FIVE YEAR PLAN FOR THE
IMPLEMENTATION OF THE
NORTH AMERICAN WATERFOWL MANAGEMENT PLAN
IN
PRINCE EDWARD ISLAND

September 7, 2008

PEI-EHJV PARTNERS

Introduction

The North American Waterfowl Management Plan (NAWMP) was signed by Canada and the United States in 1986, and expanded to include Mexico in 1994. The plan pursued a partnership approach to international conservation with goals to conserve wetland and associated upland habitats for waterfowl. The Plan's continental approach to conservation was implemented through regional and species joint ventures.

The Eastern Habitat Joint Venture (EHJV) was formed in 1988 and was officially implemented in 1989 at the Wildlife Ministers' Council. The EHJV covers the geographical jurisdictions of Canada's six eastern provinces (Ontario, Quebec, New Brunswick, Nova Scotia, Prince Edward Island, and Newfoundland and Labrador.)

The original purpose of the EHJV was to secure the waterfowl resources of eastern Canada by maintaining and enhancing the quantity and quality of wetland habitat through direct and indirect programs aimed at securing, enhancing and restoring valuable wetland habitat.

The 2005 EHJV Assessment Report outlined the major accomplishments of the EHJV including significant gains in wetland and associated upland habitat conservation delivered by the EHJV partners since the inception of NAWMP. In Prince Edward Island, the EHJV partnership continues to grow and now includes Wildlife Habitat Canada, Ducks Unlimited Canada, the Nature Conservancy of Canada, the Canadian Wildlife Service, the Prince Edward Island Department of Environment, Energy and Forestry, and numerous community-based conservation groups, corporations and individual landowners. These partners have secured in excess of 1,750 hectares of wetland habitat, enhanced 500 hectares of small wetland since 1991 and currently manage 1,575 hectares of large wetlands. Just as important, the PEI-EHJV has assisted in an increased public awareness and acceptance of the value of wetlands not only as waterfowl and wildlife habitat but also for their ecological significance.

Despite the successes of the EHJV in Prince Edward Island over the past 15 years, a number of challenges for wetland habitat conservation remain. The Prince Edward Island EHJV partnership is

well positioned to address these challenges in the future through the cooperative delivery of landscape directed programs that are based on a strong scientific foundation.

The following plan outlines Prince Edward Island's approach for the next five years (2008-2012) of NAWMP implementation in Canada.

Habitats

Prince Edward Island is a productive agricultural area located in the Gulf of St Lawrence. Productive coastal marshes occur along the bays and estuaries that bound PEI's 2,852 kilometer coastline. The brackish estuaries reach into the interior of the Island from the Gulf and collect fresh water from spring fed streams that drain relatively small watersheds. Fresh water wetlands, including beaver and man-made ponds, are part of the makeup of these watersheds. Uplands consist of a mix of forested and cleared agricultural land. Farming activity occurs in all portions of the province and just under half of the total upland area is under agricultural production (Table 1, Figure 1). Approximately ninety percent of the province is privately owned.

Table 1: Wetland and land-use areas of PEI

Wetlands	Ha	% of total area
-Fresh	25,303	4.5
-Tidal	6,847	1.2
Uplands		
-Forest	256,780	45.1
-Agriculture	222,186	39.1
-Abandoned farmland	16,142	2.8
- Other	36,959	6.5
Total Area	568,360	

Wetlands of Prince Edward Island are located throughout the province, including on some of the 18 small coastal islands, where a number of the nesting bird colonies are also located. Of these wetlands, 25,303 hectares (79%) are freshwater and 6,847 hectares (21%) are salt marsh. Fresh-water wetlands represent only 4.5 % of the landmass (Table 1). They are unevenly distributed (Figures 1 and 2), and are typically small, with 68% being less than 2 hectares. By contrast, only 1.5% of the Island's wetlands are larger than 20 hectares. Deroche Pond, a natural coastal

dune/wetland complex, is the largest wetland with an area of 220 hectares. Twenty seven percent (6,200 hectares) of the freshwater wetlands are classified as productive shallow marsh, deep marsh or open water wetlands. Bogs comprise 7,527 hectares (30%) of the freshwater wetlands. The remainder consists of shrub and wooded swamp, meadow, and seasonally flooded flats.

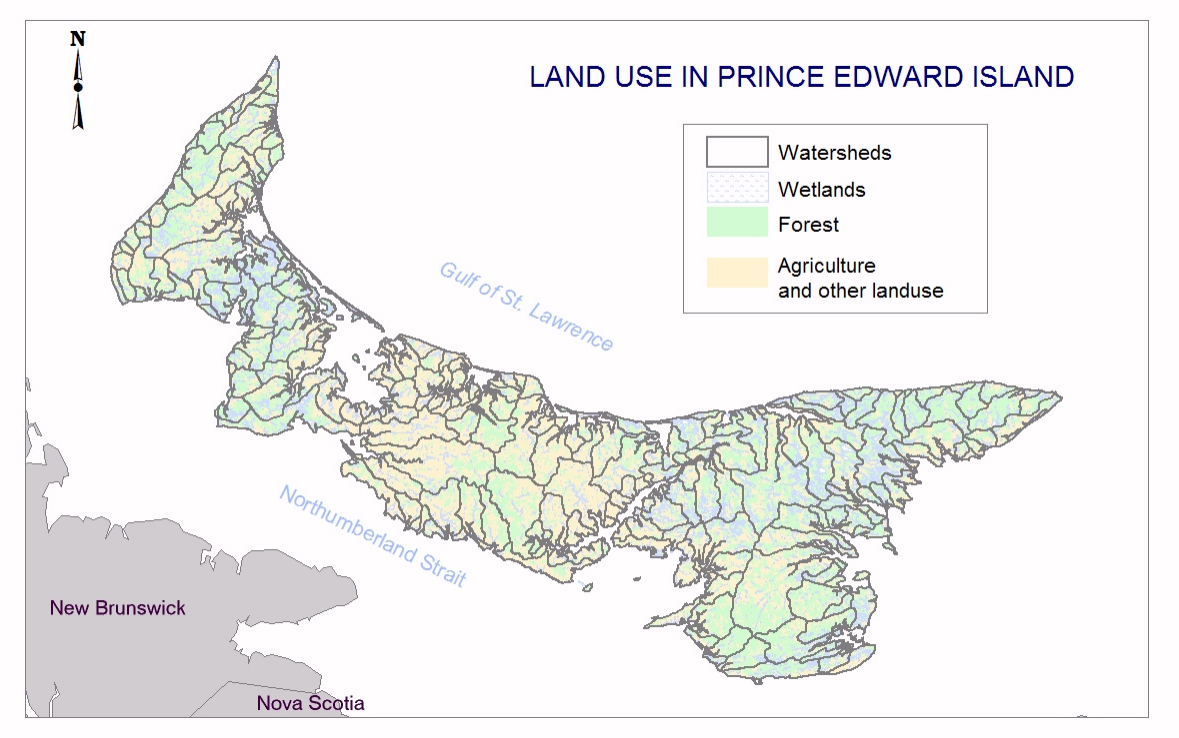

Figure 1: Land use in Prince Edward Island.

Densities of freshwater wetlands (as high as 6.8 ha/km²) are higher in the northeastern and western portions of the Province, and along the coast. The central and southeastern uplands typically have well drained soils, steeper gradients and are intensively farmed. Wetlands are relatively scarce in these areas. For example, only 1.74 ha/km² of wetland occurs in the New London Bay Watershed, located centrally along the north coast of the PEI. The overall average provincial wetland density is 3.8 ha/km².

Table 2: Wetland categories and size ranges of PEI.

Dominant Wetland Class	Number of Wetlands	Number of Wetlands in Size Range				Total Area (ha)
		< 10 hectares	10 – 25 hectares	25 – 75 hectares	> 75 hectares	
Salt marsh	1185	1021	105	49	10	6843
Open water	1427	1349	51	20	6	3647
Deep marsh	649	569	61	14	5	3263
Shallow marsh	361	349	9	2	1	666
Meadow	1562	1549	12	1	0	1930
Wooded or shrub swamp	1863	1701	116	39	7	8088
Bog	1506	1349	105	42	10	7834
Total	8553					32271

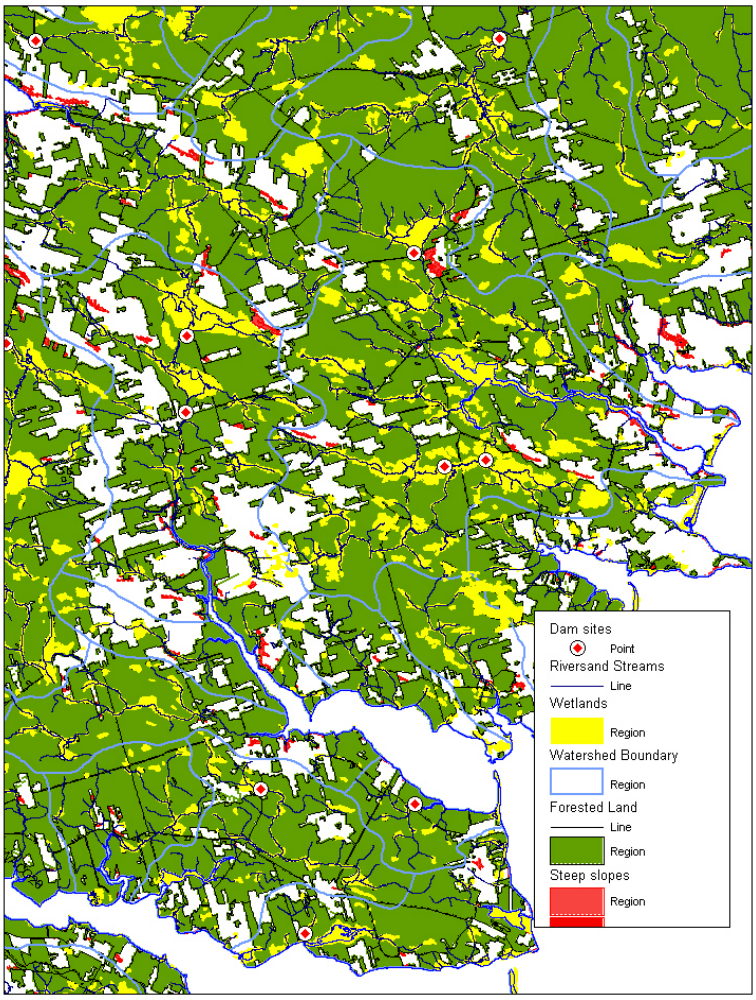

Figure 2: A section of the eastern portion of Prince Edward Island, an area rich in wetland density with low impact land use.

Beaver and manmade ponds are abundant across the island and contribute significantly to wetland abundance. Beavers are typically found at lower densities in the central part of the Island. The approximately 550 manmade ponds are more ubiquitous, and the wetlands associated with these ponds occupy approximately 3830 hectares representing 6.4% of the total number of wetlands on Prince Edward Island, and 11.9% by total wetland area.

