

# Saskatchewan NAWMP Implementation Plan 2001 - 2026

## Five Year Plan April 2007 - April 2012



North American Waterfowl  
Management Plan  
*Plan nord-américain de  
gestion de la sauvagine*  
*Plan de Manejo de Aves  
Acuáticas de Norteamérica*



prairie habitat  
joint venture

*Saskatchewan NAWMP Implementation Plan 2001-2026*

*Five Year Plan April 2007 – April 2012*

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***Five Year Plan April 2007 – April 2012***

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**&**

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## I. List of Acronyms

APF - Agriculture Policy Framework

CCS - Census Consolidated Subdivision

DUC – Ducks Unlimited Canada

EC – Environment Canada

FWDF – Fish and Wildlife Development Fund

NAWMP – North American Waterfowl Management Plan

NCC – Nature Conservancy of Canada

PFRA – Prairie Farm Rehabilitation Administration

PHJV - Prairie Habitat Joint Venture

PPM - Pintail Productivity Model

PPR - Prairie Pothole Region

RM – Rural Municipality

SMA – Saskatchewan Ministry of Agriculture

SMOE – Saskatchewan Ministry of Environment

SWA – Saskatchewan Watershed Authority

SWCC – Saskatchewan Wetland Conservation Corporation

WBF – Western Boreal Forest

WCDPP - Waterfowl Crop Damage Prevention Program

WDCP - Wildlife Damage Compensation Program

WHPA - Wildlife Habitat Protection Act

WPM - Waterfowl Productivity Model

## II. Executive Summary

Since 1989 the delivery of the North American Waterfowl Management Plan (NAWMP) in Saskatchewan has been guided by the Saskatchewan Implementation Strategy. In 2005 the Prairie Habitat Joint Venture, which coordinates NAWMP delivery across the Canadian Prairies, identified the need to update provincial implementation plans. The Saskatchewan NAWMP Technical Committee, with membership comprised of Saskatchewan PHJV Partners, has developed the updated and revised Saskatchewan NAWMP Implementation Plan (the Saskatchewan Plan).

The Saskatchewan Plan has been developed within the context and planning parameters set by the 2005 PHJV Strategic Plan. The PHJV Plan goal is to sustain waterfowl populations at the levels of the 1970s via four basic habitat goals: stop further wetland loss; stop further loss of native uplands, especially native grasslands; restore lost wetlands, especially small basins; and restore upland habitat function in landscapes conducive for maintenance of bird populations. The PHJV will set habitat objectives for the priority species of waterfowl, landbirds, shorebirds and waterbirds.

The status of waterfowl populations in Saskatchewan from 1971-2006 varies considerably among regions, but overall provincially populations have undergone large declines (American wigeon and northern pintail), moderate declines (scaup, mallard and green-winged teal), large increases (northern shoveler and gadwall), moderate increases (redhead and blue-winged teal) or are relatively stable (canvasback). May pond counts are somewhat lower than 1970s levels.

Habitat conditions are assumed to be the primary determinant of waterfowl productivity and populations, and therefore that habitat conditions of the 1970s will result in similar waterfowl populations. Although native upland cover continues to be lost at a slow rate, provincially since 1991 the area of tilled land has declined back to 1971 levels. Formerly tilled land has been converted to forage lands due to an expanding grazing livestock industry. The intensity of agricultural use on remaining tilled lands has increased significantly due to dramatic declines in summerfallow.

In contrast, wetland area is estimated to have declined by 4.1% from 1985 to 2000. Wetland loss is likely the primary factor driving reduced waterfowl productivity in Prairie Canada, therefore Saskatchewan Partners must make retention and restoration of wetland area and function a high priority.

To direct activities to the most valuable waterfowl habitat areas, the Saskatchewan Plan established new Target Landscapes using predictive breeding density maps (Ducks Unlimited Canada Decision Support System) for both the dabbling group (mallard, shoveler, blue-winged teal, and gadwall) and northern pintail. Changes in waterfowl productivity (hatched nest deficits) from 1971-2001 were estimated for each Target Landscape and the entire remainder of the PHJV Delivery Area by integrating information on changes in habitat area and agricultural management with current scientific knowledge on waterfowl responses to habitat at both site and landscape scales (the Waterfowl Productivity Model, Ducks Unlimited Canada).

The Waterfowl Productivity Model was also used to generate scenarios of wetland and upland habitat restoration treatments that over 25 years would eliminate waterfowl productivity deficits within each Target Landscape and the remainder of the PHJV Delivery Area. Habitat restoration scenarios were selected and refined using expert knowledge of the opportunities and obstacles for implementation within each Target Landscape. Habitat objectives identify the type and area of wetland and upland restorations required to eliminate waterfowl productivity deficits. Detailed delivery plans were developed for the first 5 years of the 25 year habitat objectives. Some 5 year habitat objectives will be achieved through the direct habitat activities of Saskatchewan Partners, but large contributions are also required from agricultural extension programs, adjustments to government agricultural policies, and current trends in agricultural industry. In some cases, 5 year habitat restoration objectives will not be achieved without significant new policy or investment.

Twenty-five year habitat restoration objectives for the entire Saskatchewan PHJV Delivery Area include; 56,217 wetland restorations; 1,734,640 additional acres of winter wheat; 2,478,900 acres of new seeded pasture; 1,652,880 acres of new hayland; and 57,180 acres of new planted cover. The 5 year Saskatchewan Plan restoration objectives are 20% of the 25 year restoration objectives, or; 11,245 wetland restorations; 346,936 additional acres of winter wheat; 495,784 acres of new seeded pasture; 330,571 acres of new hayland; and 11,438 new acres of planted cover. Objectives for winter wheat, and new seeded pasture and hayland are expected to be achieved, but without additional funding or policy initiatives only 58 and 60% of the 5 year restoration objectives will be achieved for wetland restorations and planted cover establishment, respectively.

Retention of wetland and upland habitats is also a high priority in the Saskatchewan Plan. Habitat retention objectives were established using the best current information on the area of existing habitat, and its relative risk of loss. The twenty-five year wetland retention objective is 914,123 acres (1,523,500 basins) of small (<2 acre) wetlands located in cultivated landscapes (5 year retention objective is 182,600 acres). Without additional funding or policy initiatives only 20% of the 5 year wetland retention objective will be achieved. The twenty-five year upland retention objective is 1,605,400 acres of native uplands at greatest risk of cultivation (5 year retention objective is 321,000 acres). Retention objectives will be fully achieved through a combination of direct programming by Saskatchewan Partners, extension and policy initiatives. Given the uncertainty of current habitat area and risk estimates, improvement of habitat inventories and risk models is warranted to refine habitat retention objectives.

Important moulting and staging wetlands were also identified, and Saskatchewan Partners will pursue retention and enhancement activities at these wetlands as opportunities arise.

There are many habitat program components of the Saskatchewan Plan, and each Saskatchewan Partner plays a role in its implementation. Policy revision and development will be particularly influential in achieving the Plan's habitat objectives, and policy objectives are identified here. The relationship of the Saskatchewan Plan to the Western Boreal Forest region, and population objectives of priority landbirds, shorebirds, and waterbirds are discussed.

Saskatchewan Partners have forecasted expenditures over the next 5 years for habitat restoration and retention, as well as support activities. A total of \$95.1 million will be required, with \$27.3, \$34.0 and \$33.6 million to be spent on habitat restoration, retention and support activities, respectively. Contributions to habitat objectives achieved through agricultural industry trends (e.g. conversion of cropland to perennial forage) are assumed to have no cost.

In setting habitat objectives, the Saskatchewan Plan made a number of assumptions. Two key assumptions are; 1) recent agricultural trends for increased tame pasture and hayland will continue for the next 5 years, and 2) wetland loss will be stopped by 2011. Continued wetland loss and decreased conversion of cropland to forage would increase waterfowl deficits and objective shortfalls, dramatically affecting Saskatchewan Partner's ability to achieve habitat objectives.

The Saskatchewan Plan recognizes that habitat objectives will be fluid as influenced by changes in policy, economic, and climate forces, thus they will be examined and refined at 5 year intervals. With change, new programs and policies must be developed and implemented to address new threats and opportunities. Integral to successful implementation of the Saskatchewan Plan's adaptive approach, improvements must be made to; 1) tracking of Partner accomplishments in order to update deficit calculations using the Waterfowl Productivity Model, and 2) inventory and monitoring of habitat trends to adjust deficit estimates and refine risk models.

### III. Introduction

The Prairie Habitat Joint Venture (PHJV) was initiated in 1986 as a partnership focused on the conservation of wetlands and associated habitats in Prairie Canada to meet the goals of the North American Waterfowl Management Plan (NAWMP). NAWMP was established in the face of reduced continental waterfowl populations to direct focused and concerted efforts to restore habitat conditions across the continent to conditions that could restore and sustain waterfowl populations at the levels of the 1970's. The advent of NAWMP represented an unprecedented partnership focusing the efforts of federal, provincial and state wildlife agencies, and conservation interests, from across North America on a common set of goals.

Since 1986, PHJV partners have secured/influenced 3.6 million acres of wetland and associated habitats that are crucial to the lifecycle needs of waterfowl and other wetland dependant wildlife. An additional 1.8 million acres, secured prior to 1986, are managed by PHJV partners, for a total of 5.4 million acres of NAWMP land in the PHJV. The partners have also promoted agricultural land use practices, policies and programs that have provided additional habitat conservation benefits across large acreages of the prairies and parklands which are critical in supporting continental waterfowl production to meet NAWMP goals.

In 2005, the PHJV renewed its strategic plan, and reaffirmed its mission vision and goals for the next 25 years. These renewed strategies have expanded the mandate of PHJV from conservation of waterfowl and wetlands in the Prairies to include all bird conservation in the prairies and the Western Boreal Forest. Conservation plans have been developed for shorebirds, water birds and land birds and partners are currently establishing population and habitat goals for these species.

#### A) PHJV Vision

Healthy prairie, parkland and boreal landscapes that support sustainable bird populations and provide ecological and economic benefits to society.

#### B) PHJV Mission

Provide leadership to achieve healthy and diverse waterfowl and other bird populations through conservation partnerships. These partnerships strive for sustainable and responsible management of the landscape taking into account social, economic and environmental factors.

#### C) PHJV Goals

##### 1. Bird Population Goals

- Sustain average waterfowl populations of the 1970's
- Set population objectives for the priority species for landbirds, shorebirds and waterbirds

These population objectives guide the process of defining habitat objectives which will form the basis of this provincial implementation plan. To achieve the landscape conditions required to support these population goals will require a variety of program actions.

## 2. Habitat Goals

- Stop further wetland loss
- Stop further loss of native lands, especially native grasslands
- Restore lost wetlands, especially small basins
- Restore function of upland habitats in landscapes conducive for maintenance of bird populations
- Set habitat objectives for the priority species for waterfowl, landbirds, shorebirds and waterbirds

### D) Relationship of Saskatchewan Implementation Plan with PHJV Strategic Plan

This implementation plan outlines specific habitat objectives and conservation program interventions for Saskatchewan designed to support the habitat and population goals of the PHJV. This implementation plan is designed to support the 2006-2011 PHJV Strategic Plan and contribute to the long term landscape vision shared by the joint venture partners.

This implementation plan builds on the success of the PHJV partnership in Saskatchewan since 1986. The approach outlined continues to foster a philosophy of partnership approaches to delivering direct conservation programs such as land securement and habitat restoration, policy development and influence, and extension. Partners will also work towards integrating NAWMP and PHJV goals and objectives in complimentary initiatives with the net effect of expanding and strengthening the partnership and achieving a sustained positive impact on the landscape.

## IV. Status of Waterfowl in Saskatchewan 1971-2006

The following review is based on data from the Breeding Waterfowl Population Survey conducted annually across prairie Canada (Benning 1976; see <http://www.fws.gov/migratorybirds/reports/reports.html> ). This trend review is limited to the 10 most common duck species (7 dabbling duck species and 3 diving duck species) and May ponds in the traditionally surveyed area covering the majority of the PHJV delivery area in Saskatchewan (Strata 30-35; Figure 1). Trends are shown as running 10-year average breeding population size by survey strata and by all strata combined. Running 10-year averages are shown to smooth annual variation and to elucidate trend.

### A) Provincial Summary

Ten-year average wigeon and northern pintail counts have shown the greatest decline of any species relative to the averages of the 1970's [-436,000 (-63%); and -979,000 (-57%) respectively], (see figures in Appendix 1). Some recent recovery in the pintail average has occurred, however, the recent wigeon trend is flat. Scaup [-153,000 (-33%)], mallard [-574,000 (-22%)], and green-winged teal [-50,000 (-15%)] have all declined since the 1970's. The recent scaup trend is generally flat and mallard and green-winged teal averages are increasing. Shoveler [+418,000 (+62%)], gadwall [+319,000 (+55%)], redhead [+51,000 (+24%)], and blue-winged teal [+240,000 (+17%)] are above their 1970's average population and all show recent upward trends. Canvasbacks are at similar levels to the 1970's [-12,000 (-5%)] and the recent trend is flat. While pond counts have recovered over the last 10 years, they remain 15% (-358,000) below 1970's levels and their recent trend has flattened.

### B) Continental Perspective

The proportion of continental populations of all seven dabbling duck species counted in Saskatchewan (Strata 30-35) during the May survey has declined from 1970's levels (see figures in Appendix 2). Change in percent of the continental population in Saskatchewan ranges from -12.9% (from 23.2% to 10.3%) for wigeon to -1.3% (from 29.9% to 28.6%) for blue-winged teal. Saskatchewan's proportion of mallards has declined 7.8% (from 31.5% to 23.7%) and northern pintail has declined 4.4% (from 30.1% to 25.7%). The proportion of the continental population of the 3 diving duck species has declined (-7.4%; from 40.2% to 32.8%) for canvasback and remained relatively stable for scaup (+1.0%; from 7.4% to 8.4%) and redhead (+0.1%; from 32.5% to 32.6%). Proportion of the continental population in Saskatchewan is currently trending upward for most species except wigeon.

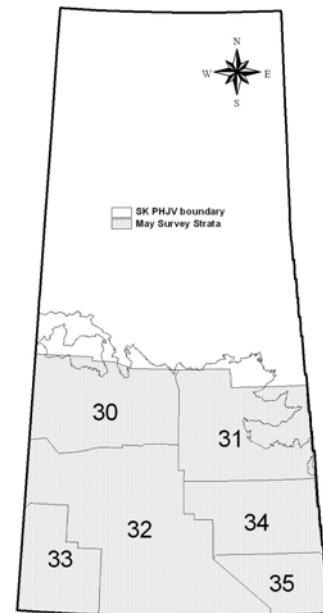


Figure 1. May Breeding Waterfowl Survey strata (30-35) relative to PHJV boundary in Saskatchewan.

### C) Strata Summary

See figures of dabbling and diving duck populations by stratum in Appendix 3 and 4, respectively.

*Strata 30:* Large declines in mallards (-239,000), pintail (-176,000), and wigeon (-90,000) from 1970's average levels. Mallard and pintail trends have flattened recently, however recent wigeon trends remain downward. Moderate declines in canvasback (-26,000) and scaup (-40,000) with a recent sharp downward trend in scaup. Blue-winged teal have shown a small downward trend (-26,000) from the average of the 70's and recent trends are generally flat to increasing. Shoveler (+20,000), gadwall (+22,000), green-winged teal (+7,000) and redhead (+2,000) are generally above 1970's levels with flat to small increasing recent trends. The May pond 10 year average count has been trending downward and currently is ~13% (-41,000) below the 1970's average.

*Strata 31:* Large declines in pintail (-154,000) and wigeon (-47,000) from 1970's average levels with recent trends generally flat. Moderate declines in mallard (-137,000), canvasback (-11,000) and scaup (-30,000) from 1970's averages. Recent trends are up for mallard and canvasback but down for scaup. Redhead trend is generally flat. Blue-winged teal (+42,000), green-winged teal (+24,000), shoveler (+42,000), and gadwall (+46,000) averages are currently above the 1970's levels and trending upward. A consistent decline in 10 year average May pond count is evident and the current average count is ~30% (-156,000) below the 1970's average.

*Strata 32:* Large declines in pintail (-372,000) and wigeon (-181,000) from 1970's average levels. Recent pintail trend has been strongly upward but recent wigeon trend is flat. Moderate declines in 10 year average mallard (-155,000), green-winged teal (-41,000), canvasback (-8,000) and scaup (-53,000) from 1970's levels. Recent trends are all strongly upward except green-winged teal which is flat. Blue-winged teal (+183,000), shoveler (+202,000), gadwall (+125,000) and redhead (+12,000) averages are all above 1970's levels and in general trending strongly upward. May pond 10 year average is currently ~10% (+56,000) above 1970's average and trending upward.

*Strata 33:* Large declines in pintail (-74,000), wigeon (-28,000) and green-winged teal (-6,000) relative to 1970's average levels. Recent pintail trend has been upward but recent wigeon and Green-winged teal trends are flat. Mallard (-20,000) and scaup (-5,000) have shown moderate declines from 1970's levels and current trends are upward. Blue-winged teal (+21,000), shoveler (+34,000), gadwall (+20,000) and canvasback (+2,000) averages are currently well above 1970's levels and trending upward. May pond average has been relatively stable in this stratum and is currently ~9% (+9,000) above the 1970's average.

*Strata 34:* Large declines in pintail (-109,000) and wigeon (-55,000) from 1970's average levels and recent trend for both is generally flat. A moderate decline in green-winged teal (-15,000) from 1970's levels is evident with a small recent increasing trend. Mallard (-30,000) and scaup(-1,000) average populations are currently similar to 1970's average levels and both show a strong recent upward trend. Current blue-winged teal (+32,000), shoveler (+68,000), gadwall (+67,000), canvasback (+20,000) and redhead (+33,000) averages are all above 1970's averages

and trending strongly upward. May pond average is currently ~21% (-122,000) below the 1970's level and the recent trend has flattened.

*Strata 35:* Large declines in pintail (-94,000), wigeon (-35,000) and scaup (-24,000) from 1970's average levels. Recent pintail and scaup trends are weakly upward and the wigeon trend is flat. Green-winged teal (-19,000) show a moderate decline from 1970's levels with a small recent upward trend. Mallard (+8,000) and blue-winged teal (-13,000) averages are currently similar to 1970's levels and both have trended upward recently. Shoveler (+52,000), gadwall (+40,000), canvasback (+13,000) and redhead (+8,000) average populations are currently above 1970's averages and are trending upward. May pond average is currently ~28% (-103,000) below the 1970's level and the recent upward trend has flattened.

Waterfowl populations in Saskatchewan have shown general positive trends since the late 1980's in most strata and many species are at, near, or above the average of the 1970's. This is in spite of generally fewer ponds in the landscape. We suspect this may be as result of increases seen in upland cover increasing production in these areas and offsetting, somewhat, the effects of wetland loss to drainage. Northern pintail, wigeon, and scaup consistently show the greatest decline and hence are species of general concern. Consensus within the waterfowl community is that pintails are limited by recruitment as a result of habitat change within the PHJV planning area and hence, habitat goals within this plan will expressly address pintails. Hypotheses directing habitat goals or other conservation action for scaup and wigeon have yet to be formulated and hence they are not addressed in this Plan.

## V. Status of Upland and Wetland Habitat in Saskatchewan 1971-2001

We used several data sources to examine the current status and trends in upland and wetland habitat within the traditional PHJV boundary in Saskatchewan. Current landscape composition (circa 1995-2001) and habitat distribution was provided by the Prairie Farm Rehabilitation Administration (PFRA) landcover data (Ashton 2001) and Statistics Canada Census of Agriculture (Statistics Canada 2001; hereafter ‘Census’). Trends over time were provided by 1) Census data gathered at 5 year intervals from 1961 to 2001, 2) Watmough et al. (2002 and pers. comm.) for the period 1985-2000, and 3) miscellaneous sources in the literature.

### A) Uplands

Based on PFRA landcover (Ashton 2001), general landscape composition within the Saskatchewan PHJV boundary is comprised of annual cropland (63%), grassland (20%), trees (6%), wetland/water (5%), shrub (3%), and forage/hay (1.4%) (Figure 2).

Because of consistency in reporting, we primarily relied on Census data at the Census Consolidated Subdivision (CCS) level (i.e., Rural Municipality level; Figure 3) to track general upland change. Some portions of the Boreal Transition ecoregion along the northern PHJV boundary are not captured in this analysis. General habitat change in this area is captured from other sources.

We extracted the acreage of spring crop, fall crop, summerfallow and hayland for each CCS directly from the Census. The balance of the CCS area was assumed to be “natural”; lands generally in grassland or

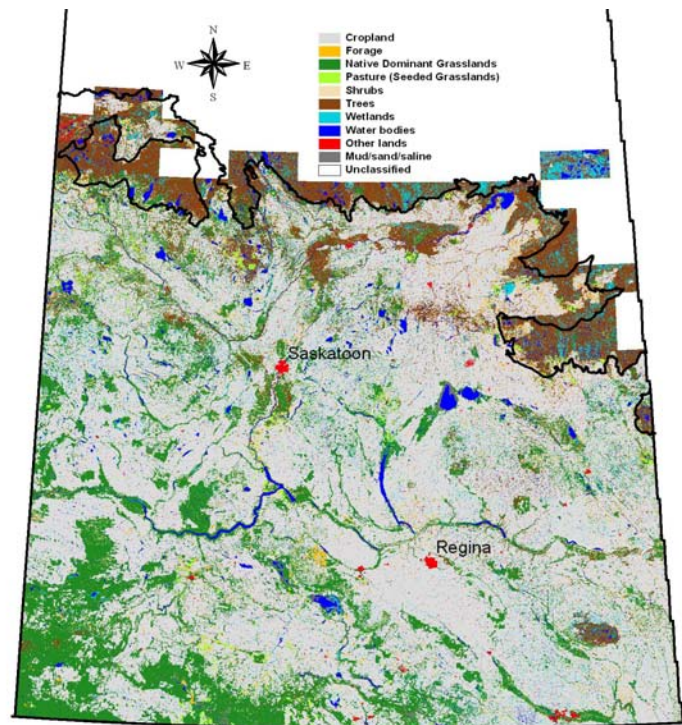


Figure 2. Distribution of landcover classes within the traditional PHJV boundary in Saskatchewan (source: Ashton 2001).

