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Hay-Zama Lakes Waterfowl Staging and Bald Eagle Nesting Monitoring Program, 2005



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Hay-Zama Lakes Waterfowl Staging and Bald Eagle Nesting
Monitoring Program, 2005

Ken D. Wright
Alberta Conservation Association
Bag 900-26
Peace River, Alberta, Canada
T8S 1T4



Report Series Editor

PETER AKU
Alberta Conservation Association
#101, 9 Chippewa Rd
Sherwood Park, AB T8A 6J7

KELLEY J. KISSNER
59 Hidden Green NW
Calgary, AB T3A 5K6

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Alberta Conservation Association
#101, 9 Chippewa Rd
Sherwood Park, AB T8A 6J7
Toll Free: 1-877-969-9091
Tel: (780) 410-1998
Fax: (780) 464-0990
Email: info@ab-conservation.com
Website: www.ab-conservation.com

EXECUTIVE SUMMARY

The Hay-Zama Lakes complex (HZLC), located in the Mid-boreal Mixed-wood ecoregion of Alberta, Canada, is an internationally recognized critical staging and nesting area for waterfowl and shorebirds. Numerous producing oil and gas wells are located within the HZLC. To moderate the impacts of these industrial activities on aquatic ecosystems in the complex the Hay-Zama Lakes Monitoring Program (HZLMP) was initiated in 1978. The HZLMP, focusing on waterfowl monitoring, and directed by the Hay-Zama Committee (HZC), is a cooperative venture among a variety of stakeholders including, representatives of the oil and gas industry, government agencies, First nations and conservation groups. As a member of the HZC, the Alberta Conservation Association (ACA) contributes advice on conservation issues and delivers the waterfowl monitoring program. In addition to monitoring waterfowl populations, the HZLMP includes monitoring of bald eagle nesting sites to quantify changes in population size through time and breeding success of this species.

Canada geese and northern pintails were the most abundant waterfowl species during the spring of 2005. Other common geese included greater white-fronted geese and other common ducks included American widgeons, mallards, blue-wing teals, and green-wing teals. Spring goose migration peaked on 3 May, consistent with the long-term (1978 - 2004) average peak date, whereas spring migration for ducks peaked on 26 April, considerably earlier than the long-term (1994 – 2004) average.

Canada geese and mallards were the most abundant waterfowl species during the fall of 2005. Other common geese included lesser snow geese and other common ducks included American widgeons, gadwalls, blue-wing teals, and canvasbacks. Fall goose migration peaked on 5 October, roughly three weeks later than the long-term (1978 – 2004) average date, whereas fall duck migration peaked on 14 September, consistent with the long-term (1994 -2004) average peak date.

Monitoring of waterfowl populations during critical migration periods is a strategy designed to identify possible negative environmental impacts on select avian species. Monitoring efforts in the HZLC allow for continued oil and gas production unless a

large congregation of waterfowl is present at a well site, at which point well production must be suspended. Alberta Sustainable Resource Development defined a threshold of 600 ducks and/or geese within a 30 m radius of the well site as the criteria for suspension of well production. The alternative, as defined by Alberta Energy and Utilities Board, is a general suspension of production on the complex during the migration periods (approximately 15 April to 31 May and 15 September to 15 October).

During the 2005 study period (26 April to 24 May and 30 August to 12 October), migrating waterfowl populations were observed on nine of the 15 well sites in the study area. Densities of waterfowl did not exceed threshold limits during the 2005 migration periods; the highest numbers recorded at a well site were 130 ducks during spring migration, and 531 ducks during fall migration. Consequently no wells were shut down due to waterfowl presence.

Results from the 2005 survey of bald eagles identified four active nesting pairs. Numbers of eaglets in the active nests ranged from one to three. This observation is within the range of three to seven nesting pairs recorded in past surveys.

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I am grateful to the following individuals, agencies, and corporations for their contributions and assistance in delivering this project. The Hay-Zama Committee oversaw all activities on this project and fostered a collaborative and cooperative approach to working with all stakeholders. Funding was provided by the committee's industry members: Nav Energy Trust and Pengrowth Corporation. Technical support for aerial surveys was provided by Taralee Stephenson (Indian Oil and Gas) and Ryan Hermantuz and Robb Stavne (Alberta Conservation Association). Garry Scrimgeour and Peter Aku (Alberta Conservation Association) reviewed this report and provided valuable insights and editorial suggestions.

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1.0 INTRODUCTION

1.1 General Introduction

The Hay-Zama Lakes complex (HZLC) is located in the Mid-boreal Mixed-wood ecoregion of the province of Alberta, Canada (Strong and Leggat 1992). Recognized internationally as a critical staging and nesting area for waterfowl and shorebirds, the complex was designated as a “Wetland of International Importance, especially as Waterfowl Habitat” by the Ramsar Convention in 1981, and in 1990 was nominated by the World Heritage Convention as a World Heritage Site. In 1999, the site was designated as a Wildland Provincial Park by the Province of Alberta. In addition to abundant migrating waterfowl, the site is used by other wildlife species (Saxena et. al 1995; Schaffe and Wright 1997).

Oil and gas exploration has occurred within the complex since 1965 and there are currently 23 producing oil and gas wells within the complex boundaries. Stakeholders felt that this activity would have a negative affect on wildlife, particularly waterfowl, in the area through harassment from regular well maintenance activities and increased risk of exposure to spills of crude oil or diesel used to power pump jacks. To moderate the impacts of oil and gas exploration activities on aquatic ecosystems in the complex, the Hay-Zama Committee (HZC) initiated the Hay-Zama Lakes Monitoring Program (HZLMP) in 1978 with a focus on waterfowl monitoring.

Since 1995, the HZC, consisting of representatives from the oil and gas industry, Dene Tha’ First Nation, municipal, provincial and federal government agencies, and environmental and conservation organizations, and charged with directing industrial activities within the HZLC, has also directed the HZLMP. Although waterfowl monitoring on the complex began in 1978 and includes most migration seasons since that time, methods and effort have varied since the inception of the program. To standardize monitoring efforts, the HZC contacted the Government of Alberta - Fish and Wildlife Division, which in turn delegated the newly formed (in 1997) Alberta Conservation Association (ACA) to assume monitoring responsibilities.

