

Distribution and Derivation of the Blue-winged Teal (*Anas discors*) Harvest, 1970 – 2003

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Executive Summary

We analyzed banding and recovery data for Blue-winged Teal (BWTE) during 1970 – 2003 to delineate breeding reference areas (BRAs; groups of BWTE breeding areas that have similar band recovery distributions) along with distribution and derivation of harvest. Distribution of the harvest is defined as the proportion of birds from a BRA that were harvested in a given area, whereas derivation of the harvest is defined as the proportion of birds harvested in a given area that came from a BRA. We delineated 12 BRAs based on 23,279 direct recoveries (banded birds recovered during the immediate hunting season after being banded) and indirect recoveries (banded birds recovered during subsequent hunting seasons) with known recovery dates. We created harvest areas to pool and analyze recoveries. Harvest areas were based on jurisdictional lines important to management (e.g., waterfowl management flyways [Flyways] or groups of countries, depending on size) and were split into minor harvest areas for more in-depth analyses. Harvest areas that were based on Flyways included the U.S. portion only. As a simplification, we used only direct recoveries ($n = 15,153$) to determine distribution and derivation of the BWTE harvest. Consistently, harvest was distributed in a southeasterly direction away from BRAs, shifting to a southerly pattern from the far eastern BRAs.

Combined, 73.5% of the BWTE harvest occurred in the Mississippi Flyway (44.0%) and Latin America (29.5%). Lesser proportions of the harvest occurred in the Central Flyway (15.6%), Canada (6.2%), the Atlantic Flyway (4.3%), and the Pacific Flyway (0.5%). Overall, highest proportions of the BWTE harvested were derived from the Eastern Dakotas BRA (29.8%), Eastern Saskatchewan/Southwest Manitoba BRA (16.9%), the Upper Midwest BRA

(12.1%), and Western Saskatchewan BRA (11.0%). A substantial shift in harvest derivation occurred during the late-1990s coincident with improvements in wetland conditions and the presence of 1.2 – 1.4 million ha (3 – 4 million ac) of perennial grassland cover in the Conservation Reserve Program in the Eastern Dakotas BRA. During the 1994 – 2003 time period, 42.6% of the total BWTE harvest was derived from the Eastern Dakotas BRA. During the 3 previous time periods (1970 – 1979, 1980 – 1986, and 1987 – 1993), 17.3 – 26.8% of the total BWTE harvest was derived from the Eastern Dakotas BRA. Harvest rates were substantially higher for BWTE originating in BRAs east of 87°W than for those in western BRAs. However, harvest rates decreased over time for both eastern and western BRAs. Harvest pressure on birds originating from BRAs in eastern Ontario, Canada, and farther east (i.e., east of 87°W) appears to be quite high, but BWTE originating from western BRAs buffer harvest of BWTE in eastern harvest areas to some degree. Harvest pressure on birds originating from BRAs west of 87°W appears to be quite low. Further analyses should be conducted to determine whether survival rates have changed relative to harvest rates, harvest regulations, and prairie habitat conditions.

Photo by Craig Bihrie



Introduction

Blue-winged Teal (*Anas discors*; BWTE) are the second most abundant duck (family Anatidae) species in North America and are widely distributed (Rowher et al. 2002). Its breeding range stretches from the southern high-plains of New Mexico and Texas in the U.S., north to the boreal forest of Canada and Alaska, and from the Pacific to the Atlantic coast above approximately 40°N (Fig. 1; Bennett 1938, Bellrose 1980, Rowher et al. 2002). The primary breeding range in the north-central U.S. and prairie Canada generally contains >85% of all BWTE breeding pairs (U.S. Fish and Wildlife

Service 2009). These areas in the north-central U.S. and prairie Canada are denoted Waterfowl Breeding Population and Habitat Survey (May Survey; Smith 1995; Fig. 2). Blue-winged Teal are often the most abundant duck species within its primary breeding range, with numbers of breeding pairs quickly diminishing and being sparsely distributed throughout the remainder of the breeding range (Bellrose 1980).