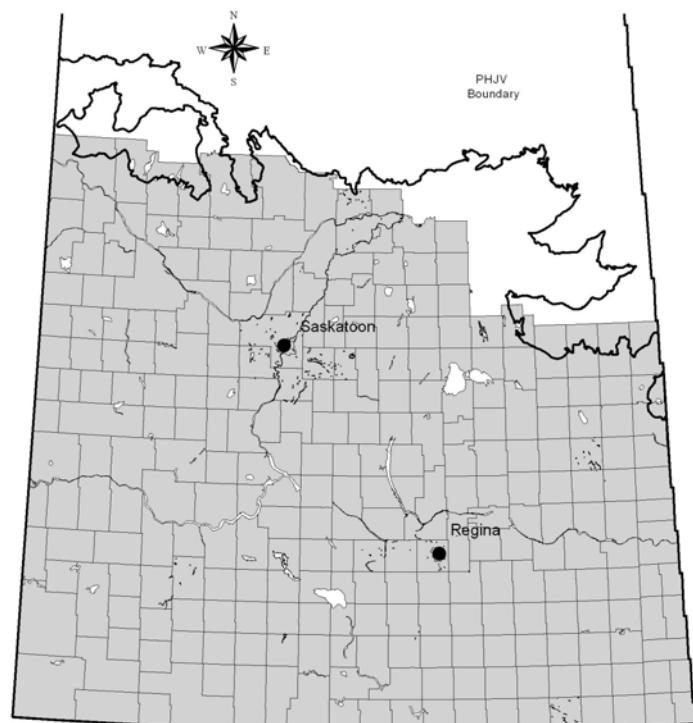


Figure 3. Location of Census of Agriculture CCS units (in grey) used in the Saskatchewan land use trend analysis.

woodland pasture and idle habitat remnants. Hence, this analysis tracks cropland, summerfallow, hayland, natural, and tilled (cropland + summerfallow).

Landscape change in Saskatchewan since 1971 is characterized by an increase in tilled land until 1991 after which tilled land has declined back to 1971 levels (Figure 4). Formerly tilled land has generally reverted to forage lands leading to observed increases in hayland and natural lands (Figure 4). Contributing factors to landscape change include removal of grain transportation subsidies in 1995, federal and provincial programs encouraging conversion of marginal cropland,

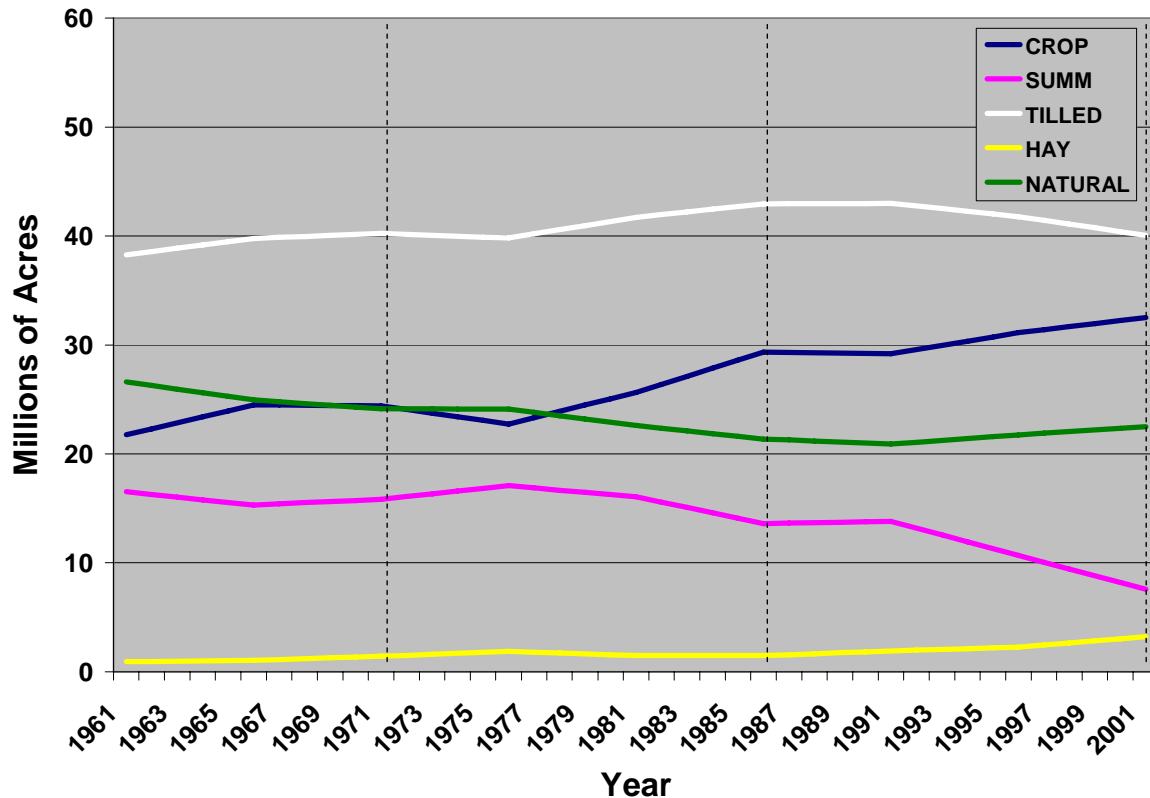


Figure 4. Change in acres of cropland, summerfallow, tilled (cropland + summerfallow), hayland, and natural lands within the traditional PHJV boundary in Saskatchewan from 1961-2001. Vertical hatched bars indicate the reference years 1971 (habitat composition at NAWMP goal), 1986 (beginning of NAWMP), and 2001 (most recent data).

and NAWMP programs, but overall global markets likely have the greatest influence on landscape change. Further, expansion of the cattle industry has increased the demand for pasture and hayland forage.

An important caveat to the above trend in ‘natural’ land is that while these lands have increased since 1986, the native prairie grassland component has continued to decline. Prairie-wide, native grassland was lost to cultivation at a rate of ~0.44%/yr from 1985-2000 (Watmough pers. comm.). Native prairie is a unique and valuable habitat component that, once lost to cultivation, is virtually impossible to restore. Loss rates specific to Saskatchewan native prairie are scarce, however Saskatchewan Partners are leading several efforts to gather this information. Initial

analysis suggests the risk of native prairie loss is influenced by patch size (higher for smaller patches), land ownership (higher on privately owned), and soil characteristics (higher for land productive as cropland).

Trends in land use change have not been uniform across the Grassland/ Parkland region of Saskatchewan. Tilled land has increased dramatically in a few localized areas; however, these are generally balanced by localized decreases in tillage (Figure 5a). Haylands have increased in most parts of the region with a few localized area of greater increase (Figure 5b). Changes in natural lands generally mirror changes in cultivated acres unless ameliorated by large changes in hayland (figure 5c). In summary, while localized changes in upland condition have varied

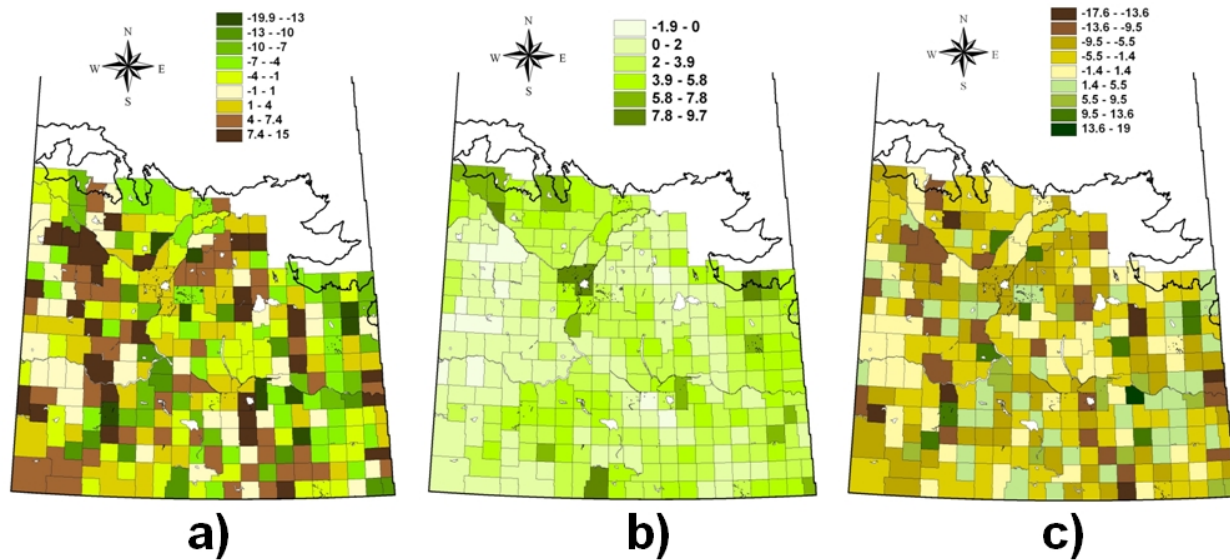


Figure 5. Percent of landscape (CCS) change in a) tilled land, b) hayland, and c) natural land from 1971-2001 within the majority of the PHJV planning area of Saskatchewan.

dramatically across southern Saskatchewan, overall upland availability is similar to 1970's levels. Since 2001, additional large acreages of tilled land have been converted to haylands and pasture under provincial and federal partner agencies.

Winter wheat is of specific interest to waterfowl managers given its use for nesting by most species of dabbling ducks. In Saskatchewan, winter wheat has experienced rapid growth since the early 1990's, from ~45,000 acres in 1992 to 530,000 acres in 2006 and the recent trend is strongly upward. Growth in winter wheat has primarily been fueled by the development of new cold-hardy and disease-resistant varieties.

Land use change not captured in the above analysis includes changes along the northern PHJV boundary otherwise known as the boreal fringe. Land use change in these areas has been substantial since the early 1970's. Typically, expansion of agriculture into the boreal fringe results in large decreases in forest cover and wetlands in these areas (e.g., Hobson et al. 2002, Cumming et al. 2001). Deforestation rates in the boreal fringe have been estimated at approximately 1% per year (Hobson et al. 2002, Cumming et al. 2001). From 1985 to 2000 in

the Boreal Transition ecoregion, Watmough (pers comm.) found that cropland decreased by ~9%, tame pasture increased by ~3.7%, hayland increased by ~6.6%, and other lands (roads, farmsteads, etc.) increased by ~1% (Watmough pers. comm.). Total loss in treed habitat over the period was ~1%, somewhat less than estimated by Hobson et al. (2002) and Cumming et al. (2001). Based on Breeding Waterfowl Population Survey data, loss of treed area may have mixed impacts on waterfowl.

## B) Wetlands

The amount of wetland habitat shows marked regional variation within the PHJV boundary in Saskatchewan (Figure 6). Generally, wetland habitat becomes more prevalent moving from the grasslands to the parklands and into the boreal fringe regions. This occurs in conjunction with a change from small potholes and sloughs to larger lake, marsh and bog systems further north.

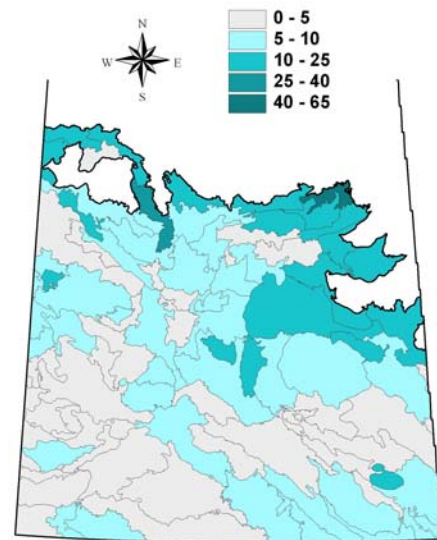


Figure 6. Estimated percent of the soil landscape occupied by wetlands (source: Atlas of Canada – Wetlands; <http://atlas.nrcan.gc.ca/site/english/maps/freshwater/distribution/wetlands>).

Estimates of wetland loss since settlement in Saskatchewan are scarce and fraught with methodological issues (e.g., drought influence) that confound regional generalizations. Prairie-wide, Goodman and Pryor (1972) reported a decrease of 13% in wetland area between 1940 and 1970 within the aspen parkland ecoregion. Watmough et al. (2002 and pers. comm.), examining wetland loss on 71 transects within the Saskatchewan PHJV boundary, indicated an overall gross loss of 4.1% of wetland area from 1985 to 2000 (-0.28% per year). Wetland area lost varied among transects from 0 to 61% and these figures are expected to be conservative given the strict definition of wetland loss applied. Wetland loss tended to be greater in the parklands versus the grasslands.

Ducks Unlimited Canada (DUC) has completed 2 wetland inventory projects examining wetland change in large landscapes in central and eastern Saskatchewan. In a 103 mi<sup>2</sup> area near St. Gregor, SK, (Lenore-Ponass Target Landscape) approximately 90% of wetland area was lost to drainage between 1974 and 2002. Likewise, in the 169 mi<sup>2</sup> Smith Creek watershed (Upper Assiniboine Target Landscape), 50% of wetland area was lost to drainage between 1958 and 2000 (L. Boychuk, Ducks Unlimited Canada unpubl. data).

Wetland loss is likely the primary factor driving reduced duck productivity from the Prairie Canada (Devries et al. 2004). Saskatchewan Partners are leading several efforts to update wetland loss estimates within the PHJV planning area. Further improvement of wetland inventory and monitoring is needed to support future planning efforts and track progress of this plan. Based on expert opinion among Saskatchewan Partners, wetland loss is of particular

concern in the Upper Assiniboine, Conjuring Creek, Lenore-Ponass, Dana Hills, Pheasant Hills, Lightning East, and Prince Albert Target Landscapes.

## VI. PHJV Habitat Delivery: 1986-2006

Waterfowl habitat conservation was underway in Saskatchewan long before the NAWMP was signed in 1986. Saskatchewan Partners achieved significant accomplishments leading up to the onset of the NAWMP. After a two-year planning process that involved developing the Mallard Model and Computer Planning Tool, the Quill Lakes area was chosen as Saskatchewan's NAWMP First Step Project and habitat program delivery began in 1989. Full delivery of the NAWMP commenced during 1991 when the North American Wetlands Conservation Act (NAWCA) funding first became available for Canada. All waterfowl habitat conservation that occurred in NAWMP eligible areas of Saskatchewan since May of 1986 was credited to the NAWMP. As of March 31, 2006, 1,872,772 acres have been secured and 773,689 acres have been influenced through Stewardship under NAWMP programs for a total of 2,646,461 acres conserved since 1986. Those habitat acres developed prior to 1986 and within NAWMP Key Program Areas have been transferred to NAWMP for ongoing project management. Hence these acres are referred to as being "Managed" under NAWMP. As of March 31, 2006 there were 201,059 acres secured prior to 1986 being managed under NAWMP (Table 1). As of March 31, 2006 there were 2,847,520 acres secured, influenced and managed under NAWMP in Saskatchewan.

NAWMP acres in Saskatchewan are defined as being secured if an agreement on a specific land parcel was signed between the landowner and a NAWMP partner and the agreement was for a minimum ten-year term. Several types of agreements are used to secure habitat under NAWMP. They include Acquisition (acquiring land title through fee simple purchase, land donation, Crown title transfer, and Crown land designation); Lease; Cooperative Land Use Agreement, Conservation Agreement or Conservation Easement. Acquisition and Conservation Easement agreements are perpetual while all other agreements have a term of 10 years or more before they expire. As of March 31, 2006 Saskatchewan had 278,683 acres under perpetual agreement and 1,594,089 acres under term agreements (Table 1).

Acres covered by agreements that were less than ten years or with no agreement at all are "Stewardship" acres. Stewardship is the voluntary adoption of sustainable land use practices by a land owner or land manager. Information exchange is the main delivery mechanism. Only occasionally are incentives involved. Stewardship acres are very difficult to track because most adoption occurs without the delivery agent's knowledge. Therefore only a small portion of Stewardship acres are reported in the NAWMP National Tracking System (NTS). As of March 31, 2006 34,639 Stewardship acres were reported in the NTS (Table 1). The Saskatchewan NAWMP Partners are committed to improving their ability to track Stewardship acres and report them through the National NAWMP Tracking System.

Table 1. Saskatchewan NAWMP habitat accomplishments from 1986 to March 31, 2006, by securement agreement type, stewardship acres, and acres currently managed under NAWMP but secured prior to 1986.

<b>PROGRAM CATEGORY</b>	<b>TERM</b>	<b>ACTUAL ACRES AS OF March 31, 2006</b>
<b><i>SECURED 1986-2006</i></b>		
Acquisition	Perpetual	191,730
Lease	10 years	51,580
Cooperative. Land Use Agreement	10 to 30 years	936,815
Conservation Agreement.	10 to 50 years	605,694
Conservation Easement	Perpetual	86,953
<b>SECUREMENT SUB-TOTAL</b>		<b>1,872,772</b>
<b><i>STEWARDSHIP 1986-2006</i></b>	Nil	<b>773,6899</b>
<b><i>SECURED PRIOR TO 1986</i></b>	10 years	<b>201,059</b>
<b>TOTAL MANAGED ACRES</b>		<b>2,847,520</b>

## VII. Setting Habitat Objectives – The Biological Foundation

### A) Target Landscapes

We defined Target Landscapes in Saskatchewan generally as areas with long-term average waterfowl pair densities  $\geq 30$  pairs/mi<sup>2</sup> of the seven primary waterfowl species in Prairie Canada (mallard, gadwall, blue-winged teal, northern shoveler, pintail, redhead, canvasback) and areas estimated to have  $\geq 6$  pairs/mi<sup>2</sup> of pintails (Figure 7). These areas are defined as per the Waterfowl and Pintail Breeding Pair Distribution maps developed by DUC. The rationale was to define regions where the most waterfowl in general or, in some cases primarily pintails, could benefit from habitat programs. Boundaries were modified based on local knowledge in some instances. The remainder of the PHJV Delivery Area was defined as all areas outside Target Landscapes but within the traditional PHJV boundary in Saskatchewan.

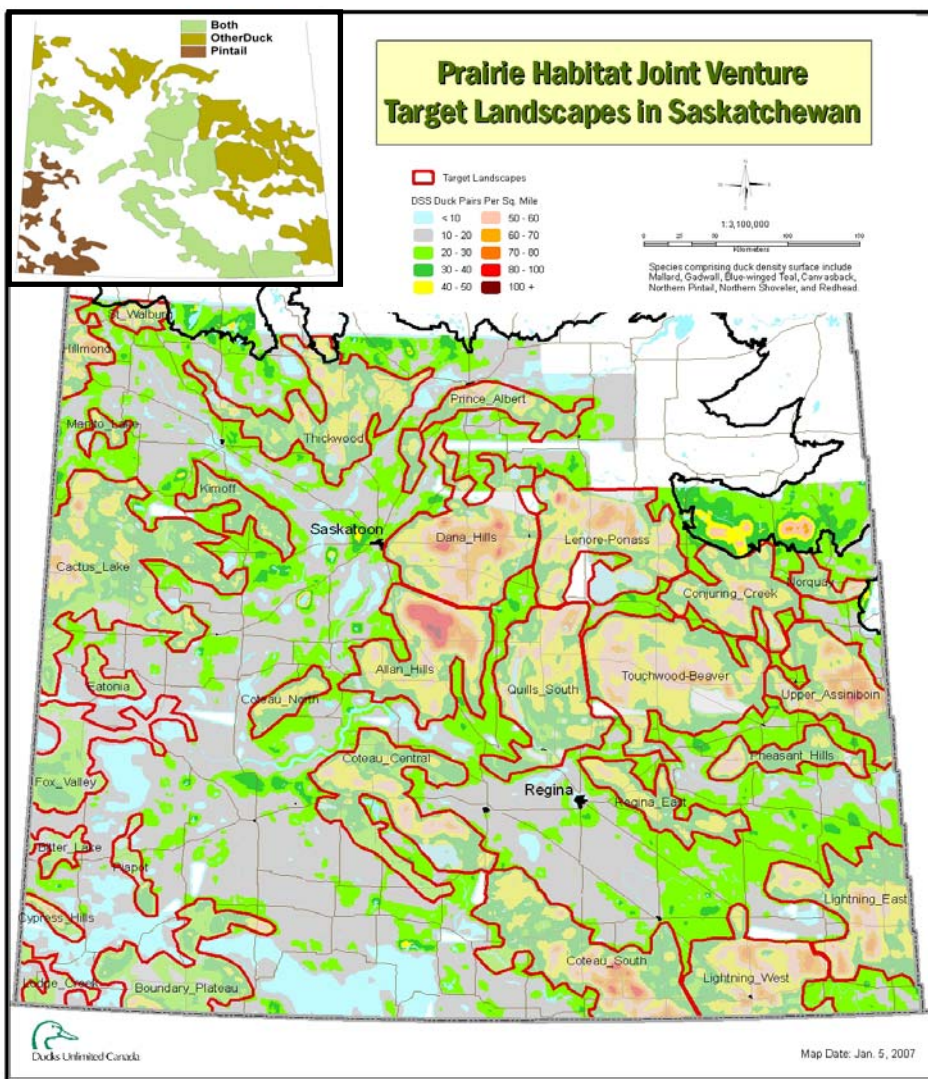


Figure 7. Location of Target Landscapes within the PHJV Delivery Area of Saskatchewan. Target Landscapes represent areas of  $\geq 30$  pairs/mi<sup>2</sup> of the seven primary breeding waterfowl species, and  $\geq 6$  pairs/mi<sup>2</sup> of pintails.

## B) Objectives Updating Process

Previously, Devries et al. (2004) described a process for updating PHJV habitat goals that estimated the influence of wetland and upland changes on waterfowl productivity in prairie Canada from 1971 to 2001 (Figure 8). The year 1971 was chosen because it was an Agricultural Census year near the beginning of the period of NAWMP population objectives and 2001 was chosen as the most recent Agricultural Census of landscape conditions. Inclusion of habitats delivered under NAWMP since 1986 were incorporated as well (Appendix D of Devries et al. 2004). Changes in waterfowl pair population carrying capacity over this time period were estimated using simulation models that converted wetland loss estimates at the municipality scale into change in population carrying capacity from 1971 to 2001 (see Appendix 5).

This approach recognizes that duck productivity from the region is impacted by both the amount of wetland habitat present (i.e., its carrying capacity for duck pairs) and the type and amount of upland habitat available for use by nesting female ducks.

Given measures of wetland and upland change over the 1971-2001 time period, changes in estimated hatched nests at the municipality scale were calculated using the Waterfowl Productivity Model (for mallard, gadwall, blue-winged teal, and northern shoveler) and the Pintail Productivity Model. Changes in hatched nests at the municipality scale were recorded as either a 'deficit' or 'surplus'. Deficits and surpluses at the municipality scale were then attributed to Target Landscapes and the remainder of the PHJV Delivery Area relative to the proportion of the local waterfowl population falling within and outside Target Landscapes.

