

# PRELIMINARY RESULTS FROM THE FORT NELSON, BRITISH COLUMBIA WATERBIRD INVENTORY PROJECT

## 2003 PROGRESS REPORT



by:  
**DUCKS UNLIMITED CANADA  
WESTERN BOREAL PROGRAM**

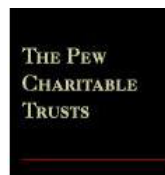
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**February 2004**



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



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## **EXECUTIVE SUMMARY**

The western boreal forest (WBF) covers over 3 million square kilometers of western Canada, stretching over portions of four provinces and three territories. Ducks Unlimited considers the WBF one of their highest priorities for conservation planning efforts (Ducks Unlimited 2001). One of the main reasons is the influence of increased industrial activity (e.g., petroleum exploration and development, forestry, mining, hydro electricity generation, agriculture) on boreal wetland ecosystems remains largely unknown.

In 2003, Ducks Unlimited Canada's (DUC) Western Boreal Program (WBP) initiated the Fort Nelson Project to help determine the importance of this area to waterbirds. Prior to conducting waterbird inventories, we obtained earth cover and water chemistry information in 2001. This 32,000-km<sup>2</sup> area is located in northeastern British Columbia. The area was selected to investigate the southern portion of the Taiga Plains ecozone because it has some of the highest wetland concentrations in British Columbia, and to expand DUC conservation efforts.

We observed 741 indicated breeding pairs (IBP) of ducks on 154 randomly selected wetlands, which included 12 species. We observed 295 unique duck broods, which included broods from 11 species. The number of waterbirds (ducks, geese, swans, coots, shorebirds, and gulls combined) observed was the highest (about 15,000) during the first staging survey.

Communication activities related to the Fort Nelson project included presentations given at a DUC fundraising banquet in Fort Nelson, as well as poster and verbal presentations made at the WBP's fall meetings. Ducks Unlimited Canada has also included the Fort Nelson project as part of the Ducks Unlimited Boreal Forest web page. The website can be viewed at [www.borealforest.ca](http://www.borealforest.ca).

## **ACKNOWLEDGMENTS**

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## **INTRODUCTION**

The WBF covers over 3 million square kilometers of western Canada, stretching over portions of four provinces and three territories (Figure 1). The WBF supports a population of twelve to fourteen million breeding ducks and has been designated as a level one priority with respect to the most important waterfowl habitat areas at risk in North America (Ducks Unlimited 2001). Populations of several common boreal nesting waterfowl species such as lesser scaup (see Appendix 1 for a list of all scientific names used in this document) and scoters are declining (Wilkins and Otto 2002). As a result, these species have been the focus of considerable discussion (see Austin et al. 2000) and are currently the emphasis of research projects (see Slattery 2002). Industrial activity including, agriculture, forestry, hydro electricity generation, mining, and, petroleum exploration and development has greatly expanded in the WBF. Consequently, the influence of these activities on boreal wetland ecosystems and waterbirds remains largely unknown.

In 1997, DUC established its WBP in an effort to help answer questions about the function of boreal wetlands and their value to waterbirds. The initiative has matured into a comprehensive DUC conservation program that includes the collection of science-based information through earth cover inventory and research projects. Furthermore, this information is used and shared by many partners to advance boreal wetland conservation. The WBP's initiatives include developing multi-stakeholder watershed-based conservation plans, and the establishing protected areas for sensitive boreal wetland habitats. This work is being conducted in partnership arrangements with a variety of stakeholders including governments, First Nations, industries, universities and foundations.

The Fort Nelson project area was selected to investigate the importance of the Taiga Plains ecozone and to complement conservation planning in other project areas in northern Alberta, Saskatchewan, Manitoba, the Yukon, and the Northwest Territories. The spring of 2003 marked the beginning of the waterbird inventory component of the Fort Nelson project. We conducted aerial waterbird surveys on a sample of wetland basins distributed among a variety ecodistricts from May through October 2003. The classified earth cover products resulting from fieldwork in 2001 has been completed and

distributed to partners. By utilizing earth cover products in conjunction with waterbird survey data collected over the next three years, a decision support system (DSS) will be developed by DUC scientists. This DSS can be used, in part, by project partners to assist with land management in the Fort Nelson project area.



Figure 1. Ecozone boundaries in the western boreal forest of Canada (Ecological Stratification Working Group 1996).

Project components include:

- Accurate and enhanced satellite-based classification
- Comprehensive waterbird inventory of representative wetland systems
- Water sampling to measure selected water chemistry parameters as an indication of wetland productivity and to determine a regional water chemistry profile
- Utilization of this information to advance wetland conservation programs

## PROJECT AREA

The Fort Nelson project area located in northeastern British Columbia, is centered near the city of Fort Nelson (59°06'57 N, 122°21'22 W) (Figure 2). Several large oil and gas camps including Yoyo, Helmut and Wildboy are located in the project area. Large landscape features include Kotcho Lake, Maxhamish Lake, the Fort Nelson, Muskwa and Prophet rivers, and foothills of the northern Rockies.