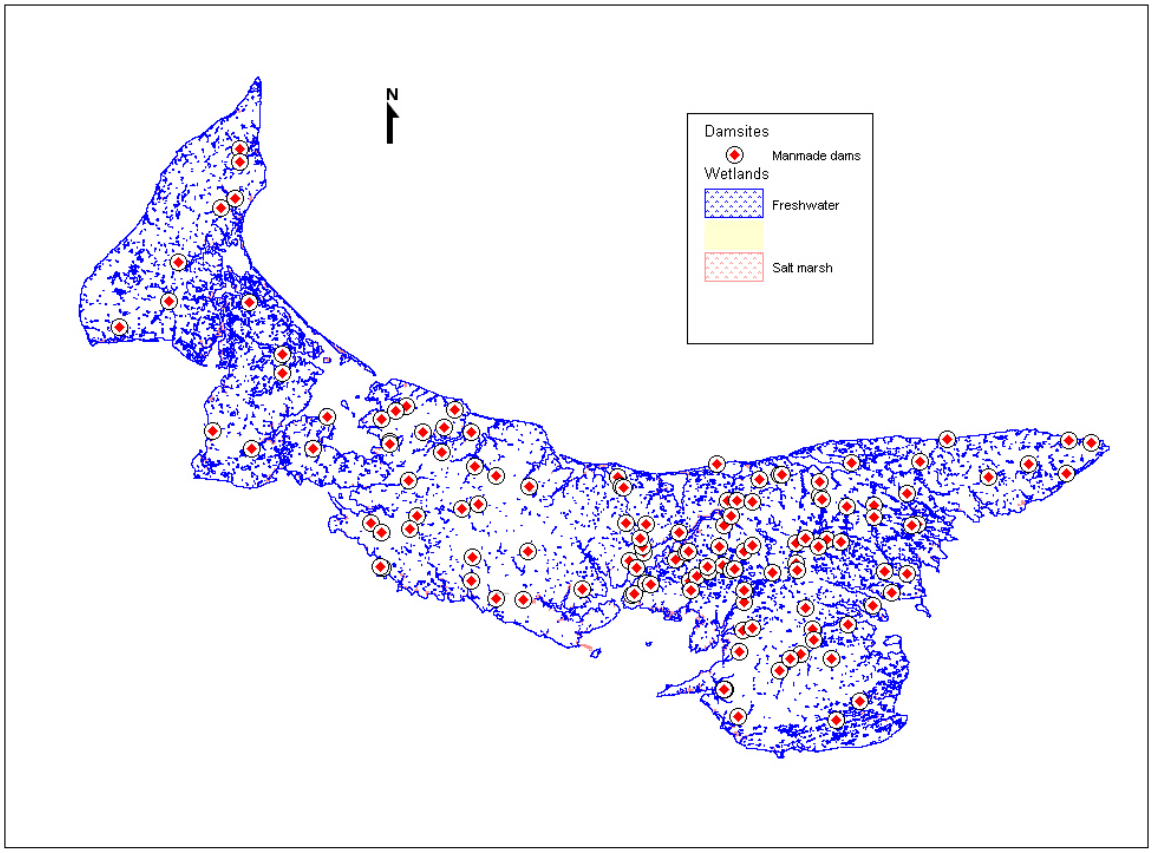

Figure 3. Distribution of Impounded Wetlands managed by the Province and Ducks Unlimited Canada on Prince Edward Island

Waterfowl populations

Waterfowl populations in Prince Edward Island can be separated into “inland ducks” (dabbling ducks plus ring-necked duck, golden eyes and common merganser) and “sea ducks” (eiders, old

squaw, scoters, red-breasted merganser, harlequin duck). Scaup and bufflehead, are also present on the coastal waters of P.E.I. during migrations.

Breeding

Breeding pair surveys for black ducks have been conducted annually in Prince Edward Island since 1983. The breeding pair surveys monitor trends in black duck abundance but are also useful for monitoring trends in other waterfowl species. During the summer nesting and brood-rearing period most duck species are widely dispersed on ponds, rivers and marshes throughout the province.

PEI's fresh water wetlands are among the most productive wetlands in northeast North America providing important nesting habitat for waterfowl and other aquatic birds including: rails; flycatchers; and raptors, such as sora, kingbird, and northern harriers, respectively. Eighty percent of the breeding waterfowl resource in P.E.I. is dominated by five inland species: black ducks (44.4%), mallard (5.2%), ring necked ducks (11.3%), green-winged teal (12.4%), and blue-winged teal (6.4%). American wigeon (4.2%), gadwall (3.4%) and Canada geese (6.5%) make up approximately 14% of the breeding population while wood duck, pintail, and northern shoveler contribute 6.3% of the breeding population (Table 3).

The inland ducks are the most abundant and widespread group in Prince Edward Island and also the most important ducks to sport hunters. As previously stated, the black duck, mallard, blue-winged and green-winged teal, and ring-necked duck are the major species, comprising over 80 per cent of all breeding inland ducks in the Province. Some species formerly considered as western ducks (American wigeon, pintail and gadwall) have made a modest incursion in the Province, largely in suitable habitats on managed marshes. A further influx of western species, particularly gadwalls, has been observed on managed impoundments. Although wood ducks have established a small breeding population in Prince Edward Island the species is largely represented by post–breeding molting males.

Table 3: Waterfowl species breeding on PEI

SPECIES	AOU Designation	ESTIMATED PAIRS
American black duck	ABDU	13,380 (44.4%)
Ring-necked duck	RNDU	3,398 (11.3%)
American green winged teal	AGWT	3,722(12.4%)
Blue winged teal	BWTE	1,927(6.4%)
Mallard	MALL	1,561(5.2%)
Canada Goose (NAP & resident))	CAGO	1,961(6.5%)
Gadwall	GADW	1,013(3.4%)
American wigeon	AMWI	1,251(4.2%)
OTHER		1,901(6.3%)
TOTAL		**30,114**

Staging and Wintering

In addition to migrating shorebirds including Semipalmated and Black-bellied Plovers, Bonaparte's Gull, and a number of sandpipers, Prince Edward Island has many sites where substantial numbers of ducks and geese occur during spring and fall migrations. PEI's location in the Atlantic Flyway, presence of coastal wetlands, and abundant agricultural land makes the Province an important staging (spring and fall) destination for migratory birds, particularly Canada geese and black ducks. A significant portion of the North Atlantic Canada goose population stages on PEI, roosting in coastal bays and feeding on waste cereal crops and potatoes.

Annual single-day aerial surveys conducted in late October or early November by the PEI Fish & Wildlife Division and the Canadian Wildlife Service indicate that between 15,000 and 52,600 Canada geese are present along coastal waters during fall migration. The number of geese that actually migrate through the province is considerably larger as birds migrate south as early as September and as late as January. An estimation of the total number of Canada geese migrating through PEI is not available.

Table 4: Results of the annual Prince Edward Island Canada Goose fall survey.

SURVEY YEAR	TOTAL CAGO	10 YEAR AVERAGE
1990	10,206	15,675.9
1991	N/S	N/S
1992	15,120	15,795.1
1993	13,016	16,457.9
1994	13,202	16,787.4
1995	13,042	15,507.1
1996	21,492	15,298.3
1997	20,740	15,706.4
1998	31,782	15,954.4
1999	26,817	17,291.2
2000	52,641	18,243.3
2001	24,192	21,805.8
2002	36,724	23,204.4
2003	17,253	25,364.8
2004	38,101	27,187.0
2005	30,315	29,971.3

Since sea ducks occur mainly as migrants they are not a priority in the Prince Edward Island EHJV Program. The red-breasted merganser is the only regularly breeding species in this group. Long-tailed duck, all three scoters, and common eider are seen regularly in spring and fall, and a few eiders molt alongshore in summer. Only the long-tailed duck is regularly encountered in large numbers. Both scaup species and bufflehead occur regularly during the migrations.

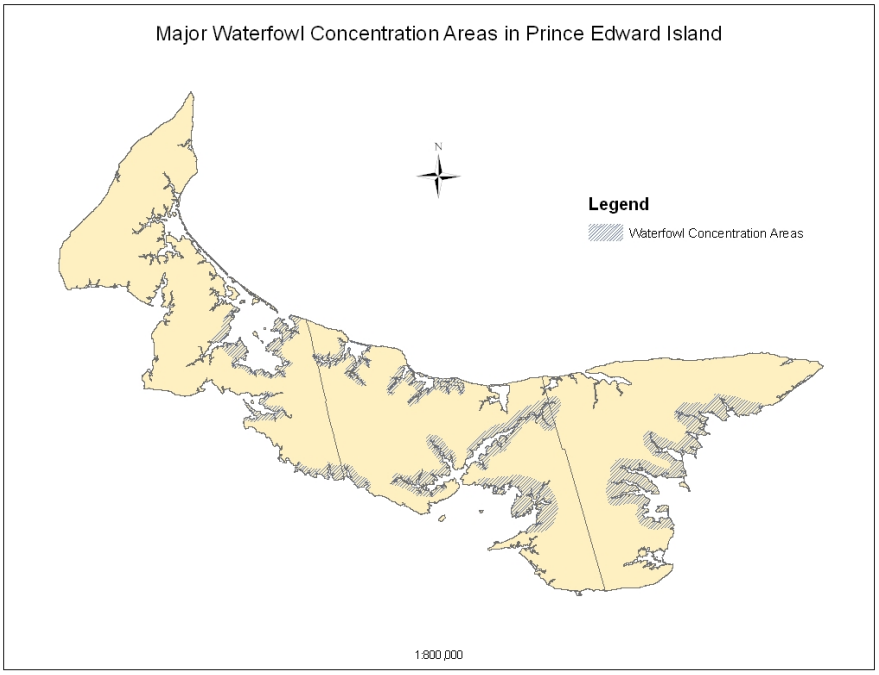

Figure 4: Major waterfowl staging areas on Prince Edward Island.

Both the Gulf of St. Lawrence, on the Island's north coast, and the Northumberland Strait, separating PEI from Nova Scotia and New Brunswick, commonly freeze over from late December until March; in some years ice may persist as late as May. A varying number of black ducks do overwinter in open-water areas around the eastern two thirds of the Island; their abundance and distribution depend on the severity of the winter and the ice conditions. During winter, small ice-free areas in estuaries and a few ponds support overwintering black ducks (7,000), goldeneyes (4,000), and mergansers (3,000). (MEAN Maximun – 10 year) In near shore areas, open leads in the ice pack are frequented by over-wintering long-tailed ducks.

Table 5**:** Annual mean maximum numbers of wintering waterfowl species in P.E. I.

YEAR	ABDU	MALL	COGO	BAGO	COME	OTHER
96	5,973	79	4,331	142	3,116	116
97	7,307	179	4,224	96	2,852	196
98	6,271	134	3,347	96	3,217	216
99	8,920	413	3,434	107	2,186	262
00	10,051	286	4,328	134	3,033	595
01	7,277	230	3,210	229	2,915	329
02	9,104	309	3,357	185	3,659	228
03	5,862	225	4,704	189	2,812	215
04	6,725	355	4,241	219	3,323	340
05	5,270	166	3,420	273	2,335	234
06	6,499	305	1,639	236	1,890	3,037
Mean 96-05	**7,276**	**238**	**3,860**	**167**	**2,945**	**273**

Of particular interest are the consistent numbers of Barrow's Goldeneye wintering in the Province. Barrow's Goldeneye is listed as a species of Special Concern under the federal Species at Risk Act as is the eastern population of the harlequin duck. Up to 20 individual harlequin ducks are observed each spring, fall and winter in Prince Edward Island.

Risks and threats

Benefits that accrue to humans as a result of natural wetland functions include the natural processes and derivation of benefits and values associated with wetland ecosystems. Functioning properly, wetlands form a vital link in the hydrologic (water) cycle by: acting as groundwater recharge, discharge and storage reservoirs; acting as water purification systems removing potentially harmful products in runoff from terrestrial sources; assimilating nutrients (nitrates, phosphates, ammonia) and accumulating and retaining suspended sediments (silt). Wetlands also contribute to the productivity of rivers and estuaries by producing and exporting organic material and nutrients vital to nursery, growth and survival of valuable fish and wildlife species;

The greatest threat to wetland function and loss in both Prince Edward Island's freshwater and coastal wetlands is competition from conflicting human activities. Intensive agricultural use of adjacent uplands has resulted in a loss of nearby nesting cover and a decrease in waterfowl production in some wetlands. In the current context, the cumulative impacts of urban and cottage developments, toxic chemicals, acid rain and many other factors, all contribute to habitat degradation.

Agricultural Landscape

An unknown quantity of freshwater wetlands has been lost through drainage and infilling during the past 350 years. Current pressures from large scale farming operations and commercial developments continue to degrade both the quantity and quality of freshwater wetlands.

Degradation of wetland function from accelerated terrestrial erosion and resulting sedimentation reduces the capacity of wetlands to filter, assimilate, and purify “natural” runoff from these operations with potentially harmful results downstream.

The single greatest threat to wetland quality on PEI continues to be runoff from agricultural lands laden with sediment and with the nutrients, pesticides, and bacteria bound to that sediment. Agriculture on P.E.I. is currently dominated by potato and livestock production, and both contribute to the degradation of wetlands and other aquatic habitats. Soil loss from potato land has been measured at greater than 20 tonnes per acre in extreme cases, resulting in the complete loss of many smaller wetlands and portions of larger wetlands (sediment deposits in excess of 2 meters in depth). Unrestricted access by livestock to wetlands and watercourses also has a detrimental effect on the vegetation along the adjacent riparian areas leaving the wetlands and waterways exposed to increased sedimentation and nutrient levels.

From 1976 - 2006 the number of farms on PEI declined from over 3000 to 1700, although farmland area decreased by only 45,000 hectares (15%). During this period individual farm size has increased and the number of large farms of 1000 hectares or greater has increased by 150% - despite legislation restricting individual land holdings. The area of potato production doubled from 21,800 hectares in 1976 to 43,750 hectares by 1996. On average 40,000 hectares of potatoes are cultivated annually but because of the need for rotational cropping, the total area under a potato rotation is much greater, roughly 110,000 hectares. Accompanying this trend is a large increase in the application of chemical fertilizers and pesticides and also in the amount of farmland left in bare soil over winter. In addition, hedgerows were removed and wetlands were in-filled at accelerated rates during this expansion period. The quality of surface and ground water has also declined, with nitrate levels 10 times greater than background levels commonly measured in areas of intensive potato production.