At the provincial scale in Saskatchewan, annual hatched nest deficits from 1971 to 2001 for the 4 Dabblers and Pintails were -47,113 (-9%) and -18,852 (-19.5%), respectively. Deficits by Target Landscape are provided in Table 2 below.

*Note: Because our biological models are based on average breeding parameters gathered over a number of years, we assume that a specific Agricultural Census year represents **average** landscape conditions for a broad time period around the specific Agricultural Census year and not the specific year itself. Hence, we are assuming average waterfowl populations for the time period with average reproductive effort interacting with average landscape conditions at local scales.*

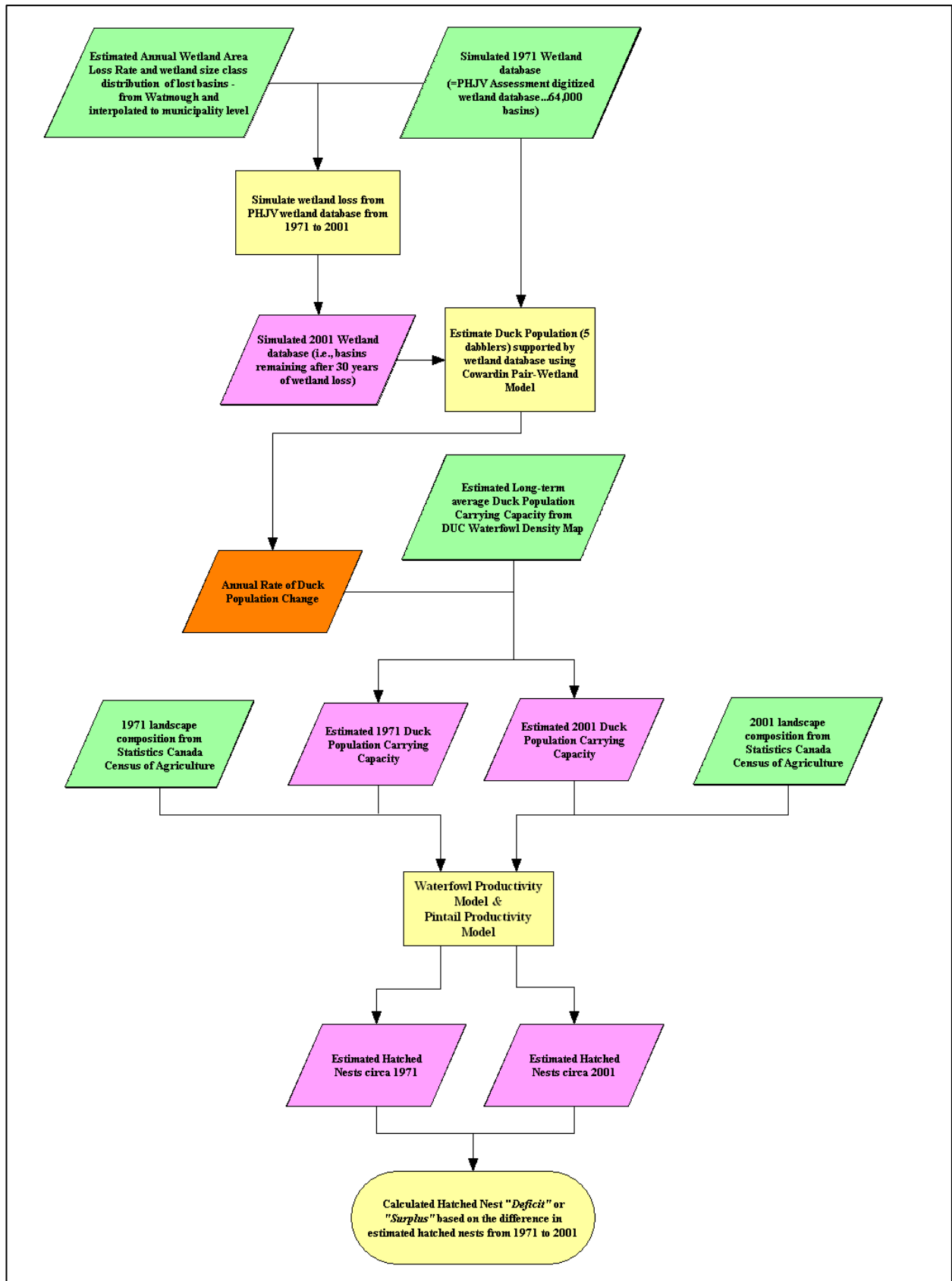


Figure 8. Process used to estimate change in waterfowl productivity potential (estimated hatched nests) at the municipality scale from 1971 to 2001.

## VIII. Habitat Restoration and Retention Objectives

Wetland and upland habitat restoration objectives were set based on a series of simulation runs of the Waterfowl Productivity Model with a minimum objective of removing productivity deficits over the 25 year planning horizon. Scenarios included; 1) wetland restoration with the assumption that basins restored would match the size class distribution of wetlands most frequently drained (as per Watmough data), 2) conversion of cropland to hayland or tame pasture, 3) adoption of winter wheat into cropping rotations, 4) conversion of cropland to planted nesting cover, and 5) delivery of nesting tunnels. The effect of wetland loss continuing for 10 years (i.e., increasing deficits until 2011) was included in these scenarios.

### A) Habitat Restoration Scenarios

#### 1. Wetland Restoration

The total estimated number of wetland restorations available within the Target Landscapes was 240,000 basins. Estimates of wetland restoration delivery potential by Target Landscape 1) increased estimated wetland loss, 2) decreased with the current area of cropland, and 3) increased with restoration objectives for tame pasture, hayland, and planted nesting cover. Wetland restorations were capped at 6,000 in any one Target Landscape for logistical reasons. In the remainder of the PHJV Delivery Area, it was assumed wetland restoration would be minimal.

#### 2. Hay and Pasture

Cropland conversion to hay and tame pasture (at a fixed ratio of 40% hay/60% tame pasture) was estimated based on industry projections (Agriculture and Agri-Food Canada report "Prairie Agricultural Landscapes 2: Foundations For Growth") for Target Landscapes and the remainder of the PHJV Delivery Area. In Target Landscapes where expert knowledge indicated these projections over-estimated the potential for establishment of hay and pasture, we reduced the projections to levels perceived to be realistic as of 2007.

#### 3. Winter Wheat

We estimated the potential for winter wheat acres based on the current growth trend and that 15% of all wheat acres would be winter wheat at any point in time. Based on current expert opinion the maximum potential for winter wheat is likely ~30% of all wheat acres.

#### 4. Planted Nesting Cover

Restoration objectives were set by increasing the area of each Target Landscape in planted cover to 0.5%; where current planted cover area exceeds 0.5%, no additional acres were added. Planted cover objectives were not established for the remainder of the PHJV Delivery Area.

Further details regarding habitat restoration scenarios and assumptions are provided in Appendices 5 and 6.

## B) Habitat Restoration Objectives

### 1. 25 Year Objectives

Habitat objectives vary considerably among Target Landscapes reflecting landform and agricultural trends. For example, wetland restoration objectives are higher in Target Landscapes with higher wetland drainage (e.g. Upper Assiniboine), and planted nesting cover area is higher where it has not been implemented historically (e.g. Cactus Lake; Figure 9, Table 2). Target Landscapes with relatively productive cropland (e.g. Cactus Lake) have higher objectives for winter wheat than permanent forage, whereas the reverse is true for Target Landscapes with more marginal cropland (e.g. Coteau Central; Figure 9, Table 2). Some small Target Landscapes composed almost entirely of native pasture (e.g. Cypress Hills) have virtually no opportunity for wetland restoration or conversion to permanent cover, so efforts will focus on incorporating winter wheat into the existing cropland and securing at risk native habitats (Figure 9, Table 2). Overall these habitat restoration scenarios require significantly more acres of upland restoration in the remainder of the PHJV Delivery Area than Target Landscapes (Figure 10, Table 2).

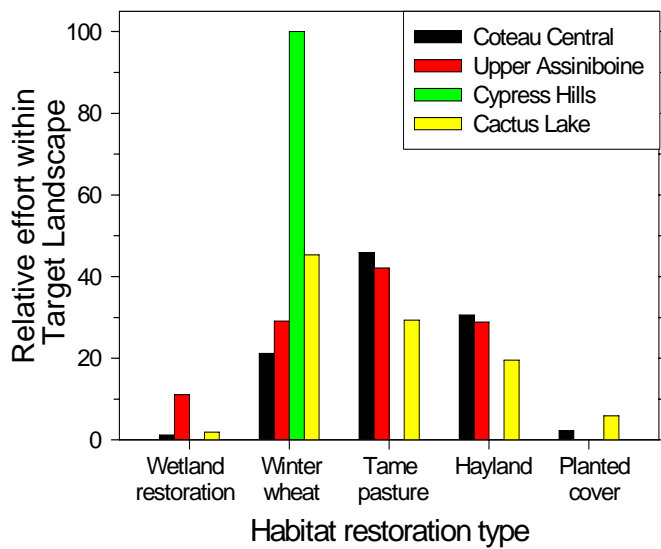


Figure 9. Due to variation in parameters such as landform and producer uptake, the 25 year restoration objectives differ by habitat type among Target Landscapes. Four Target Landscapes are displayed as examples.

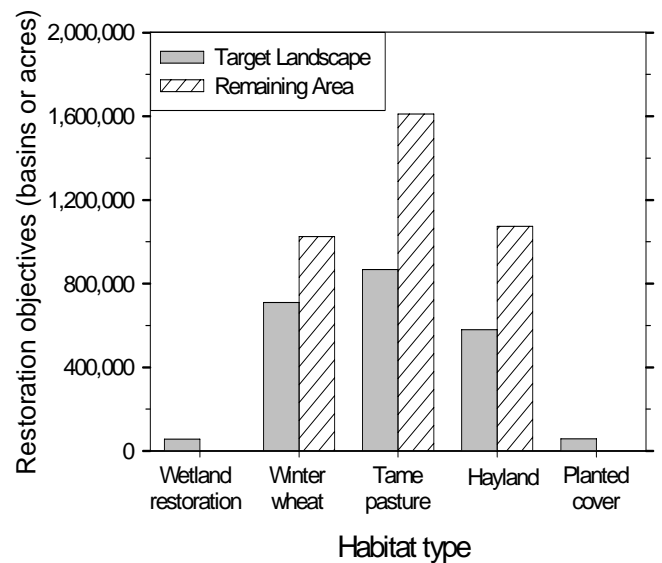


Figure 10. Twenty-five year wetland restoration (basins) and planted nesting cover (acres) objectives are applied only in Target Landscapes. Objectives for winter wheat, tame pasture and hayland (acres) in the remainder of the PHJV Delivery Area (“Remaining Areas” above) exceed those in Target Landscapes.

Habitat objectives (Figure 11) will increase 4 Dabbling duck hatched nests considerably above cumulative deficits, with net production totaling 18,582 hatched nests above 1970's levels (Figure 11, Table 2). Increased Pintail production will exceed cumulative losses only modestly, with a net increase of 885 hatched nests above 1970's levels (Figure 11, Table 2). Target Landscapes will contribute more net hatched nests than the remainder of the PHJV Delivery Area for 4 Dabblers, but not Pintail (Figure 11, Table 2). Although overall 4 Dabbling and Pintail productivity will exceed 1970's levels, net productivity within individual Target Landscapes ranges from strongly positive (e.g. Coteau South) to strongly negative (e.g. Upper Assiniboine; Figure 12, Table 2) depending on agricultural trends and the estimated rate on ongoing habitat loss.

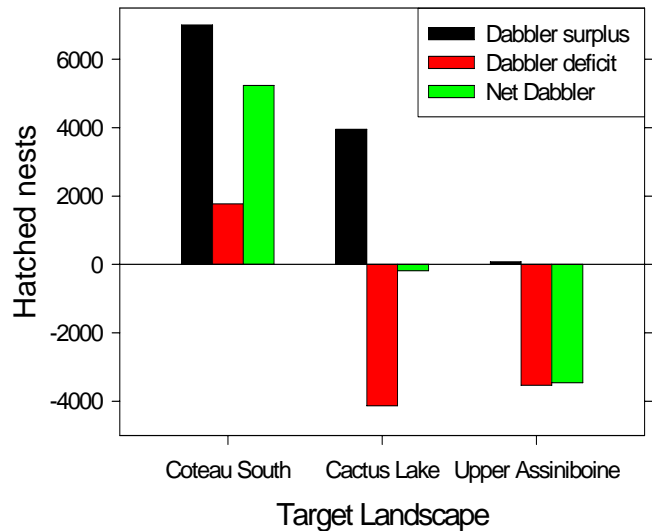
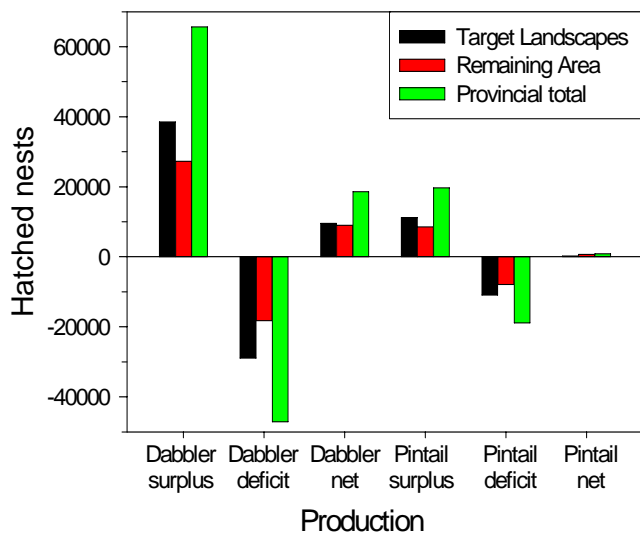


Figure 11. Twenty-five year habitat restoration objectives will result in net Dabbling and Pintail hatched nests exceeding 1970's levels (for net production, hatched nests=0 represents 1970's level). "Remaining Area" refers to the remainder of the PHJV Delivery Area.

Figure 12. After 25 years net hatched nests may be a) much higher (e.g. Coteau South), b) equivalent (e.g. Cactus Lake), or c) much lower (Upper Assiniboine) than 1970's levels (for net production, hatched nests=0 represents 1970's levels).

## 2. 5 Year Objectives

Restoration objectives for the current five-year period (2006-2011) have been set at 20% of the 25 year objectives for each Target Landscape (Figure 13, Table 3). Over the next 5 years the Saskatchewan Partner intensive habitat, extension and policy initiatives are projected to restore **4,900 acres** of wetlands (**6,500 wetland basins**) or **58%** of the habitat objective of **8,400 acres** (**11,245 basins**, Figure 14, see also Table 4). Wetlands will be restored through direct NAWMP activities (**1,100 acres or 1,500 basins**) and policy initiatives (**3,800 acres or 5,000 wetlands** via wetland compensation requirements for Industry, with the exception of extensive agriculture). Without additional funding and/or enhanced policy, we will fall **42%** (**3,500 acres or 4,700 basins**) short of the 5 year wetland restoration objective. Five year habitat objectives for winter wheat, tame pasture and hayland are projected to be **fully achieved (100%)** through a combination of the intensive habitat, extension, and policy initiatives of Saskatchewan Partners, and current agriculture industry trends (Figure 14). Sixty-two percent of the habitat objective for tame pasture and hayland combined will be achieved through industry trends, with Saskatchewan Partners accounting for the remainder. Future Agriculture and Agri-Food Canada programs that convert cropland to forage similar to Greencover would significantly reduce the reliance on industry trends to achieve upland restoration objectives. Through intensive habitat initiatives Saskatchewan Partners will establish **6,844 acres** of planted nesting cover, but without additional funding these efforts will fall **40%** (**4,594 acres**) short of the habitat objective (Figure 14, see also Table 5).

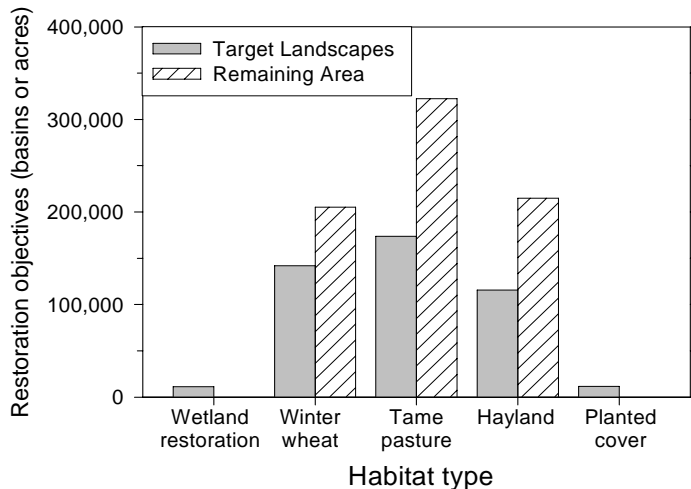


Figure 13. Five year habitat restoration objectives are 20% of the 25 year objectives. “Remaining Area” refers to the remainder of the PHJV Delivery Area.

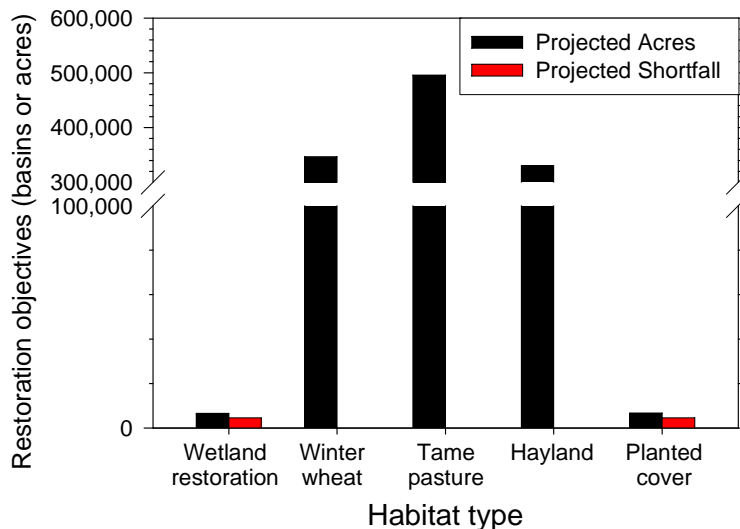


Figure 14. Current Saskatchewan Partner activities (projected acres) will not achieve the 5 year habitat restoration objectives for wetlands and planted nesting cover. Objectives for winter wheat, tame pasture and hayland will be achieved by Partner activities and agricultural industry trends.

Implementation planning for NAWMP is a dynamic activity that will be adjusted on an ongoing basis as new information arises and landscape changes become evident. It follows that objectives for subsequent five-year periods will be adjusted on the basis of:

- 1) Improvements in the waterfowl science that lead to refinement of current productivity models
- 2) Changes to the habitat base and agricultural land use patterns that affect waterfowl productivity across landscapes of interest
- 3) Progress made towards habitat objectives and waterfowl productivity deficit recovery in the current five-year plan.

Table 2. Targeted habitat restoration objectives over 25 years and estimated surplus in hatched nests relative to estimated deficits for each Target Landscape and the remainder of the PHJV Delivery Area (“Remaining Delivery Area” in table below) within Saskatchewan. Wetland restorations are expressed as number of wetland basins with the assumption that restored basins will generally match the size classes of most commonly drained basins. Upland habitat restorations reflect the change in upland acres including conversion to winter wheat as estimated in restoration scenarios.

TARGET LANDSCAPE	Habitat Restorations (in Acres)										Hatched Nests					
	Wetland Restoration (Basins)	Additional Winter Wheat	Conversion to Pasture	Conversion to Hayland	Planted Nesting Cover	4 Dabblers Surplus	4 Dabblers Deficit	Net 4 Dabblers Productivity	Pintails Surplus	Pintails Deficit	Net Pintails Productivity					
Allan Hills	688	59,580	50,910	33,940	0	3,919	411	4,330	1,063	-518	545					
Bitter Lake	187	0	2,650	1,770	0	82	-196	-114	42	-92	-50					
Boundary Plateau	1,659	14,560	21,300	14,200	0	710	-1,225	-515	450	-773	-323					
Cactus Lake	3,969	94,050	60,800	40,530	12,160	3,948	-4,134	-186	1,391	-1,431	-40					
Conjuring Creek	6,000	17,780	21,640	14,400	1,690	-42	-4,119	-4,161	49	-539	-490					
Coteau Central	2,794	50,440	109,180	72,790	5,510	4,510	-370	4,140	1,574	-507	1,067					
Coteau North	646	5,710	9,210	6,140	1,160	467	-193	274	140	-136	4					
Coteau South	1,829	71,790	135,730	90,490	5,080	7,002	-1,770	5,232	1,978	-887	1,091					
Cypress Hills	0	20	0	0	0	-43	-182	-225	-17	-87	-104					
Dana Hills	2,957	67,760	39,130	26,090	0	2,798	-1,794	1,004	622	-723	-101					
Eatonia	159	0	5,990	4,000	0	124	-80	44	64	-69	-5					
Fox Valley	425	9,410	41,440	27,620	0	834	-866	-32	475	-399	76					
Hillmond	1,234	6,920	13,650	9,100	1,280	424	-500	-76	76	-135	-59					
Kimoff	919	8,260	12,410	8,270	1,910	624	-612	12	163	-239	-76					
Lenore-Ponass	3,354	43,890	11,700	7,800	2,970	752	-2,399	-1,647	221	-658	-437					
Lightning East	3,455	9,280	46,790	31,200	4,810	1,219	-672	547	194	-283	-89					
Lightning West	1,511	44,960	28,630	19,090	6,210	2,762	-2,006	756	779	-770	9					
Lodge Creek	580	1,110	650	440	0	140	-278	-138	62	-124	-62					
Manito Lake	213	1,860	580	390	80	47	-125	-78	14	-47	-33					
Norquay	1,644	7,900	5,160	3,440	1,020	214	-169	45	46	-52	-6					
Pheasant Hills	1,504	11,280	16,330	10,890	1,510	385	-430	-45	67	-98	-31					
Piapot	458	850	4,250	2,830	0	160	-64	96	75	-37	38					
Prince Albert	2,352	19,830	8,990	5,990	0	319	-834	-515	93	-195	-102					
Quills South	963	52,060	46,750	31,170	7,160	3,374	-336	3,038	683	-567	116					
Regina East	2,375	19,300	9,100	6,070	3,230	426	-434	-8	130	-190	-60					
St Walburg	816	2,310	3,250	2,170	760	202	-242	-40	30	-51	-21					
Thickwood	1,524	30,230	53,600	35,730	640	1,277	118	1,395	283	-236	47					
Touchwood-Beaver	6,000	42,050	85,310	56,730	0	1,755	-1,874	-119	381	-515	-134					
Upper Assiniboine	6,000	15,740	22,770	15,600	0	75	-3,529	-3,454	66	-613	-547					
<b>Target Landscape Total</b>	<b>56,215</b>	<b>708,930</b>	<b>867,900</b>	<b>578,880</b>	<b>57,180</b>	<b>38,464</b>	<b>-28,904</b>	<b>9,560</b>	<b>11,194</b>	<b>-10,971</b>	<b>223</b>					
<b>Remaining Delivery Area</b>	<b>0</b>	<b>1,025,710</b>	<b>1,611,000</b>	<b>1,074,000</b>	<b>0</b>	<b>27,231</b>	<b>-18,209</b>	<b>9,022</b>	<b>8,544</b>	<b>-7,882</b>	<b>662</b>					
<b>PROVINCIAL TOTAL</b>	<b>56,215</b>	<b>1,734,640</b>	<b>2,478,900</b>	<b>1,652,880</b>	<b>57,180</b>	<b>65,695</b>	<b>-47,113</b>	<b>18,582</b>	<b>19,738</b>	<b>-18,853</b>	<b>885</b>					

Table 3. Targeted habitat objectives over 5 years and estimated surplus in hatched nests relative to estimated deficits for each Target Landscape and the remainder of the PHJV Delivery Area (“Remaining Delivery Area” in table below) within Saskatchewan. Wetland restorations are expressed as number of wetland basins with the assumption that restored basins will generally match the size classes of most commonly drained basins. Upland habitat restorations reflect the net change in upland acres including conversion to winter wheat as estimated in restoration scenarios.