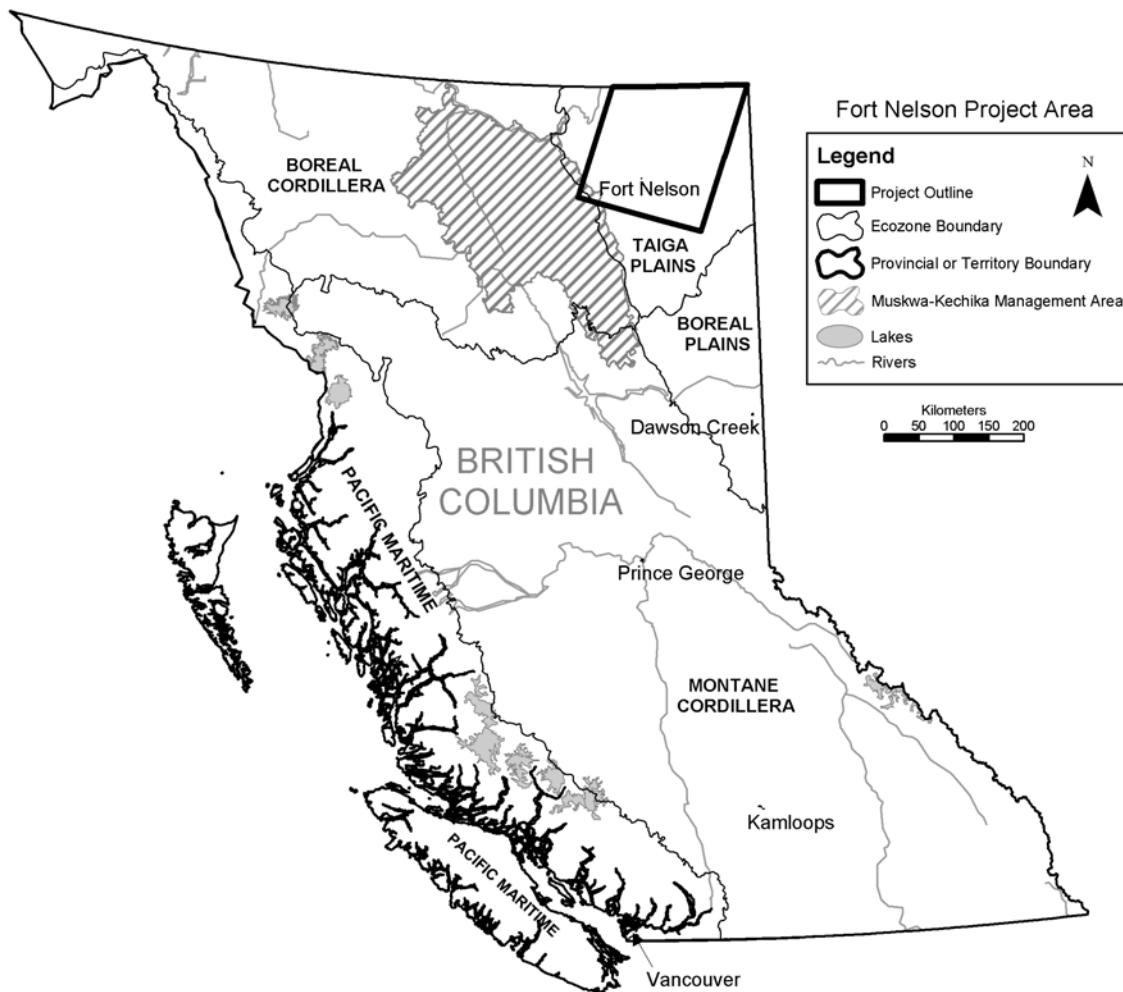


Figure 2. The Fort Nelson project area, 2003, located in northeastern British Columbia.

This project area includes portions of the Muskwa-Kechika Management Area; the Muskwa Plateau, Hay River Lowlands and Northern Alberta Uplands ecoregions (Ecological Stratification Working Group 1996). Five ecodistricts (defined in Ecological Stratification Working Group 1996) all in the Taiga Plains ecozone were investigated during 2003 (Figure 3). Ecodistrict and wetland information is provided in Table 1.