Livestock production has remained relatively stable over the past two decades but has become more concentrated outside the major potato growing regions. Increasing herd size typically results in more livestock concentrating in or along riparian zones leading to hastened habitat

degradation, greater potential from manure (if improperly handled) to impact aquatic resources, and increasing the level of bacteria and nutrients in watercourses.

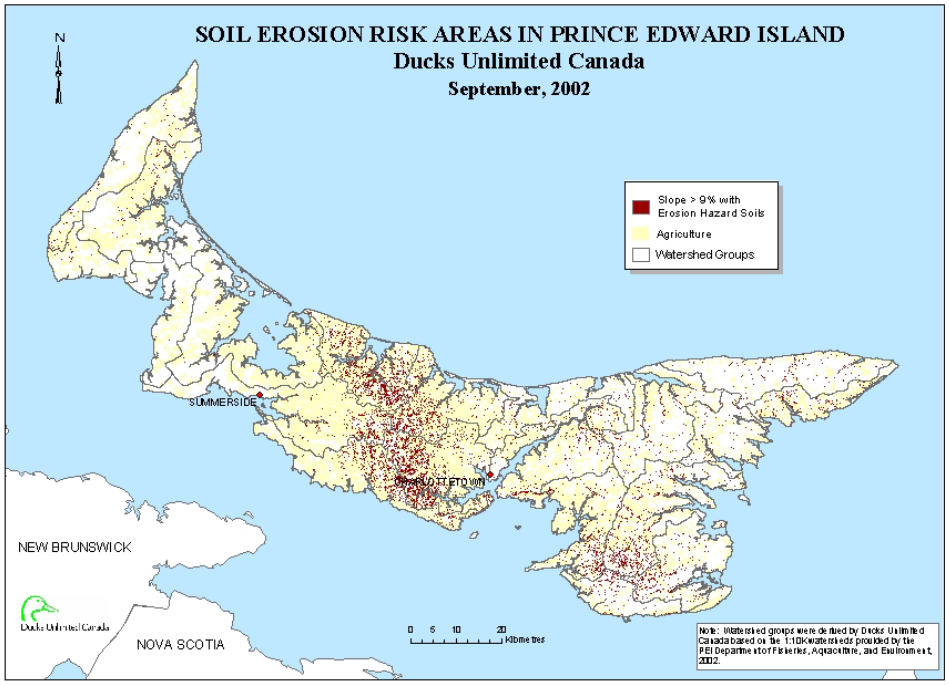

Figure 5: Areas of Slopes greater than 9% with Erosion Hard Soils.

Although farming practices provide migratory waterfowl with an abundance of food, the agricultural by-products (nutrients and pesticides), contained in runoff, can result in extreme sedimentation, bacterial and pesticide contamination, and nutrient loading of wetlands and estuaries. High nitrate levels in estuaries are resulting in anoxic conditions that are degrading coastal habitats. Bacterial contamination is responsible for the closure of 86 shellfish harvesting areas. Pesticide contamination of aquatic habitats has resulted in numerous fish kills and is suspected to have altered the invertebrate community.

Despite the impact that agricultural practices have had on the Province's wetland resources opportunities to conserve wetland habitat and to produce more waterfowl abound on PEI. The agricultural industry has been very proactive in recent years in seeking solutions to environmental impacts. Provincial incentive programs to protect water resources from agricultural production have produced significant environmental benefits. To date, 1200 of the

1700 farms in PEI have completed Environmental Farm Plan workshops and most of those farms have completed Action Plans.

In 2001, the PEI government legislated the mandatory use of crop rotation on row cropped agricultural fields and will no longer allow row crops to be planted on slopes greater than 9%. There is currently significant recognition of the need for changes in practices within the agricultural community. Our challenge is to provide farmers with the knowledge, and technical and funding assistance to change those practices in a manner that is consistent with wetland conservation.

Coastal Habitat

Status of Coastal Wetlands

Salt marshes are some of the most productive ecosystems on earth. They provide essential habitat and nutrients for commercially important fish species and contribute globally to carbon sequestration. PEI has little salt marsh considering the province has 2,852 kilometres of coastline. The importance of the Province's coastal wetlands was acknowledged internationally when Malpeque Bay was recognized as a *Wetland of International Importance* in 1988 under the RAMSAR convention. A third of the offshore islands on PEI are located in or adjacent to Malpeque Bay.

Tidal marshes on PEI were altered over the past 300 hundred years by the dyking, draining, and infilling of salt marshes for hay production. While these practices have been abandoned for decades many of the affected marshes still do not function or resemble the marsh that once existed. Some have been converted to freshwater marshes in the past, however regulatory agencies currently discourage the practice.

Salt marshes now only constitute about 1 % of the Island's land mass and many of PEI's salt marshes and coastal wetlands continue to be threatened by terrestrial runoff and sedimentation

and coastal developments, particularly cottage subdivisions and municipal development projects. The small size of PEI's watersheds leaves coastal wetlands vulnerable to effects from inland activities such as agriculture, highway construction and maintenance, forestry, and industry.

More recently aquaculture, particularly blue mussel production, has expanded to most bays and estuaries, adding pressure on coastal lands for service areas. This expansion has also caused conflict between mussel producers and sea duck managers, as sea ducks forage on the newly available cultured mussels.

PEI is a popular tourism destination with annual visitation rates in the range of one million people. When the Confederation Bridge opened in 1997, visitation rates peaked at 1.7 million visitors. Rates have declined recently following similar trends in other parts of the country. The resident population of the Island continues to grow, exacerbating the trend toward urbanization and the related impacts on natural resources, including coastal wetlands. Both of the Island's cities are located on the coast, as is 70 % of 23 PEI's largest communities, and the most developed tourism facilities.

The desire by summer residents to have a piece of the coast for their own enjoyment will, at the least threaten wetland function, and in the extreme, result in the loss of wetlands through infilling. Municipalities are interested in expanding facilities to serve the needs of tourism and recreation, as currently municipal wastewater treatment facilities are stressed at peak tourism season to properly treat wastewater before being discharged into estuaries. As a result, estuaries are exhibiting signs of eutrophication and anoxic conditions during summer in response to high levels of nutrients received from agricultural and residential areas.

Sea level rises of 40 to 100 centimetres over the next century are likely to have impacts on coastal wetlands. In some cases fresh water marshes may become brackish or tidal or salt marsh may be lost or forced inland due to elevated water levels. Early models of accelerated sea-level rise used for PEI predict that coastal erosion will double with the effect that almost 10% of the present area of coastal properties will be lost within the next 20 years, and almost one-half in the next 100 years. Despite this trend, the greatest immediate threat to the limited coastal wetlands

on PEI is the increase of human activity and expanding industries within 1 kilometre of tidal waters.

Waterfowl Prioritization

Key Waterfowl Species -- PEI

The waterfowl species found in PEI are listed in Table 6. Of these the black duck, mallard, ring-necked duck and green winged teal are considered to be the key breeding species, based on their contribution to local and Atlantic flyway populations. The other species breeding in PEI are assumed to also benefit from management activities directed at the key species.

Table 6: Waterfowl species found in PEI. Key species are highlighted in blue.

SPECIES OF PEI BREEDING WATERFOWL	AOU Designation
American black duck	ABDU
Ring-necked duck	RNDU
American green winged teal	AGWT
Blue winged teal	BWTE
Mallard	MALL
Canada Goose (NAP & resident))	CAGO
Gadwall	GADW
American widgeon	AMWI

BCR 14 Waterfowl Priorities

Waterfowl Conservation Region 14 Prioritization

Prince Edward Island is located in Waterfowl Conservation Region (WCR) 14. Table 7 outlines the "waterfowl prioritization" rankings for WCR 14. The American black duck and mallard all rank "high" as continental priorities in WCR 14 and efforts to conserve habitat for these species will be a priority for the PEI-EHJV Program. The Canada goose (NAP) has been ranked as "moderate high", and green-winged teal and ring-necked ducks both rank as "moderate" as continental priorities for WCR 14.

Table 7 - Waterfowl Prioritization Chart for WCR 14 (adopted from NAWMP 2004 Implementation Plan)

Species/Population	Continental Priority	Breeding Importance	Breeding Need	Nonbreeding Importance	Nonbreeding Need	Continental Trend 1970-2003
American black duck	HIGH	HIGH	HIGHEST	MOD HIGH	HIGH	DECREASING
Common eider	HIGH	HIGH	HIGHEST	HIGH	HIGHEST	DECREASING
Lesser scaup	HIGH			MOD LOW	MODERATE	DECREASING
Mallard	HIGH	MOD LOW	MODERATE	MOD LOW	MODERATE	STABLE
Northern pintail	HIGH	MOD LOW	MODERATE	MOD LOW	MODERATE	DECREASING
Canada goose - North Atlantic	MOD HIGH			HIGH	HIGH	INCREASING
American wigeon	MOD HIGH	MOD LOW	MOD LOW	MOD LOW	MOD LOW	STABLE
Black scoter	MOD HIGH			MOD LOW	MOD LOW	DECREASING
Blue-winged teal	MOD HIGH	MOD LOW	MOD LOW			STABLE
Common goldeneye	MOD HIGH	MOD HIGH	MOD HIGH	MOD HIGH	MOD HIGH	STABLE
Long-tailed duck	MOD HIGH			HIGH	HIGH	DECREASING
Surf scoter	MOD HIGH			HIGH	HIGH	DECREASING
White-winged scoter	MOD HIGH			MOD HIGH	MOD HIGH	DECREASING
Barrow's goldeneye	MODERATE			MOD HIGH	MOD HIGH	STABLE
Bufflehead	MODERATE	MOD LOW	MOD LOW	MOD LOW	MOD LOW	INCREASING
Gadwall	MODERATE	MOD LOW	MOD LOW			INCREASING
Green-winged teal	MODERATE	MOD HIGH	MOD HIGH	MOD LOW	MOD LOW	INCREASING
Harlequin duck	MODERATE			MOD HIGH	MOD HIGH	STABLE
Ring-necked duck	MODERATE	MOD HIGH	MOD HIGH			INCREASING
Wood duck	MODERATE	MOD HIGH	MOD HIGH	MOD LOW	MOD LOW	INCREASING
Atlantic brant	MOD LOW			MOD HIGH	MODERATE	STABLE
Common merganser	MOD LOW			MOD HIGH	MODERATE	INCREASING
Hooded merganser	MOD LOW	MOD HIGH	MODERATE			INCREASING
Red-breasted merganser	MOD LOW			MOD HIGH	MODERATE	INCREASING

The NSST developed scores for threats to habitats within WCRs by using the following criteria:
- Very Low: Expected future conditions better than historical conditions.
- Low: Expected future conditions similar to historical conditions – no known threats.
- Moderate: Slight to moderate decline in future habitat abundance or quality, but current conditions similar to historical conditions; or, future conditions expected to be stable but significant habitat losses have already occurred.
- Moderately High: Severe past or expected future deterioration or decline in habitat quality or availability.
- High: Extreme past or expected future deterioration or decline in habitat quality or availability.

Population Goals and Priority Species

Breeding

The black duck, mallard, ring-necked duck and green winged teal are considered to be the priority breeding species based on their relative contribution to Atlantic flyway populations. The other species breeding in PEI remain of regional interest and it is assumed that these species will also benefit from management activities directed towards the priority species. Population estimates of waterfowl breeding in PEI for the purposes of this plan were determined using the following methodology:

Background

The PEI breeding pair and brood survey sites were originally selected from the 1983 PEI wetland inventory. The inventory was stratified by Golet Score into 13 classes from which a random sample of 100 sites was chosen. Those sites have been surveyed for breeding pairs twice annually since 1985. The wetland inventory for PEI was updated and digitized in GIS in 1990 and 2000.

Breeding Pair Data

The Breeding Pair survey sites were grouped by survey site into 13 Golet score classes (GSC) based on the wetland surveyed. The total number of Breeding Pairs for each species was calculated for each Golet Score Class. This number was divided by the total area (ha) of wetland of each Golet Score Class in the survey. This created a rate of pairs/ha.

Wetland Inventory Data

The 2000 wetland inventory was grouped by 5 point increments into 13 Golet Score Classes and the total area for each Golet Score Class was determined. The breeding pair rate for each Golet Score Class was multiplied by the area of wetland of that score class. The estimates based on this direct extrapolation procedure are summarized in the Table 8.