Blue-winged Teal are an important species in the composition of the North American duck harvest,



Figure 1. Breeding and wintering ranges for Blue-winged Teal (*Anas discors*; adapted from Bellrose 1980, Rowher et al. 2002).

usually ranking as the 3rd or 4th most common duck species harvested in the U.S. (Raftovich et al. 2009). Total harvest for BWTE is typically estimated to be >1 million birds annually, ranging from 193,874 in 1988 to 1,559,761 in 2001 (Fig. 3; Raftovich et al. 2009, Gendron and Collins 2007). Blue-winged Teal, because of their early migration chronology, are somewhat unique compared to most other duck species in that they are hunted during a special September teal seasons where they are exposed to additional harvest beyond the regular duck season. The September teal season became operational in 1969 as a 9-day hunting season for BWTE, Green-winged Teal (*A. crecca*), and Cinnamon Teal (*A. cyanoptera*) and was continued until 1988 when it was suspended due to low abundance indices for BWTE (Fig. 4) and extraordinary drought in prairie breeding areas. In 1992, the September teal season was reinstated with the requirement that the BWTE population index from the May Survey be above 3.3 million birds to open a September teal season (U.S. Fish and Wildlife Service 1992). In 1998, a request from the Central Flyway Council was approved to expand the September teal season to 16 days whenever the breeding population index from the May Survey was above 4.7 million birds (U.S. Fish and Wildlife Service 1998). The expansion also was provided to the Mississippi Flyway at that same time, and subsequently to the Atlantic Flyway in 2009.

Harvest opportunity provided by the September teal season is clearly an important consideration in BWTE management as it generally accounts for approximately 1/3 of the total U.S. portion of

the BWTE harvest, ranging from 23.8% to 59.0% (Raftovich et al. 2009). Despite increased harvest opportunity provided by September teal seasons, a higher proportion of the BWTE harvest occurs in Latin America relative to other North American waterfowl species (Botero and Rusch 1988).

Numerous BWTE are banded during pre-season (i.e., prior to opening of hunting seasons) banding activities that, for the most part, are intended primarily for Mallards (*A. platyrhynchos*) and Northern Pintail (*A. acuta*). The Central Flyway preseason duck banding program, initiated in 1996, greatly expanded banding efforts in the north-central states of North Dakota, South Dakota, and Montana. Moreover, during that same time period, changes in band types and implementation of a toll-free phone number to report bands improved band-reporting rates (Royle and Garrettson 2005) and increased the number of recoveries available for analysis.

Since BWTE are a broadly distributed species (Fig. 1) the distribution and derivation of their harvest may vary widely. This could result in annual survival rates that are heterogeneous among portions of the overall population. We strove to categorize the population into portions that could be viewed or analyzed at levels that would result in homogenous survival rates and have identifiable connections with breeding, migration, and wintering grounds that are of interest to managers and policy makers.