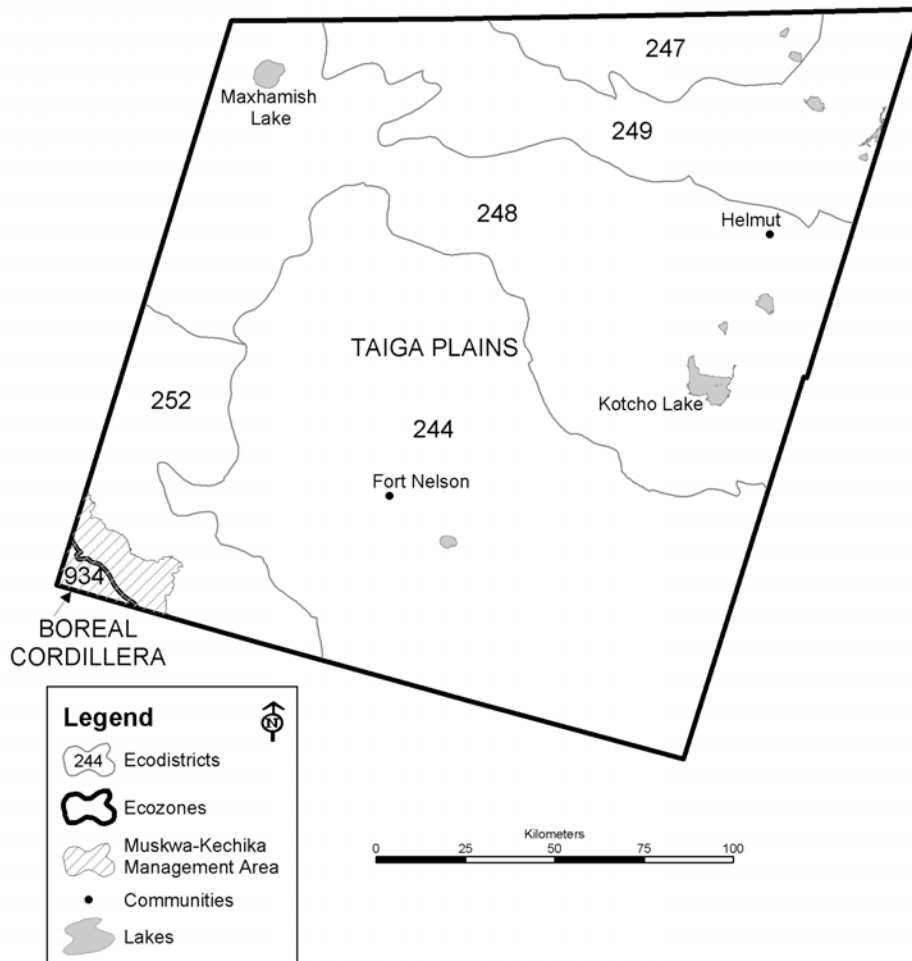


Figure 3. Ecodistricts in the Fort Nelson, BC project area, 2003 (Ecological Stratification Working Group 1996).

Table 1. Ecodistrict sizes and related wetland information for the Fort Nelson Project, British Columbia, 2003.

Ecodistrict	Ecodistrict Area (ha)	Total Wetlands <sup>1</sup>	Total Wetland Area <sup>2</sup> (ha)	Total # wetlands (1-300ha)	Total wetland area (1-300ha)	Total wetlands (301-3000)	Total wetland area (301-3000ha)
244	1,409,636	4,344	21,850	4,342	20,244	2	1,606
247	156,975	266	3,813	264	2,702	2	1,111
248	1,138,169	2,865	30,764	2,860	14,848	5	15,916
249	492,492	1,369	16,763	1,365	13,565	4	3,198
252	318,477	156	631	156	631	0	0
<b>Total</b>	<b>3,515,749</b>	<b>8,991</b>	<b>73,821</b>	<b>8,978</b>	<b>51,990</b>	<b>13</b>	<b>21,831</b>

<sup>1</sup> Total number of wetlands (>1 ha) delineated from earth cover maps. We eliminated basins classified as 100% wet graminoid, and basins with less than 1 ha of open water from the sample universe.

<sup>2</sup> Total wetland area for wetlands >1 ha. We eliminated basins classified as 100% wet graminoid, and basins with less than 1 ha of open water from the sample universe.