Table 8: Deficit of IBP of waterfowl species breeding on Prince Edward Island

SPECIES	ESTIMATED PAIRS	Breeding Pair Objectives	Deficit Number of BP
American black duck	13,380	16,500 (ABDU+MALL)	1,539
Ring-necked duck	3,398	5,000	1,602
American green winged teal	3,722	5,000	1,278
Blue winged teal	1,927	2,000	73
Mallard	1,561	N/A (Included with ABDU)	-
Canada Goose (NAP & resident))	1,961	2,000	39
Gadwall	1,013	1,500	487
American wigeon	1,251	1,500	249
OTHER	1,901	2,000	99
TOTAL	**30,114**	**35,500**	**5,386**

Staging and Wintering

The number of birds staging and wintering in PEI is related to continental and local breeding population size, habitat conditions, food availability, and weather. PEI waterfowl are exclusively associated with the Atlantic flyway. Trends in NAP geese in PEI have generally been upward and the overall objective for NAP geese in PEI is to maintain the count at or above the previous 15-year mean. Securement of the Island's coastal wetlands is expected to also be beneficial to black ducks by maintaining staging numbers.

Key Program Areas and Priority Landscapes

Due to the relatively diminutive size of Prince Edward Island and the proximity of inland areas to coastal areas, Prince Edward Island, as a whole, is treated as a Key Program Area and as a single Priority Landscape.

Habitat Goals

Table 9 PEI-EHJV 5-Year Habitat Conservation Targets

	Wetland (hectares)	Upland (hectares)	Total (hectares)
Securement	498	435	933
Enhancement	678		678
Management	230		230

Conservation Actions

Securement

Land securement has been, and will continue to be, a key element of the PEI-EHJV program. Wetlands have been secured in the past by fee simple acquisition, donation of wetland, and conservation agreement. To date 87 properties totaling 1750 hectares have been secured through fee simple acquisition or donation through the PEI-EHJV program.

One of these 87 properties is Bird Island, an 80 hectare offshore island located in Mapleque Bay. Malpeque Bay is designated as a wetland of international importance under the RAMSAR Convention. The acquisition and securement of Bird Island is rare for PEI in that it is one of the very few pieces of Prince Edward Island that has not been directly influenced by human activity. In addition to a deciduous forest, bog, and freshwater wetlands, almost half of the island consists of salt marsh. This acquisition is also rare in that blocks of coastal property of this size are often not available.

Figure 6: Aerial view of Bird Island, an off-shore island in Malpeque Bay, a designated RAMSAR site.

By contrast, 19 properties totaling 193 hectares of coastal marsh were acquired in the Mt.Stewart area of the Hillsboro River and have been incorporated into the Mt. Stewart Wildlife Management Area (WMA), one of nine such areas designated by the Province. Many of the

wetlands acquired through the PEI-EHJV program have been incorporated into the WMA's along with other lands obtained by the Province .

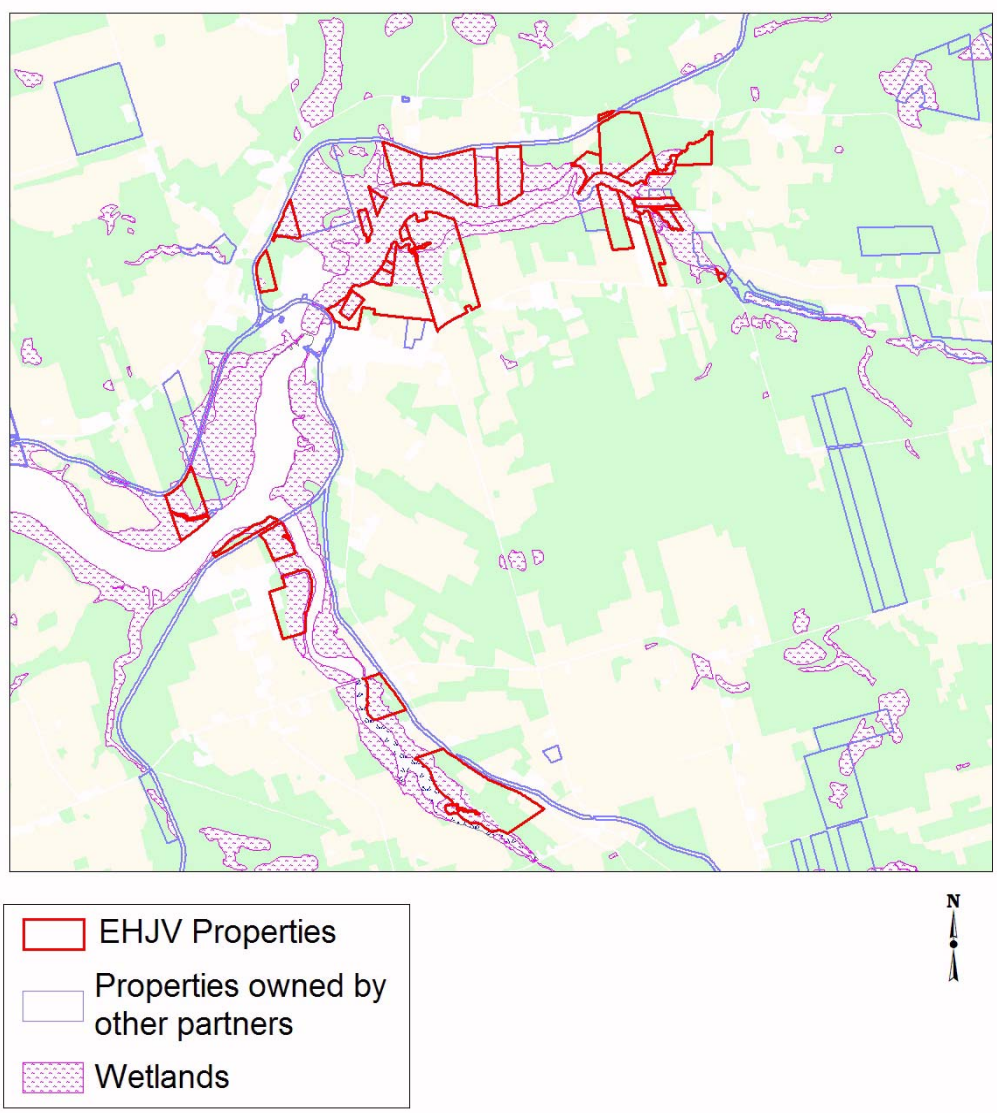

Figure 7: Mt. Stewart Wildlife Management Area showing EHJV contribution to the securement total of tidal wetlands in this area..

Since 1989, through the EHJV 107 ha of tidal wetlands have been acquired in the three coastal priority areas (Figure 8). In addition to this habitat, the Province of PEI, Government of Canada and other conservation organizations have also secured 1053 ha of salt marsh through donation, fee simple acquisition, and Restrictive Covenants. In total 15.4% of the 6,843 ha of salt marsh is already protected.

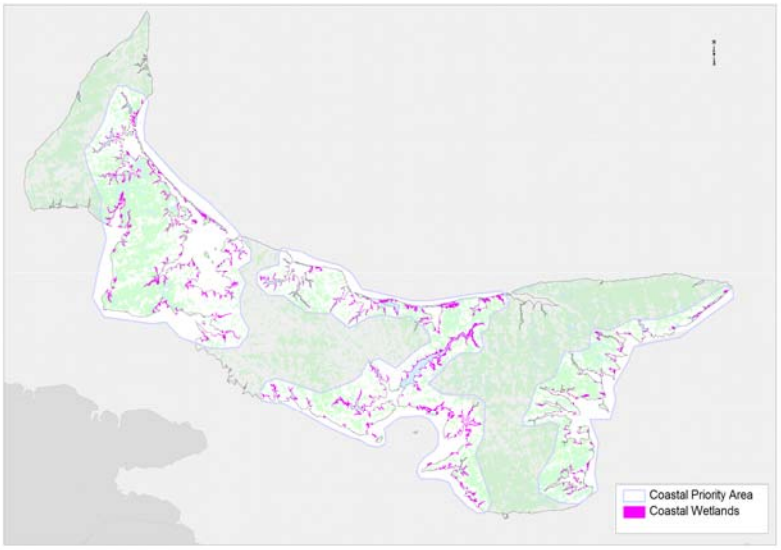

Figure 8: Priority Coastal Acquisition Areas

Through the EHJV program a significant amount of quality habitat has been acquired that will support a portion of breeding and staging populations of waterfowl in the province. The focus of the EHJV Securement Plan will be to secure coastal habitat for staging waterfowl and to acquire lands that consolidate larger EHJV holdings at priority inland sites (Figures 10 and 11).

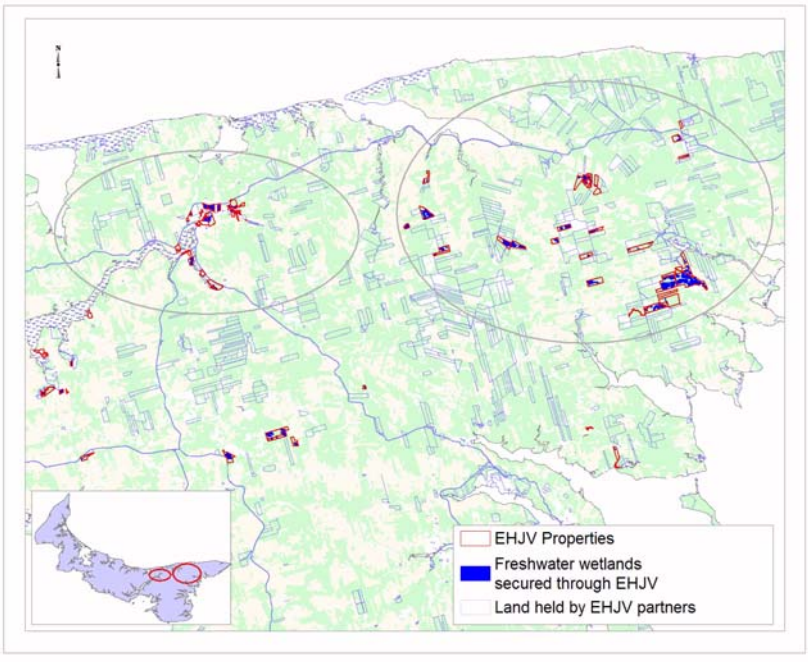

Figure 10: Priority inland areas

Our goal will be to secure 50% of the key tidal wetlands that support 80% of PEI's staging waterfowl. In the next five years 363 ha of salt marsh will be acquired within the coastal priority areas moving us closer to the target of half the Island salt marshes protected. Inland, our goal is to secure an additional 135 ha that will consolidate existing land holdings at EHJV priority areas. Combined with wetlands secured by the Province and NGO's, breeding habitat for a total of 7275 pairs of breeding waterfowl will be secured representing 24.2% of the estimated 30,000 breeding pairs of waterfowl found on PEI.