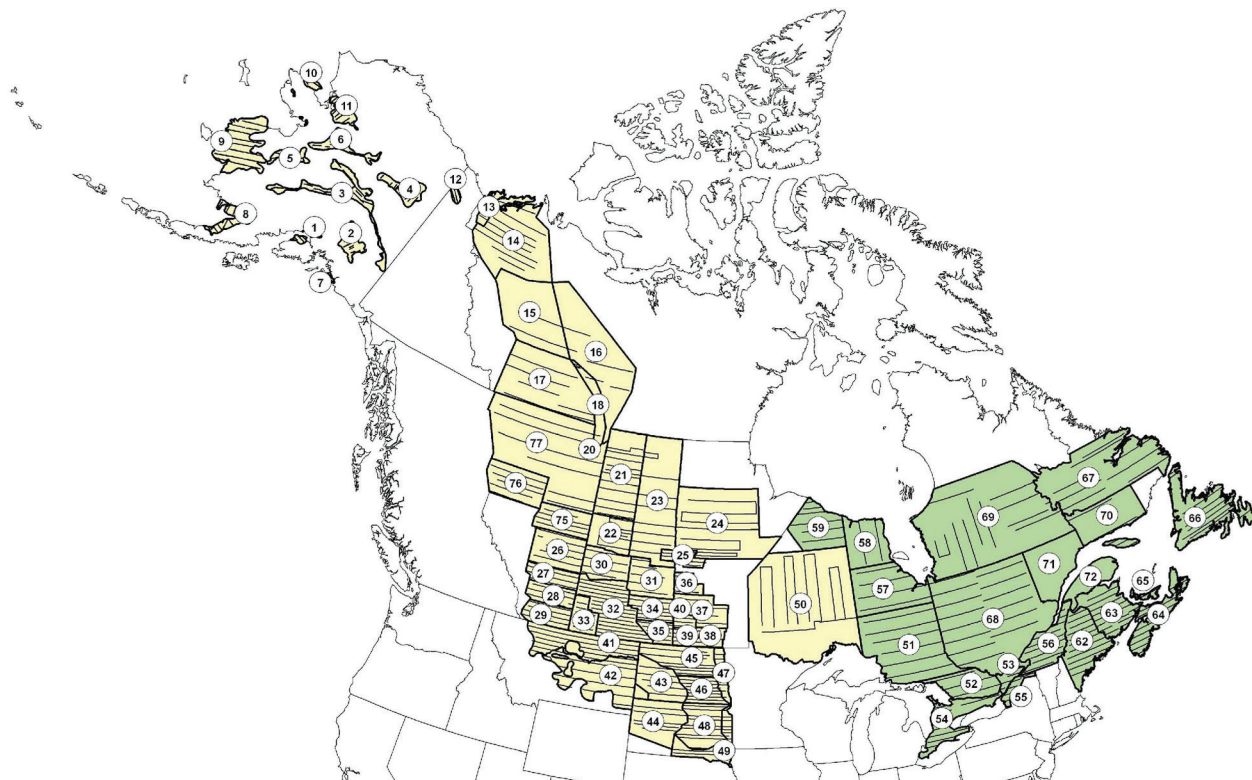


Figure 2. Strata and transects for the Waterfowl Breeding Population and Habitat Survey (yellow = traditional survey area, green = eastern survey area; U.S. Fish and Wildlife Service 2009).