TARGET LANDSCAPE	Habitat Restorations (in Acres)					Hatched Nests					
	Wetland Restoration (Basins)	Additional Winter Wheat	Conversion to Tame Pasture	Conversion to Hayland	Planted Nesting Cover	4 Dabbling Surplus	4 Dabbling Deficit	Net 4 Dabbling Productivity	Pintail Surplus	Pintail Deficit	Net Pintail Productivity
Allan Hills	138	11916	10182	6788	0	784	82	702	213	-104	109
Bitter Lake	37	0	531	354	0	16	-39	-23	8	-18	-10
Boundary Plateau	332	2912	4259	2839	0	142	-245	-103	90	-155	-65
Cactus Lake	794	18811	12160	8107	2432	790	-827	-37	278	-286	-8
Conjuring Creek	1200	3557	4328	2879	339	-8	-824	-832	10	-108	-98
Coteau Central	559	10088	21837	14558	1101	902	-74	828	315	-101	214
Coteau North	129	1142	1842	1228	233	93	-39	54	28	-27	1
Coteau South	366	14358	27146	18098	1015	1400	-354	1046	396	-177	219
Cypress Hills	0	3	0	0	0	-9	-36	-45	-3	-17	-20
Dana Hills	591	13551	7827	5218	0	560	-359	201	124	-145	-21
Eatonia	32	0	1199	799	0	25	-16	9	13	-14	-1
Fox Valley	85	1882	8287	5525	0	167	-173	-6	95	-80	15
Hillmond	247	1385	2731	1821	256	85	-100	-15	15	-27	-12
Kimoff	184	1653	2481	1654	382	125	-122	3	33	-48	-15
Lenore-Ponass	671	8779	2339	1560	594	150	-480	-330	44	-132	-88
Lightning East	691	1856	9359	6239	961	244	-134	110	39	-57	-18
Lightning West	302	8992	5726	3817	1242	552	-401	151	156	-154	2
Lodge Creek	116	221	131	87	0	28	-56	-28	12	-25	-13
Manito Lake	43	373	116	77	16	9	-25	-16	3	-9	-6
Norquay	329	1580	1031	688	204	43	-34	9	9	-10	-1
Pheasant Hills	301	2256	3267	2178	302	77	-86	-9	13	-20	-7
Piapot	92	170	850	566	0	32	-13	19	15	-7	8
Prince Albert	470	3965	1798	1199	0	64	-167	-103	19	-39	-20
Quills South	193	10413	9350	6233	1433	675	-67	608	137	-113	24
Regina East	475	3861	1820	1214	645	85	-87	-2	26	-38	-12
St Walburg	163	462	650	433	152	40	-48	-8	6	-10	-4
Thickwood	305	6047	10719	7146	129	255	24	279	57	-47	10
Touchwood-Beaver	1200	8410	17062	11346	0	351	-375	-24	76	-103	-27
Upper Assiniboine	1200	3149	4554	3119	0	15	-706	-691	13	-123	-110
<b>Target Landscape Total</b>	<b>11245</b>	<b>141792</b>	<b>173582</b>	<b>115770</b>	<b>11436</b>	<b>7692</b>	<b>-5781</b>	<b>1747</b>	<b>2240</b>	<b>-2194</b>	<b>46</b>
<b>Remaining Delivery Area</b>	<b>0</b>	<b>205143</b>	<b>322201</b>	<b>214801</b>	<b>0</b>	<b>5446</b>	<b>-3642</b>	<b>1804</b>	<b>1709</b>	<b>-1576</b>	<b>133</b>
<b>PROVINCIAL TOTAL</b>	<b>11245</b>	<b>346935</b>	<b>495783</b>	<b>330571</b>	<b>11436</b>	<b>13138</b>	<b>-9423</b>	<b>3551</b>	<b>3949</b>	<b>-3770</b>	<b>179</b>

## C) Habitat Retention Objectives

To overcome waterfowl productivity deficits in Saskatchewan, activities must restore lost habitats. Saskatchewan Partners also recognize the need to retain existing high-value wetland and upland habitats that are threatened by loss. Investment to secure existing habitat ensures a base from which waterfowl production and contributions to the fall flight can be reliably expected. Habitat retention efforts will focus on maintaining existing wetland and upland habitats. These efforts will focus on protection of small wetlands from drainage and annual cultivation and maintaining uplands in native grassland and perennial cover. In keeping with the PHJV Strategic Plan, the Saskatchewan Implementation Plan includes the goal of no loss of existing wetland and upland habitat. Saskatchewan Partners recognize that significant changes will have to occur within the public policy framework as well as overall societal/cultural attitudes toward wetlands and other habitats to attain these goals.

### 1. Wetland Retention

Given ongoing wetland loss in Saskatchewan (-8.1% from 1971 to 2000 as estimated by Devries et al. 2004), there is an ongoing need for long-term securement of high value, threatened wetland habitat.

Long-term securement of wetland and associated habitats will be targeted by protecting high-value wetlands that are at greatest risk of loss. The highest value wetland habitats from the standpoint of waterfowl productivity have been identified by the establishment of the Target Landscapes (Figure 7). Retention and enhancement of important wetlands and wetland complexes outside of Target Landscapes are discussed under “XI. Important Moulting and Staging Wetlands”.

Estimates of existing wetland habitat within Target Landscapes have been determined from analysis of Ducks Unlimited Canada satellite-based Wetland Habitat Inventory data (1986-1993) adjusted with photo interpretation of high-resolution aerial photography from 91 sites (16–25 mi<sup>2</sup> in area) within the Target Landscapes. Total wetland area within Target Landscapes is estimated to be **4,324,727 acres** (60% in Prairie, 40% in Parkland) and this comprises our overall wetland retention goal.

We suspect the magnitude of risk of wetland degradation or loss due to drainage, clearing, filling or intensification of agricultural production depends on a variety of factors such as topography, landcover, landuse, climate, availability of outlet, and producer behaviour. We also recognize that under the current economic and regulatory environment, in many situations wetland drainage results in net profits to private producers. Saskatchewan Partners are developing predictive models to better target securement activities to high risk wetlands in the future. However, current available data from Watmough et al. (2002) supports general observations from field staff that smaller, seasonal wetlands experience the highest rates of loss. Coincidentally, these are the basins that provide the greatest waterfowl productivity potential.

For the purposes of setting wetland securement goals, we have assumed that wetlands <2 acres in size and associated with cultivated land are those at greatest risk of loss to drainage (e.g., Watmough et al. 2002). Accordingly, we have designated wetlands smaller than two acres in cropland to be the highest priority for retention through direct securement (purchase, easement, etc.). Based on landscape composition within Target Landscapes, we estimate that **914,100 wetland acres (21% of total acres)** are at the greatest risk of loss and hence these acres comprise our 25 year wetland securement objective. The average area of wetlands experiencing complete loss is 0.67 acres (Watmough et al. 2002), but we have assumed basins will average 0.75 acres for consistency with our wetland restoration calculations. Therefore **914,100 wetland acres** represents approximately **1,218,800 wetland basins** to be retained. Our five-year wetland retention objective is **182,800 acres (243,700 basins)**, with **20,500 acres (27,300 basins)** to be secured directly with NAWMP or Partner funds (see also Table 4), and the remainder to be secured through extension (**13,100 acres or 17,500 basins**) and policy (**3,800 acres or 5,000 basins** on Crown Land). Without additional funding for securement and extension, or increased protection through policy, we will fall **80% (145,500 acres or 193,900 basins)** short of our 5 year wetland retention objective (see also Table 4). We anticipate these retention objectives will be adjusted (up or down) once predictive risk models become available.

## 2. Upland Retention

The importance of securing upland habitat associated with wetlands comes from the values this habitat contributes to waterfowl and biodiversity in the Prairie Pothole Region as well as the contributions upland habitats confer to the integrity of the wetlands they surround. Physical and ecological functions provided by uplands include buffering nutrients and sediments from runoff, providing nesting habitat to waterfowl, and providing cover, breeding, and foraging habitat for a multitude of wetland-dependant fauna. When combined, complexes of wetland and associated upland habitat are highly diverse and productive for waterfowl and other wetland-dependant species.

The amount of upland nesting habitat for waterfowl in Saskatchewan has increased over the last decade (see 'Status of Habitat' section). However, native upland communities have continued to be lost, and cannot be restored once lost. While waterfowl nest readily in suitable tame and native habitats, impacts on native-dependent species are likely great. Similar to wetlands, we suspect the magnitude of risk of native upland loss depends on a variety of factors such as topography, landuse, climate, and producer behaviour. However contrary to the wetland situation, under the current economic and subsidy environment cultivation of much of the remaining native uplands appears to hold little potential for increased profits to private producers. Therefore identification and securement of high risk native habitats in Target Landscapes will be pursued as priority by Saskatchewan Partners.

Using information on historic patterns of native prairie loss, Saskatchewan Partners are developing predictive models to better target securement activities to highest risk native uplands in the future. Until such predictive models are available, we used the Canadian Land Inventory Agricultural Suitability information to identify native uplands at greatest

potential risk of cultivation. There is **6,095,700 acres** of native prairie/shrub habitat within the Target Landscapes. That portion of native uplands comprised of aspen trees was not included in this total because it is a population sink for waterfowl (Ducks Unlimited Canada, unpublished data). We assumed native uplands in Agricultural Suitability Classes 1-3 were at greatest risk of cultivation, and calculated the area of native grassland and shrub from the Southern Digital Land Cover within these Classes for each Target Landscape. Native upland acres that fell within Protected Areas and Provincial and Federal Pastures were removed from this total because we assumed these were at lower risk of cultivation than those that are privately owned.

The 25 year upland habitat retention objective for these high risk areas is **1,605,400 acres**. Our five-year upland habitat retention objective for these high risk areas is **321,000 acres**, which will be achieved by **266,600 acres** to be secured directly with NAWMP or Partner funds (see also Table 4), and the remainder to be secured through extension (**50,000 acres**) and policy (**5,000 acres** of high risk Crown Land; see also Table 4). We anticipate these retention objectives will be adjusted (up or down) once predictive risk models become available.

## IX. Important Moulting and Staging Wetlands

While this Plan emphasizes retention and restoration of high-value and threatened breeding habitats (primarily small wetlands and native uplands) in the Prairie Pothole Region of Saskatchewan, other wetland areas are also important to the life cycle needs of waterfowl. Many large wetlands and wetland complexes, including many outside the Target Landscapes and the PPR, are critical moulting and staging habitat for waterfowl. Targeted aerial surveys (Nieman and Isbister 1976) and other observations (Adam 1988) have identified four hundred and fifty Important Moulting and Staging Wetlands (total=2,727,152 acres) in Saskatchewan (Figure 15). These wetlands also provide key habitat for many waterbirds, shorebirds and landbirds; in 2007 eight of nine Saskatchewan waterbodies that supported Franklin's Gull colonies were Important Moulting and Staging Wetlands (unpubl. data, G. Beyersbergen, Canadian Wildlife Service). Some wetlands may also function as crucial spawning and nursery areas for fish and deliver other important ecological services like nutrient capture and carbon sequestration. Threats to these large wetlands are poorly quantified, but may include changes to water regimes, exotic species invasion, and climate change.

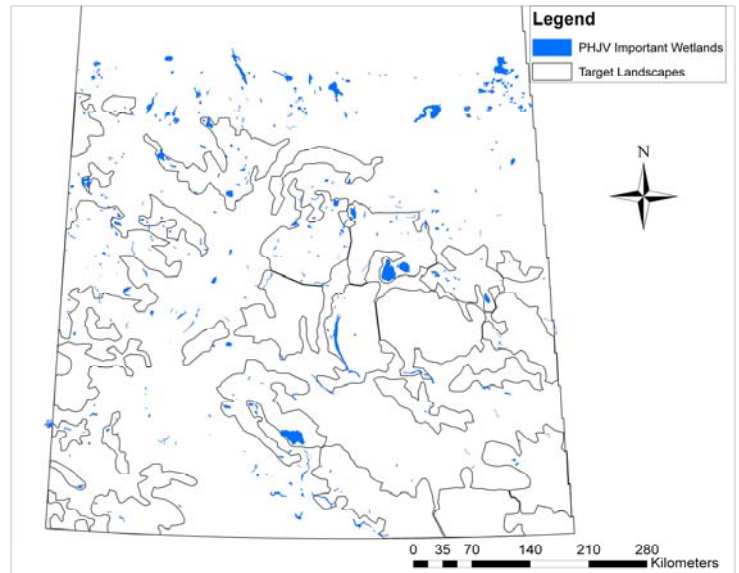


Figure 15. Location of Target Landscapes and Important Moulting and Staging Wetlands in Saskatchewan.

While this Plan does not include direct expenditures for large marsh restoration activities, PHJV partners will:

- Pursue opportunities to secure and protect designated wetlands, especially those that are owned by the Provincial Crown.
- Examine opportunities to pursue restoration activities in a cost-effective manner.
- Highlight the need to protect the diversity and productivity of large wetlands if threats arise.

## X. Implementation – Habitat Program Components

The Saskatchewan NAWMP Implementation Plan will achieve its stated goals through a combination of conservation actions under the broad definitions of Direct Implementation, Implementation by Extension, and Implementation by Policy. The details of these 3 approaches are provided below.

### A) Direct Implementation

Direct habitat programs retain and/or restore wetland and upland habitats with long-term securement tools. They are delivered by Saskatchewan Partners or through agreements with third-party delivery agencies. Direct habitat programs operate under 10 year agreements and are primarily delivered within Target Landscapes. These programs focus on habitat restoration and retention. Saskatchewan Partners evaluate and adjust direct programs to maximize benefits.

#### 1. Habitat Restoration/Enhancement

##### i) Wetland Restoration

Restoration involves plugging drainage channels to restore historic water regimes and ecological function. For many wetland types, hydrophytic vegetation will reestablish rapidly following restoration of water regimes. Wetland restorations are tightly linked with upland restoration and retention to maximize habitat value. Wetlands are not restored in habitats such as cropland which offer little waterfowl benefits. Management of restored wetlands will focus primarily on ensuring that ditch plugs continue to function properly.

To the extent possible, wetland restoration will be focused on conservation easement or purchase lands but projects will also be undertaken on lands secured with minimum 10-year habitat protection agreements. Saskatchewan Partners will also seek opportunities to lever participation and resources from agencies and organizations outside of the PHJV. For example, restoration opportunities may arise from integrated watershed management plans, habitat mitigation activities or agriculture policy initiatives.

##### ii) Forage Establishment

Saskatchewan PHJV partners will continue to support the expansion of perennial forage cover (haylands or tame pasture) using tame and/or native species on previously cultivated land. Beyond the direct habitat benefits of forage establishment, these projects may also indirectly benefit surrounding habitat by deferring and reducing the duration of grazing on native pastures within a grazing system. Incentives are based on a minimum 10-year agreement that also includes securement of existing wetlands. Federal and provincial environmental agriculture programs are expected to continue to provide incentives for the expansion of permanent forage cover.

Management of forage stands is the responsibility of landowners. As forage incentive options can be effectively delivered through third parties and in response to new or emerging landscape issues, Saskatchewan Partners will be flexible and pursue new opportunities to partner with groups such as watershed organizations and First Nations.

### iii) Planted Nesting Cover Establishment

On purchased lands, planted nesting cover will be used to enhance waterfowl nesting use and success. This primarily involves seeding grass/legume mixtures on land previously cropped and idling these lands between periodic management treatments. Management of planted nesting cover is conducted as required to maintain stand characteristics, which vary with the species composition, site characteristics and stand condition. Management practices include managed burns, haying or grazing as required.

## 2. Habitat Retention

Restrictions on the ability of conservation agencies to purchase land or place conservation easements due to the *Saskatchewan Farm Security Act* were lifted in 2006 by development of the *Southern Conservation Lands Policy*. Under the new policy, criteria required for land purchase and conservation easement are 1) the acquisition meets Saskatchewan's conservation goals (predominately retention of native habitats at representative levels to protect biodiversity), 2) willing seller – willing buyer, 3) a long-term conservation plan that includes regional consultation is developed and approved, and 4) annual reports summarize acquisitions, stewardship activities and consultations. In addition, acquisition of land holdings by all conservation agencies from 2006 - 2016 is capped at 100,000 acres provincially, and the cumulative land holdings of all conservation agencies combined, irrespective of date, cannot exceed 3% of the Rural Municipality area. Acreage of conservation easements is not included in the 100,000 acre or 3% limits.

### i) Conservation Easements

Perpetual conservation easements transfer some of the rights associated with private property to eligible conservation agencies. Perpetual conservation easements have become the primary long-term habitat securement instrument employed by Ducks Unlimited Canada and Nature Conservancy of Canada due to reduced costs compared to purchase and management of the land. Easements are typically placed on existing wetlands and native uplands to restrict wetland drainage and cultivation of uplands. Use of uplands for grazing and/or haying is usually maintained. Conservation easements are not used to secure cultivated or other improved farm acres. While most easements are purchased, they may also be donated, triggering a tax-deductible receipt to the donor relative to the value of the rights donated. Lands with easements are monitored by conservation agencies to ensure landowner compliance with restrictions.

### ii) Land Purchase

While Saskatchewan Partners emphasize conservation easements as the long-term securement tool, the fee-simple land purchase option may be used on high value lands. Cultivated land on purchased property is typically seeded to appropriate grass/legume mixtures for nesting cover. Purchased lands are monitored generally on an annual or semi-annual basis and management of these lands focuses on maintaining the ecological values for which the land was secured. Management practices may involve periodic haying, grazing or burning, and control of woody plants and invasive weeds may also be required. Saskatchewan Partners also accept donations of habitat lands, for which donors receive tax-deductible receipts for the value of the donation.

### iii) Revolving Land Purchase

The Revolving Land Purchase program enables the protection and restoration of important waterfowl habitat at the critical time when land ownership changes. Many landowners are reluctant to encumber their land with conservation easements for fear this will diminish the marketability of the land when it is sold. Under this program, lands for sale that have high quality waterfowl habitat are purchased at market value by a PHJV partner. Drained or degraded wetlands are restored and cultivated uplands are planted to grass/legume mixes. Once the habitat is successfully restored, the land is offered for sale on the open market with a condition of sale that all existing and restored wetlands and uplands are secured with a CA. Where cultivated upland is restored to perennial cover, a minimum 10-year agreement to retain the perennial cover is also a condition of sale.

### B) Implementation by Extension

Extension activities are designed to change land-use decisions through the provision of information. Saskatchewan Partners will direct extension efforts towards the agricultural community with the goal of stimulating adoption of agronomically-sound land and water management practices that are waterfowl-friendly.

Because extension provides information to a broad audience, it has the potential to affect large acreages relative to the more intensive activities associated direct implementation described above. For extension programs to have a long term impact, they must focus on activities that are agronomically sustainable. PHJV partners place a high priority on achieving results through extension activities.

### 1. Priority Extension Programming

In the Saskatchewan Implementation Plan, extension activities directly supported by PHJV funds and delivery structures will include:

#### i) Winter cereal agronomy

Because waterfowl use and nest survival in winter cereals is many times higher than in spring-seeded crops, this extension effort is designed to accelerate the adoption of winter wheat through removal of barriers to adoption, technology-transfer, and promotion of the economic benefits to target audiences. Two important areas of extension activity include 1) DUC's Core Grower Program, which provide assistance to leading agricultural producers to demonstrate and support further adoption of winter wheat in their communities and 2) DUC's support for winter wheat variety development is designed to improve disease resistance and overwinter survival.

#### ii) Rangeland management

Well managed rangelands provide numerous benefits to wildlife, but also improve the sustainability of producer operations and therefore reduce the risk of native prairie and wetland loss. Rangeland extension activities promote retention of native habitats and managing for range and riparian health. Extension activities include field days, workshops, grazing clubs, on-farm planning, and stewardship programs.

## C) Implementation by Policy

To achieve Saskatchewan's habitat goals, all available tools must be used. Policy, which in this context generally refers to the policies governing federal and provincial regulations and programs, has a significant impact on land use and thus on the achievement of Saskatchewan's goals to conserve and restore wetland and upland habitats. Saskatchewan Partners must therefore identify issues and opportunities in government programs and regulations, and influence guiding policies to ensure they support maintenance of healthy ecosystems and waterfowl populations. The ecological goods and services provided by waterfowl habitat and their socioeconomic benefits will be crucial factors in development of future policy and programs that protect and restore healthy landscapes and waterfowl populations.