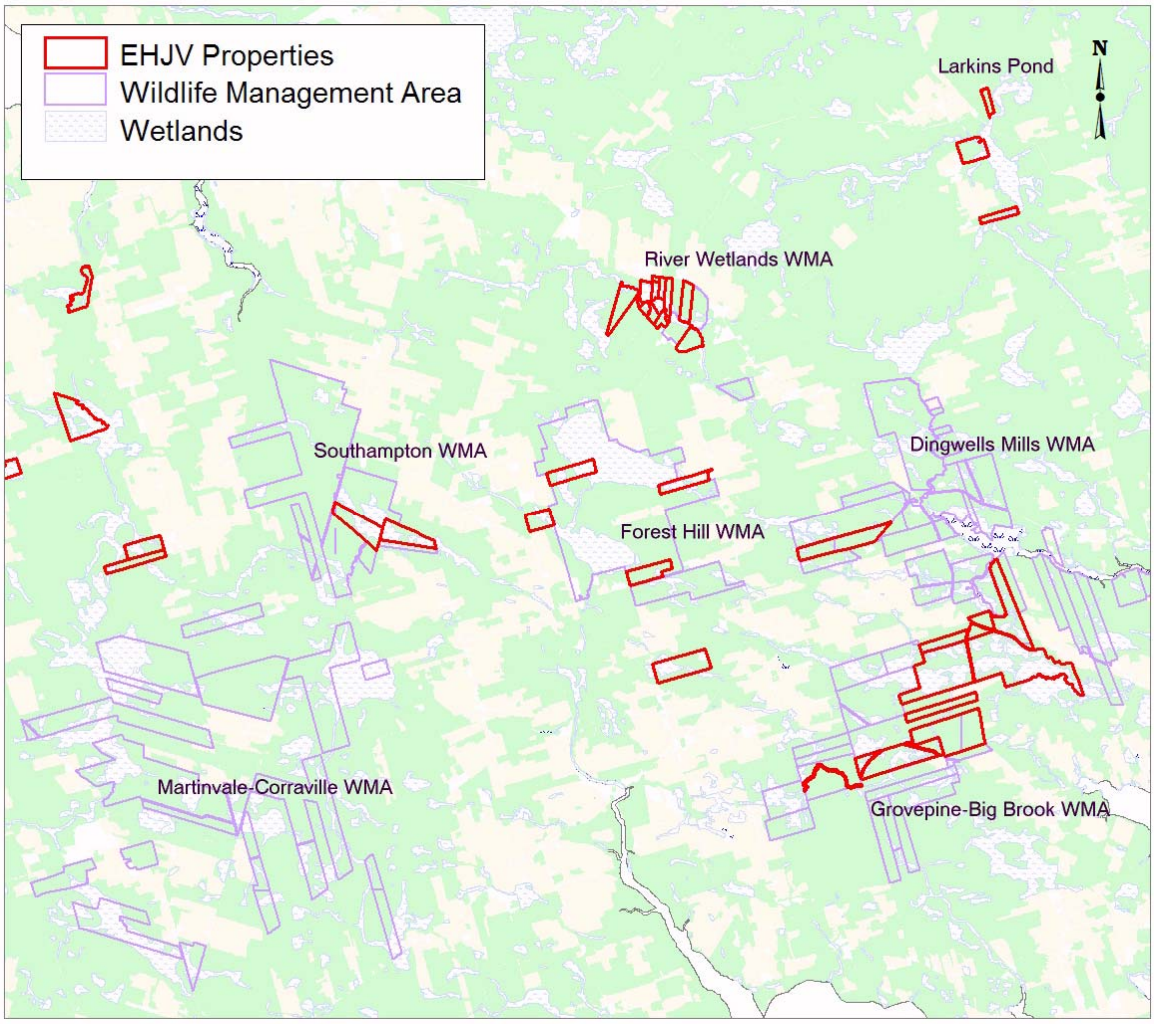

Figure 11: *Six of the Provincial Wildlife Management areas located in the southeastern part of PEI with wetlands secured through the EHJV outlined. A priority securement activity will be to consolidate and add productive wetlands to these and similar areas.*

European settlers to Prince Edward Island impounded streams to construct ponds for both industrial and aesthetic reasons. These impounded wetlands represent 6.4% of the total number of wetlands on Prince Edward Island and 11.9% of the total wetland area on PEI (3,830 ha). Currently, there are approximately 550 impoundments on Prince Edward Island, of which 115 are managed, either solely or cooperatively, by the Province and/or Ducks Unlimited Canada (DUC). One or more of these impoundments are often the focal point of the Wildlife Management Areas.

Wetland Restoration in PEI

The goal of the EHJV partnership is to restore breeding waterfowl populations to the relatively high levels observed during the past decade and to improve the nutritional status of migrating and wintering waterfowl thereby increasing their survival and reproductive potential. Habitat objectives are linked to desired population goals for key species. Habitat objectives for key species are assumed to reflect and accommodate the needs of other waterfowl species within PEI. and will be refined and adjusted as new biological and environmental information is developed and integrated into a model-based decision process.

Key Assumptions:

1) Nest success is not limiting for key waterfowl species as suitable nesting habitat appears to be abundant. Duckling survival is the primary limiting factor for our key waterfowl species. Improvements in duckling survival are assumed to be related to increases in the availability of permanent open water marshes with hemi-marsh conditions.
2) Seasonal and small wetlands are important to early breeding waterfowl (Krapu et al 1997), which are often most successful (Greenwood et al 1995, Blums et al. 2002, Pietz et al 2003, Hoekman et al 2004) and because seasonal wetlands are easily drained and occur at lower densities in eastern North America then in the prairies (Krapu et al 2000,

Hoekman et al 2004) suggesting that restoration of seasonal and small wetlands is an important strategy to enhance duckling survival. This approach is assumed to be particularly effective when done in proximity to large wetlands (Steevens et al. 2003). Restoring small wetlands in the periphery of large wetlands is assumed to increase the overall carrying capacity of the landscape.

3) Non- breeding season survival (harvest mortality) is a strongly influential factor to population dynamics of eastern populations. It was the primary demographic factor for eastern mallards (Hoekman et al 2004, Coluccy et al in prep.). We assume that non-breeding season survival will remain constant.

EHJV partners will employ an array of habitat conservation tools/approaches to achieve habitat goals that will produce the desired waterfowl population response. These are generally categorized as habitat restoration or retention initiatives.

Wetland Restoration

Wetland restoration includes actions that restore habitat features (e.g. provide the "missing element" that relates to the key waterfowl vital rates) that have been lost or degraded, and the creation of new waterfowl habitats that serve as ecological equivalents to lost habitat.

Breeding Waterfowl

Attaining waterfowl breeding population goals in PEI will require an increase in the breeding populations of black ducks, mallards, green-winged teal and ring-necked ducks (Table 1). In to overcome the deficit, programs must reduce or eliminate limiting factors. The key limiting factor for black ducks, mallards and green-winged teals is assumed to be duckling survival and breeding propensity (assessed through waterfowl settlement rates). However, other factors such as inter-specific competition are also important drivers of black duck populations. Key limiting factors for ring-necked ducks are unknown but numbers have increased slightly over the period

surveyed goals. Recognizing that restoration activities benefit the suite of key species in Table 10 we assume an overall population deficit of 5,386 IBP.

Table 10: Population deficit for waterfowl species breeding in PEI. Key species are highlighted.

SPECIES	ESTIMATED PAIRS	Breeding Pair Objectives	Deficit
American black duck	13,380	16,500 (ABDU+MALL)	1,539
Ring-necked duck	3,398	5,000	1,602
American green winged teal	3,722	5,000	1,278
Blue winged teal	1,927	2,000	73
Mallard	1,561	N/A (Included with ABDU)	-
Canada Goose (NAP & resident))	1,961	2,000 (*Status quo*)	39
Gadwall	1,013	1,500	487
American widgeon	1,251	1,500	249
OTHER	1,901	2,000	99
TOTAL	**30,114**	**35,500**	**5,386**

Pollard (2000) demonstrated that it was possible to double waterfowl production through wetland enhancement activities in agricultural areas. In addition, he also demonstrated that work on the agricultural areas resulted in increased waterfowl densities in adjacent forested area. Therefore, enhancement activities focused on the agricultural areas will over time close the waterfowl deficit.

There have been substantial declines in wetlands within the agricultural and coastal areas of PEI. A significant amount of wetland in these agricultural areas has been lost through direct alteration. Much of this has occurred through the infilling or drainage of an unknown but significant amount of small wetlands. Remaining wetlands within agricultural watersheds might

potentially be degraded through contaminated runoff containing high levels of nutrients, sediments or pesticides.

Wetlands within the agricultural areas continue to be lost or negatively impacted by poor land use practices in PEI. The underlying soil fertility in agriculture landscapes is greater than in forested landscapes, as a result, wetlands in agricultural areas are more productive than wetlands in forested landscapes. DUC assessed the waterfowl Indicated Breeding Pair (IBP) and brood responses for all waterfowl species on a series of enhanced wetlands from 1980 – 1982. They compared the waterfowl response to enhanced wetlands in a forested and agricultural landscape and demonstrated that there were significantly more pairs and broods on wetlands in the agricultural landscape compared to the forested landscape (Table 11: t-test, Pairs, 25 df, $t = 3.57$, $P = 0.0015$, broods, 26 df, $t = 2.34$, $P = 0.027$). Therefore, wetland restoration programs will be focused in agricultural areas where waterfowl response will be greatest.

Table 11: Comparison of IBP and brood use of large restored wetlands in forested and Agricultural landscapes

Landscape	# projects	# survey years	Pairs/ha	# survey years	Broods/ha
Agriculture	22	40	1.00 ± 0.82	39	0.95 ± 1.1
Forest	10	17	0.34 ± 0.18	17	0.36 ± 0.27

Wetland restoration is one of the key solutions to increasing waterfowl population for the key species (Table 10) as it improves the abundance and productivity of brood rearing habitat. We assume that duckling survival is the key limiting factor for our key species. Wetland restoration directly increases duckling survival and should increase the number of breeding pairs settling in the landscape. Positive responses to the creation of freshwater wetlands in breeding pair densities (All species: Pre treatment 33.8 pairs/100 km^2, Post treatment 64.4 pairs/100km^2) and brood use (All species: Pre treatment 72 broods, Post treatment 162 broods) were demonstrated

by Pollard (1996) at Belle Isle NS. Based on these results, we established the goal of doubling waterfowl production from the agricultural landscape.

Currently brood rearing and pairing wetlands represent 3.0% of the agricultural landscape in PEI. Based on Pollards (2000) results from Belle Isle, we established a long term goal of increasing wetland densities to 4% of the agricultural landscapes. Wetland enhancement will focus primarily on marginal farmlands and wet and difficult-to-farm areas on active farms. Enhancement will restore some of the wildlife productive capacity and natural capital to the agriculture landscape. This is important given that in some areas substantive amounts of wetlands have been lost or degraded.

Given the deficit in breeding waterfowl in PEI (Table 10), we will need to restore or intensively manage an additional 4150 wetland ha in PEI. This figure is beyond the scope of the resources available over the 5 years of the implementation plan we will focus on eliminating 678 ha or about 16.3% of the habitat deficit over the coming 5 years.

Wetland Restoration programs

Rural Wetland Restoration Program

The Rural Wetland Restoration Program will diversify the landscape throughout the Maritimes by putting more open water on the agricultural landscape. The focus of this program is rural non-farming landowners. This program involves restoring waterfowl habitat on small fresh water wetlands in the agricultural landscape. Restored wetlands are open water marshes approaching a hemi-marsh state and involves the removal of vegetation and organic soil from densely vegetated wetlands or by placing of small earthen berm. Many of the wetlands enhanced show signs of alteration through infilling or drainage ditches.

Restoration of small wetlands within the agricultural landscape results in a significant increase in the number of waterfowl pairs and broods (Stevens et al. 2003, Table 12; Assumption 3, page 26-7). Mean wetland size in this study was 2.3±0.31 hectares. Thus small marsh restoration produces an array of expected pair and brood responses (Table 13). These results indicate a positive waterfowl response with 3.9 times the density of indicated breeding pairs and 7.5 times as many broods on restored versus control wetlands. Therefore, restoration of small wetlands will produce a significant positive waterfowl response that addresses the key vital rate of brood survival. We assume that the landscape level benefits to waterfowl are enhanced when small wetlands are restored in proximity to large open water wetlands (Figure 12).

Table 12: Waterfowl indicated breeding pairs and brood per wetland on restored and control wetlands (Stevens et al 2003).

Species	Pairs		Broods	
	Restored	Control	Restored	Control
Black Duck	1.38±0.25	0.67±0.15	0.70±0.2	0.06±0.05
Mallard	0.32±0.16	0.06±0.06	Ns	
Green-winged Teal	0.80±0.22	0.18±0.12	0.45±0.15	0.08±0.07
Ring-necked Duck	1.02±0.36	0.06±0.06	0.14±0.07	0
Gadwall	0.55±0.30	0	0.11±0.07	0
Blue-winged Teal	0.43±0.12	0.06±0.04	NS	

Table 13: Waterfowl indicated breeding pairs and brood/ha per wetland on restored and control wetlands (Stevens et al 2003).