1.2 Study rationale

In 1995 the Alberta Energy and Utilities Board (AEUB), in consultation with the reconstituted HZC, revised guidelines for oil and gas operations within the HZLC during which boundaries were defined around the wetland complex to include the most environmentally sensitive areas to industrial activity (Alberta Energy and Utilities Board 1996). Monitoring of select wildlife species within the new boundaries was undertaken to comply with the following clause in the AEUB guidelines pertaining to general drilling and production requirements:

1. During a 5-week spring period (commencing mid-April) and an 8-week fall period (commencing mid-August) each year, the company shall:
 - a. Suspend well production and helicopter operations, or
 - b. AEP¹ and operators within the Complex will monitor fish and wildlife activity in the Complex and, in consultation with the Fish and Wildlife Division of AEP, determine for which wells, if any, suspension of production and helicopter operations is required² and for what period of time
2. All wells, batteries, compressor stations, satellites and pipeline routes shall be patrolled within 24 hours.

1.3 Study objectives

The objectives of this study were to:

- i) Determine whether congregations of duck and geese exceeded previously determined threshold densities (i.e., 600 ducks and/or geese within 30 m of an active well) that should necessitate a change in management practices; and
- ii) Quantify numbers of nesting bald eagles and estimate brood production.

¹Alberta Environmental Protection is presently Alberta Sustainable Resource Division (ASRD).

²Alberta Fish and Wildlife defined the criterion for suspension of production in 1992 as 600 ducks and/or geese within a 30-m radius of an active well site.

2.0 STUDY AREA

2.1 Description

The Hay-Zama Lakes are part of a unique and diverse wetland complex located in northwestern Alberta (N 58° 45', W 119° 00', Figure 1). Comprised of over 50,000 ha of open water, wet meadows, rivers and floodplain woodlands, this area is characterized by highly variable water levels on a seasonal and annual basis (Fearon and Larsen 1986). The complex's major fluvial system, Hay River, meanders through the complex, separated from lacustrine cells by high levees. Other fluvial systems entering the complex include Sousa Creek, Mega River, Amber River, Zama River, Moody Creek, as well as several unnamed creeks. Major lacustrine cells include Hay, Zama, Duck and Sand Lakes. Numerous unnamed shallow water bodies (i.e., sloughs) make up the remainder of the complex's wetted area. During spring runoff high water in the Hay River backs up Omega River and Sousa Creek filling the complex. After peak runoff, the complex slowly discharges into the Hay River via these same drainages. By mid-summer some of the large ephemeral lacustrine cells recede into vast grasslands.

Hay Lake, Amber River, and Zama Lake Indian Reserves all border the wetland complex. People of the Dene Tha' First Nation have used and continue to use the complex and surrounding areas for traditional activities such as hunting, fishing, trapping, gathering and traditional ceremonies.

2.2 Ecoregion, forest cover and soils

The HZLC occurs in the Mid Boreal Mixed-wood ecoregion (Strong and Leggat 1992). The climate is characterized by relatively low annual precipitation, cool summers and long, cold winters (Strong and Leggat 1992). Forest cover in the ecoregion is dominated by trembling aspen (*Populus tremuloides*) and balsam poplar (*Populus balsamifera*) with understories commonly containing species like blue joint (*Calamagrostis canadensis*), prickly rose (*Rosa acicularis*), bunchberry (*Cornus canadensis*), wild sarsaparilla (*Arilia nudicaulis*), dewberry (*Rubus pubescens*) and common fireweed (*Epilobium angustifolium*) (Strong and Leggat 1992).