## 2003 ACTIVITIES

### Waterbird Survey Methods

#### *Wetland Basin Site Selection*

Prior to waterbird surveys, we obtained and classified habitats using a Landsat Thematic Mapper 7 image. A ratio of the number of wetland basins per ecodistrict to total number of wetland basins was used to determine the proportion of wetland basins chosen from each ecodistrict. We pre-selected 87 wetlands for the waterbird inventory surveys in 2003. These basins had been randomly selected for the water chemistry sampling in 2001 (Bell et al. 2002). Keeping in mind the locations of the 87 pre-selected basins, we used a random proportional allocation method to select specific basins for waterbird surveys, stratified by ecodistrict (Wiken 1986, Ecological Stratification Working Group 1996). For pair and brood surveys, and for staging surveys, we surveyed randomly selected wetlands between 1 and 300 ha, and >1 ha, respectively. Wetlands less than 1 ha were excluded to reduce risks of misclassification (e.g., terrain shadow, misclassified pixels), and wetlands over 300 ha were omitted from breeding pair and brood surveys and replaced by the next randomly selected wetland that was < 300 ha. We also excluded

wetland sites that were classified as 100% wet graminoid and basins with less than 1 ha of open water from the selection set. We selected 151 wetland basins for the first breeding pair survey and increased this to 154 wetland basins for the second breeding pair survey and both brood surveys in 2003. We randomly selected twenty percent of these basins to be surveyed for all 2003 surveys. These wetlands will also be surveyed during 2004 and 2005. During breeding pair survey 1, some selected basins were omitted from the sample set due to the basins being completely dry. These were replaced with the next randomly selected basin. Because the majority of wetland basins on the Fort Nelson project area are under 5 ha (>90%), we determined the standard site selection procedure might be inappropriate for capturing use of wetland basins by staging waterbirds. Therefore, we addressed this by dividing the wetland basins into seven different size classes (<1.9 ha; 2-4.9 ha; 5-9.9 ha; 10-49.9 ha; 50-299.9 ha; 300-999.9 ha; and >1,000 ha). In each size class, we randomly selected wetland basins using the proportional allocation protocol. We surveyed 139 wetland basins during the staging 1 survey, and 161 wetland basins for the remaining staging surveys when it became evident that there was enough time to survey a larger sample.

### *Waterbird Surveys*

We used a Bell 206B helicopter equipped with bubble windows for breeding pair and brood surveys, and Cessna 285 or 206 fixed-wing aircraft for staging surveys. Breeding pair and brood surveys were flown 35 m above ground level (AGL). Ground speeds did not exceed 100km per hour during surveys. The fixed-wing aircrafts were flown 100m AGL at about 150km per hour. Flight paths varied depending on the size and shape of basins in order to attain about 100% coverage. Each survey crew consisted of a pilot, an observer/navigator and an observer. To ensure all basins corresponded with pre-defined coordinates, we used ArcView 3.2a software with a Tracking Analyst moving map extension (Environmental Systems Research Institute Inc. 1996) and global positioning system (GPS). Our survey techniques were based partially on protocols developed by the Black Duck Joint Venture (1996).

Two breeding pair surveys (May 19-21 and June 9-11) and two brood surveys (July 8-10 and July 29-31) were conducted on the same wetlands to estimate densities

and brood productivity for early and late nesting species. During breeding pair surveys, we recorded species, gender, and social status (see USFWS/CWS 1987) for all ducks seen, and species for other waterbirds seen. During duck brood surveys, we recorded species, duckling age, brood size, and female presence. Duckling ages were estimated using Gollop and Marshall (1954) and Wishart (1983). We conducted 3 staging surveys in late summer (Sept 04-05, Sept 20-21, and Oct 01-02) to estimate the number of migrating/staging waterbirds present. We recorded the number of birds, and species and gender whenever possible. A thorough description of survey methods is provided by Ducks Unlimited Canada (2003).

#### *Data Summarization*

We summed total observed pairs, lone males, and males in groups of 2-4 to determine indicated breeding pair (IBP) estimates for all duck species except for ring-necked ducks, scaup spp., redheads, and ruddy ducks. For these 4 species, we derived the IBP estimates by summing observed pairs only. We used data from the first 2002 pair survey to calculate IBP for mallard, bufflehead, goldeneye spp., and northern pintail. We used data from the second survey to calculate IBP for ring-necked duck, scaup, gadwall, scoter spp., blue-winged teal, green-winged teal, canvasback, redhead, American wigeon, ruddy duck, and merganser spp., were calculated using the second pair survey. We estimated IBP for northern shoveler and all unidentified species by averaging both surveys. We used protocol established by USFWS/CWS (1987) to estimate IBP. The number of non-breeding waterfowl was determined by summing the total number of birds observed in mixed groups or in groups of 5 or more males.

We conservatively estimated the number of unique broods by comparing age and hatch dates of broods seen during each survey. We then censored those from the second survey that could have hatched before or during the first survey (Gollop and Marshall 1954). We estimated hatch date by back dating the brood age from survey date. Subsequently, clutch initiation date was estimated by back dating hatch date by known nesting periods (Wishart 1983).

We estimated the density of pairs, broods, and staging waterbirds based on the wetland area surveyed. Density was calculated using the sum of observed birds (e.g., pairs, broods, staging waterbirds) seen divided by the total wetland area (km<sup>2</sup>) surveyed.

