas of coastal erosion and sea level rise is high. Avoidance, in lieu of mitigation, is a much more efficient long-term economic goal.

As with the buffer zone portion of this study, communication and partnership with the watershed group when an application for development or land alteration should be encouraged when an application for development or land alteration is submitted for the coastal zone properties. The watershed group has identified and listed all coastal zone properties for anticipated future consultation and advisement. As the watershed group works closely with the municipality and the Department of Environment, Energy and Forestry, they can serve as both an advisory board and liaison between the town and government. Additionally, as seen in watershed groups across the Island, residents often are often willing to listen to a local non-profit organization with regards to restoration and environmental stewardship.

10.0 HIGH SLOPED AREAS

“In the end, we will conserve only what we love, we will love only what we understand, and we will understand only what we are taught.” Baba Dioum

Stratford is situated among several tracts of high-sloped land. With homes and gardens nestled within these areas, it is a stunning testament to Islanders’ ability to develop on a variety of landscapes. Historically, significantly less agriculture and development have occurred on these slopes, allowing flora to persevere and remain relatively intact until the late 20th century and early 21st century; encroachment and the allure of panoramic views have led to some degradation of these slopes. However, if one feels motivated to maneuver through woods and hills, one can still view parcels of beautiful cliffs, rocky escarpments, high hills and large old growth trees within the municipal boundaries.

Figure 35 High Sloped Areas in Stratford and Adjacent Areas



Recommendations: With a number of properties located on steep sloped areas, it would be prudent to develop municipal guidelines and regulations regarding development. The government of Utah prohibits development within 50 feet of very steep slopes, and Stratford could similarly disallow develop on slopes exceeding 9%. Additionally, retaining walls should be erected and stabilized using materials with sufficient capability to withstand extreme weather events; landscapers and homeowners must commit to landscaping and revegetating exposed slopes. No bare soil should be allowed to be exposed, and the use of silt fencing must be mandatory to prevent siltation, erosion and runoff into adjacent properties, watercourses or wetlands.

It is strongly advised that further development on high sloped coastal areas be strongly discouraged. With the ever increasing threat of climate change and more aggressive coastal processes, it is no longer feasible to disturb these areas for development that may not be sustainable in the long-term. Erosion is occurring more frequently, and present methods of coastal protection are not sufficient to prevent erosion and slumping. A forestry professional would be available to the Town of Stratford to develop Forest Management Plans for high sloped areas. Additionally, Forest Enhancement Plans are also available to the public at very little cost to the landowner; Stratford could arrange to have these plans for both municipal and

private property; part of the annual budget should be allotted to tree planting in sensitive areas prone to erosion.

As very little high sloped land is owned by the Town of Stratford, it is recommended that as many headlands as possible be purchased from private landowners or real estate corporations. The determination and assessment of potential sites can be conducted in partnership with the Stratford Area Watershed Improvement Group and the PEI Department of Environment, Energy and Forestry.

11.0 CONCLUSION AND VISION

"A true conservationist is a man who knows that the world is not given by his fathers but borrowed from his children" Audobon

The challenges planners and policymakers face in managing urban growth and protecting open space in the 21st century are daunting. However, the completion of the Stratford Natural Heritage Study will provide the necessary tools for the municipality to make informed decisions on the enhancement and protection of the natural environment. Suggestions for official planning and future by-law development are provided in this report for the consideration by Stratford as part of their implementation process.

The notion of 'conservation zoning' is one that is being utilized by jurisdictions such as the Halifax Regional Municipality, where environmentally sensitive areas are protected through the municipality. Although there have been no specific scientific

Figure 36 Steps Towards Protection in Stratford



studies which identify areas within Stratford, anecdotal evidence, provincial maps/records,

fieldwork, and ongoing personal communication are more than sufficient to establish some primary locations for acquisition, conservation and permanent protection.

The purchase of land by the governing agency is one mechanism which provides some long-term protection; unfortunately, this is not an option for all natural heritage within Stratford. "It is necessary, therefore, to find other ways to preserve these areas while they remain in private ownership. Protection through private land stewardship initiatives offers an alternative to public acquisition" (HRM, 1996).