Land use is the most extensive driver of wetland and upland habitat change in Saskatchewan. Global agricultural market trends are the major drivers of land use especially on private lands, but government policy initiatives can also have significant impacts on land use, on both Crown and private lands. For example, the recent increases in Saskatchewan tame pasture and hayland acres have largely been due to low global grain prices resulting in higher potential economic returns of beef production on lands that are marginal for cropping. This market trend has been greatly facilitated by the supportive government policies that resulted in the federal Agricultural Policy Framework and other federal and provincial environmental incentive programs. Government policies resulting in such incentive programs may also address perceived imbalances between the public benefits producers provide and the private benefits they receive. Future increased grain prices may challenge further increases or maintenance of forage acre achievements. Trends for higher grain prices in 2007 are due largely to low global supplies, but government policies that subsidize local demand for grain (e.g. biofuels) should also be scrutinized for negative impacts on habitat.

Trends in land use can also impact wetland habitats. In cultivated landscapes wetland loss appears to have two important drivers, 1) straight gain of cultivated acres, 2) increased efficiency of tractor operation and input application due to reduced obstacles. While landowners generally understand that wetlands produce benefits, they tend to see those as public benefits while the benefits of drainage accrue directly to the landowner. In other words, retention of wetlands in privately owned, cultivated landscapes requires private costs to be reconciled with public benefits.

Restoration of uplands to tame pasture or hayland, or retention as native prairie, significantly reduce the incentive to drain existing wetlands. Indeed wetlands are often seen as an asset in pasture land because of the water supply and increased grass production, especially in dry years. Given the amount of cropland converted to forage in Saskatchewan over the last 15 years, the opportunity to restore previously drained wetlands likely dwarfs current available capacity and resources. Therefore, although conversion to forage has reduced the risk of loss for some wetlands, likely only a small percentage of previously drained basins are being restored, while loss of wetlands in cultivated areas continues.

There is increasing acceptance in Saskatchewan of the importance of maintaining wetlands and native prairie on Crown lands. All the significant land holding agencies are Partners of both the Saskatchewan NAWMP and the Prairie Conservation Action Plan. Saskatchewan Ministry of Agriculture (SMOA), Agriculture and Agri-Food Canada, and The Department of Defence have also made commitments to protect areas as part of the Representative Areas Network. The

Provincial *Wildlife Habitat Protection Act* provides legislated protection to large areas of native prairie and a number of wetlands on Crown Lands. SMOA now places conservation easements on native uplands and wetlands on sales of Crown land through tender, and is considering extending this policy to all Crown land sales. Provincial agencies have also proposed applying higher levels of protection to large outstanding areas of Crown Land important to waterfowl through mechanisms such as *The Wildlife Habitat Protection Act*.

The Saskatchewan Government adopted the Saskatchewan Wetland Policy in 1995. It affirms the government's belief "in the sustainable management of wetlands to maintain the multiple benefits they provide, now and into the future." Similarly, the objective of the Federal Government with respect to wetland conservation, as stated in the Canadian *Federal Policy on Wetland Conservation*, is to "promote the conservation of Canada's wetlands to sustain their ecological and socio-economic functions, now and in the future.". The Saskatchewan Wetland Policy has three objectives:

1. To encourage sustainable management of wetlands on public and private lands to maintain their functions and their benefits.
2. To conserve wetlands essential to maintain critical wetland species or wetland functions.
3. To restore or rehabilitate degraded wetland ecosystems where previous destruction or alteration has resulted in a significant loss of wetland functions or benefits.

As one component of implementation of the Saskatchewan Wetland Policy, the Saskatchewan Watershed Authority (SWA) is currently revising its own wetland conservation policy. While this revised policy is anticipated to make significant contributions to wetland conservation, alone it will be insufficient to halt loss of wetlands. Given the decades-long wetland loss trend, Saskatchewan Partners are under no illusions as to the scale of cultural attitudes and policy adjustments required to halt the trend. This will require an integrated approach to wetland policy that includes adequate incentives for retention, effective regulation of drainage activities, and effective education and awareness efforts. Federal, provincial and municipal governments all have roles in this wetland policy.

Stopping the ongoing loss of wetland habitat is a primary goal of PHJV policy efforts in Saskatchewan. Saskatchewan Partners foresee a three phased approach to this goal:

1. Slow the current rate of wetland loss
2. Achieve a "no net loss" equilibrium
3. Achieve a no wetland loss condition, where wetland restoration results in a net gain of wetland habitat acreage and function

A major interim objective towards the no wetland loss goal is achieving a "no net loss" equilibrium where wetland restoration/mitigation activities offset ongoing wetland loss. A caveat is that restoration/mitigation wetlands must restore the suite of functions and benefits found in natural PPR wetlands. New research suggests wetlands may sequester considerable amount of carbon which may further increase future policy interest in wetland retention and restoration.

Land use and watershed planning are potential tools to address some of the land use issues impacting waterfowl production. Land use planning is mandatory on Forest Management Areas and land use plans have been developed for some southern areas such as the Great Sand Hills, but

this is not a routine aspect of governance in agricultural Saskatchewan. However, in 2003 SWA initiated Watershed and Aquifer Protection Planning for 6 watersheds and 1 aquifer. While focused on protection of drinking water sources, the planning areas have addressed broader questions including wetland retention and protection or restoration of riparian areas. As the first of these plans have been completed, citizens have created agencies in the watersheds to lead implementation of the plans. The planning and implementation processes provide opportunities and potential new partners to achieve NAWMP goals.

## 1. Policy Objectives for NAWMP in Saskatchewan

Policy work for the Saskatchewan NAWMP Partners focuses on reducing the risk of habitat loss, and supporting habitat restoration by influencing government legislation, regulations, and appropriations. This includes policy initiatives that provide support for intensive programs such as implementation of beneficial management practices, and policy initiatives that support regulatory programs such as drainage regulations or Crown land policy. It will be important to align and coordinate NAWMP policy initiatives other environmental strategies with complementary goals, including the Prairie Conservation Action Plan, the Biodiversity Action Plan, Saskatchewan Species at Risk, the Representative Areas Network, Saskatchewan Energy and Climate Change Plan, and the Green Strategy.

1. NAWMP partners will work to influence public policy with the following goals.
  - A. Functions and values of wetlands are retained.
    - i. Develop strong and effective implementation plan for Saskatchewan Wetland Policy.
    - ii. Improve enforcement to control illegal drainage.
    - iii. Protect important wetland areas on Provincial Crown land using *The Wildlife Habitat Protection Act*.
    - iv. Improve understanding of the ecological and hydrological roles of wetlands.
    - v. Include carbon releases from wetland drainage and cultivation of permanent cover in carbon dioxide emission reduction plans.
    - vi. Implement mitigation requirements for wetlands impacted by industry.
  - B. Waterfowl habitat on Crown land is protected and restored.
    - i. Identify valuable waterfowl habitat on Crown land and protect under *The Wildlife Habitat Protection Act*.
    - ii. Review Crown land policies of federal and provincial land holding agencies, especially SMOA, SMOE, SWA, Agriculture and Agri-food Canada and Department of Defence and implement changes to protect waterfowl habitats, including protection in case of land sales.
  - C. Agricultural and environmental policy encourages and supports protection and restoration of waterfowl habitat by producers.
    - i. Identify programs or policies which encourage habitat loss and revise to eliminate such impacts.
    - ii. Assess the broad impacts of government initiatives like biofuels on habitats.

- iii. Influence the new Canada-Saskatchewan agricultural policy agreement to ensure it continues and builds on important components of the Agricultural Policy Framework.
  - iv. Initiate policies supportive of practices beneficial to waterfowl such as establishment of permanent cover, riparian protection and growth of winter cereals.
  - v. Support development of a drought strategy which incorporates wetland protection and restoration, and retention of lightly utilized grasslands as emergency forage supplies.
  - vi. Support programs which reward producers for sequestering carbon in wetlands and with permanent cover.
- D. Land use planning works to protect and restore waterfowl habitat.
- i. Support development of more agri-environmental group farm plans focused on water.
  - ii. Support watershed planning that adopts an Integrated Water Resource Management approach that addresses all water issues.
  - iii. Support watershed planning and implementation that includes wetland retention and restoration as goals.
  - iv. Support municipal planning that includes retention of natural water bodies and areas of natural cover as ecological sites within communities.
2. Saskatchewan NAWMP partners will ensure effective plan implementation.
- i. Assess potential impacts of climate change on future waterfowl production and NAWMP programming.

## XI. Expenditure Forecast

Saskatchewan Partners have forecasted the total expenditures (direct and indirect expenditures combined) that will be incurred from April 2007 to April 2012 while working toward achieving the 5 year habitat restoration and retention objectives. Indirect expenditures were calculated using the ratio of direct to indirect expenditures as reported for historic Saskatchewan data in the National Tracking System. Expenditure forecasts assume expenses are incurred by Saskatchewan Partners; no cost (\$0) is projected where habitat is created by industry trends or policy. Expenditure forecasts should be viewed as best estimates current at the time of writing of the Plan. Significant differences between expenditure forecasts and actuals are likely to occur due to changes in agricultural commodity and land prices, agricultural industry trends, variation in National Tracking System data used to calculate indirect expenditures, inflation, etc. Such factors also combine to create variation in costs between provincial Plans.

Saskatchewan Partners will spend \$30.8 million over the next 5 years on habitat restoration (Table 4). Five year habitat restoration objectives for winter wheat and conversion of cropland to tame pasture and hayland will be achieved through substantial investment by Saskatchewan Partners (\$18.1 million, 59% of total restoration cost) and additional acres to be created through industry trends (no cost; Table 4).

Over the next 5 years Saskatchewan Partners will spend a total of \$50.1 million on habitat retention activities, with 92% of the total directed to securing native uplands (Table 4).

To achieve the 5 year habitat restoration and retention objectives, Saskatchewan NAWMP Partners will spend an additional \$38.1 million on support activities including policy, project operation and maintenance, research and evaluation, communications and coordination (Table 4). The total forecasted expenditure by Saskatchewan Partners for 2007-2012 is \$118.9 million.

Table 4. Five-year habitat objectives and expenditure forecast (2007-2012) relative to 25-year Saskatchewan habitat objectives.

	5-Year Objectives (acres)					% 25-Year Habitat Objective	5-Year Expenditure Forecast <sup>2</sup>
	25-Year Habitat Objective (Acres)	Direct NAWMP	Extension NAWMP	Policy NAWMP	Industry Trend <sup>1</sup>		
<b>Habitat Restoration</b>							
Winter Wheat	1,734,600	144,500	202,500	0	0	20	\$ 3,892,000
Tame Pasture	2,478,900	161,600	87,000	0	247,200	20	\$ 8,403,000
Tame Hay	1,652,900	107,700	58,000	0	164,900	20	\$ 5,814,000
Planted Cover	57,200	6,400	0	0	0	11	\$ 11,331,000
Wetland <sup>3</sup>	42,200	1,100	0	3,800	0	12	\$ 1,340,000
<b>Restoration Sub-total</b>	<b>5,965,800</b>	<b>421,300</b>	<b>347,500</b>	<b>3,800</b>	<b>412,100</b>		<b>\$ 30,780,000</b>
<b>Habitat Retention</b>							
Wetland	914,100	24,200 <sup>5</sup>	13,100	0 <sup>5</sup>	0	4	\$ 4,021,000
Upland <sup>4</sup>	1,605,400	271,600 <sup>5</sup>	50,000	0 <sup>5</sup>	0	20	\$ 46,078,000
<b>Retention Sub-total</b>	<b>2,519,900</b>	<b>295,800</b>	<b>63,100</b>	<b>0</b>	<b>0</b>		<b>\$ 50,099,000</b>
<b>Restoration &amp; Retention Total</b>	<b>8,485,700</b>	<b>717,100</b>	<b>410,600</b>	<b>3,800</b>	<b>412,100</b>		<b>\$ 80,879,000</b>
<b>Policy</b>							<b>\$ 4,367,000</b>
<b>Operation &amp; Maintenance</b>							<b>\$ 13,969,000</b>
<b>Research &amp; Evaluation</b>							<b>\$ 7,027,000</b>
<b>Communication</b>							<b>\$ 3,121,000</b>
<b>Coordination</b>							<b>\$ 9,580,000</b>
<b>Support Total</b>							<b>\$ 38,064,000</b>
<b>GRAND TOTAL</b>							<b>\$ 118,943,000</b>

<sup>1</sup> An estimate of land use changes by major types based on most current, broad-scale data (2001 Canadian Census of Agriculture).

<sup>2</sup> Includes both direct and indirect costs.

<sup>3</sup> Assumes small basins are primary restoration target (range 0.5-1.0 acre, average 0.75 acre).

<sup>4</sup> Includes native grassland only.

<sup>5</sup> Acres to be secured through policy (p. 31 and 32) have been included under Direct NAWMP activities in this table for consistency with National Tracking System definitions.

## XII. Challenges

To achieve the objectives of the Saskatchewan Plan, a variety of challenges will have to be overcome. They are discussed below, by activity type:

**Wetland Restoration:** The five-year objective for restoration is approximately 12% of the 25-year plan objective. Saskatchewan Partners have scaled back the wetland restoration objective for the first five-year period because it is a relatively new delivery option and efforts by delivery partners have, to date, resulted in modest numbers of restored wetlands.

To meet its wetland restoration objective, Saskatchewan Partners first must determine the incentive levels and delivery approaches that trigger program uptake by significant numbers of landowners. Saskatchewan Partners also recognize that delivery of wetland restoration must accelerate in subsequent five-year plan windows, a fact that places even greater importance on finding effective approaches to delivering wetland restoration in subsequent Plans. As wetland restoration opportunities increase, additional NAWMP funds will be required. An inventory of wetland restoration potential might better identify and target program opportunities. The emerging knowledge of the value of wetlands in sequestering carbon could enhance future policy interest in wetland restorations. Given the link between availability of wetlands and the ability of waterfowl to settle and nest in a given landscape, a wetland restoration shortfall will directly reduce the productive capacity of Target Landscapes.

**Winter Wheat:** The five-year objective for winter wheat is 20% of the 25-year plan objective. It is expected that winter wheat objectives will be met or exceeded in this five-year plan period.

Given the accelerating growth in winter wheat acreage in Saskatchewan, it is evident that agricultural producers have greater confidence using winter wheat regularly in crop rotations. Increased demand for wheat as a feedstock for ethanol production also has positive implications for winter wheat production. Given the tremendous advantage that fall-seeded crops offer over the traditional spring-seeded crops for waterfowl nesting (both nesting densities and nesting success), growth in winter wheat, driven largely by industry trends, are significant and positive.

**Perennial Forage (Hay and Pasture):** The five-year objective for perennial forages is 20% of the 25-year plan objective. Under the current planning scenario, this objective is projected to be met through direct NAWMP activities (cropland conversion incentive programs), NAWMP partner programs (e.g. continuation of the current Greencover land conversion program) and, most importantly, continuation of the 1991 to 2006 agricultural industry trend toward conversion of annual cropland to forage.

Recent events in the agricultural marketplace significantly challenge the achievement of this objective. Increased grain and oilseed prices and lower cattle prices in 2007 have stressed the livestock industry and made annual crop production a more economically attractive alternative in the near future. Should the grazing livestock industry contract, a loss of perennial forage acres will follow. Further, there is no assurance that current federal agricultural incentive programs supporting conversion of cropland to perennial forage will carry forward into the next generation of agricultural policies and programs.

Saskatchewan Partners will follow this and other land use trends and adjust its mix of programs and objectives accordingly. It must be recognized, however, that agricultural market forces have largely dictated land use and conversion trends in the past. They will continue to be the major driver in the future unless significant agricultural policy adjustments supporting retention and expansion of perennial cover emerge. Two possible options include a robust ecological goods and services policy framework or a biofuels policy framework that supports biomass energy development.

Given the link between perennial forage cover and waterfowl nesting success, any shortfall in this land use category will add to the waterfowl productivity deficit.

**Planted Nesting Cover:** The five-year objective for planted nesting cover is 11% of the 25-year plan objective.

The current objective is based on expected levels of funding available for this activity in the next five-year period. Expanding this delivery option will require an increase in funding for direct NAWMP programs. An alternative would be for Canada to adopt a U.S. style Conservation Reserve Program, where cultivated lands are retired and largely idled under perennial cover. Such an option is not expected in the near future.

Land purchase and idling by conservation agencies and organizations in Saskatchewan is regulated by the *Southern Conservation Lands Policy*. The limits on land purchase established by policy are important considerations in the implementation of this program delivery activity in Saskatchewan Target Landscapes.

**Wetland Habitat Retention:** The five-year objective for wetland retention is approximately 9% of the 25-year plan objective. The five-year retention objective is based on existing NAWMP program funding levels that support direct securement, management agreements and extension, and new policy protecting wetlands on Crown land. These activities will focus on Target Landscapes.

The deficit estimates in the Saskatchewan Plan assume that wetland loss will be stopped by 2011. Saskatchewan Partners recognize that this assumption is unlikely to be met by 2011, and that immense challenges must be overcome to achieve this result. Future Plans will likely have to account for continued wetland loss beyond 2011 that will increase waterfowl deficits, and erode the carrying capacity of the landscape.

Saskatchewan Partners recognize that delivery of wetland retention must accelerate in subsequent five-year plan windows. In the near future, retention of the majority of existing wetlands will rely on direct securement. Saskatchewan Partners must determine the incentive levels and delivery approaches that trigger program uptake by significant numbers of landowners with high risk wetlands. As wetland retention opportunities increase, additional NAWMP funds will be required. Investment is warranted to develop models that predict risk of wetland loss and better target retention activities.

An attractive alternative to direct securement would be a policy framework that provides both effective protection for the existing wetland base on private lands and a system of incentives for landowners who retain wetland habitat. Currently implementation of this option appears unlikely,

even as the recently reinvigorated agricultural market for grains and oilseeds is poised to accelerate wetland losses. Given these factors, Saskatchewan Partners recognize the pressing need for, and high priority that must be placed on, achieving public policies and programs that lead to effective wetland retention.

**Upland Habitat Retention:** The five-year objective for native upland habitat retention is approximately 20% of the 25-year plan objective. This objective is based on existing NAWMP program funding levels that support direct securement, management agreements, and extension in Target Landscapes.

In the near future retention of native uplands will be achieved through a diverse portfolio of conservation tools. Investment is warranted to develop models that predict risk of native upland loss and better target retention activities. Currently it is anticipated that the recently reinvigorated agricultural market for grains and oilseeds is more likely to increase significant loss of tame forage than native upland. However, extended market strength could increase risk to native uplands that are more amenable to cultivation. Effective public policies and programs that provide incentives for landowners to maintain native uplands would complement NAWMP direct programs.

### XIII. Partner Roles in the Saskatchewan Implementation Plan

The Prairie Habitat Joint venture is a partnership of various government and non-government agencies. Successful achievement of the PHJV objectives in Saskatchewan requires coordinated implementation and synergy between agency programs.

SWA is the agency responsible for management of the quantity and quality of Saskatchewan's water resources. In 2002 SWA succeeded the Saskatchewan Wetland Conservation Corporation (SWCC) as the provincial coordinator for NAWMP implementation. This change created a larger agency and allows NAWMP programs to integrate more completely with other provincial water programs. However some functions, such as the role of the SWCC Board in providing a forum involving all the NAWMP partners, were lost. A new Saskatchewan NAWMP Management Committee was created July 2007 to bring senior officials of the Partner agencies together to address issues and ensure effective and integrated plan implementation. Through activities like watershed planning, coordination of NAWMP implementation, and regulation of drainage, the SWA can have a significant effect on wetlands. Drainage regulations have, however, been designed from a perspective of downstream impacts rather than for wetland retention. The Watershed Authority is developing new policies on drainage and wetlands which it expects to complete during 2007.

Agriculture and Agri-Food Canada established the Federal-Saskatchewan Agricultural Policy Framework (APF) which is the most important agricultural policy affecting NAWMP goals. Its environmental chapter provides direction and programs which have helped to maintain and restore some of the habitats and functions essential to achieving NAWMP goals. Environmental Farm Plans and Agri-Environmental Group Planning aid producers in identifying issues and planning for certain environmental benefits. These plans also make the producer eligible for financial assistance for beneficial management practices, such as riparian protection. The APF has assisted producers taking many individual actions which have helped restore cover, protect wetlands and riparian areas and contributed to achieving NAWMP goals. The APF expires in 2008. Ensuring that there is a replacement program which also provides strong environmental supports will be very important to achieving NAWMP goals. Agriculture and Agri-Food also cost-shares, with the Saskatchewan Ministry of Agriculture, funding for the Wildlife Damage Compensation Program (WDCP) which pays farmers for 80% of appraised crop damage caused by waterfowl and other wildlife.

Environment Canada (EC) is the lead federal agency for NAWMP in Canada, and its role is critical to the overall success of NAWMP in Saskatchewan. EC leads and coordinates national and joint venture partnerships and funding mechanisms needed to achieve our continental goals. In addition to providing direct funding to partners for habitat conservation program delivery, EC is a key player in many of the scientific programs that drive program priorities, including long-term population surveys, the PHJV Habitat Monitoring Program, the Avian Botulism Research Program, the International Pintail Action Group, and many other directed studies. EC is also a lead department in implementation of *The Federal Policy on Wetland Conservation*. Strategies of the Canadian Wetland Policy include increasing public awareness, managing and conserving wetlands on federal lands, managing wetland impacts as influenced by federal programs, enhancing conservation of important wetlands cooperatively with provincial and non-government agencies, and ensuring a sound scientific basis for policy. EC also cost-shares, with the

Saskatchewan Ministry of Environment, funding for the Waterfowl Crop Damage Prevention Program (WCDPP) which operates lure crops, feeding stations, and scare cannons.

Ducks Unlimited Canada (DUC) is a private, not-for-profit organization that conserves, restores and manages wetlands and associated habitats for the benefit of North America's waterfowl. DUC delivers a full complement of conservation programs including traditional preservation and restoration projects as well as broader-based programs that include extension efforts, policy initiatives, government relations and educational activities. Management and maintenance of existing projects requires significant annual investment of funds and effort by DUC. DUC's conservation programs are guided and informed through substantial commitments to waterfowl research, conservation planning, and development of conservation delivery tools. The wide range of programs DUC is able to deliver is critical to meeting our long-term habitat conservation and waterfowl population goals. DUC focuses on five streams of program delivery: Habitat Retention, Wetland Restoration, Upland Restoration, Habitat Asset Management, and Industry and Government Relations.