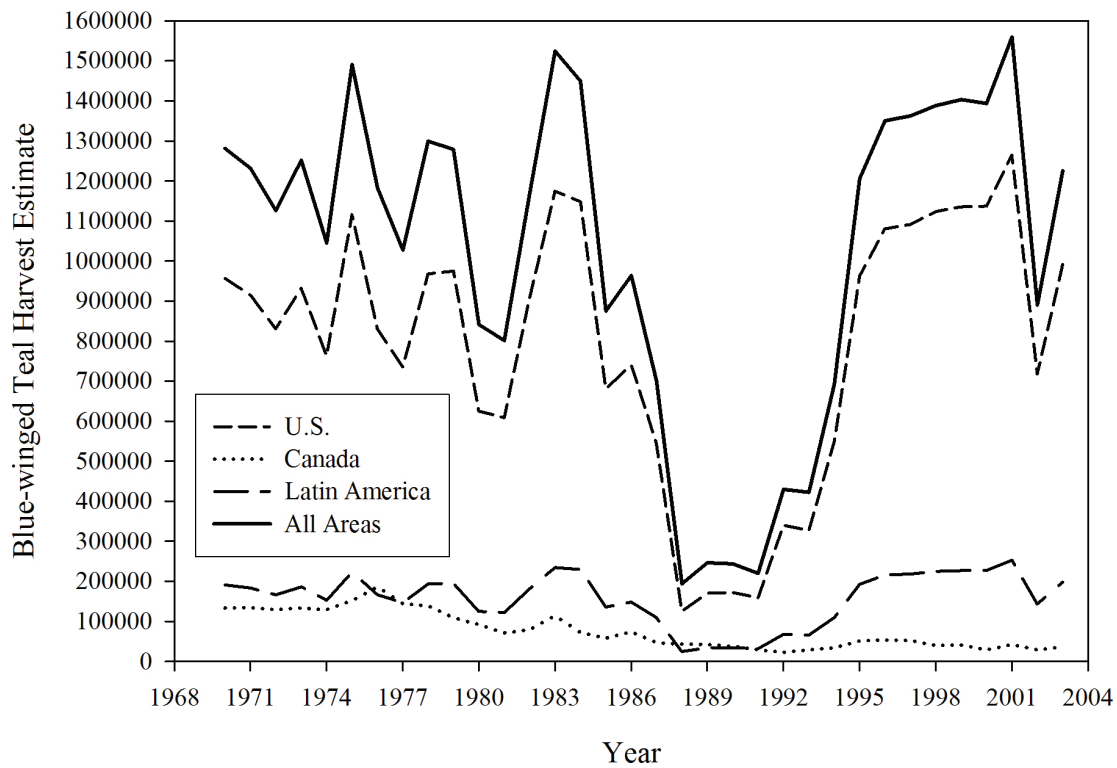


Figure 3. Blue-winged Teal harvests, 1970 – 2003 (Kruse et al. 2002, Gendron and Collins 2007, Kruse 2009). Latin American harvests (H) for each age/sex class are based on:

$$H_{\text{Latin American Area, Age/Sex}} = [(H_{\text{U.S., Age/Sex}} + H_{\text{Canada, Age/Sex}}) / (1 - \rho_{\text{Age/Sex}})] - (H_{\text{U.S., Age/Sex}} + H_{\text{Canada, Age/Sex}}).$$