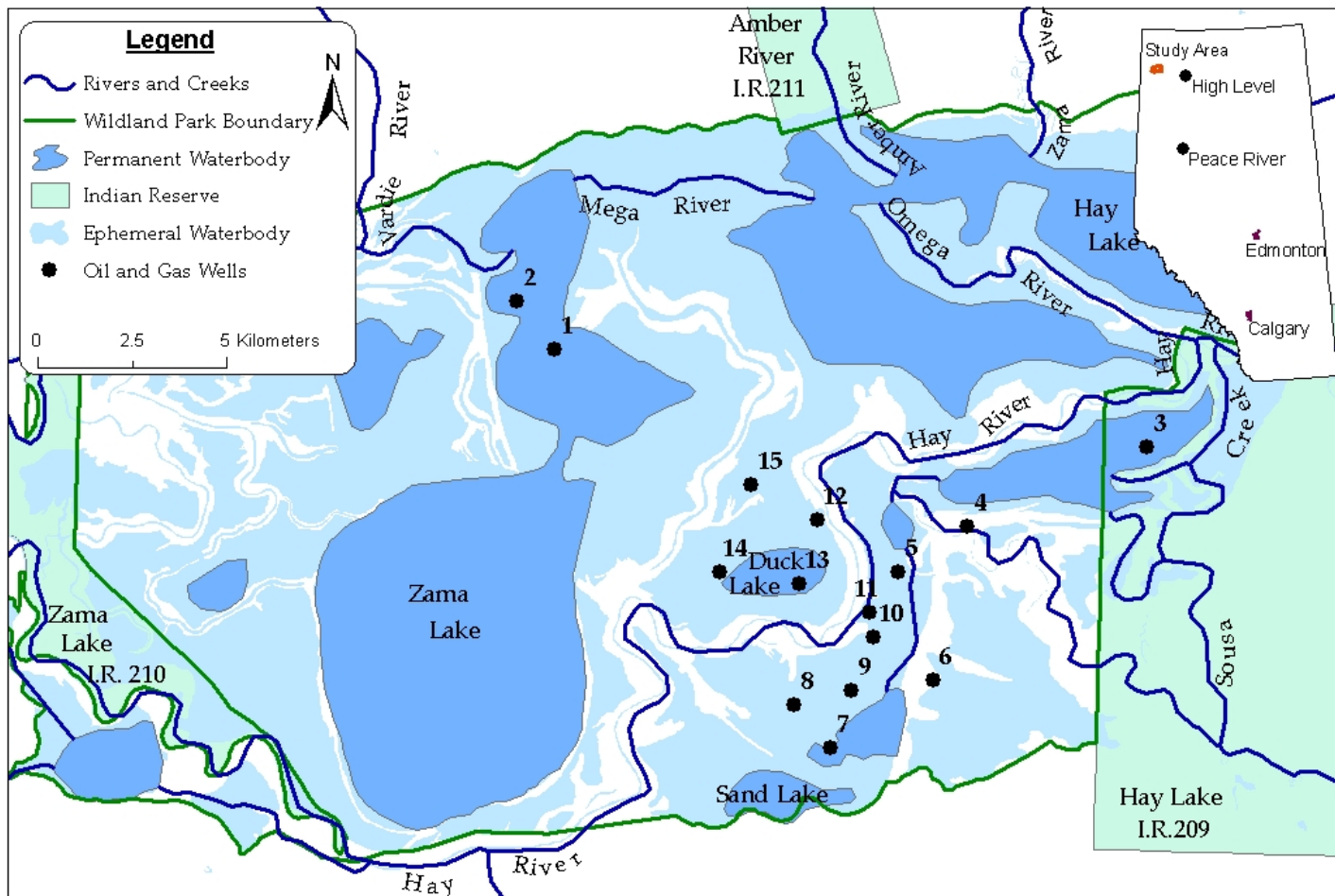


Figure 1. Location of oil and gas well sites monitored in the Hay-Zama Lakes study area during spring and fall migration periods, 2005.

Soils in the study area include luvisols, regosols, gleysols and organic types (Bentz et al. 1994). Luvisolic soils dominate the well-drained, upland sites where glaciolacustrine deposits form the dominant parent material. Regosolic soils are prominent on recently deposited sediments of fluvial origin like the floodplains of the Hay River and its tributaries. Gleysolic soils are very common in poorly drained areas, often overlain by organic layers or peat (Bentz et al. 1994).

2.3 Plant and animal communities

Fluctuating water levels in the HZLC is an important attribute of the region and profoundly influences the structure and functioning of plant communities. Aspen and balsam poplar dominate the limited upland sites with sporadic occurrence of white spruce (*Picea glauca*) and paper birch (*Betula papyrifera*). Fluvial deposits adjacent to watercourses are dominated by balsam poplar, with a dense understory of willow (*Salix* spp.), red-osier dogwood (*Cornus stolonifera*) and chokecherry (*Prunus virginiana*). Dense willow thickets, often associated with thick grass and sedge (*Carex* spp.) meadows, cover the poorly drained transitional areas between the river levees and the ephemeral lacustrine basins. Sedges, slough grass (*Beckmannia syzigachne*), water smartweed (*Polygonum* spp.), yellow cress (*Rorippa palustris*) and small bedstraw (*Galium trifidum*) cover the ephemeral lacustrine basins once water levels have receded.

In addition to abundant migrating waterfowl, several other wildlife species have been observed in past surveys (Wright 1998). These include raptors, gulls, terns and numerous songbirds. Ungulates observed include wood bison (*Bison bison athabascae*), which are considered to be the only free-ranging disease free herd in Alberta, moose (*Alces alces*) and white-tailed deer (*Odocoileus virginianus*). Larger carnivores observed on the complex include black bear (*Ursus americanus*), wolf (*Canis lupus*) and red fox (*Vulpes vulpes*). Other mammals, including beaver (*Castor canadensis*) and muskrat (*Ondatra zibethicus*) have been observed in past monitoring surveys and their dams, lodges and push-ups are evident throughout the complex (Saxena et. al 1995, Wright 1998).

Fish species in the Hay River and tributaries include northern pike (*Esox lucius*), walleye (*Sander vitreus*), burbot (*Lota lota*), white sucker (*Catostomus commersoni*) and longnose sucker (*C. catostomus*) (Shaffe and Wright 1997). Additionally, flooded

grasslands in spring provide critical spawning and rearing habitat for northern pike (Moller and Rosin 1994; Schaffe and Wright 1997; Wright 1998).

3.0 MATERIALS AND METHODS

3.1 Waterfowl monitoring

Waterfowl (ducks and geese) numbers at all producing well sites within the wetland complex were monitored at weekly intervals during spring and fall migration periods for a total of 11 surveys. Twenty-three wells were monitored at 15 sites (several sites contained multiple wells). Four spring surveys were completed from 26 April to 24 May and seven fall surveys from 30 August to 12 October. Aerial surveys were flown in a Bell 206 or R-44 rotary wing aircraft at an altitude of approximately 30 m with ground speed of 60 to 100 km/h. Survey routes were similar to previous surveys (Saxena et al. 1995; Schaffe and Wright 1997) and included all producing wells in addition to a general coverage of the complex to monitor migration periods (Figure 1). Flight speed was reduced at well sites to minimize disturbance of waterfowl and to facilitate accurate counts. Waterfowl counts at the well sites encompassed a radius of 30 m around the well. Where the threshold level of 600 ducks or geese within the 30 m radius was exceeded, the High Level office of AEUB was notified to determine whether well suspension procedures should be initiated. Suspended wells were patrolled within 24 h and production was resumed as soon as waterfowl numbers fell below threshold levels. For monitoring of migration periods, all waterfowl observed within 200 m of the survey route were recorded and, where practical, identified to species.

We compared peak counts from this study with those of historical records. Peak goose migration data from 1978 to 1993 were reported by Calverley et al. (1993) and for ducks from 1994 to 2004 by Saxena et al. (1995), Schaffe and Wright (1997) and Wright (2007). Since 1994, duck surveys have been conducted using similar methods as this study. Although goose survey methods have varied among years, comparison of our data with historical data should provide some insight into general trends in migration patterns.