Species	Pairs		Broods	
	Restored	Control	Restored	Control
Black Duck	0.6	0.32	0.3	0.03
Mallard	0.14	0.03	0.02	0
Green-winged Teal	0.34	0.09	0.20	0.04
Ring-necked Duck	0.44	0.03	0.06	0
Gadwall	0.24	0	0.05	0
Blue-winged Teal	0.19	0.03	0.05	0.02
Total	1.95	0.5	0.68	0.09

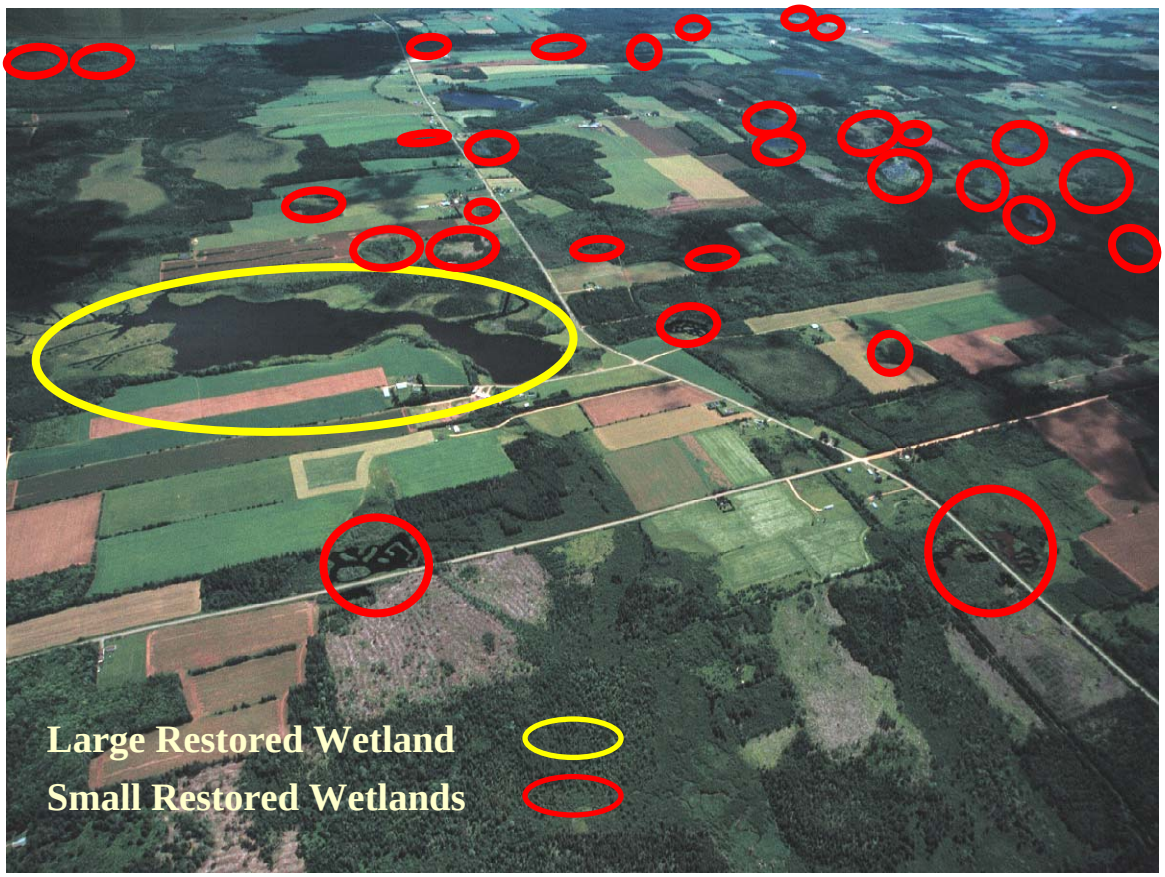

Figure 12. Optimal juxtaposition of small and large restored wetlands.

To date over 515 projects have been completed in the Maritimes resulting in the restoration of 960 ha. In PEI 285 projects (500 ha) have been developed. The potential exists to restore an additional 4,000 wetlands across the Maritimes. The target in PEI is to restore 100 sites (150 ha) over the next 5 years resulting in an expected overall increase of 293 pairs settling in the agricultural landscape, as well as the annual production of 103 additional broods. Species specific benefits are summarized in Table 14.

Table 14: Species specific pair and brood responses to restoration of 150 ha of small wetland. Based on waterfowl indicated breeding pairs and brood/ha per wetland on restored and control wetlands (Stevens et al 2003).

Species	Pairs	Broods
Black Duck	90	45
Mallard	21	3*
Green-winged Teal	51	30
Ring-necked Duck	66	9
Gadwall	36	8
Blue-winged Teal	29	8
Total	293	103

* Mallards were starting to colonize PEI at the time of the study, so brood response is thought to be conservative.

Agricultural Biodiversity Program

Opportunity now exists to restore wetlands on agriculture lands through federal and provincial agriculture programs. In recent years the agricultural community has become proactive in implementing environmental programs within farm management. Examples in Atlantic Canada include the development of environmental farm plans and assistance programs to help farmers implement environmental initiatives. The announcement of the Agricultural Policy Framework (APF) in 2003 includes a greater focus on the environment. The APF encourages the farm community to put in place practices that will lead to better quality air, soil, water and biodiversity. Restoring wetland on the landscape produces the greatest waterfowl response because of the relatively high productivity of these wetlands. Clearly there is convergence of mission between EHJV partners and agriculture regarding improvements in biodiversity and water quality on farm. Over the last few years, DUC has engaged the agriculture sector in an effort to increase wetland quantity and quality within the agricultural landscape. This represents a significant opportunity to reverse the loss of wetland on the agricultural landscape.

In 2004, DUC embedded conservation programs as solutions for farmers using the Environmental Farm Plan process and signed an MOU with Prince Edward Island Department of Agriculture to deliver this program. This provided a solution-based program to restore waterfowl habitat, and to provide farmers with one-stop shopping, with the program being managed and co-funded through the provincial Farm Investment Fund.

The Agricultural Biodiversity Program features a cost-sharing arrangement for small wetland restoration techniques whereby government and the farmer will contribute 65% of the direct costs to complete a project. DUC will contribute 35% of the project cost. Through this new cost-sharing partnership, there is an opportunity to deliver more wetland restoration projects. The program includes wetland restoration and constructed farm ponds-tertiary wetlands focusing on the restoration or enhancement of waterfowl habitat and improving duckling survival and breeding propensity (i.e. settling rates) for our key waterfowl species.

Wetland Restoration

The wetland restoration program assists farmers to restore wetlands on their property that are congested with vegetation, previously drained, or filled in. This is similar to the rural wetland restoration technique, but is focused on farms with Environmental Farm Plans.

In addition to the impact on waterfowl and wildlife habitat, the significant loss of wetlands compromises water quality and quantity, biodiversity, soil quality and the economic viability of people who depend on these natural resources. This program provides direct on-farm benefits as the restored wetland, when fenced, can provide a source of water for livestock and can be used recreationally by the farm family for skating, hunting or observing wildlife.

Constructed Farm Pond – Tertiary wetlands Program

The farm pond-tertiary wetland program is an innovative approach to adding waterfowl habitat (i.e. wetlands) to the agricultural landscape. The program responds to the need from the livestock sector to mitigate the negative impacts of water runoff from feedlots, solid manure storage and disposal of milk house wastewater. Runoff often has high levels of nutrients and can carry contaminants (i.e. bacteria, petroleum products, pesticides). Runoff can be a point source

of contamination of surface water and aquifers and can potentially result in both human and animal health risks.

Natural processes within wetlands can improve the quality of the water leaving the farm. These natural processes can be engineered through constructed wetland systems involving the creation of primary and secondary wetland cells. Typically the primary and secondary cells require professional engineering design assistance so that they provide adequate treatment of runoff while protecting ground water. The quality of water can be further improved by the addition of a wetland cell that will also provide high quality wildlife habitat. The program provides incentives for the development of these tertiary wetlands so that in addition to clean water, habitat for breeding waterfowl is added to the landscape.

Program impact

The impact on the landscape has the potential to contribute substantial habitat for waterfowl production. These gains will be realized over time as more farmers complete Environmental Farm Plans, as government adjusts incentives to promote wetland restoration, and as conservation partners work with government and farmers to convey knowledge in identifying projects and restoring wetlands. The next phase of APF will begin in April 2008 and it is expected that these positive changes will be captured in the next generation of Environmental Farm Planning.

This initiative will target the completion of 35 wetland restoration and farm pond construction projects on 60 hectares of wetland by the end of 2008. This should result in an additional 117 pairs and 41 broods/year.

Large Wetland Restoration:

The traditional wetland restoration program has involved restoring large wetlands within the productive agricultural areas using a pool of restoration techniques (i.e., water control structures and dykes). The resulting habitat is typically open marsh in a hemi-marsh state. These wetlands are important to all key waterfowl species in terms of increasing duckling survival. Table 11

describes the pair and brood use of these wetlands. These intensively managed wetlands are essential to increasing the overall carrying capacity of the landscape and on average support 1 brood/ha. Pollard's (2000) work demonstrated that strategic deployment of these activities produces substantive waterfowl breeding pair and brood capacity at the landscape scale.

The opportunity for this type of restoration is becoming increasingly limited as a result of past success and a changing regulatory environment. However, the target is to restore 11 sites resulting in 248 ha of wetland restored within the agricultural landscape. As a minimum this should result in an additional 248 pairs and 238 broods/year. However, waterfowl response is expected to be greater, particularly when small wetlands are restored in the periphery of these wetlands.

Beaver Management

Beavers are abundant and widely distributed in PEI. As a result, beaver ponds are a prominent landscape feature in both the forest and agricultural landscapes and provide important wildlife habitat. Healthy beaver population are critical to the stability of waterfowl populations in the forested regions of Canada because they create and maintain a diversity of habitats important to breeding waterfowl (Gabor et al. 2002). However, in settled areas conflicts between beavers and man can be frequent and substantive. Typical solutions involve removal of the beavers and loss of the habitat.

The beaver management program also applies to non farm land and is similar to the program laid out earlier in the biodiversity section. The program focuses on beaver that are creating a conflict with human interests (i.e., flowing roads, agricultural lands, forest). Estimates of waterfowl use of beaver ponds are 0.4 IBP/ha and 0.6 broods/ha (Gabor et al. 2002). The potential exists to intensively manage 1000's of wetlands in the agricultural landscape. The program will result in intensive management of 10 sites resulting in management of 20 wetland hectares. This will result in 10 pairs and 10 broods/year.

INTENSIVE WETLAND MANAGEMENT

Intensive management generally requires repeated efforts to attain and sustain habitat conditions. These actions improve habitat conditions for waterfowl beyond what would occur in the absence of management and are suited to areas where the overall carrying capacity of the landscape has been reduced.

There are a total of 3,830 ha of wetlands managed jointly by the Province and Ducks Unlimited Canada in PEI. Of these, 917 ha are NAWMP projects. A substantial part of these enhanced wetlands involve the construction of dykes and water control structures that require ongoing operation and maintenance. As projects age their productivity gradually declines as the interspersion of water within the vegetation decreases. Active management can reverse these trends through water level adjustment, repair and upgrading of water control structures or dykes, and/or physical manipulation of vegetation. Active management of wetlands will help ensure that waterfowl productivity is retained.

A significant number of intensively managed projects in PEI are nearing the life expectancy of the associated infrastructure. One of the consequences of this aging aside from the decline in the condition of the infra-structure is typically a gradual decline in productivity as the wetlands move increasingly away from a hemi-marsh state. This decline can be reversed or minimized through intensive management activities. These activities range from low cost water level manipulation when the vegetative community is rooted, to the high cost of physically removing dense vegetation mats. These activities are expected to return waterfowl productivity back to levels expected in the early stages of the project.

Investments in these activities will focus on those wetlands within the productive agricultural areas. Activities will focus on intensive management of 200 ha of wetlands over the 5 years of this implementation plan and it is expected to support an additional 95 pairs and produce 95 additional waterfowl broods.

Summary of wetland restoration impact on breeding waterfowl

Wetland restoration activities will result in 565 ha of restored wetlands over 5 years. The waterfowl response to these restored wetlands will accumulate as the program in deployed across the landscape. Table 15 summarized the compounded breeding waterfowl response to wetland restoration.

Currently, there are no waterfowl productivity models that relate the additional brood production to waterfowl population response. We recommend that waterfowl productivity models be developed to help understand the waterfowl population response to conservation actions.

Table 15. Anticipated waterfowl increases in pairs and broods from wetland restoration programs. Cumulative production represents the compounded broods produced assuming that 20% of the restored hectares occur each year.

		Restored	Production in 2010	
Program	Projects	Ha	Pairs	Broods
Rural Wetland Restoration	100	150	293	103
Agriculture Biodiversity	35	60	117	41
Large wetland restoration	11	248	248	238
Beaver pond	10	20	10	10
Intensive Wetland Management	5	200	95	95
Total	161	678	763	497

Staging and Wintering Waterfowl

The number of birds staging and wintering in PEI is related to continental and local breeding population size, habitat conditions, food availability, and weather. PEI waterfowl are exclusively associated with the Atlantic flyway. Milder winters have resulted in long ice free periods that are resulting in increased wintering populations as well as potentially increasing the residency time of waterfowl during migration.