## Waterbird Survey Results

### *Breeding Pair Surveys*

A total of 741 IBP of ducks were observed during pair surveys (Appendix 2). See Table 2 for distribution of surveyed wetlands. We encountered 12 breeding duck species on 154 wetland basins surveyed across five ecodistricts. The dominant species observed during pair surveys were bufflehead, mallard, and scaup spp. (Table 3). Collectively, these species represented 64% of all duck IBP observed. Density for all ducks combined ranged from 23 IBP per km<sup>2</sup> in ecodistrict 248 to 139 IBP per km<sup>2</sup> in ecodistrict 252 (Table 3).

Table 2. Number of wetlands and area surveyed for waterbird breeding pairs and broods. Fort Nelson, BC, 2003.

Ecodistrict	# of Wetlands Selected for Pair 1 Survey	Wetland Area (ha) Surveyed for Pair 1	# of Wetlands Selected for Pair 2 and Brood 1 and 2 Surveys	Wetland Area (ha) Surveyed for Pair 2 and Brood 1 and 2
244	70	456	71	463
247	9	221	9	221
248	47	643	48	649
249	23	455	23	455
252	2	5	3	5
<b>Total</b>	<b>151</b>	<b>1,780</b>	<b>154</b>	<b>1,793</b>

<sup>1</sup> Total number of wetlands (>1 ha) delineated from earth cover maps. We eliminated basins classified as 100% wet graminoid, and basins with less than 1 ha of open water from the sample universe.

<sup>2</sup> Total wetland area for wetlands >1 ha. We eliminated basins classified as 100% wet graminoid, and basins with less than 1 ha of open water from the sample universe.

Table 3. Number of indicated breeding pairs and pair densities per km<sup>2</sup> of wetland surveyed determined during aerial waterbird surveys<sup>1</sup> at Fort Nelson, BC, 2003. The three dominant breeding species and all ducks combined are shown.

Ecodistrict	Bufflehead		Mallard		Scaup spp.		All Ducks	
	Observed Total	Density (IBP/km <sup>2</sup> )	Observed Total	Density (IBP/km <sup>2</sup> )	Observed Total	Density (IBP/km <sup>2</sup> )	Observed Total	Density (IBP/km <sup>2</sup> )
244	87	19.1	83	18.2	32	7.0	339	73.3
247	7	3.3	17	8.0	20	9.4	63	29.7
248	49	7.6	41	6.4	4	0.6	150	23.1
249	76	16.7	19	4.2	37	8.1	182	40.0
252	0	0	0	0	0	0	7	138.9
<b>Total</b>	<b>219</b>	<b>12.3</b>	<b>160</b>	<b>9.0</b>	<b>93</b>	<b>5.2</b>	<b>741</b>	<b>41.7</b>

<sup>1</sup>Surveys were conducted on wetlands ranging from 1-300ha.

The most numerous non-duck species encountered during the breeding pair surveys were red-necked grebes (48), mew gulls (85), yellowlegs spp. (238), and Bonaparte's gulls (221). A total of 2, 7, and 21 pairs of Canada geese, trumpeter swans, and common loons were encountered during the breeding pair surveys, respectively. In addition, 11 pairs of trumpeter swans were recorded while en route to surveyed wetlands. Shorebirds accounted for 8% of all birds observed during the breeding pair surveys.

#### *Brood Surveys*

We estimated 295 duck broods were present during brood surveys and observed broods from 11 waterfowl species. Bufflehead broods were the most abundant followed by mallard, and ring-necked duck (Table 4). These three species accounted for 66% of all observed broods. Density for all duck broods combined ranged from 10 broods per km<sup>2</sup> in ecodistrict 248 to 99 broods per km<sup>2</sup> in ecodistrict 252 (Table 4). See Appendix 3 for brood information for each species seen. Non-duck young observed during brood surveys included red-necked grebes, Canada geese, common loons, gulls spp., and trumpeter swans.

Table 4. Number of broods and brood densities per km<sup>2</sup> of wetland surveyed determined during aerial waterbird surveys<sup>1</sup> at Fort Nelson, BC, 2003. The three dominant brood species and all duck broods combined are shown.

Ecodistrict	Bufflehead		Mallard		Ring-necked Duck		All Ducks	
	Observed Total	Density (broods/km <sup>2</sup> )	Observed Total	Density (broods/km <sup>2</sup> )	Observed Total	Density (broods/km <sup>2</sup> )	Observed Total	Density (broods/km <sup>2</sup> )
244	41	8.9	28	6.1	20	4.3	139	30.0
247	2	0.9	13	6.1	3	1.4	23	10.8
248	13	2.0	20	3.1	13	2.0	67	10.3
249	20	4.4	8	1.8	12	2.6	61	13.4
252	1	19.8	2	39.7	0	0	5	99.2
<b>Total</b>	<b>77</b>	<b>4.3</b>	<b>71</b>	<b>4.0</b>	<b>48</b>	<b>2.7</b>	<b>295</b>	<b>16.5</b>

<sup>1</sup>Surveys were conducted on wetlands ranging from 1-300ha.