3.2 Bald eagle nesting survey

Nesting sites of bald eagles (*Haliaeetus leucocephalus*) on the complex were monitored during a single aerial survey on 7 June 2005. The survey route covered areas of the complex with large mature trees suitable for nesting, and included all nesting sites identified in previous surveys (see Saxena et al. 1995; Schaffe and Wright 1997; Wright 2007). Locations of nests were geo-referenced using the aircrafts Global Positioning (GPS) system. Numbers of adults, young, or eggs were recorded and nest status was reported as:

1. Brooding, if eggs or brooding adults were observed;
2. Rearing, if young were observed in the nest;
3. Empty, if no evidence of nesting observed; or
4. Absent, if the nest was not found in this year's survey but historically existed at the site.

4.0 RESULTS

4.1 Waterfowl monitoring

4.1.1 Well site monitoring

During the 2005 migration periods, waterfowl were observed on nine of the 15 well site locations in the study area. Waterfowl numbers remained below threshold densities at all of the well sites in the study area. The highest numbers recorded at a site were 130 widgeons (*Anas americana*) and mallards (*A. platyrhynchos*) during spring migration, and 531 ducks during fall migration.

Brief summaries of observations of waterfowl and general habitat descriptions for each of the 15 well site locations monitored in this study are provided below. Appendix 1 lists the actual numbers of waterfowl recorded at the well sites for each survey date.

Well location 1 (Grid reference = 15-11-113-7-W6) This oil well is operated by Nav Energy Trust and is situated in the permanent lake basin of North Zama Lake.

Waterfowl were present at this site in relatively low numbers (range = 4 – 130) during the spring monitoring period, and in low to high numbers during the fall monitoring period (range = 33 – 350).

Well location 2 (Grid reference = 9-15-113-7-W6) This oil well is operated by Nav Energy Trust and is situated in a marsh area dominated by emergent vegetation located to the north of North Zama Lake. Waterfowl were present at this site in relatively low numbers (range = 3 – 30) during the spring monitoring period and in low to moderate numbers during the fall monitoring period (range = 25 – 220).

Well location 3 (Grid reference = 12-4-113-5-W6) This oil well cluster (2 wells) is operated by Pengrowth Corporation and is located in an ephemeral marsh that typically dries up by the end of the spring monitoring period. Waterfowl were present at this site in low numbers (range = 8 – 87) during the spring monitoring period and were absent during the fall monitoring period.

Well location 4 (Grid reference = 3-36-112-6-W6) This oil well cluster (2 wells) is operated by Pengrowth Corporation and is located in a willow thicket adjacent to an ephemeral watercourse. There were no waterfowl observed at this site during the spring or fall monitoring periods.

Well location 5 (Grid reference = 5-26-112-6-W6) This gas well is operated by Nav Energy Trust and is situated in an ephemeral sheetwater area north of Sand Lake. There were no waterfowl observed at this site during the spring and fall monitoring periods.

Well location 6 (Grid reference = 9-14-112-6-W6) This gas well is operated by Nav Energy Trust and is located in an isolated ephemeral sheetwater area in the southeast part of the wetland complex. There were no waterfowl observed at this site during the spring and fall monitoring periods.

Well location 7 (Grid reference = 12-10-112-6-W6) This gas well is operated by Nav Energy Trust and is located on the west end of an unnamed permanent lake north of Sand Lake. Waterfowl were present at this site in relatively low numbers (range = 7 -

36) during the spring monitoring period and in low to moderate numbers during the fall monitoring period (range = 55 – 260).

Well location 8 (Grid reference = 2-16-112-6-W6) This gas well is operated by Nav Energy Trust and is situated in a permanent marsh north of Sand Lake. Waterfowl were present at this site in low numbers (range = 1 - 25) during the spring monitoring period and absent during the fall monitoring period except for one observation of 24 ducks on 8 September.

Well location 9 (Grid reference = 6-15-112-6-W6) This oil well is operated by Nav Energy Trust and is situated in an ephemeral sheetwater area north of Sand Lake. Waterfowl were present at this site in low numbers (range = 8 - 82) during the spring monitoring period and absent during the fall monitoring period.

Well location 10 (Grid reference = 8-22-112-6-W6) This oil well is operated by Nav Energy Trust and is located in an ephemeral marsh. Waterfowl were present at this site in low numbers (range = 9 - 60) during the spring monitoring period and absent during the fall monitoring period.

Well location 11 (Grid reference = 16-22-112-6-W6) This gas well is operated by Nav Energy Trust and is located in an ephemeral marsh. There were no waterfowl observed at this site during the spring and fall monitoring periods.

Well location 12 (Grid reference = 8-33-112-6-W6) This oil well cluster (3 wells) is operated by Nav Energy Trust and is located in an ephemeral sheetwater area between the Hay River and Duck Lake. There were no waterfowl observed at this site during the spring or fall monitoring periods.

Well location 13 (Grid reference = 2-28-112-6-W6) This oil well cluster (4 wells) is operated by Nav Energy Trust and is situated in the permanent lake basin of Duck Lake. Waterfowl were present at this site in low numbers (range = 2 – 92) during the spring monitoring period and in low to high numbers for the fall monitoring period (range = 30 – 531). The highest number of waterfowl observed at this site during this study was 531 ducks on 12 October.

Well location 14 (Grid reference = 7-29-112-6-W6) This oil well cluster (2 wells) is operated by Nav Energy Trust and is situated in the permanent lake basin of Duck Lake. Waterfowl were present at this site in relatively low numbers during both spring and fall monitoring periods. Numbers observed ranged from 10 to 150 ducks.

Well location 15 (Grid reference = 16-32-112-6-W6) This gas well is operated by Nav Energy Trust and is located in an ephemeral marsh between Duck Lake and West Hay Lake. Water in this area typically draws down rapidly after peak spring water level. There were no waterfowl observed at this site during the spring and fall monitoring periods.

4.1.2 General waterfowl migration

Waterfowl numbers reported in this document represent observations on the survey route. These migration data are presented as a comparison to migration numbers observed in past surveys (see Appendix 2) and are not intended to represent a population estimate.