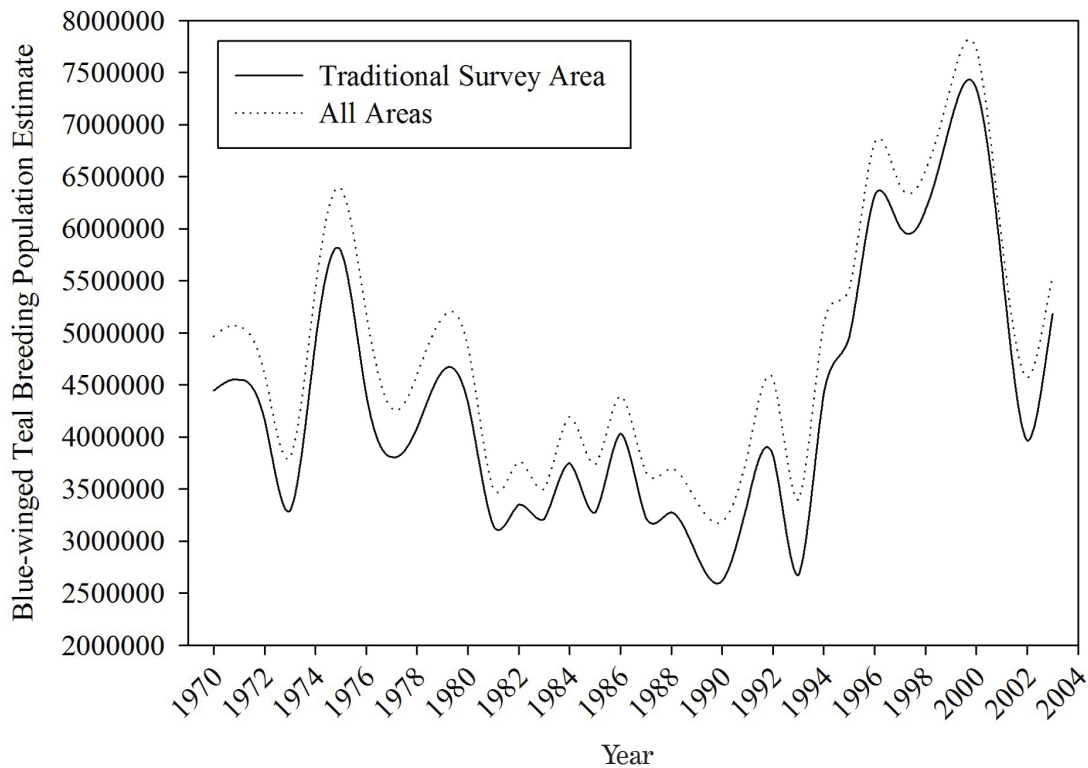


Figure 4. Blue-winged Teal breeding population indices from the Waterfowl Breeding Population and Habitat Survey (Smith 1995, U.S. Fish and Wildlife Service 2009), and all breeding areas. The Traditional area is represented by strata 1 – 18, 20 – 50, and 75 – 77 (U.S. Fish and Wildlife Service 2009). Data for All Areas includes survey data from state surveys and beginning in 1990, from the Eastern Survey Area (strata 51 – 72; U.S. Fish and Wildlife Service 2009). Prior to 1990, breeding population indices in eastern breeding areas were based on their proportional contribution to the overall breeding population index in years where data was available.

Objectives

- (1) Develop breeding reference areas (BRAs) for BWTE, and
- (2) Determine distribution and derivation of the BWTE harvest.