### *Staging Surveys*

See Table 5 for distribution of surveyed wetlands. Survey 3 had the highest numbers, and densities of dabbling ducks during the staging surveys (Table 6). Staging survey 2 marked the peak for diving duck species numbers and densities (Table 7). The number of waterbirds combined (ducks, geese, swans, and coots) hit the highest point during staging survey 1, with about 15,000 individuals being seen. During staging surveys 2 and 3, the number of waterbirds seen was about 11,700 and 12,000 individuals, respectively (Table 8).

Table 5. Number of wetlands and area surveyed for staging waterbirds. Fort Nelson, BC, 2003.

Ecodistrict	# of Wetlands Selected for Staging 1 Survey	Wetland Area (ha) Surveyed for Staging 1	# of Wetlands Selected for Staging 2 and 3 Surveys	Wetland Area (ha) Surveyed for Staging 2 and 3
244	53	2,235	66	3,328
247	9	1,313	10	1,486
248	41	16,786	49	17,614
249	32	4,597	33	4,673
252	4	90	3	89
<b>Total</b>	<b>139</b>	<b>25,021</b>	<b>161</b>	<b>27,190</b>

<sup>1</sup> Total number of wetlands (> 1 ha) delineated from earth cover maps. We eliminated basins classified as 100% wet graminoid, and basins with less than 1 ha of open water from the sample universe.

<sup>2</sup> Total wetland area for wetlands > 1 ha. We eliminated basins classified as 100% wet graminoid, and basins with less than 1 ha of open water from the sample universe.

Table 6. Number of observed dabbling ducks and estimated dabbling duck densities per km<sup>2</sup> of wetland surveyed determined during three aerial waterbird surveys<sup>1</sup> at Fort Nelson, BC, 2003.

Ecodistrict	Aug 26 - 28		Sept 17 - 19		Sept 30 - Oct 02	
	Observed Total	Density (Birds/km <sup>2</sup> )	Observed Total	Density (Birds/km <sup>2</sup> )	Observed Total	Density (Birds/km <sup>2</sup> )
244	409	18.3	43	1.3	796	23.9
247	57	4.3	68	4.6	45	3.0
248	700	4.2	179	1.0	407	2.3
249	92	2.0	102	2.2	78	1.7
252	20	22.2	0	0	0	0
<b>Total</b>	<b>1,278</b>	<b>5.1</b>	<b>392</b>	<b>9.1</b>	<b>1,326</b>	<b>30.9</b>

<sup>1</sup>Staging surveys were conducted on wetlands ranging from 1-8,363ha.

Table 7. Number of observed diving ducks and estimated diving duck densities per km<sup>2</sup> of wetland surveyed determined during three aerial waterbird surveys<sup>1</sup> at Fort Nelson, BC, 2003.

Ecodistrict	Aug 26 - 28		Sept 17 - 19		Sept 30 - Oct 02	
	Observed Total	Density (Birds/km <sup>2</sup> )	Observed Total	Density (Birds/km <sup>2</sup> )	Observed Total	Density (Birds/km <sup>2</sup> )
244	523	23.4	3,287	99.2	1,520	45.7
247	164	12.5	803	54.0	515	34.7
248	3,976	23.7	4,696	26.7	4,068	23.1
249	1,009	21.9	2,143	45.9	1,588	34.0
252	32	35.5	206	232.6	5	5.6
<b>Total</b>	<b>5,704</b>	<b>117.0</b>	<b>11,135</b>	<b>458.4</b>	<b>7,696</b>	<b>143.1</b>

<sup>1</sup>Staging surveys were conducted on wetlands ranging from 1-8,363ha.

Table 8. Number of observed duck, goose, swan, and coot (combined) and estimated densities per km<sup>2</sup> of wetland surveyed determined during three aerial waterbird surveys<sup>1</sup> at Fort Nelson, BC, 2003.

Ecodistrict	Aug 26 - 28		Sept 17 - 19		Sept 30 - Oct 02	
	Observed Total	Density (Birds/km <sup>2</sup> )	Observed Total	Density (Birds/km <sup>2</sup> )	Observed Total	Density (Birds/km <sup>2</sup> )
244	2,547	114.0	3,360	101.4	2,834	85.2
247	589	44.9	872	58.7	727	48.9
248	8,600	51.2	5,062	28.7	6,181	35.1
249	3,169	68.9	2,262	48.4	2,171	46.5
252	196	217.6	206	232.6	41	46.3
<b>Total</b>	<b>15,101</b>	<b>496.6</b>	<b>11,762</b>	<b>469.8</b>	<b>11,954</b>	<b>262.0</b>

<sup>1</sup>Staging surveys were conducted on wetlands ranging from 1-8,363ha.