In 2005, spring goose migration peaked on 3 May with 5,824 Canada geese (*Branta Canadensis*) and 1,289 greater white-fronted geese (*Anser albifrons*) observed (Table 1). Timing of the 2005 goose migration peak (3 May) was consistent with the long-term (1978 - 2004) average date of 4 May, and similar numbers of geese were observed (Appendix 2). The peak of the spring duck migration occurred one week earlier, on 26 April, with 29,014 birds observed (Table 1). This date was considerably earlier than the long-term average date of 6 May, but numbers of ducks observed were very similar to the 11-year average of 29,744 (Appendix 2). Over the past 11 years of monitoring, peak spring duck numbers were often observed on the first spring survey date.

Table 1. Summary of numbers of ducks and geese species observed in the Hay Zama study area in spring 2005. Species abbreviations: CAGO - Canada goose, GWFG - greater white-fronted goose, LSGO - lesser snow goose.

Date	Ducks	CAGO	GWFG	LSGO	Swans
26 Apr.	29,014	5,773	25	0	88
3 May	11,716	5,824	1,289	0	42
10 May	9,891	1,776	250	0	7
24 May	1,858	76	0	8	11
TOTAL	52,479	13,449	1,564	8	148

Canada geese were the most common goose species observed during spring monitoring (Table 1). Greater white-fronts were present for the earlier survey dates, but were fewer in number, and a small flock of eight lesser snow geese (*Chen caerulescens*), was present on the final spring survey. Swans were present on all spring survey dates, however it was unknown whether they were trumpeter swans (*Cygnus buccinator*) or tundra swans (*C. columbianus*). Similarities of these two species made accurate identification from the air difficult without undue harassment of the birds.

During the spring surveys, on average 36.8% of ducks were unidentifiable as to their species. Of the 33,174 ducks identified, northern pintails (*Anas acuta*) were the most abundant species observed during spring monitoring, accounting for 25.2% of identified ducks (Figure 2, Appendix 3). American widgeons, mallards, blue-wing teals (*A. discors*), and green-wing teals (*Anas crecca*), were also abundant accounting for 22.2, 20.3, 8.9 and 7.6% of the total, respectively. The remaining 15.8% of identified duck species, in order of abundance, were lesser scaups (*Aythya affinis*), canvasbacks (*A. valisineria*), northern shovelers (*Anas clypeata*), gadwalls (*A. strepera*), redheads (*Aythya americana*), ruddy ducks (*Oxyura jamaicensis*), common goldeneyes (*Bucephala clangula*), buffleheads (*B. albeola*) and white-winged scoters (*Melanitta fusca*) (Figure 2). Other waterfowl species of note included grebes (*Aechmophorus occidentalis*, *Podiceps grisegena*) and an abundance of American coots (*Fulica americana*).

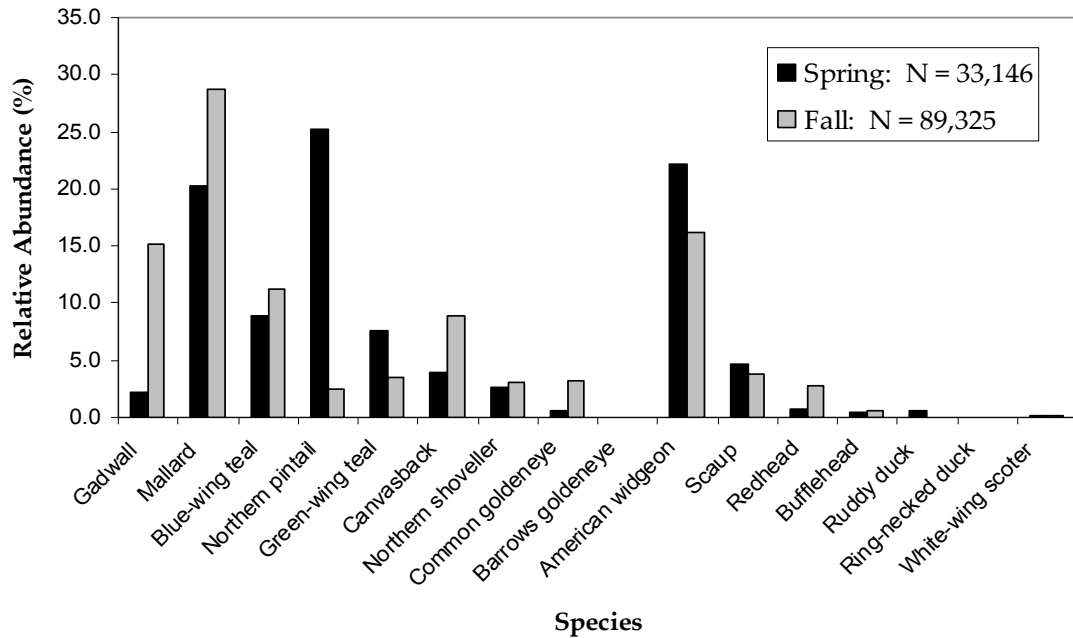


Figure 2. Relative abundance of duck species observed during the 2005 spring and fall migrations in the Hay Zama study area in Alberta.

Fall goose migration in 2005 peaked on 5 October with 2,174 lesser snow geese, 537 greater white-fronted geese and 193 Canada geese (Table 2). This date was roughly three weeks later than the long-term average date of 13 September and considerably fewer birds were observed than the long-term average of 7,275 geese (Appendix 2). This late peak was primarily due to the presence of several large flocks of snow geese along the southeast shore of Zama Lake (Appendix 3). Fall duck migration peaked on 14 September with 53,021 birds. The date and numbers of ducks observed were consistent with the 11-year average peak of 17 September and 46,573 birds (Appendix 2).

Table 2. Summary of numbers of ducks and geese species observed in the Hay Zama study area in fall 2005. Species abbreviations: CAGO - Canada goose, GWFG - greater white-fronted goose, LSGO - lesser snow goose.