Nature Conservancy of Canada (NCC) is a national charitable organization that takes direct action to protect areas of significant biodiversity for the benefit of future generations. In partnership with landowners and individuals, foundations, corporations and governments NCC has conserved ~100,000 acres of critical habitat on over 100 properties. Their unique approach includes the negotiation of donated or purchased conservation easements, which allows for conservation-minded landowners to continue utilizing the land while protecting it for future generations. NCC-Saskatchewan Region concentrates its conservation efforts primarily in the Prairie Ecozone: the Aspen Parkland and Mixed Grasslands in the southern half of the province.

Saskatchewan Ministry of Environment (SMOE) has broad responsibility for the environment and for fish and wildlife. SMOE has a regulatory role under *The Environmental Management and Protection Act* where shoreline alteration permits may be required for wetland drainage. SMOE also has a regulatory role related to *The Wildlife Habitat Protection Act* (WHPA). WHPA protects over 3 million acres of uplands and wetlands, much of which is leased for grazing, and prevents the Crown from selling designated lands. Lessees of WHPA designated land require permission prior to destruction of habitats. Petroleum development is allowed on WHPA land, but at lower than normal intensities. Thirty percent of all Saskatchewan trapping, hunting and fishing licence revenues are directed to The Fish and Wildlife Development Fund (FWDF), from which SMOE makes direct expenditures on habitat protection including wetlands, often through partnerships with other Saskatchewan Partners. Over 165,000 acres have been secured through the FWDF. SMOE also cost-shares, with EC, and delivers the WCDPP which operates lure crops, feeding stations, and scare cannons.

As the provincial government department concerned with agriculture, SMOA delivers programs and policies that will achieve a thriving, environmentally sustainable, agricultural production and processing industry in support of healthy and diverse rural communities. Working with individuals, businesses, communities, and governments, SMOA will assist farmers and ranchers, encourage higher value production and processing and promote sustainable economic and social development in rural Saskatchewan. SMOA makes valuable contributions to the NAWMP in Saskatchewan through management of Crown lands and encouragement of forage production by private producers. SMOA's Performance Plan includes objectives beneficial to achieving NAWMP goals, including "Enhances environmental stewardship" and "Increased livestock

production and diversification to higher value crops”. SMOA through the Saskatchewan Crop Insurance Corporation also cost shares, with AAFC, and delivers the WDCP which pays farmers for 80% of appraised crop damage caused by waterfowl and other wildlife.

#### XIV. Monitoring, Research, and Adaptation of the Plan

Saskatchewan Partners realize that the waterfowl habitat landscape is dynamic and change due to a host of socio-economic influences. Saskatchewan Partners also recognize that research is required to test the assumptions that underpin this Plan (Appendix 6) and refine our targets, models and objectives. Hence, periodic reviews of habitat change, revision of planning models with new information, and re-planning efforts will be undertaken every 5 years.

The impact habitat gains and losses have via the WPM on goal-setting in this Plan underscores the need for improved habitat monitoring data. Saskatchewan Partners must develop an improved habitat accomplishment database to be updated annually to track Partner restoration and retention activities at a spatial scale sufficient to provide inputs into the WPM for deficit/surplus calculations. Use of Geographic Information Systems has the potential to improve the tracking, coordination, and reporting of agency accomplishments to both Saskatchewan Partners and external funding agencies. This tracking and reporting system will enable Saskatchewan Partners to move from simple acre accomplishment totals to biologically relevant estimates (hatched nests) of program impacts, which ultimately will result in improved targeting.

Saskatchewan Partners currently rely on Census of Agriculture data for overall habitat trends. However Census data does not provide good estimates of trends for some habitat types, especially wetlands. Saskatchewan Partners need to expand and adapt current habitat monitoring efforts to provide inputs into the WPM for deficit/surplus calculations. In some locations inventories employing high resolution methods and protocols based on conventional or digital aerial photography have been completed (Smith and Blackbird Creeks, RM of Emerald, St. Gregor) or are underway (Lower Souris, Fishing and Waldsea Lakes), but little information exists for other areas irrespective of suspected levels of wetland loss. Saskatchewan NAWMP Partners are also involved in planning for development of the Canadian Wetland Inventory. Such data is also required in order to develop risk models and guide policy development.

Research needs include:

- Refine the WPM including testing of habitat selection and nest survival assumptions particularly in prairie environments and across a range of spatial and temporal scales.
- Quantify landscape influences on brood/duckling survival, particularly for pintails.
- Influence of habitat change and restoration, particularly wetland loss and restoration on biodiversity at landscape scales.
- Risk modeling to assist in targeting of protection efforts.
- Development of wetland carrying capacity models for the prairies and parklands of Canada including exploration of landscape influences on wetland use.

## XV. Western Boreal Forest Status in Saskatchewan

The Canadian Western Boreal Forest (WBF) is located north of the prairie Ecozone and west of the Ontario border to Alaska (Figure 16). The 300 million hectare area is primarily comprised of conifer forest interspersed with a multitude of wetland systems. This water dominated region includes marshes, swamps, shallow open water and peatlands (bogs and fens), which represent well over 50% of the landscape in many locations (Environment Canada 1997).



Figure 16. Location of Western Boreal Forest region and habitat inventory projects.

Based on the Breeding Waterfowl Population Survey, the WBF including Central Alaska holds 12-14 million

ducks, or ~30% of the total continental waterfowl surveyed (Figure 17). Over 50% (8 million ducks) of the WBF waterfowl population reside south of the 60<sup>th</sup> parallel. Waterfowl populations in the Saskatchewan portion of the WBF are estimated at 2.9 million, or 36% of the total WBF

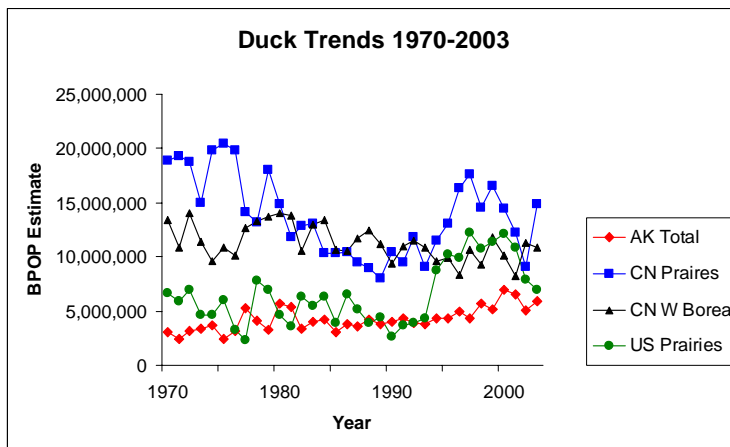


Figure 17. Duck population trends in the Western Boreal Forest region from 1970-2003 relative to other regions.

population south of the 60<sup>th</sup> parallel. In addition, the WBF is generally believed to be heavily used by prairie waterfowl displaced by drought or for annual feather moult. Furthermore, Blancher and Wells (2005) indicate more than 1.6 billion birds (landbirds, shorebirds, waterbirds, waterfowl combined) breed in the boreal forest, which is over 30% of the total U.S. and Canadian bird population.

Over 50% of the continental breeding populations of green-winged teal, American wigeon, scaup, scoters, ring-necked ducks and goldeneye are found in the WBF. The WBF south of the 60<sup>th</sup> parallel supports between 61-72%

of the total breeding season population estimate of these six species combined. Although populations are generally stable south of the 60<sup>th</sup> parallel, over the last 30 years 9 species appear to be increasing, 6 are decreasing and 3 are stable (see figures in Appendix 7).

Once thought to be isolated from development and a stable habitat for waterfowl and other waterbirds, the WBF is undergoing far-reaching development by the energy sector (oil and gas, hydroelectricity), forest industry, agriculture expansion, and mining (mineral and peat extraction). One of the primary concerns is loss of ecosystem function which can result in reduced habitat

quality and quantity. Although these developments are taking place across the WBF, by far the greatest direct anthropogenic landscape change is currently occurring south of 60°. Further, in many locations multiple developments are occurring simultaneously generating concerns about cumulative impacts. In addition, the influence of climate change on wetland systems is of significant concern.

These industrial developments present significant conservation challenges because of our limited knowledge about how associated habitat change impacts waterfowl populations. In addition, there is a general lack of basic ecological information, including on wetlands and waterfowl, which is required to begin understanding the linkages between industrial activity and waterfowl populations. Activities are prioritized to target the Boreal and Taiga Plains Ecozones where the abundance and distribution of boreal waterfowl is the highest in conjunction with high wetland density. Although activities do occur outside of this priority area, each opportunity is assessed on a project by project basis depending on the opportunity to strengthen wetland conservation.

Activities are coordinated across the WBF to fill these knowledge gaps with a focus on undertaking inventory projects (e.g. wetland, waterfowl, water chemistry), and supporting other initiatives that will provide a better understanding of boreal ecology and utilizing this information to aid conservation planning initiatives that will lead to secured wetland acres. In addition, and on an ongoing basis, information is utilized to influence government and corporate policy reform to enhance wetland conservation within the boreal landscape.

In Saskatchewan, work is currently focused on undertaking inventory projects and participating with conservation planning programs with government, industry and non-government organizations. The Beauval Inventory Project initiated in 2004 will provide a comprehensive inventory uplands and wetlands for over 12 million acres of the boreal forest in the west central portion of the province. This work will support the identification and protection of sensitive areas and the development of best management practices as they relate to the protection of wetland systems. A similar inventory process is near completion for the Pasquia Project which focuses on a 9 million acre area including the upper reaches of the Saskatchewan River Delta.

As the majority of development in the WBF is occurring on Provincial Crown land, information provided through these initiatives provides valuable guidance to resource policy, regulation and designation of protected areas (e.g. Representative Areas Network and *Wildlife Habitat Protection Act*). For example, inventory information will contribute to the Nisbet, North-Central, and Pinehouse-Dipper Integrated Forest Land-use Planning processes led by the Provincial Government through identification of wetland areas requiring protection, and sensitive zones where special management criteria must be developed.

## XVI. Other Bird Initiatives

The Prairie landscape contains a diverse array of avian habitats. Relatively large contiguous tracts of native prairie interspersed with a variety of wetland complexes, riparian areas, and aspen parklands provide valuable habitats for breeding, migrating, and wintering birds. These birds can be broadly categorized into four groups; waterfowl, shorebirds, waterbirds and landbirds. Previous planning efforts have identified priority shorebird, waterbird and landbird species (Gratto-Trevor et al. 2001, Beyersbergen et al. 2004, Canadian Prairie Partners in Flight 2004, respectively) based on the percentage of the global and/or Canadian population breeding in Prairie Canada, Species at Risk status, and perceived population declines or range contractions. Currently, 22 landbird, 7 shorebird, and 8 waterbird species (Table 5) breeding within the Prairie Habitat Joint Venture region of Saskatchewan have been identified as priority species for future conservation efforts. Of these 37 species, 9 landbird, 1 shorebird, and 2 waterbird species are listed as ‘threatened’ or ‘endangered’ under the Species at Risk Act.

### **Populations**

Despite a number of recognized survey biases, the North American Breeding Bird Survey provides the best available information on distribution, population size and trends for many species. Better information is available for species at risk with small populations, limited distributions, and regular surveys (e.g. Greater Sage-grouse, Piping Plover and Whooping Crane). Population estimates and trends for most priority species have been calculated in Bird Conservation Region planning using Breeding Bird Survey data, the methodology of Rosenberg and Blancher (2005), and other available data. Population objectives have been assigned to each priority species following the methodology of Rich et al. (2004), or through Species at Risk Recovery Strategies. Currently, results indicate populations of most priority species are declining, and many declines are significant (Table 5). However, there is considerable uncertainty around the population estimates, trends, and thus objectives, for most species. Saskatchewan has considerable responsibility for All Bird conservation. Saskatchewan is estimated to support over 50% of the total Prairie Habitat Joint Venture breeding population for 16 (57%) of the priority species (Table 5). Despite the large number of breeding populations found in Saskatchewan, many species populations must increase significantly for Saskatchewan objectives to be reached (Table 5).

### **Habitat**

Presently, information on existing landscape-level habitat availability and specific population requirements is insufficient to predict the area of habitat required to meet shorebird, waterbird and landbird population objectives. However, general habitat requirements are known for most priority species. Priority species will benefit from conservation efforts that conserve, maintain and restore existing landscapes with healthy native and tame upland cover, and wetland complexes. Habitat niches occupied by priority species fall along gradients influenced by a combination of local and landscape parameters such as vegetation structure and wetland permanence. The requirements of individual species are often in conflict. The interaction of weather and human management activities can significantly alter parameters determining habitat suitability among years. Therefore, implementation of conservation efforts must consider both local and landscape scales to ensure a mosaic of upland and wetland conditions are available for all species throughout the typical Prairie wet/dry cycle.

## **Future Work**

Knowledge of the response of some landbirds and shorebirds to habitats, landscapes, and current agricultural and waterfowl management practices, has increased significantly over the last 15 years (e.g. Davis 2005, McMaster et al. 2005). It is now possible to estimate the probability of occurrence and density at large spatial scales for some priority species (e.g. Sprague's Pipit). These species should be the immediate focus of future efforts to develop habitat objectives and determine synergies with waterfowl conservation activities. However, for many other species, especially the waterbirds, which are irruptive, secretive, or occur at low densities, the development of habitat objectives must be delayed until improved population-habitat relationships are established via increased survey effort. The process of habitat objective development for all priority species would benefit from expanded and improved upland and wetland habitat inventory and monitoring.

Table 5. Population estimates, trends and objectives for priority shorebird, waterbird and landbird species in Saskatchewan.

Species	Saskatchewan population estimate (% of PHJV population)	PHJV Population trend	Saskatchewan population objective
<b>Shorebirds</b>			
Piping Plover	1 100 (85)	decreasing	1 200
Long-billed Curlew	5 000 (12)	stable	10 000
Marbled Godwit	38 000 (37)	decreasing	57 000
Wilson's Phalarope	90 000 (45)	stable	99 000
Willet	50 000 (51)	decreasing	75 000
American Avocet	32 000 (67)	stable	32 000
Upland Sandpiper	21 000 (49)	stable	23 000
<b>Waterbirds</b>			
American Bittern	285 152 (68)	possible decrease	427 728
Black Tern	467 774 (62)	uncertain	514 551
Franklin's Gull	Unknown (--)	uncertain	--
Horned Grebe	325 554 (80)	large decrease	651 108
Western Grebe	Unknown (--)	uncertain	--
Yellow Rail	Unknown (--)	uncertain	--
Whooping Crane	217 (100)	--	--
<b>Landbirds</b>			
Baird's Sparrow	499 000 (71)	uncertain	548 900
Black-billed Cuckoo	14 500 (42)	large decrease	29 000

Species	Saskatchewan population estimate (% of PHJV population)	PHJV Population trend	Saskatchewan population objective
Bobolink	100 000 (37)	possible decrease	150 000
Burrowing Owl	500 (63)	decline	--
Chestnut-collared Longspur	491 000 (29)	large decrease	982 000
Ferruginous Hawk	580 (35)	possible decrease	870
Grasshopper Sparrow	41 500 (25)	possible decrease	62 250
Greater Sage-Grouse	230 (40)	decline	--
Lark Bunting	130 500 (68)	uncertain	143 550
Le Conte's Sparrow	1 036 500 (57)	uncertain	1 140 150
Loggerhead Shrike	129 000 (65)	uncertain	--
McCown's Longspur	150 000 (48)	possible decrease	225 000
Nelson's Sharp-tailed Sparrow	112 500 (55)	stable/possible increase	112 500
Northern Harrier	9 000 (60)	large decrease	18 000
Peregrine Falcon	150 (--)	uncertain	--
Prairie Falcon	110 (--)	uncertain	121
Red-headed Woodpecker	n/a (--)	possible decrease	--
Sage Thrasher	n/a (--)	uncertain	--
Sharp-tailed Grouse	75 000 (59)	possible decrease	112 500
Short-eared Owl	2 150 (70)	uncertain	2 365
Sprague's Pipit	280 000 (38)	large decrease	--

## XVII. Conclusions

The 2006-2011 Saskatchewan NAWMP Implementation Plan sets ambitious 25 year habitat objectives within the PHJV Delivery Area capable of sustaining average waterfowl populations at the levels of the 1970's. This Plan provides Saskatchewan Partners with detailed 5 year habitat restoration and retention objectives within new Target Landscapes that will guide and direct conservation actions in support of the PHJV goals and objectives. This Plan also introduces two new important topics: the addition of the Western Boreal Forest to Saskatchewan's waterfowl habitat jurisdiction, and integration of all-bird conservation with NAWMP plans and programs.

A retrospective analysis of PHJV-scale net landscape change over 1971-2001, made possible by new Waterfowl and Pintail Productivity Models, challenged NAWMP Partner perceptions. Despite major habitat conservation successes to date, the impact of cumulative wetland losses offset or in some cases outstripped these gains. This knowledge stimulated adaptation of existing program priorities and actions for this Plan.

The new 5 year Plan sets forth complementary direct, extension and policy habitat program actions focused on the restoration and retention of wetlands and uplands. High priority initiatives for Saskatchewan Partners are *wetland restoration*, primarily through direct programs, and *wetland retention*, through all possible direct, extension and policy initiative options. However, the Plan recognizes that overcoming the many challenges associated with wetland issues will not be easy, and will require a long-term effort. The Plan recognizes that upland restoration activities of Saskatchewan Partners complement those of the agriculture industry, and emphasizes the need for favorable industry trends during this 5 year period. The Plan also sets forth to ensure habitat changes on the landscape, as affected by both Saskatchewan Partner activities and other forces, are monitored and as a result appropriate conservation programs are refined or developed to address new and emerging trends.

The 5 year habitat objectives described in this Plan will be fully achieved *with the significant exceptions of wetland restoration, planted cover and wetland retention*. This Plan requires a variety of challenges to be overcome, including financial, societal, and agency technical capacity (specific to wetland restoration and retention), and has refocused Saskatchewan Partner priorities and activities to achieve the habitat objectives.

Saskatchewan Partners recognize there are a number of challenges to the realization of the full complement of objectives outlined in this Plan. Saskatchewan Partners must aggressively pursue new funding, partnership, and policy opportunities to achieve Plan objectives. New habitat inventory, monitoring and accomplishment tracking initiatives are required to target and direct programming, and improve the adaptive resource management capacity of the Partnership. The expansion of Partner focus to include the Western Boreal Forest and Other Birds is biologically sound, but must be well integrated with existing programming. Saskatchewan Partners must incorporate the potential impacts of climate change into program delivery planning. Saskatchewan NAWMP Partners are already tackling the challenges of the 2007-2012 Saskatchewan NAWMP Implementation Plan.