This study is not solely about land use planning; stewardship, education, and restoration of impaired habitats are vital components of the long-term commitment to the natural environment. Stratford is encouraged to work with other government and non-profit organizations and the community to identify and undertake stewardship and restoration projects. Ongoing data collection, monitoring and implementation will be imperative in order to ensure the success of a natural heritage strategy.

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APPENDIX A:

GLOSSARY OF TERMS

Acadian Forest - presence of Red Spruce is characteristic but not exclusive to the Acadian Forest region, as well as Yellow Birch, Red oak, Sugar Maple, White and Red Pine, American Beech and Eastern Hemlock. In low land areas, Black Spruce, Larch and Red Maple are common. Other species of note are White Spruce, White Elm, White Ash, White and Grey Birch, Eastern White Cedar, as well as poplars

Alternative Land Use Services (ALUS) - a voluntary program for PEI landowners and farmers. This program helps to reduce soil erosion and siltation of streams, improve water quality, and improve and increase wildlife habitat

Anoxic - conditions in a body of water where oxygen levels are low or absent. Such conditions are detrimental to most forms of aquatic life

Avoidance - The prevention of impacts on wetlands, either by choosing an alternate project, alternate design or alternate site for development

Biodiversity - variety of all forms of life, from genes to species, through to the broad scale of ecosystems

Buffer Zone - 15 meter strip of land adjacent to watercourses, coastlines and wetlands primarily aimed at maintaining good water quality, controlling erosion, or providing wildlife habitat

Coastal Zone - A coastal zone is the interface between the land and water

Compensation - Action taken as a last resort in the sequence of wetland mitigation, and consists of measures taken to offset losses of wetland, and wetland function and values which remain after all possible minimization measures have been applied. It consists of wetland creation, reconstruction, restoration or replacement

Ecosystem - system formed by the interaction of a community of organisms with their environment

Erosion - Erosion is a natural process that causes a gradual wearing away of land surfaces by water, ice and wind

Estuary - are where fresh water from rivers meets and mingles with salt water from oceans and are among the most biologically productive ecosystems on Earth

Dissolved Oxygen - measure of the amount of oxygen that is dissolved or carried in water

Forest Enhancement Program - Provincial program designed to make landowners aware of the potential of their forest land through the development of a forest management plan. Wildlife, recreation, biodiversity are all increased through this program

Groundwater - water located beneath the ground surface in soil pore spaces and in the fractures of rock formations

Headwater - A tributary stream of a river close to or forming part of its source

Hedgerow – rows (often linear) of trees or shrubs designed to act as a windbreak or ground/bank stabilizer

Minimization – The reduction of adverse effects of development on the function and values of wetlands, at all project stages including planning, design, implementation and monitoring to the smallest practical degree

Mitigation – A process for achieving wetland conservation through the application of a hierarchical progression of alternatives to the adverse effects of development, which include avoidance, minimization and compensation

Restoration – conducted by summer staff and volunteers in the watercourses within the watershed

Sea Level Rise – The continued rise of the world's oceans, potentially impacting global populations and marine environments

Sediment (siltation) – loose clay, sand and silt that settle at the bottom of a body of water. Sediment can come from soil erosion or the decomposition of plants and animals. The primary concern of most watershed groups on PEI

Stratford Area Watershed Improvement Group (SAWIG) – watershed group consisting of Rosebank, Fullerton's Marsh and Alexandra sub-watersheds. This group, formed in 2008, aim to improve the quality and quantity of water within the watershed boundaries; activities can include tree planting, stream restoration, and public education

Tributary – a stream or river that flows into a larger (parent) stream or river. The larger parent stream will eventually empty into the ocean or sea

Watershed – all land on PEI can be divided into areas call watersheds. Each watershed consists of all the land that surface water and groundwater flows over or through to get to a particular river or stream. Watershed boundaries are high points of land where water flows into distinct waterways at lower elevations

Wetland - Wetlands are areas that are permanently or temporarily submerged in water - such as marshes, swamps, and bogs