Date	Ducks	CAGO	GWFG	LSGO	Swans
30 Aug	22,667	1,882	41	3	32
8 Sep	45,135	1,133	0	0	43
14 Sep	53,021	1,205	446	0	50
22 Sep	33,671	716	0	0	77
28 Sep	30,300	861	0	131	134
5 Oct	18,070	193	537	2,174	148
12 Oct	25,866	276	0	808	1,486
TOTAL	228,730	6,266	1,024	3,116	1,970

Canada geese were the most common goose species observed throughout the fall monitoring (Table 2). Snow geese were abundant in the later fall surveys. Greater white-fronted geese were observed on only three of the seven fall surveys. Swans were present throughout fall monitoring, with the greatest numbers observed during the later survey dates typical of past observations.

During fall surveys, on average 60.9% of ducks were unidentifiable. Of the 89,485 ducks identified, mallard was the predominant species, accounting for 28.7% of the total (Figure 2, Appendix 3). American widgeon, gadwall, blue-wing teal and canvasback were abundant as well, accounting for 16.2, 15.1, 11.2 and 8.9% of identified ducks respectively. The remaining 19.9% of identified duck species, in order of abundance, were lesser scaup, green-wing teal, common goldeneye, northern shoveler, redhead, northern pintail, bufflehead and white-winged scoter (Figure 2). Other waterfowl species of note included common merganser (*Mergus merganser*) and an abundance of American coots.

4.2 Bald eagle nesting

Bald eagle nesting success has been monitored annually on the HZLC since 1994 (Appendix 4). Saxena et al. (1995) reported six active nesting pairs in a June 1994 survey of the treed areas along the Hay River. The survey area was expanded in 1996 to include other suitable nesting habitat within the wetland complex boundaries, specifically a small aspen upland east of Sand Lake and aspen uplands on the west end of the complex (Figure 3). From 1995 to 2004, active nesting pairs observed on the complex have ranged from three to seven with the lowest count attributed to a wildfire in late May 2001 that burned through several nesting sites along the Hay River (Schaffe and Wright 1997; Wright 2007). During the 7 June, 2005 survey (Table 3, Figure 3), four active nests were observed that were classified as rearing, containing young eagles. Brood size ranged from one to three eaglets and at least one adult eagle was present at each of the four nests. At one additional nest (#9), one adult was present on the nest and another was roosting nearby. Although they appeared to be a nesting pair, no eggs or young were observed in the nest when the adult flushed and the nest status was classified as other.

Table 3. Summary of observations recorded during a survey of bald eagle nest sites in the Hay Zama study area on 7 June, 2005.

Nest No.	UTM Location		Status	Number observed			Comments
	Easting	Northing		Adults	Young	Eggs	
1	369918	6510319	Empty	0	0	0	Nest in good condition.
2	358525	6514823	Rearing	1	2	0	
3	376796	6521484	Empty	0	0	0	Nest in good condition.
4	393105	6517409	Absent	0	0	0	Area burned. Nest not found.
5	388872	6517157	Absent	0	0	0	Area burned. Nest not found.
6	387706	6511868	Other	0	0	0	Red-tailed hawk with 3 young in nest
7	383334	6513080	Rearing	1	1	0	Young eaglet very small.
8	376306	6506117	Empty	0	0	0	Nest in good condition.
9	388104	6507802	Other	2	0	0	Adult on nest. No young or eggs observed
10	390669	6511350	Rearing	1	3	0	One eaglet very small.
11	389233	6514829	Rearing	1	2	0	
12	383838	6513051	Absent	0	0	0	Nest not found.
TOTAL			4 active	6	8	0	