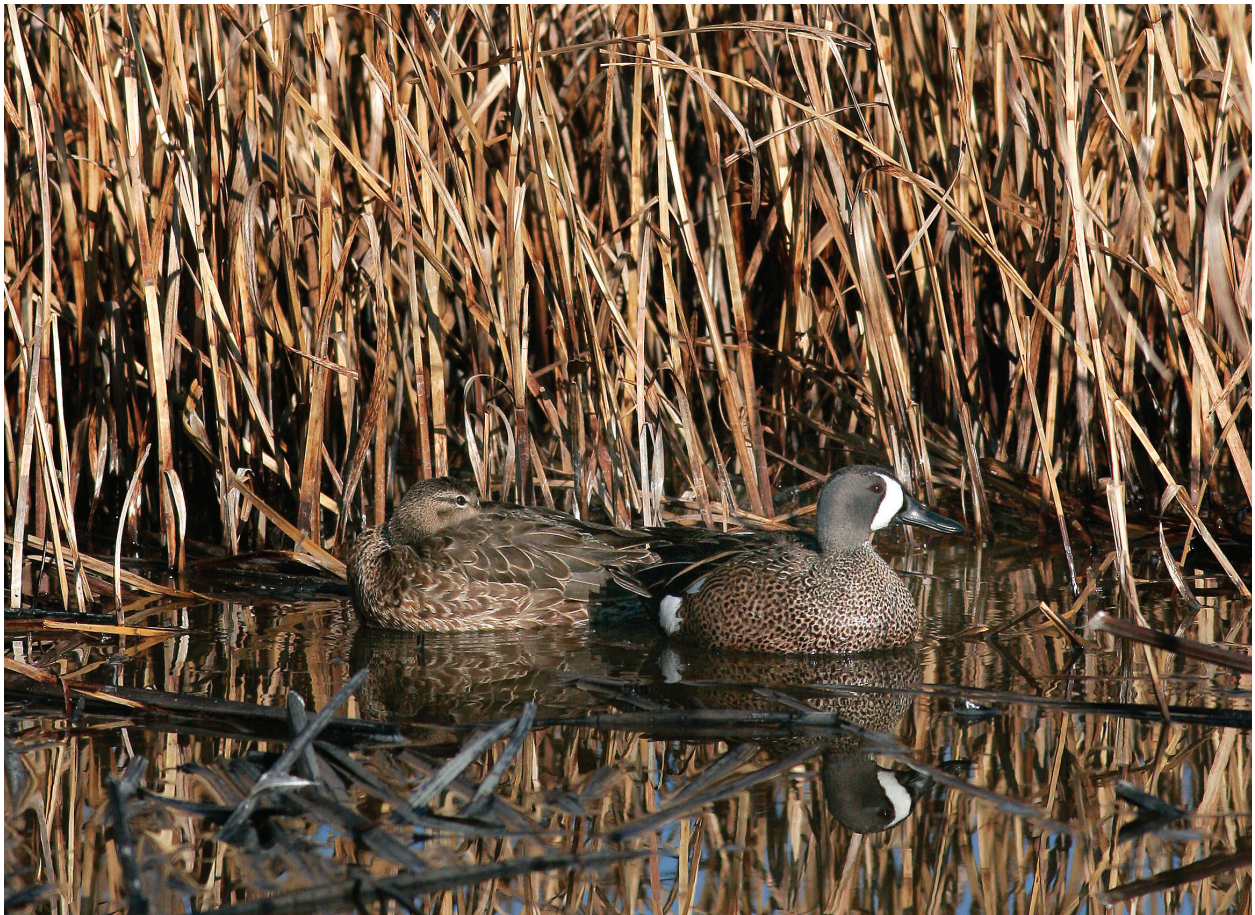


Photo by Craig Bihrie

Methods

Datasets Used

Breeding population data

Population indices (estimates of abundance) have been collected as part of the May Survey in the Traditional Survey Area (Fig. 2; strata 1 – 18, 20 – 50, and 75 – 77) since 1955, and were initiated in portions of the Eastern Survey Area (Fig. 2; strata 51 – 72) in 1990 (U.S. Fish and Wildlife Service 2009). Some BRAs (primarily in the contiguous U.S.) are not covered by the May Survey and in those areas, we used data from state surveys in Iowa, Michigan, Minnesota, and Wisconsin, and U.S. Fish and Wildlife Service (USFWS) plot surveys in portions of New Hampshire, Vermont, New York, Pennsylvania, Connecticut, Massachusetts, Rhode Island, New Jersey, Maryland, and Delaware (i.e., northeast U.S.; Heusmann and Sauer 2000). For BRAs that did not have abundance data going back to 1970, we used the proportion of total BWTE estimated in a given BRA during years where data are available for all areas to estimate breeding population size in those BRAs during years with missing data. This methodology assumes that there were not drastic changes in breeding population abundances, or the distribution of the breeding population amongst regions between 1970 and 1990 – 1995 when estimates became available in the Eastern Survey Area (Fig. 2).

Banding and band recovery data

There were 730,996 normal, wild BWTE banded during pre-season (July – September) banding operations from 1970 – 2003. We excluded birds banded south of 40°N with the exception of birds banded and recovered from Delaware, Maryland, and New Jersey, which comprised a major portion of a BRA's banding and recovery data. Other bandings south of 40°N were geographically isolated or relatively sparse over time and space and were excluded. Preseason bandings resulted in 15,153 direct (recovered during the hunting season immediately following banding) recoveries and 8,126 indirect (recovered during subsequent hunting seasons) recoveries coded as shot or found dead during the hunting season with known recovery dates. Recoveries in Latin America from February to April were included, given extended hunting of migratory birds in those countries. Finally, bandings and recoveries from local (LOC; young-of-the-year birds yet to attain flight) and hatch-year (HY; young-

of-the-year birds that have attained flight) age class birds were combined as immature birds.

Recoveries must first be weighted to account for differences in banding effort relative to population sizes within and among areas and changes in reporting rates over time to determine distribution and derivation of harvests (Crissey 1955, Geis 1972). Therefore, we used similar procedures for weighting recoveries as Munro and Kimball (1982, see below).

Harvest data

Harvest in the U.S. was estimated from 1970 – 2000 using the mail questionnaire survey (Kruse et al. 2002), and 2001 – 2003 using the Harvest Information Program (HIP; Kruse 2009). We estimated proportion of the harvest comprised by each age/sex class based on numbers of wings in the parts collection survey (K. Richkus, pers. comm.). We allocated wings with unknown age or sex based on overall proportions in each respective Flyway; wings of unknown age and sex were distributed proportionally among each age/sex class. Harvest data in Canada has been collected in a similar manner as the mail questionnaire survey in the U.S., except that hunters are grouped based on their likelihood of being active and non-resident aliens are not part of the parts collection survey in Canada (Gendron and Collins 2007). Estimates of BWTE harvest in Canada collected from 1970 – 1974 were derived using slightly different methodology and were made comparable to data from post-1974 (M. Gendron, pers. comm.).