## XVIII. Literature Cited

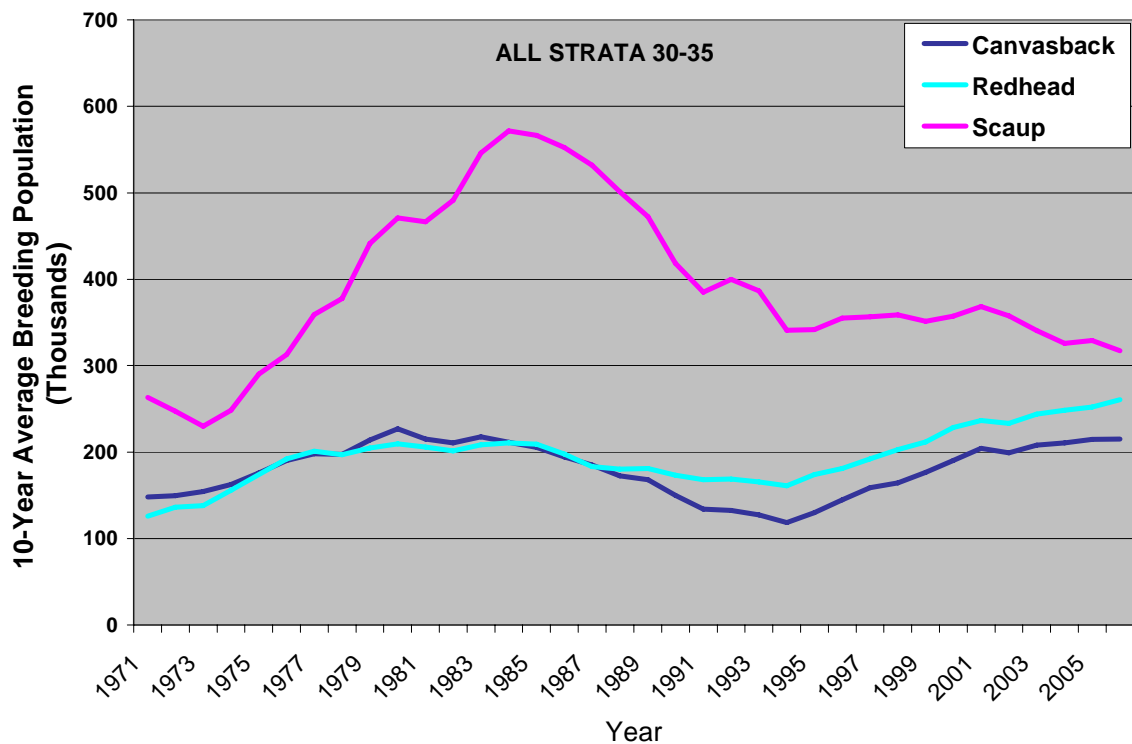
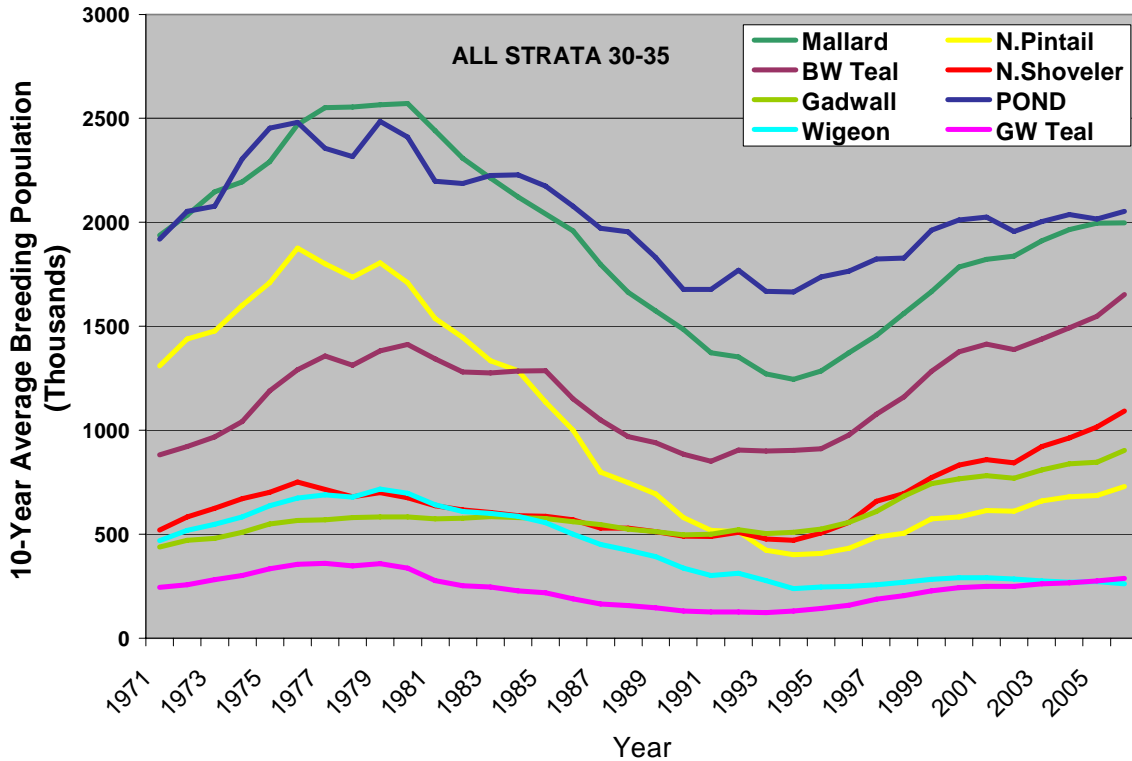
- Ashton, J. 2001. PFRA generalized landcover for the Canadian prairies: Version 1. Agriculture and Agri-Food Canada, Prairie Farm Rehabilitation Administration. Vector Digital Data. <http://www.agr.ca/pfra/gis>
- Benning, D. S. 1976. Standard procedures for waterfowl population and habitat surveys: operating manual. U. S. Fish and Wildlife Service, Office of Migratory Bird Management, Laurel, Maryland, USA.
- Beyersbergen, G.W., N.D. Niemuth, and M.R. Norton, coordinators. 2004. Northern Prairie & Parkland Waterbird Conservation Plan. A plan associated with the Waterbird Conservation for the Americas initiative. Prairie Pothole Joint Venture, Denver, Colorado. 183 pp.
- Blancher, P. and J. Wells. 2005. The Boreal Forest Region: North America's Bird Nursery. Canadian Boreal Initiative, Ottawa, Ontario. 10 pp.
- Canadian Prairie Partners in Flight. 2004. Landbird conservation plan for Prairie Pothole Bird Conservation Region 11 in Canada. Prairie Habitat Joint Venture, Canadian Wildlife Service, Edmonton, AB. 136 pp.
- Cowardin, L. M., T. L. Shaffer, and P. M. Arnold. 1995. Evaluation of duck habitat and estimation of duck population sizes with a remote-sensing-based system. Biological Science Report 2. National Biological Service, Washington, D.C. 26 pp.
- Cumming, E., K. A. Hobson, S. L. Van Wilgenburg. Breeding bird declines in the boreal forest fringe of western Canada: Insights from long-term BBS routes. *Canadian Field-Naturalist* 115:425-434.
- Davis, S.K. 2005. Nest-site selection patterns and the influence of vegetation on nest survival of mixed-grass prairie passerines. *Condor* 107:605-616.
- Devries, J. H, K. L. Guyn, R. G. Clark, M. G. Anderson, D. Caswell, S. K. Davis, D. G. McMaster, T. Sopuck, and D. Kay. 2004. Prairie Habitat Joint Venture (PHJV) Waterfowl Habitat Goals Update: Phase 1. 82 pp.
- Environment Canada. 1997. The National Wetland Database. Ottawa, Ontario. Unpublished data.
- Goodman, A. S. and S.P Pryor. 1972. A preliminary study of the methods and rates of alteration of waterfowl habitat in the black soil zone of Western Canada. Unpubl.: Canadian Wildlife Service; 1972. 77p.
- Gratto-Trevor, C., G. Beyersbergen, L. Dickson, P. Erickson, B. MacFarlane, M. Raillard, T. Sadler. 2001. Prairie Canada shorebird conservation plan. Prairie Habitat Joint Venture, Canadian Wildlife Service, Edmonton, AB. 141 pp.

- Hobson, K. A., E. M. Bayne, and S. L. Van Wilgenburg. 2002. Large-scale conversion of forest to agriculture in the Boreal Plains of Saskatchewan. *Conservation Biology* 16:1530-1541.
- M<sup>c</sup>Master, D.G., J.H. Devries, and S.K. Davis. 2005. Nest success of grassland birds in haylands of southern Saskatchewan: identifying landscape influences and conservation priorities. *Journal of Wildlife Management* 69:211-221.
- Rich, T.D., C.J. Beardmore, H. Berlanga, P.J. Blancher, M.S.W. Bradstreet, G.S. Butcher, D.W. Demarest, E.H. Dunn, W.C. Hunter, E.E. Inigo-Elias, and others. 2004. Partners in Flight North American landbird conservation plan. Cornell Lab of Ornithology, Ithaca, New York. 85 pp.
- Rosenberg, K.V., and P.J. Blancher. 2005. Setting numerical population objectives for priority landbird species. Pages 57-67 in *Bird Conservation Implementation and Integration in the Americas: Proceedings of the Third International Partners in Flight Conference* (C.J. Ralph and T.D. Rich, Eds.). U.S. Department of Agriculture Forest Service, General Technical Report PSW-GTR-191.
- Statistics Canada. 2001. 2001 Census: Census of agriculture. Statistics Canada, Ottawa, ON, Canada. <http://www.statcan.ca/english/agcensus2001/index.htm>
- Watmough, M., D. Ingstrup, D. Duncan, and H. Schinke. 2002. Prairie Habitat Joint Venture Monitoring Program Phase I: Recent habitat trends. Canadian Wildlife Service, Environment Canada, Edmonton, AB, Canada. 93pp.

# XIX. Appendices

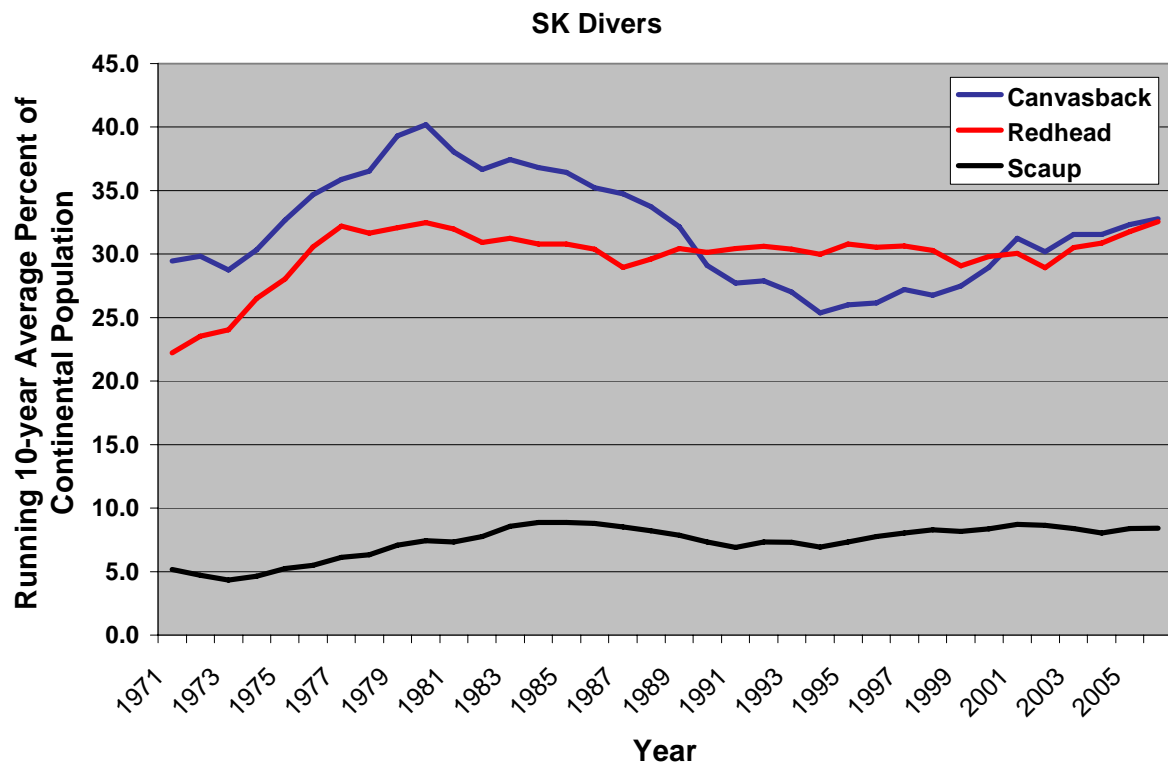
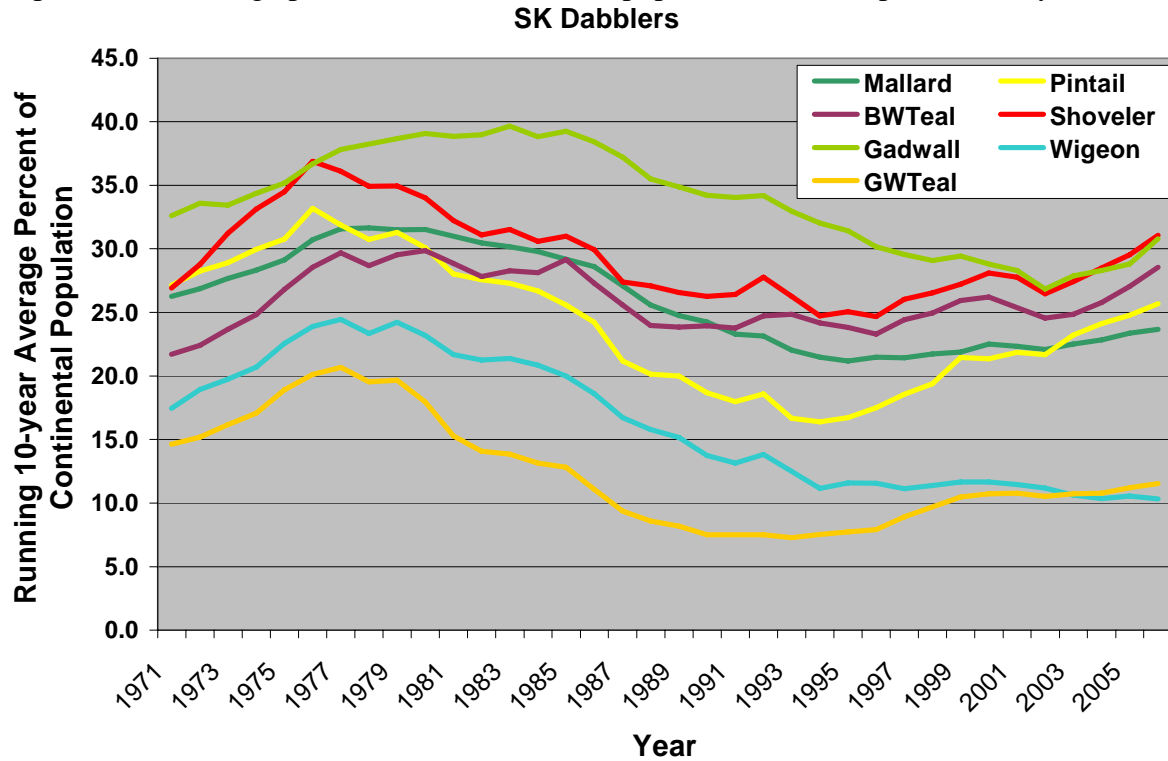
## A) Appendix 1

Trends in the ten-year running average pond and breeding population estimates (1971-2006) summarized provincially across Breeding Waterfowl Population Survey strata 30-35 covering the PHJV delivery area of Saskatchewan. The top chart provides population trends for ponds and the seven most common dabbling duck species and the bottom chart provides population trends for the three most common diving duck species. Annual data points represent the average population estimate over the previous 10 years.



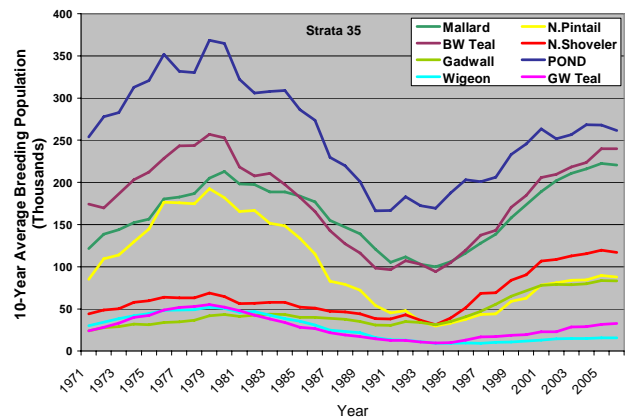
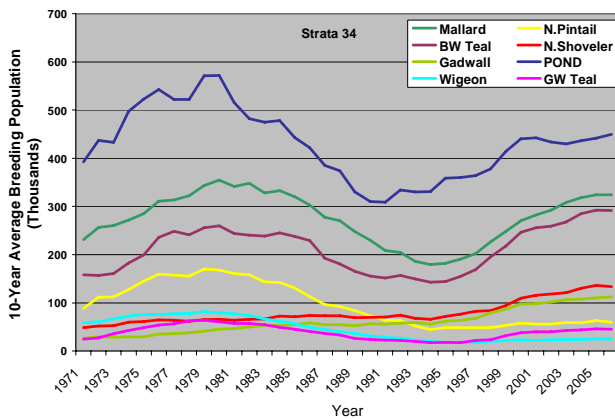
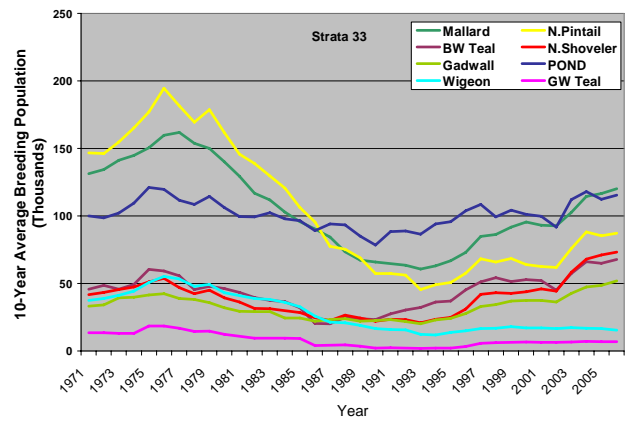
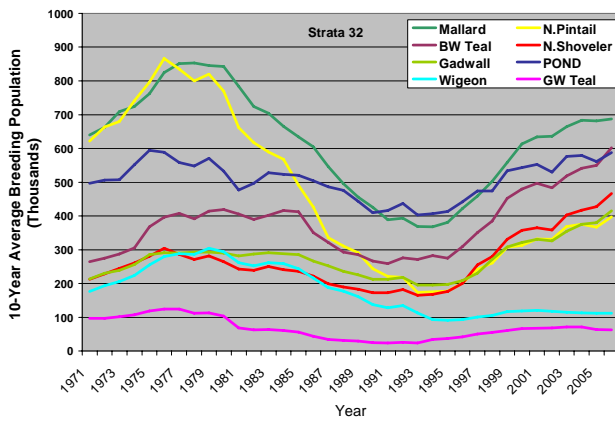
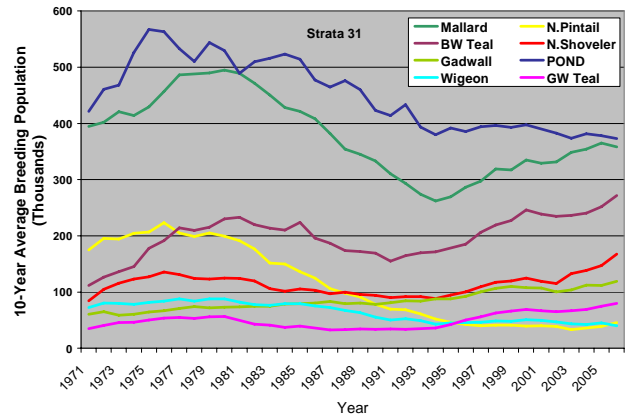
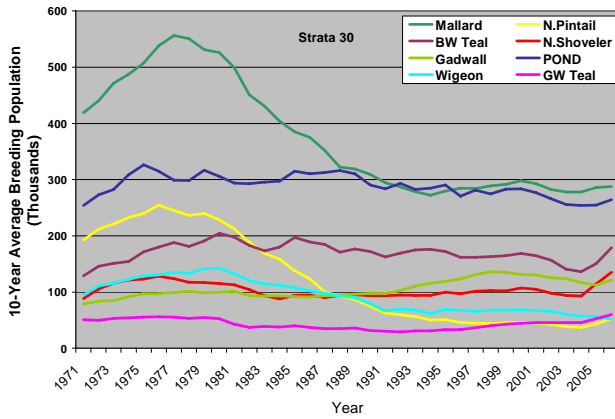
## B) Appendix 2

Trends in the ten-year running average percent of the continental population (1971-2006) of the seven most common dabbling duck species and three most common diving duck species found in Breeding Waterfowl Population Survey strata 30-35 of Saskatchewan. Annual data points represent the average percent of the continental population over the previous 10 years.



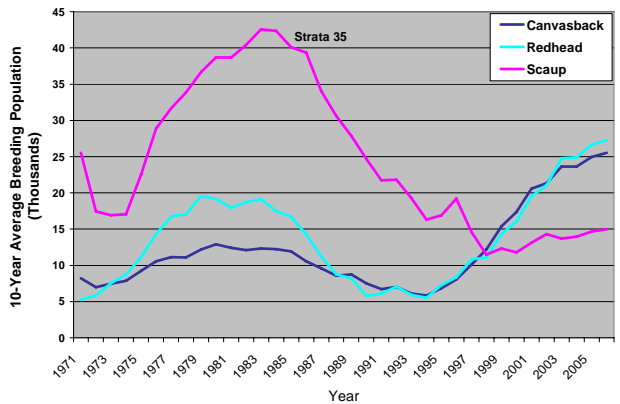
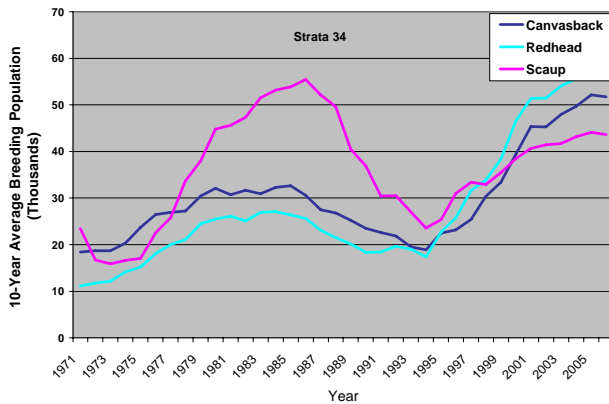
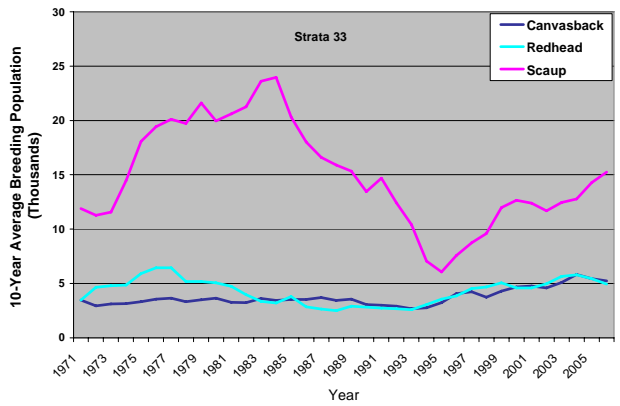
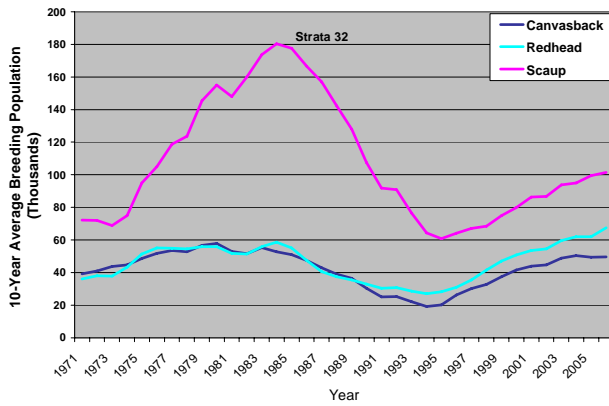
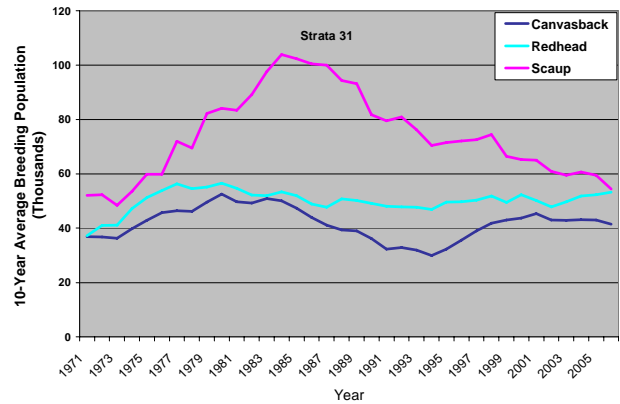
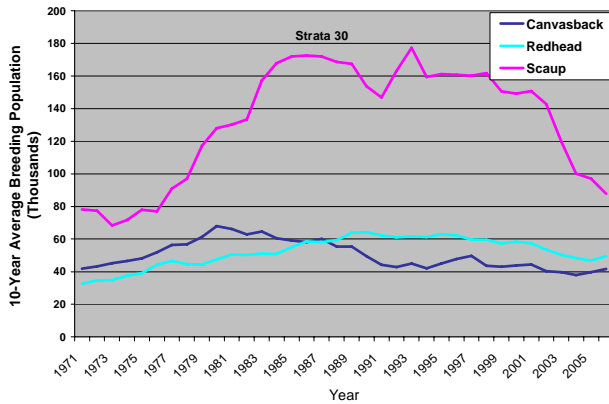
### C) Appendix 3

Trends in the ten-year running average pond and breeding population estimates (1971-2006) by Breeding Waterfowl Population Survey strata for the seven most common dabbling duck species found in the PHJV delivery area of Saskatchewan. Annual data points represent the average population estimate over the previous 10 years.