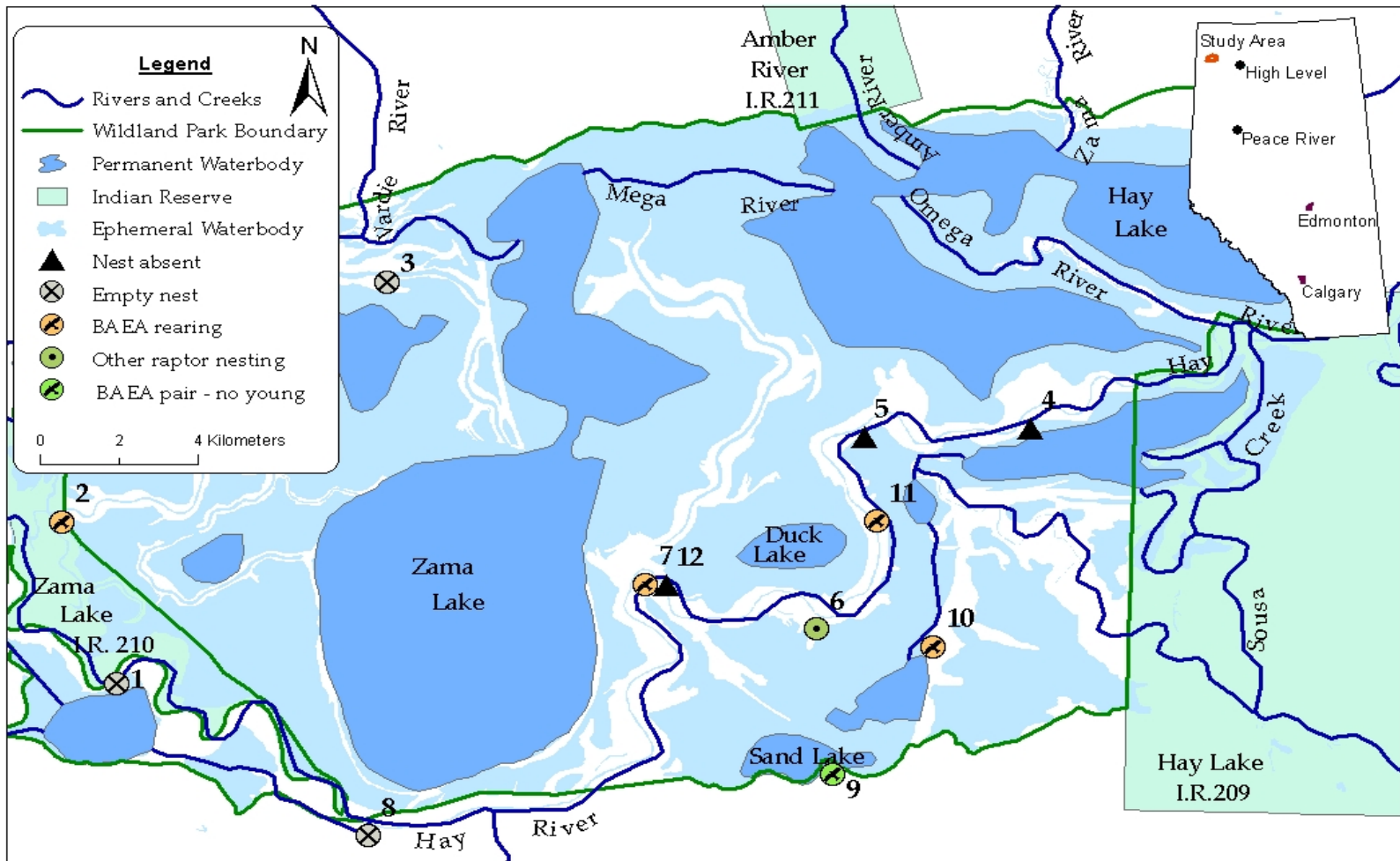


Figure 3. Locations of bald eagle (BAEA) and red-tailed hawk (RTHA) nest sites observed in an aerial survey in the Hay Zama study area 7 June, 2005.

4.3 Summary

Monitoring of waterfowl populations during critical migration periods is a strategy designed to identify possible negative environmental impacts on select avian species. Monitoring efforts in the HZLC allow for continued oil and gas production unless a large congregation of waterfowl is present at a well site, at which point well production must be suspended. Alberta Sustainable Resource Development (ASRD) defined a threshold of 600 ducks and/or geese within a 30-m radius of the well site as the criteria for suspension of well production. The alternative, as defined by AEUB, is a general suspension of production on the complex during the migration periods (approximately 15 April to 31 May and 15 September to 15 October).

The maximum number of waterfowl observed at a well site during the 11 aerial surveys was 531 birds at the oil well cluster located on 2-28-112-6-W6, just below the threshold number of 600 birds defined by ASRD. Consequently, AEUB did not require any of the oil and gas companies operating within the study area to suspend production at any of the well sites. As in past surveys, northern pintail was the most common duck species observed during spring surveys. Mallard was the predominate duck species observed during fall surveys.

Four active bald eagle nesting pairs were observed during the 7 June 2005 survey. This observation is within the range of three to seven nesting pairs recorded in past surveys. Young eaglets observed in the active nests ranged from one to three.

Based on the results presented in this report, it is recommended that monitoring of waterfowl at well sites continue during migration periods to ensure that AEUB is notified expeditiously in the event of the presence of a threshold concentration of waterfowl. Continued monitoring is necessary to help ensure that potential negative impacts of oil and gas activities on waterfowl are minimized during migration periods.

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6.0 APPENDICES

Appendix 1. Summary of waterfowl observed during the 2005 spring and fall migrations at active well sites in the Hay-Zama study area in Alberta.

Spring Migration 2005

Site	Well location	26 Apr	3 May	10 May	24 May
1	15-11-113-7-W6	4	130	28	43
2	9-15-113-7-W6	0	30	0	3
3	12-4-113-5-W6	87	69	0	8
4	3-36-112-6-W6	0	0	0	0
5	5-26-112-6-W6	0	0	0	0
6	9-14-112-6-W6	0	0	0	0
7	12-10-112-6-W6	0	7	36	16
8	2-16-112-6-W6	0	0	25	1
9	6-15-112-6-W6	28	20	82	8
10	8-22-112-6-W6	0	49	60	9
11	16-22-112-6-W6	0	0	0	0
12	8-33-112-6-W6	0	0	0	0
13	2-28-112-6-W6	2	35	92	36
14	7-29-112-6-W6	0	10	18	27
15	16-32-112-6-W6	0	0	0	0

Fall Migration 2005

Site	Well location	30 Aug	8 Sep	14 Sep	22 Sep	28 Sep	5 Oct	12 Oct
1	15-11-113-7-W6	0	0	230	33	350	0	80
2	9-15-113-7-W6	0	150	0	0	0	0	25
3	12-4-113-5-W6	0	0	0	0	0	0	0
4	3-36-112-6-W6	0	0	0	0	0	0	0
5	5-26-112-6-W6	0	0	0	0	0	0	0
6	9-14-112-6-W6	0	0	0	0	0	0	0
7	12-10-112-6-W6	55	0	260	0	185	0	68
8	2-16-112-6-W6	0	24	0	0	0	0	0
9	6-15-112-6-W6	0	0	0	0	0	0	0
10	8-22-112-6-W6	0	0	0	0	0	0	0
11	16-22-112-6-W6	0	0	0	0	0	0	0
12	8-33-112-6-W6	0	0	0	0	0	0	0
13	2-28-112-6-W6	0	30	0	340	360	0	531
14	7-29-112-6-W6	27	45	0	150	0	0	0
15	16-32-112-6-W6	0	0	0	0	0	0	0

Appendix 2 Summary of peak numbers of geese observed from 1978 to 2005 and peak numbers of ducks observed from 1994 to 2005 during spring and fall migration in the Hay Zama study area in Alberta.

Goose Migration Peak

Year	Spring Migration		Fall Migration	
	Peak Date	Total Geese	Peak Date	Total Geese
1978	28-Apr	5,588	27-Sep	13,688
1980	4-May	2,396	24-Sep	39,876
1981	6-May	6,278	20-Sep	8,417
1982	12-May	20,486	30-Aug	6,278
1983	5-May	22,064	10-Aug	7,604
1984	4-May	4,599	6-Sep	3,556
1985	8-May	3,529	20-Sep	5,445
1986	4-May	5,081	18-Sep	7,173
1987	5-May	8,588	31-Aug	3,692
1988	7-May	15,668	15-Sep	1,693
1989	29-Apr	6,398	2-Sep	1,317
1990	4-May	1,022	17-Sep	2,368
1991	2-May	817	10-Sep	4,062
1992	10-May	650	29-Sep	21,513
1993	7-May	1,068	24-Sep	4,724
1994	26-Apr	535	5-Oct	4,780
1995	3-May	9,082	8-Sep	7,122
1996	6-May	3,949	10-Sep	8,666
1997	7-May	3,973	2-Sep	222
1998	4-May	206	17-Sep	10,988
1999	29-Apr	6,975	9-Sep	7,570
2000	1-May	5,483	18-Sep	4,559
2001	30-Apr	4,252	13-Sep	4,332
2002	6-May	5,056	4-Sep	1,905
2003	28-Apr	7,879	15-Sep	5,035
2004	3-May	11,810	6-Sep	2,558
1978 – 2004				
AVERAGE	4-May	6,286	13-Sep	7,275
2005	3-May	7,113	5-Oct	2,904