### Waterbird Survey Discussion

We completed the first of three years of aerial waterbird surveys to acquire information about the number of waterbirds in the Fort Nelson, BC area. We completed all of the planned surveys, and the dates for each appeared to have been timed correctly to coincide with optimal observation periods for respective surveys. However, exact

future survey dates will be determined on a year-to-year basis to adjust for climatic differences that may occur.

Preliminary results from all surveys appear to indicate that the Fort Nelson project area is important to many species of waterbirds during the breeding season (i.e., pair and brood rearing) and fall migration. During the breeding season, bufflehead and mallard appeared to have the highest density of all ducks observed in most ecodistricts (Table 3). However, because we have not yet incorporated the amount of area surveyed and wetland habitat in any analysis, it is too early to recommend if one ecodistrict has a higher waterbird value than another. This analysis will be completed at a later date.

During fall migration, we observed higher numbers of diving ducks than dabbling ducks for all three surveys. There could be several reasons for this; one of which could be that diving ducks are more easily seen since they tend to use the open water and larger wetlands, whereas dabbling ducks tend to use emergent vegetation and smaller wetlands. For example, we observed the majority of the diving ducks on Kotcho Lake, Lake Thinahtea, Clarke Lake, and Maxhamish Lake, which are more conducive to divers than dabblers. Comparisons of wetland size and type will be included after the project is completed.

To our knowledge, this is the first attempt to acquire estimated numbers of waterbirds in this region. Therefore, once this study is completed, we plan to provide information to partners that will lead to conservation of key areas used by waterbirds. Until then, however, please remember that data presented in this interim report are preliminary.

### **Earth Cover Inventory**

A mosaic was created from two Landsat TM scenes imaged on August 2, 1999. The TM scene was used to classify the project area into 29 earth cover categories. A five-person helicopter crew performed the ground truthing process in July 2000. Each crew consisted of a pilot, biologist, recorder, navigator, and alternate. A GPS was used to navigate to the 603 pre-selected sites and to record new sites selected in the field.

The final products included a digital earth cover classification, a change detection image (1989-99), a 1-band colour representation of the Landsat TM raw imagery (RGB

cluster image), a hard-copy map of the project area, and a digital database of the field data collected. Ducks Unlimited Inc. (2003) provides a thorough description of the earth cover inventory.

### **Water Chemistry**

Several landscape features, including: bedrock and surficial geology, relative elevation, pond order, and ecodistrict, were used to determine the most appropriate indices to generalize wetland chemistry, nutrient status and potential productivity in the Fort Nelson region.

Water chemistry sampling was conducted on 90 wetlands in the Fort Nelson project area in July 2001. This survey indicates that wetlands in the area will potentially have different responses and susceptibilities to natural (fire, climate) and anthropogenic (harvesting, road building, oil and gas drilling) disturbances, depending on their landscape position. Bell et al. (2002) provides a detailed report of water chemistry methods, results, and discussion.

### **Communications**

Communication activities related to the Fort Nelson project included presentations given at a DUC fundraising banquet in Fort Nelson, as well as poster and verbal presentations made at the WBP's fall meetings. The Fort Nelson DUC fundraiser and the Fort Nelson project was the subject of a Fort Nelson newspaper article (November, 2003). Additional activities included a Fort Nelson Project Fact Sheet, regular progress reports of activities and this annual progress report. Ducks Unlimited Canada will continue to pursue opportunities through all forms of media to promote the Fort Nelson Project.

Lastly, the WBF web page in the DUC web site was launched. We plan to expand the web page to include additional information, which will be of interest and value to project partners and the public. Please visit the WBF website at: [www.borealforest.ca](http://www.borealforest.ca).

### **Ancillary Data**

During the field season, we also collected information on species of interest including: swans, cranes, raptors, and large mammals. When possible, we recorded individual observations, nest sites, and colonial nesting sites for wetland-associated birds. This information, although only collected en route to the surveyed basins, is available to partners upon request. Each observation has an associated coordinate and is currently being compiled into a spatial database for future reference and distribution.

We also conducted two beaver surveys on the surveyed wetlands to determine the level of beaver activity and how, if at all, beaver influence the distribution of waterbirds. These surveys took place on the second breeding pair survey and the first staging survey of 2003. The data from these surveys will be discussed in a report after the project is completed.

### **Future Plans**

In 2004, we plan to complete the second year of waterbird surveys with some slight adjustments to staging survey dates. The two brood surveys are being dropped due to budgetary constraints. A comprehensive analysis of the distribution of pair, brood, and staging observations in relation to wetland characteristics will be completed after the 2005 field season. A detailed analysis of waterbird observations obtained from three years of inventory work, the earth cover classification, and the water chemistry data will be integrated into one report, which will be available to partners in 2006.