The availability of high-energy food resources from our agricultural activities is a key factor for staging waterfowl such as Black Ducks, Mallards and Canada Geese. Access to aquatic food resources is important for species that do not feed in agricultural fields like ring-necked ducks and green-winged teal. Wetland drainage within the agricultural landscape has likely degraded habitat conditions for staging waterfowl. However, given the mobility of most species and the proximity of agricultural areas to coastal environments, this degradation is likely buffered to some degree by the availability of coastal and estuarine habitats. These coastal and estuarine habitats are also important to migrating sea ducks such as common eiders, black scoters and long-tailed ducks. Staging and wintering contributions from PEI may be as important as breeding contributions to continental waterfowl populations. This statement is supported by the diversity of species and the migration numbers. Estimates of fall flights in Atlantic Canada are 3 million waterfowl; however, these estimates are conservative as they under represent sea ducks. PEI supports a substantial migration of sea ducks. We lack detailed information on waterfowl use days, however observations of collar marked Canada geese indicates that residency times of field feeding waterfowl are relatively long.

Limiting factors:

The abundance and accessibility of quality foods and adequate energy are considered limiting factors for many migrating and wintering waterfowl. However, the availability of waste grain and legumes from agricultural activities is assumed to meet the energetic needs of most key staging waterfowl.

For field feeding waterfowl we assume that the interspersion of fresh water wetlands and coastal habitats is sufficient to meet their needs. We assume the same for diving ducks as well, but are less certain about this assumption.

For sea ducks and coastal waterfowl we assume that the current mix of habitat and food resources is sufficient to meet their needs. Anthropogenic factors may be influencing access to these resources however.

Aquaculture activities are increasing human waterfowl interactions in the coastal environment. However, the overall impact of these interactions on migrating and wintering waterfowl is unknown.

Energy needs per individual

Estimates of energy needs during staging and winter are estimated based on body mass and calculation of Basal Metabolic Rate (Aschoff and Pohl 1970). Wintering energy needs are slightly higher than that required for staging so rates were adjusted. Staging and wintering needs are expressed in terms of daily energy requirements (DER).

Table 16. Estimated basal metabolic rate (BMR) and daily energy requirement (DER) of key species for staging and migration.

Species	Body Mass (kg)*	BMR (kcal/day)**	DER staging (kcal/day)***	DER winter (kcal/day)***
Black Duck	1.25	87	290	400
Mallard	1.25	86	290	400
Lesser Scaup	0.85	65	156	299
Ring-necked Duck	0.78	61	146	281
Common Eider	2.0	122	292	561
Black Scoter	1.15	80	192	368
Long-tailed Ducks	0.82	63	151	290
Canada Geese (NAP)	4.0	203	487	934

* body mass based on adult males from Bellrose 1980.

** BMR = $73.5(\text{mass})^{0.734}$ mass in kg (Aschoff and Pohl 1970).

*** DER staging = 2.4 BMR and DER winter -= 4.6 BMR.

Energy available per unit area.

A key information need is the evaluation of energy available to staging and wintering waterfowl using both the agricultural and coastal environments. From this we could determine if deficits exist and develop responsive conservation programs. This could also serve a means of focusing retention activities and demonstrating waterfowl consequences of these programs.

Conservation programs:

Wetland Restoration:

There is limited information on the staging value of managed wetlands in Atlantic Canada. However, based on results of staging surveys of restored wetlands we used a value of 6.0 staging waterfowl/ha the average production from the projects along the St, John River was 6.1 staging waterfowl/ha when the 2 projects that were closed to hunting were eliminated. Local survey results demonstrate that managed wetlands are used heavily by several of our key waterfowl species, particularly black ducks. Waterfowl usage of restored wetlands typically peaks toward the end of September prior to the opening of the hunting season.

The existing inventory of 1805 ha of restored wetlands in PEI conservatively supports 11,000 staging waterfowl. The placement of these restored wetlands in proximity to agricultural areas likely enhances an individual's ability to access key agricultural food resources. While the wetland restoration activities primarily provide breeding benefits, the restoration of an additional 565 ha of wetlands within the agricultural landscape is expected to increase the capacity of the landscape to support an additional 3400 staging dabbling ducks.

Restored wetlands provide limited wintering benefit for PEI waterfowl. However, changes in climate may result in these wetlands remaining ice free for longer periods. As such, restored wetlands may become increasingly important to wintering waterfowl.

Stewardship

Land ownership is an issue that is deeply rooted in the culture of PEI residents given the high percentage of private land holdings (90%), and the often detrimental impact of human activity on wetlands, there continues to be a strong need for land stewardship as an essential and complimentary component of wetland conservation in the Province.

EHJV partners (NGO's, government departments, community groups, and agricultural associations) have been very active in the past, raising awareness and developing solutions to changing land use practices that have had and continue to have detrimental effects on the natural resources of the Province. Stewardship activities have included: the promotion, demonstration, and adoption of soil conservation measures, livestock fencing and alternate watering programs, hedgerow establishment, nutrient management planning, and the restoration of over 200 small wetlands. These activities have been supported through the Agricultural Environmental Resource Program in the past, and currently the under the Sustainable Resource Conservation Program within the Agricultural Framework Policy.

Agricultural Biodiversity Planning

Prince Edward Island farmers are becoming increasingly aware and interested in habitat conservation and biodiversity related issues. This is, in part, due to the Federal Governments 2003 Agricultural Policy Framework and supporting Provincial programs that aim to position Canada as the world leader in food safety, innovation and environmentally responsible agricultural production. Under the APF, farmers are eligible to apply for financial and technical assistance to implement beneficial management practices that provide benefits to biodiversity including the restoration of wetlands. Interest by the agriculture community to implement beneficial management practices that improve habitat provides a potential benefit to waterfowl. By focusing on agricultural lands that represent 45% of the province's land base a significant portion of the breeding waterfowl in PEI can be positively influenced.

However, few farmers have applied for "biodiversity related" assistance in Prince Edward Island. Through the EHJV Partnership, biodiversity plans will be developed with farmers to promote the implementation of such BMP's as wetland restoration and riparian management. The EHJV Partnership will continue to develop partnerships with agricultural producers, provincial agricultural extension staff and Environmental Farm Plan Staff to develop new BMP's that conserve wetland habitats and support increasing breeding potential for PEI waterfowl. A total of 10,000 ha of farmland and woodlots will be assessed to identify potential BMP's that could be implemented to enhance waterfowl habitat. These actions will contribute to maintaining the 530 breeding pairs of American black duck, mallard, green-winged teal, ring-necked duck and Canada goose currently using this habitat and will lead to additional breeding pairs as outlined under the Restored Wetlands Section.

Management

Management will involve the inspection and maintenance of water control structures, vegetation control, and other related activities to ensure that the wetlands secured under NAWMP are providing optimal wildlife habitat conditions.

Action - Manage habitat on existing NAWMP projects (over 1,370 hectares). Habitat management will occur throughout all Ecoregions in PEI. This action will contribute to achieving the waterfowl population goals for Prince Edward Island by maintaining critical wetland and associated upland habitat for breeding, wintering and staging.

Communications

Communication activities promote the activities and partnership of NAWMP and the EHJV to target audiences.

Action - Communications activities will include the design and production of signs identifying projects and the promotion and delivery of existing wetland conservation displays and literature to various audiences throughout the province. This action will contribute to achieving the waterfowl population goals for Prince Edward Island by increasing public awareness of critical

breeding, wintering and staging issues associated with waterfowl, wetlands and associated upland habitats.

Legislation and Policy

The Province of Prince Edward Island has adopted a number of policies and legislation that aids in the conservation and protection of wetlands. EHJV partners have been instrumental in increasing the public awareness and garnering acceptance required to adopt these measures.

Responsibility for managing and protecting wetlands in Prince Edward Island rests with the Department of Environment, Energy and Forestry. The Department is also responsible for wetland habitat, bio-diversity functions, and for groundwater and surface water quality and quantity.

The Department of Environment, Energy and Forestry is responsible for provincial statutes and regulations that provide protection for wetlands. Permits issued under sections 9 and 10 of the *Environmental Protection Act* (EPA) dealing with "Environmental Impact Assessment" and "Watercourse Alterations" provide protection for wetlands. In some instances, wetlands receive additional protection under the "Watercourse Buffer Zones" section. EEF is also responsible for the *Wildlife Conservation Act* and the *Natural Areas Protection Act*, which have provisions to protect wetlands through designation, covenants and easements. The Coastal Area Regulations of the *Planning Act*, developed by the Department of Community and Cultural Affairs, regarding the development of private or commercial developments reinforce protection of wetlands and watercourses.

The expansion of the amount of land in potato production in the past three decades has prompted an amendment of the *Environmental Protection Act* to include Buffer Zone protection in agricultural and forested land, and strengthens the regulations of the *Planning Act* with repect to development. Most recently the *Agricultural Crop Rotation Act* was enacted in part to reduce the threat to watercourses and wetlands from upland areas under intensive agriculture.

Supporting and guiding the legislation pertaining to wetland conservation in Prince Edward Island, the Provincial Government has adopted the *Wetland Conservation Policy* in 2002. This policy refers to all wetlands as defined by the policy and in the Prince Edward Island Wetland Inventory, regardless of ownership; the objectives, goals and principles of the policy are outlined in Appendix 3

Evaluation

Monitoring

Breeding pair and brood surveys for black ducks and other key waterfowl species have been conducted annually in Prince Edward Island since 1983. Survey areas are representative of wetlands of all types and are located throughout the Province. These surveys will be continued as the primary monitoring of progress towards PEI waterfowl objectives.

Aerial surveys are also conducted each autumn by the Canadian Wildlife Service and the Province to determine the peak numbers of staging Canada geese and black ducks. This information provides an indication of long term trends.

Changes in the amount and type of wetland habitat are monitored through the PEI Wetland Inventory, maintained by the Province. The Inventory is an essential aid in monitoring and assessing the success in meeting the objectives of the PEI-EHJV.

The Province participates in the Maritime Breeding Bird Atlas to provide as a source of additional information to evaluate the effectiveness of the PEI-EHJV objectives for conservation of non-waterfowl species.

Directed Studies

Directed studies are designed to test the biological assumptions underlying the Implementation Plan. Directed studies are often delivered in association with an academic institution and often involve many partners. Directed study projects are intended to be specific in nature and often

lead to modifications of operational standards or program restructuring. The PEI-EHJV Technical and Steering Committees are responsible for identifying and establishing directed study priorities. All directed study projects will be required to go through review by the EHJV Science Support Team.

Past studies in support of the PEI EHJV include:

Waterfowl use of small, excavated wetlands in Prince Edward Island, and
Anuran Response to small excavated wetlands in Prince Edward Island

Assessment

The PEI-EHJV Steering Committee will annually assess the progress towards achieving the PEI-EHJV Implementation Plan. Assessment reviews will be driven by detailed annual reports prepared by EHJV partners. Assessment outcomes will be used to renew key waterfowl species lists, population objectives, and habitat conditions. Effective assessment will also be a valuable tool to renew the strength of the EHJV partnership.

Resource Needs

Table 17A. Five Year Securement Resource Needs and Waterfowl benefits Prince Edward Island.