Duck Migration Peak

Year	Spring Migration		Fall Migration	
	Peak Date	Total Ducks	Peak Date	Total Ducks
1994	24-May	18,417	8-Sep	35,525
1995	3-May	11,706	14-Sep	53,859
1996	6-May	19,810	16-Sep	28,255
1997	1-May	13,884	24-Sep	29,165
1998	8-May	32,676	10-Sep	62,941
1999	6-May	49,556	16-Sep	63,617
2000	1-May	29,307	2-Oct	32,902
2001	30-Apr	39,427	18-Sep	43,095
2002	13-May	52,725	18-Sep	43,095
2003	5-May	16,564	16-Sep	87,830
2004	3-May	43,111	14-Sep	32,016
1994 – 2004 AVERAGE	6-May	29,744	17-Sep	46,573
2005	26-Apr	29,014	14-Sep	53,021

Appendix 3. Summary of relative abundance of waterfowl species observed on the aerial survey route during the 2005 spring and fall migrations in the Hay Zama study area in Alberta.

Spring Monitoring				
Waterfowl observed	26-Apr	3-May	10-May	24-May
Geese and Swans				
Canada Goose (<i>Branta canadensis</i>)	5,773	5,824	1,776	76
Greater White-fronted Goose (<i>Anser albifrons</i>)	25	1,289	250	0
Snow Goose (<i>Chen caerulescens</i>)	0	0	0	8
Swans (<i>Cygnus columbianus</i> , <i>C. buccinator</i>)	88	42	7	11
Ducks, Grebes and Mergansers				
Mallard (<i>Anas platyrhynchos</i>)	3,298	1,603	1,514	323
Gadwall (<i>Anas strepera</i>)	62	90	524	61
Blue-winged Teal (<i>Anas discors</i>)	2,150	373	404	33
Northern Pintail (<i>Anas acuta</i>)	4,704	3,179	420	40
Green-winged Teal (<i>Anas crecca</i>)	1,471	214	810	23
Canvasback (<i>Aythya valisineria</i>)	457	345	429	73
Northern Shoveler (<i>Anas clypeata</i>)	34	276	470	88
American Widgeon (<i>Anas americana</i>)	5,945	1,034	382	8
Lesser Scaup (<i>Aythya affinis</i>)	733	224	517	63
Common Goldeneye (<i>Bucephala clangula</i>)	68	18	84	5
Bufflehead (<i>Bucephala albeola</i>)	33	12	66	13
Redhead (<i>Aythya americana</i>)	74	4	104	44
Ring-necked Duck (<i>Aythya collaris</i>)	0	0	0	4
Ruddy Duck (<i>Oxyura jamaicensis</i>)	12	10	164	15
White-winged Scoter (<i>Melanitta fusca</i>)	0	1	44	0
Grebes (<i>Aechmophorus occidentalis</i> , <i>Podiceps grisegena</i>)	6	2	10	0
Common merganser (<i>Mergus merganser</i>)	0	6	0	0
Unidentified Ducks	9,966	4,325	3,949	1,065
TOTAL	34,899	18,871	11,924	1,953

Fall Monitoring

Waterfowl observed	30-Aug	8-Sep	14-Sep	22-Sep	28-Sep	5-Oct	12-Oct
Geese and Swans							
Canada Goose	1,882	1,133	1,205	716	861	193	276
Greater White-fronted Goose	41	0	446	0	0	537	0
Snow Goose	3	0	0	0	131	2,174	808
Swans	32	43	50	77	134	148	1,486
Ducks, Grebes and Mergansers							
Mallard	3,318	6,766	3,820	3,561	2,285	1,996	3,979
Gadwall	1,667	3,567	4,041	1,636	1,521	730	362
Blue-winged Teal	463	4,711	1,057	2,286	272	605	595
Northern Pintail	158	429	90	499	284	474	336
Green-winged Teal	1,321	213	584	315	231	162	305
Canvasback	564	107	3,083	543	1,533	1,919	260
Northern Shoveler	521	451	1,267	119	29	35	308
American Widgeon	546	7,507	2,365	2,223	204	332	1,332
Lesser Scaup	83	1,364	582	997	206	46	140
Common Goldeneye	426	202	1,526	411	43	169	63
Bufflehead	8	21	4	492	4	12	21
Redhead	198	62	1,732	287	38	170	41
Ring-necked Duck	0	0	0	4	0	0	0
Ruddy Duck	1	2	2	21	2	1	0
White-winged Scoter	0	0	0	0	0	0	0
Grebes	0	24	0	3	0	0	0
Common merganser	138	55	0	6	0	0	0
Unidentified Ducks	13,255	19,640	32,821	20,268	23,646	11,419	18,124
TOTAL	24,625	46,297	54,675	34,464	31,424	21,122	28,436

Appendix 4. Summary of the results of bald eagle nesting surveys in the Hay Zama study area in Alberta from 1994 to 2005.

Year	Active Nests	Comments
1994	6	Source: Saxena et al (1995)
1995	4	Source: Schaffe and Wright (1997)
1996	4	Survey area expanded
1997	5	none
1998	7	none
1999	5	none
2000	7	none
2001	3	Wildfire burned through east portion of study area 2 days prior to survey.
2002	6	none
2003	7	none
2004	6	none
2005	4	Wildfire burned through much of study area 3 weeks prior to survey.
Mean	5.4	

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