## D) Appendix 4

Trends in the ten-year running average breeding population estimates (1971-2006) by Breeding Waterfowl Population Survey strata for the three most common diving duck species found in the PHJV delivery area of Saskatchewan. Annual data points represent the average population estimate over the previous 10 years.



## E) Appendix 5

### Calculation of Habitat Restoration Scenarios

Figure 8 (p. 24) outlines the process described by Devries et al. (2004) for updating PHJV habitat goals that estimated the influence of wetland and upland changes on waterfowl productivity in prairie Canada from 1971 to 2001.

#### Wetland Restoration

Wetland restoration potential was estimated by using Cowardin wetland-duck pair models to estimate the CCS (RM)-specific change in number of wetland basins from 1971-2001. The proportion of those basins that are set as restoration goals for target landscapes is based on the percentage of cropland present in the Target Landscape. If cropland is  $\geq 90\%$ , no restoration effort is applied; if no cropland is present, 100% of potential wetland restoration is applied (this is based on a simple linear regression equation relating potential restoration to % cropland). Where other scenario influences decrease the amount of cropland (i.e., adding hay, pasture, planted nesting cover), wetland restorations are increased accordingly (again regression based). Wetland restorations were capped at 6,000 in any one Target Landscape for logistical reasons. In the remainder of the PHJV Delivery Area, it was assumed wetland restoration would be minimal.

#### Hay and Pasture

Cropland conversion to hay and pasture (at a fixed ratio of 40% hay/60% pasture) was estimated based on projections of where cropland conversion would likely occur as indicated in the unpublished Agriculture and Agri-Food Canada report "Prairie Agricultural Landscapes 2: Foundations For Growth". The "PAL 2" report provided projected estimates of the percent change in cultivated acres by Land Practice Group (LPG) from 1996 to 2005. These projected changes were attributed to CCSs (RMs) in a Geographic Information System. For example if LPG2 and LPG3 had estimated cultivated acre changes of -2 and -5% respectively and an RM was 50% LPG2 and 50% LPG3, then the projected change for that RM was  $0.5(-2) + 0.5(-5) = -3.5\%$ . Estimated change by Target Landscape was similarly calculated. These changes apply similarly in both Target Landscapes and the remainder of the PHJV Delivery Area. While the PAL 2 projections were for the period 1996-2005, we have assumed that this change will occur over the next 20 years. In Target Landscapes where expert knowledge indicated PAL2 projections over-estimated the potential for establishment of hay and pasture, we reduced the projections to 5 levels perceived to be realistic as of 2007 (20%, 40%, 60%, 80% and 100% of PAL2 estimate).

#### Winter Wheat

To estimate the potential for WW acres, we projected the current growth trend in Winter Wheat acres across the prairies out to 20 years. Based on the projection, an estimated 15% of all wheat acres would be WW varieties at that point in time. In each CCS(RM) we therefore set the WW goal as the percent of the landscape in WW when WW made up 15% of the wheat acres currently grown (this assumes overall wheat acres will be relatively constant). Note that linking the potential WW acres as a % of all wheat acres currently grown gives us a way to vary the acres spatially in a realistic manner. Potential WW acres were attributed from CCS(RM) level estimates to Target Landscapes and the remainder of the PHJV Delivery Area. Note that based on the current opinion of DUC's Regional Agrologist, the maximum potential for winter wheat is likely ~30% of all wheat acres.

### Planted Nesting Cover

We arbitrarily set 0.5% of the Landscape as the upper limit for the amount of Dense Nesting Cover to be applied to any Target Landscape. Where current levels exceed 0.5%, no further addition is modeled, where some exists currently at levels below 0.5%, addition of the balance is modeled, and where none exists currently, 0.5% is added. No DNC is added in Target Landscapes primarily designated for pintails or in the remainder of the PHJV Delivery Area.

## F) Appendix 6

### Planning Assumptions

The planning process used in the development of Provincial Implementation Plans is dependent on several models that incorporate the best information currently available regarding landscape and wetland influences on waterfowl productive capacity at landscape scales. Implicit in the use of any model and modeling process are key assumptions about the biological/ecological system and the interaction of component parts. These assumptions are necessary and clearly stating them provides a basis for future testing and refinement of the models and updating management plans under an adaptive management framework.

Key assumptions behind current Implementation Plans include:

- 1) That landuse reflected in the 1971 and 2001 Agricultural Census years were reasonably accurate.
- 2) That the amounts of wetland and upland habitats that existed in the early 1970's were sufficient to support continental waterfowl populations at NAWMP goals with the average water conditions of the 1970's and that returning hatched nest levels to 1970's levels will achieve NAWMP population goals.
- 3) That wetland loss rates measured by Watmough between 1985 and 1999 have remained constant within municipalities over the period 1971-2001.
- 4) That landscape influences on reproductive success have remained constant over the 1970-current time span.
- 5) That temporal dynamics (annual variation) is an integral part of the prairie system and influence reproductive effort and success. We assume that our models have adequately captured the 'average' values for habitat selection and reproductive parameters through the wet-dry cycle.
- 6) That diving ducks (primarily redheads and canvasbacks) will benefit from wetland retention and restoration efforts.
- 7) Wetland loss will continue until 2011 after which PHJV will have succeeded in arresting the decline.
- 8) The current upward trend in grassland will continue through 2011 and then be maintained.

### Operational Assumptions

Evaluating and adaptively improving habitat programs in response to new information have been hallmarks of the PHJV. The latest round of planning reflects continued adaptation with program shifts towards increased focus on wetland restoration and an increase focus on policy initiatives to conserve and restore natural capital. In accordance with these modifications come new needs for evaluation and tests of assumptions. The following list, while not complete, contains some uncertainties that should receive consideration for development in an adaptive management framework.

#### **1. Planning tools.**

Scope: Implementation plans rely on spatially explicit models that relate landscape conditions to waterfowl reproduction. The current implementation plans were constructed using a second-generation of planning tools. Parameter estimates and modeled relationships need to be evaluated and refined with additional data.

Assumptions:

- The Cowardin et al. (1995) wetland-duck models from North Dakota apply to the prairies and parklands of Canada.
- Surrounding landscape composition has minimal influence on the use of various wetland types by ducks
- Parameter estimates for nest success and nest-site selection currently in the WPM and PPM accurately capture the interaction between landscape attributes and duck nesting.

## **2. Cost efficiencies of delivery options (direct, extension, policy)**

Scope: Evaluations have revealed that meeting our objectives through direct programs will be both difficult and expensive. Therefore, new implementation plans rely increasingly on extension and policy initiatives.

Assumptions:

- PHJV influence through extension and policy-makers can accomplish desired landscape change more cost-effectively than direct programs.

## **3. Effects of wetland loss/restoration**

Scope: Continued wetland loss has been identified as the single greatest factor affecting waterfowl productivity since the inception of NAWMP. Accordingly, increased focus has been placed on conserving and restoring wetlands. New information about the temporal dynamics of pair settling would improve management decisions. Density dependence is likely most intense during periods of drought. Conversely, density dependence may be least intense when the prairies are coming out of drought and ponds are plentiful while populations of birds are low.

Assumptions:

- Density dependence as mediated through behavioral spacing mechanisms limits the breeding population (carrying capacity) within the PHJV area (i.e., all the ponds are essentially 'full').
- Restoring wetlands results in 'new' breeding pairs and not simply a redistribution of birds.
- Increasing the carrying capacity in prairie Canada increases the productive capacity of the population (i.e., reduces overflight into less productive habitat).

## **4. Relationship between reproductive success and perennial cover**

Scope: Naturally occurring perennial vegetation has been largely replaced by cereal grain agriculture in much of the PHJV focus area. Many PHJV programs are designed to retain or restore perennial vegetation to improve nest survival. Evidence from the PHJV Assessment study confirmed that population dynamics of mallards are responsive to nesting success—especially where nesting success rates are typically low. However, where nesting success rates typically appear higher (e.g. prairie biome), populations may be equally sensitive to variation in other vital rates. Evidence for a positive relationship between nesting success and amounts of perennial covers is growing, though lots of ‘scatter’ remains. Ongoing efforts through the SpATs study to account for both temporal variability and variation in cover height and density should help clarify the relationship. Finally, models embedded within current planning tools use a linear relationship between perennial cover and nesting success. Non-linearities would have substantial implications for targeting; therefore, the assumption of linearity should continue to be evaluated with the addition of new data.

Assumptions:

- Population dynamics of prairie-nesting ducks are most responsive to changes in nesting success
- Nesting success is related to the cumulative amounts of perennial grassland types in the landscape
- Current models suggest this effect is approximately 3 times stronger in the prairies than in the parklands.

## 5. Land-use change

Scope: Recent analyses reveal that since 1986, perennial cover has increased throughout much of the PHJV area. The WPM predicts that nesting success has increased with the increase in perennial cover. Current planning efforts project this increase to continue through 2011. Much of the increase, though, has been in tame forages (Pasture and Hay) while native prairie has continued to be lost. Continued loss of habitats (primarily wetlands and native prairie/parkland habitats) is a significant threat to PHJV goals. However, given limited resources, an efficient retention strategy requires the ability to predict where losses are likely to occur. Efficient monitoring and a mechanistic understanding of the drivers of habitat loss will ultimately allow the best predictions for targeting retention efforts.

Assumptions:

- Increased hayland does not increase female mortality.
- Waterfowl production at a landscape scale is more influenced by the proportion of ‘Grazed’ versus ‘Idle’ grassland than the degree or timing of use (currently being investigated by the DUC SpATS study).
- For waterfowl, native prairie (grazed or idle) is no more productive than seeded (restored) grassland (grazed or idle).
- Tools being developed by PHJV partners will improve the ability to identify habitat parcels (wetland and native prairie) at risk of loss.

## 6. Fall cereals

Scope: Fall cereals have shown excellent promise for providing safe, attractive nesting habitat in agriculturally dominated landscapes. Much of the evaluations of fall cereals have occurred in the prairie biome, however. Implementation plans call for increases in winter wheat in both prairie and parkland ecoregions.

Assumptions:

- Fall cereals (especially winter wheat) will be similarly attractive to nesting ducks in the parklands as they are in the prairies, and will have similar nesting success rates.

## **7. EGS on PHJV projects**

Scope: Interest in ecological goods and services has grown in recent years, both for PHJV projects and for natural habitats generally. PHJV should endeavor to better quantify the provision of EGS from habitats upon which waterfowl rely including other types of plant and animal diversity, habitat for pollinators, both consumptive and non consumptive recreational opportunities, water storage, groundwater recharge, improved water quality, carbon sequestration. Additionally, more work is needed to quantify societal demand, and therefore true market value, for these goods and services.

Assumptions:

- PHJV habitat programs provide EGS for which ‘markets’ already exist or for which they could be developed.

## **8. Species of concern**

Scope: Within the PHJV area several species are below target population levels. The current Pintail Study is providing much new information about pintail nesting, but more information is required about environmental correlates of other vital rates. American wigeon provide a perplexing problem. Populations on the prairies are well below long-term averages (74% below LTA in Manitoba in 2006), yet are well above their LTA’s in Alaska (+61% in 2006). This dramatic redistribution is cause for concern for the PHJV. Little research has been conducted on factors affecting population dynamics of wigeon, though initial indication may suggest that reproductive success on the prairies and Canadian boreal forest may be responsible. A retrospective analysis of landscape correlates of population change should be a first step, likely to be followed by a study of factors affecting their reproductive ecology.

Assumptions:

- For pintails, nest survival is limited due to their selection of cropland stubble for nesting and subsequent nest destruction by agricultural machinery and nest predation.
- Habitat programs will improve nest survival for a significant portion of the nesting population to restore populations to the NAWMP goal.

## **9. Biofuels**

Scope: Biofuels have the potential to rapidly alter the economics of agriculture throughout the prairies. A rapid transformation is already underway in the U.S. prairies with some spill-over effects evident in Canada. If the growth of biofuels is driven mostly through grain-based

ethanol or biodiesel, with the exception of winter wheat, impact on duck populations could be substantial and negative if large areas of perennial forage are converted to annual cultivation. If cellulosic ethanol production gains the competitive advantage, the effects on waterfowl and other wildlife could be quite positive. This dynamic warrants close attention by the PHJV.

Assumptions:

- Biofuels will be a significant driver of land use decisions in prairie Canada in the near future.

## **10. Climate change**

Scope: Evidence of warming climates is growing daily. The most recent Global Circulation Models predict continued warming over the PPR while predictions for precipitation range from slight decreases to slight increases. Continued warming likely will result in greater rates of evapotranspiration and reduced soil moisture. Among other effects, this likely will reduce the numbers of wetlands holding water in an average year. Substantial uncertainty remains about interannual variability of wetland conditions. Drought may be more frequent and more prolonged. Conversely, climate change may encourage conversion of annual cropping to forage production. Concurrent changes to the hydrology and ecology of the boreal forest are likely, with the thawing of permafrost likely resulting in wetland drying in some regions, and floral and faunal distributional changes most likely. Increased monitoring and application of global circulation models should inform the regional prioritization of PHJV target areas as data become more available.

Assumptions:

- Climate change impacts will most likely affect wetland availability and hence waterfowl carrying capacity in prairie Canada in, as yet, unpredictable ways.

G) Appendix 7.

Trends in breeding waterfowl populations in the Western Boreal Forest.

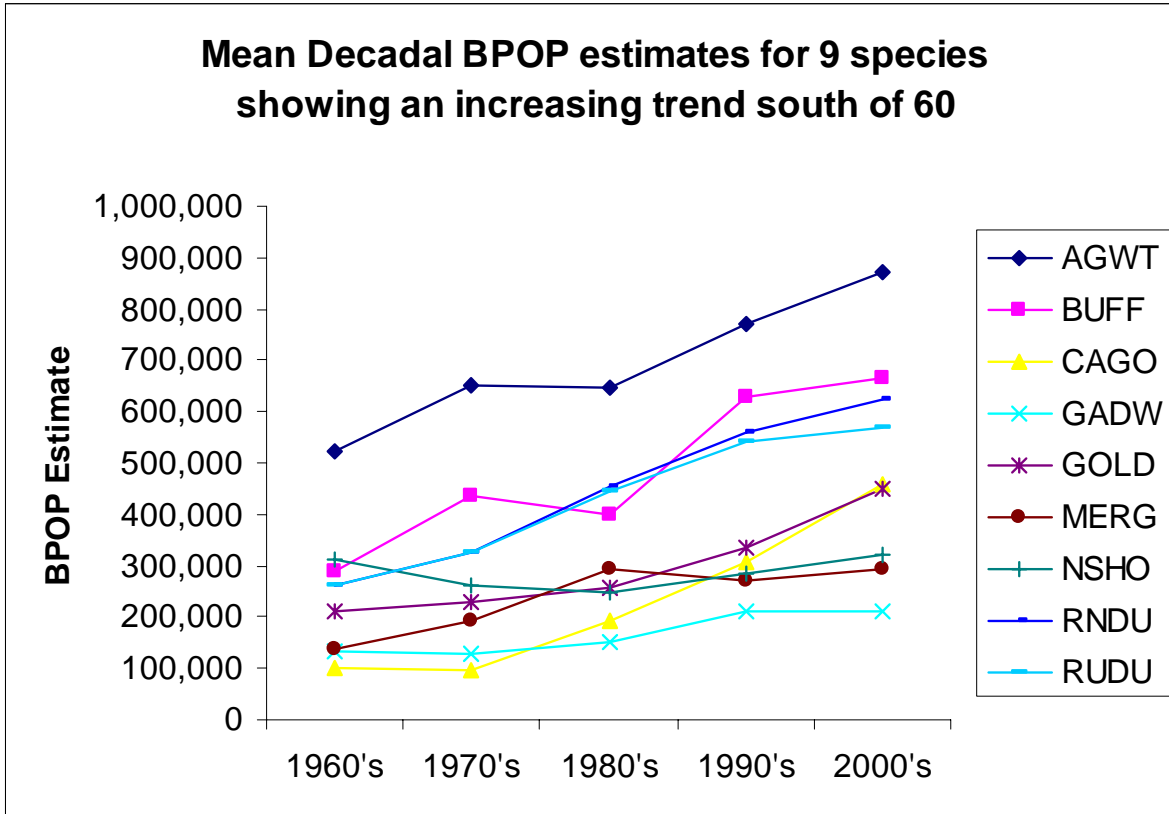


Figure B. Mean decadal breeding season population (BPOP) estimates have increased for nine species (AGWT=American Green-winged Teal, BUFF=Bufflehead, CAGO=Canada Goose, GADW=Gadwall, GOLD=goldeneye, MERG=merganser, NSHO=Northern Shoveler, RNDU=Ring-necked Duck, RUDU=Ruddy Duck) in the Western Boreal Forest region located south of the 60<sup>th</sup> parallel (i.e., in British Columbia, Alberta, Saskatchewan and Manitoba combined).

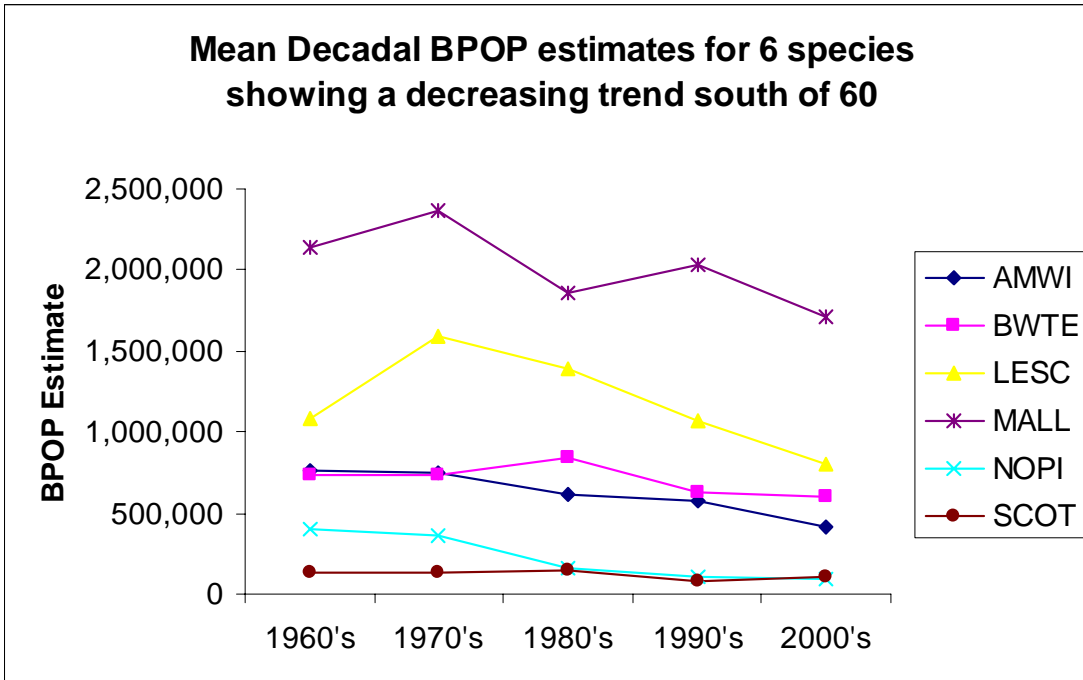


Figure C. Mean decadal breeding season population (BPOP) estimates have decreased for six species (AMWI=American Wigeon, BWTE=Blue-winged Teal, LESC=Lesser Scaup, MALL=Mallard, NOPI=Northern Pintail, SCOT=scoter) in the Western Boreal Forest region located south of the 60<sup>th</sup> parallel (i.e., in British Columbia, Alberta, Saskatchewan and Manitoba combined). *Note: Scaling issues prevent the scoter decline from being noticeable in the figure; however, the estimated population in Boreal Strata south of 60 has dropped from about 150,000 in the 80's to 100,000 in the 2000's.*

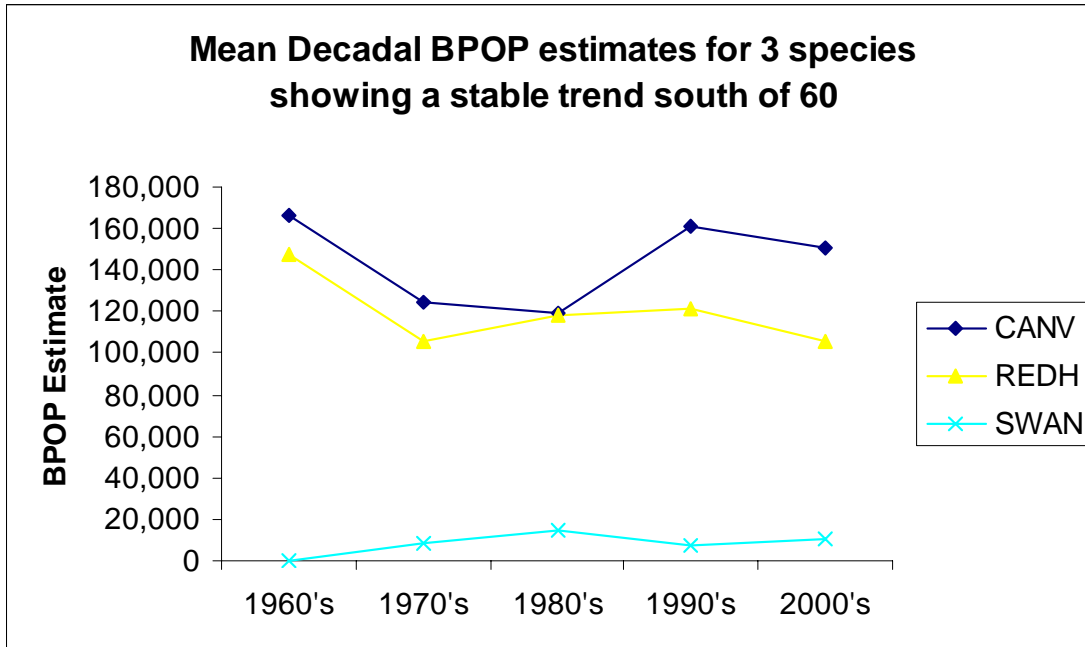


Figure D. Mean decadal breeding season population (BPOP) estimates are stable for three species (CANV=Canvasback, REDH=Redhead, SWAN=Tundra Swan) in the Western Boreal Forest region south of the 60<sup>th</sup> parallel (i.e., in British Columbia, Alberta, Saskatchewan and Manitoba combined).