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## APPENDICES

### Appendix I. Species and scientific names used in report.

<b>Common Name</b>	<b>Species Name</b>
American Wigeon	<i>Anas americana</i>
American Coot	<i>Fulica americana</i>
Barrow's Goldeneye	<i>Bucephala islandica</i>
Blue-winged Teal	<i>Anas discors</i>
Bonaparte's Gull	<i>Larus philadelphia</i>
Bufflehead	<i>Bucephala albeola</i>
Canada Goose	<i>Branta canadensis</i>
Canvasback	<i>Aythya valisineria</i>
Common Goldeneye	<i>Bucephala clangula</i>
Common Loon	<i>Gavia immer</i>
Common Merganser	<i>Mergus merganser</i>
Gadwall	<i>Anas strepera</i>
Green-winged Teal	<i>Anas crecca</i>
Hooded Merganser	<i>Mergus cucullatus</i>
Mallard	<i>Anas platyrhynchos</i>
Mew Gull	<i>Larus canus</i>
Northern Pintail	<i>Anas acuta</i>
Northern Shoveler	<i>Anas clypeata</i>
Red-breasted Merganser	<i>Mergus serrator</i>
Red-necked Grebe	<i>Podiceps grisegena</i>
Redhead	<i>Aythya americana</i>
Ring-necked Duck	<i>Aythya collaris</i>
Ruddy Duck	<i>Oxyura jamaicensis</i>
Sandhill Crane	<i>Grus canadensis</i>
Scaup spp.	<i>Aythya spp.</i>
Surf Scoter	<i>Melanitta perspicillata</i>
Trumpeter Swan	<i>Cygnus buccinator</i>
White-winged Scoter	<i>Melanitta fusca</i>
Yellowlegs spp.	<i>Tringa spp.</i>

Appendix II. Total pairs, pairs per pond, and pairs per km<sup>2</sup> of wetland surveyed, for all duck species observed at Fort Nelson, BC, 2003. Additionally, the survey number used to calculate the pairs for each species is included.

<b>Common Name</b>	<b>IBP</b>	<b>IBP/Pond</b>	<b>IBP/km<sup>2</sup> of Wetlands Surveyed</b>	<b>Survey Number</b>
Bufflehead	219	1.450	12.3	1
Mallard	160	1.060	9.0	1
Scaup spp.	93	0.604	5.2	2
Green-winged Teal	73	0.474	4.1	2
Ring-necked Duck	65	0.422	3.6	2
American Wigeon	46	0.299	2.6	2
White-winged Scoter	25	0.162	1.4	2
Blue-winged Teal	25	0.162	1.4	2
Northern Shoveler	10	0.065	0.6	Avg
Surf Scoter	5	0.032	0.3	2
Barrow's Goldeneye	5	0.033	0.3	1
Scaup or Ring-necked Duck	4	0.026	0.2	2
Common Goldeneye	3	0.020	0.2	1
Unidentified Scoter	3	0.019	0.2	2
Northern Pintail	2	0.013	0.1	1
Unidentified Goldeneye	2	0.013	0.1	1
Goldeneye or Bufflehead	1	0.007	0.1	1
<b>Total</b>	<b>741</b>	<b>4.852</b>	<b>41.7</b>	<b>n/a</b>

Appendix III. Total broods, broods per pond, broods per km<sup>2</sup> of wetland surveyed, and the median clutch initiation date, for all species observed at Fort Nelson, BC, 2003.

<b>Common Name</b>	<b>Broods</b>	<b>Broods/Pond</b>	<b>Broods/km<sup>2</sup></b>	<b>Median Clutch Initiation Date</b>
Bufflehead	77	0.500	4.3	19 May
Mallard	71	0.461	4.0	15 May
Ring-necked Duck	48	0.312	2.7	25 May
Green-winged Teal	25	0.162	1.4	29 May
Scaup spp.	22	0.143	1.2	n/a
American Wigeon	13	0.084	0.7	21 May
Common Goldeneye	12	0.078	0.7	13 May
Unidentified Diver	8	0.052	0.4	n/a
Scaup or Ring-necked Duck	7	0.045	0.4	n/a
Unidentified Dabbling	3	0.019	0.2	n/a
Barrow's Goldeneye	2	0.013	0.1	Insufficient data
Blue-winged Teal	2	0.013	0.1	Insufficient data
Unidentified Duck	2	0.013	0.1	n/a
White-winged Scoter	2	0.013	0.1	Insufficient data
Canvasback	1	0.006	0.1	Insufficient data
<b>Total</b>	<b>295</b>	<b>1.916</b>	<b>16.5</b>	<b>n/a</b>