PEI-Habitat Conservation Program

Securement	Wetland (ha)	Upland (ha)	Total (ha)	Cost/ha	Total Costs	Waterfowl benefits	Key Waterfowl Species
(Coastal)							
Fee Simple NCC	243	243	486	1186	576,200	Breeding Staging, Wintering	ABDU, MALL, RNDU CAGO
DUC	60	15	75	100	22,500		
PEI	40	35	75	1259	94,425		
TOTAL	343	293	636		693,125		
Agreements NCC						Breeding Staging, Wintering	ABDU, MALL, RNDU CAGO
DUC	20	5	25	100	2,500		
PEI							
TOTAL	20	5	25		2,500		
(Freshwater)							
Fee Simple NCC	40	81	121	1186	143,225	Breeding	ABDU, MALL, RNDU CAGO
DUC	20	5	25	250	6,250		
PEI	55	46	101	1060	107,060		
TOTAL	115	132	247		256,535		
Agreement NCC						Breeding	ABDU, MALL, RNDU CAGO
DUC	20	5	25	100	2,500		
PEI							
TOTAL	20	5	25		2,500		
	498	**435**	**933**		**954,660**		

Table 17 B Five Year Enhancement Resource Needs and Waterfowl benefits Prince Edward Island

PEI-Habitat Conservation Program						
Activity	**# of projects (5 Years)**	**Restored Ha**	**Cost per Ha**	**Total Cost – 5 Years**	**Waterfowl Benefits**	**Key Waterfowl Species**
Enhancement						
Rural Wetland Restoration	100	150	3705	555,750	Breeding	ABDU, MALL, AGWT
Agricultural Biodiversity	35	60	2200	132,000	Breeding	ABDU, MALL, AGWT
Large Wetland Restoration	6 5	135 112.5	3705	463,125 416,812	Breeding, Staging	ABDU, MALL, AGWT
Beaver Pond	10	20	617	12,340	Breeding	ABDU, MALL, AGWT, RNDU
Intensive Wetland Management		200	115	23,000	Breeding Staging,	
Riparian	100	60	2470	148,200	Breeding	ABDU, MALL
Management			85000/yr	425,000		
Coordination			70000/yr	350,000		
Policy			10000/yr	50,000		
Evaluation			25000/yr	125,000		
TOTAL	**256**	**737.5**		**2,701,227**		

Integration with other Bird Conservation Initiatives

The following came directly from A Strategic Framework for the Delivery of the Eastern Habitat Joint Venture Program

In Canada, implementation of conservation plans under NABCI will follow development of the other three bird initiatives: Canadian Shorebird Plan (CSP) for shorebirds; Wings Over Water (WOW) for sea birds, marsh birds and colonial birds; and Partners in Flight (PIF) for land birds. There are natural links and enhanced opportunities for delivery of programs specifically aimed at the conservation of shorebirds and waterbirds, however, opportunities for linkages with PIF are less obvious. The EHJV can work with its partners to influence activities on habitats important to species covered under these plans until the other plans are funded and ready for implementation.

Under the present structure, with significant NAWMP funding being provided through the North American Wetlands Conservation Act (NAWCA), waterfowl and their habitats remain a clear priority of the EHJV. **Implementation of the other bird initiatives by an expanded EHJV partnership will be undertaken as plans are completed and funding becomes available**. In the interest of getting the other bird initiatives operational, the EHJV may facilitate the completion of these other plans, and their integration, by providing technical assistance and limited funding. However, it is unlikely that the EHJV will become heavily involved in their implementation, unless there is a strong overlap with existing programs, until additional sources of funding become secured. Once the plans are completed, the EHJV could become the delivery arm of the other plans and provide funding to support "first step" projects that are compatible with the NAWCA funding guidelines while additional funding and resources are acquired. The EHJV Board must be linked into national and international level activities and viewed as the delivery agent responsible for the delivery of other bird initiatives with implementation carried out at the provincial level.

Partner Responsibilities

The Province of Prince Edward Island and Ducks Unlimited Canada will contribute funding, securement, enhancement, management, stewardship, evaluation, communications, policy, coordination, planning to the PEI EHJV. The Canadian Wildlife Service will contribute funding, securement, stewardship, evaluations, planning, and coordination. The Nature Conservancy Canada will contribute funding, securement, management, stewardship, evaluation, communications, policy, coordination, planning to the PEI EHJV.

Relationship to Other Joint Ventures

The activities outlined in this implementation plan link directly with the goals of the Black Duck Joint Venture by enhancing American black duck populations through conservation of wetland and associated upland habitat.

The activities links with the goals of the Atlantic Coast Joint Venture by conserving habitat for waterfowl including American black duck, mallard, green-winged teal, blue-winged teal, Canada goose and mallard in the Atlantic Flyway.

APPENDIX 1 - *PEI-EHJV Steering Committee / Technical Committee*

PEI -EHJV Steering Committee (2006 membership)			
Organization	Committee Member	e-mail	Telephone
Environment Canada	Keith McAloney	keith.mcaloney@ec.gc.ca	(506) 364-5013
Ducks Unlimited Canada	Deanne Meadus	d_meadus@ducks.ca	(902) 667-8726
Nature Conservancy of Canada	Diane Griffin	diane.griffin@natureconservancy.ca	(902) 450-6010
PEI Department of Environment	Gerald MacDougall	dgmacdougall@gov.pe.ca	(902) 368-5111
PEI Department of Environment	Kate MacQuarrie*	kemacquarrie@gov.pe.ca	(902) 679-6139
NS-EHJV Program Manager	Alan McLennan	admclennan@gov.pe.ca	(902) 679-6223
EHJV Coordinator	Trish Edwards	patricia.edwards@ec.gc.ca	(506) 364-5085

* Committee Chair

NS-EHJV Technical Committee (2006 membership)			
Organization	Committee Member	e-mail	Telephone
Environment Canada	Colin Mackinnon	colin.mackinnon@ec.gc.ca	(506) 364-5039
Ducks Unlimited Canada	Wade Lewis	w_lewis@ducks.ca	(902) 569-4544
Nature Conservancy of Canada	Diane Griffin	diane.griffin@natureconservancy.ca	(902) 569-2343
PEI Department of Environment	Randy Dibblee	rldibblee@gov.pe.ca	(902) 368-4666
PEI Department of Environment	Rosemary Curley*	frcurley@gov.pe.ca	(902) 368-4668
PEI Department of TPW	Bob Wilson	jrwilson@gov.pe.ca	(902) 368-5177
PEI-EHJV Program Manager	Alan McLennan	admclennan@gov.pe.ca	(902) 368-4667

* Committee Chair

APPENDIX 2– General Assumptions and Guiding Principles

The following list of general assumptions and guiding principles were drafted by the members of the PEI-EHJV Steering and Technical Committee during the development of the 2007 PEI-EHJV Implementation plan:

Principles

- Habitat securement priorities for the PEI-EHJV include:
  - Large contiguous salt marsh parcels.
  - Private in-holdings within wildlife management areas and sanctuaries.
- PEI-EHJV enhancement activities overlap the agricultural communities interest in water quality and riparian health.
- The effectiveness of waterfowl management can be measured in many different ways including: changes in waterfowl populations as shown in waterfowl surveys; the "amount" of waterfowl habitat secured for long-term protection from habitat threats; the adoption of land use changes that support waterfowl use; and the "amount" of habitat enhanced or restored to support waterfowl.
- A significant inventory of intensively managed wetland projects in Atlantic Canada is now aging. Maintaining existing managed wetlands is a priority for the PEI-EHJV will help to sustain and support current habitats and waterfowl populations.

Assumptions

- The available of food (invertebrates) is limiting – adding more open water marsh will increase invertebrate production and improve waterfowl brood habitat and increase waterfowl populations in the agricultural landscape.

- Limited information is available on the relationships between habitat conditions and waterfowl populations in the Maritimes.

- Private land stewardship programs can effect land use changes that have positive effects on wetland habitat and waterfowl population.

- The PEI-EHJV Stewardship Program is best positioned to promote and deliver Beneficial Management Practices (BMP's) that conserve wetland habitat in the agricultural landscape to agricultural practitioners, producers, woodlot owners and land users.

- Evaluation is an important component of the PEI-EHJV Program - partners and funding for evaluations need to be identified during project planning.

- Global warming may contribute to larger populations of wintering waterfowl along Prince Edward Island's coast.

- Nesting success is not limiting for key waterfowl species as nesting habitat seems to be abundant.

- Duckling survival is the primary limiting factor for our key waterfowl species. Improvements in duckling survival are assumed related to increases in the availability of permanent open water marshes with hemi-marsh conditions.

- Seasonal and small wetlands are important to early breeding waterfowl (Krapu et al 1997), which are often most successful (Greenwood et al 1995, Blums et al. 2002, Pietz et al 2003, Hoekman et al 2004) and because seasonal wetlands are easily drained and occur at lower densities in eastern North America then in the prairies (Krapu et al 2000, Hoekman et al 2004) suggesting that restoration of seasonal and small wetlands is an important strategy to enhance duckling survival. This approach is assumed to be particularly effective when done in proximity to large wetlands (Steevens et al. 2003). Restoring small wetlands in the periphery of large wetlands is assumed to increase the overall carrying capacity of the landscape.

- Non-breeding season survival (harvest mortality) is a strongly influential factor to population dynamics of eastern populations. It was the primary demographic factor for eastern mallards (Hoekman et al 2004, Coluccy et al in prep.). We assume that non-breeding season survival will remain constant.

- Habitat objectives for key species are assumed to reflect and accommodate the needs of other waterfowl species within PEI

- The availability of waste grain and legumes from agricultural activities is assumed to meet the energetic needs of most key staging waterfowl

- For field feeding waterfowl we assume that the interspersion of fresh water wetlands and coastal habitats is sufficient to meet their needs.

- For sea ducks and coastal waterfowl we assume that the current mix of habitat and food resources is sufficient to meet their needs. Anthropogenic factors however, may be influencing access to these resources.

APPENDIX 3– Prince Edward Island Wetland Conservation Policy

Policy Objective

The objective of the Provincial Government with respect to wetlands is:
To promote the conservation and protection of Prince Edward Island's wetlands to sustain their ecological and socio-economic functions, now and in the future.

Policy Statements

The Provincial Government through the Department of Environment Energy & Forestry(EEF) will***:***

- Utilize existing wetlands management and protection mechanisms to control development in and adjacent to wetlands, and develop new management tools as appropriate, to ensure no net loss of wetlands and wetland function;
- Promote and develop wetlands education and awareness programs;
- Promote stewardship and securement of wetlands through enhanced cooperation among local, municipal, provincial and federal governments and the private sector.

All wetlands are considered under this policy.

Policy Goals

The goals of this policy are:

1. To manage human activity on or near wetlands in a manner which will achieve no net loss of wetlands and wetland function;
2. To promote and facilitate the development of wetland stewardship awareness and education through government initiatives and cooperative relationships among local citizens, stakeholder groups, the private sector, and municipal, provincial, and federal governments.

Guiding Principles

• Wetlands serve numerous valuable social, economic and environmental functions.
• In recognition of the historical and on-going wetland loss, concerted efforts are required to conserve and protect remaining wetlands.
• Because wetlands and their function are inseparably linked to their surroundings, wetland conservation must be pursued through an integrated systems approach to environmental conservation and sustainable development.
• Public support is essential and can be facilitated through public education and awareness regarding the functions and values of wetlands.

APPENDIX 4– Literature

Barney, T. and S. Petrie. 2006. Changes in availability and nutritional quality of post-harvest waste corn for staging waterfowl near Long Point, Lake Erie. 4th North American Duck Symposium, 54-55.

Blums, P., R.G. Clark, and A. Mednis. 2002. Patterns of reproductive effort and success in birds: Path analyses of long-term data from European ducks, J. Anim. Ecol. 71:280-295.

Coluccy, J.M., T. Yerkes, R. Walling, J.W. Simpson, L. Armstrong, and J. Davis. Population dynamics and sensitivity analyses of breeding mallards in the Great Lake state. In prep.

Gabor, S.T., H.R. Murkin, and J.W. Ingram. 2002. Waterfowl use of managed and unmanaged beaver ponds in south-central Ontario. Northeast Wildl. 57:45-57.

Greenwood, R.J., A.B. Sargeant, D.H. Johnson, L.M. Cowardin, and T.L. Shaffer. 1995. Factors associated with duck nest success in the Prairie Pothole Region of Canada. Wildl. Monographs 128.

Hoekman, S.T., S.T. Gabor, H.R. Murkin, and L. Armstrong. 2004. Factors affecting survival of mallard ducklings in southern Ontario, Canada. Condor 106:485-495.

Hoekman, S.T., S.T. Gabor, M.J. Petrie, R. Maher, H.R. Murkin, and M.S. Lindberg. 2006. Population dynamics of mallards breeding in agricultural environments in eastern Canada. J. Wildl. Manage. 70:

Krapu, G.L., R.J. Greenwood, C.P. Dwyer, K.M. Kraft, and L.M. Cowardin. 1997. Wetland use, settling patterns, and recruitment in mallards. J. Wildl. Manage. 61:L736-746.

Krapu, G.L., P.J. Pietz, D.A, Brandt, and R.R. Cox, Jr. 2000. Factors limiting mallard brood survival in prairie pothole landscapes. J. Wildl. Manage. 64:553-561.

McCullough M.M.,Forbes D.L., and Shaw R.W. 2002. Executive Summary – Coastal Impacts of Climate Change and Sea-Level Rise on Prince Edward Island. Climate Change Action Fund, Geological Survey of Canada Open File 4261.

Pietz, P.J., G.L. Krapu, D.A. Brandt, and R.R. Cox. 2003. Factors affecting Gadwall brood and duckling survival in prairie pothole landscapes. J. Wildl. Manage. 67:564-575.

Stevens, C.E., T.S. Gabor, and A.W. Diamond. 2003. Use of restored small wetlands by breeding waterfowl in Prince Edward Island, Canada. Restoration Ecol. 11:3-12.