Harvests ($H_{\text{Latin American Area}}$) for each of four Latin American areas (i.e., Caribbean, Central America, Mexico, and South America) were estimated by age/sex class using the proportion (ρ) of bands recovered in each of these areas. Before determining the proportion of bands recovered in an area, recoveries were weighted based on reporting rates (see below). Proportions of recoveries were then multiplied by BWTE harvest estimates from the U.S. ($H_{\text{U.S.}}$) and Canada (H_{Canada}) and the harvest was estimated using:

$$H_{\text{Latin American Area, age/sex class}} = [(H_{\text{U.S., age/sex class}} + H_{\text{Canada, age/sex class}}) / (1 - \rho_{\text{age/sex class}})] - (H_{\text{U.S., age/sex class}} + H_{\text{Canada, age/sex class}}).$$

Immature ducks are harvested at higher rates than adult birds due to age-related differences in vulnerability (Anderson 1975, Cox et al. 1998, Pace and Afton 1999). Therefore, harvest data must be adjusted for differential vulnerability to determine estimates of abundance (Anderson 1975, Munro and Kimball 1982). These adjustments can be made using the ratio of recovery or harvest rates of banded juvenile birds to that of banded adult birds. We calculated vulnerability ratios for each breeding reference area within each time period. Different ratios of band types were used (see below) resulting in differences in reporting rates across time, space and age/sex class. Therefore, we used harvest rates as opposed to recovery rates to calculate our vulnerability ratios. We then divided harvest estimates of immature birds for each sex and time period by their respective vulnerability ratios.

Development of Breeding Reference Areas

Anderson and Henny (1972) developed BRAs for Mallards; however, those areas did not align with May Survey strata (Smith 1995), and may not necessarily represent homogeneous units for analysis of BWTE banding data. Therefore, we developed BRAs for BWTE with the objectives of (1) obtaining sample sizes large enough for analysis; (2) maintaining relatively homogeneous distributions of BWTE recoveries from BRAs; (3) maintaining relatively homogeneous BWTE survival rates within BRAs; and (4) develop geographic reference areas that are meaningful to managers at both the flyway and North American Waterfowl Management Plan levels (North American Waterfowl Management Plan, Plan Committee 2004).

We pooled all age/sex classes for final distributions and derivations because numbers of recoveries for some age/sex classes generally were inadequate for presentation of results. However, we also have provided a coarse summary and tables of distribution and derivation of harvest by age/sex class. As a conservative measure, we used both direct and indirect recoveries to develop BRAs, but only direct recoveries to determine distribution and derivation of the harvest.

We used ArcGIS to identify and assign banding sites of recoveries to the breeding population strata within which they were located (Environmental Systems Research Institute 2009). We excluded any breeding population strata with fewer than 20 total recoveries that originated within their boundaries for analyses to develop BRAs, but later included them within appropriate BRAs for distribution and derivation analyses. We used the following Julian-date derivative to represent recovery dates in analyses. Because recoveries beginning on New Year's Day are actually at the end of the annual hunting season, we added 365 to the Julian dates of recoveries from January through early April. We then log-transformed Julian-date derivatives for recoveries

to help meet assumptions of normality, and used only records with known recovery dates ($n = 23,279$) for analyses using the log-transformed recovery date derivative (LOGRDATE) as a covariate. We also used untransformed latitude (RLAT) and longitude (RLONG) of recoveries as covariates.

To create BRAs that represented homogeneous units of distributions of band recoveries, we ran a clustering procedure and then grouped clusters based on their statistical characteristics and geographic proximity to one another to form BRAs. We first used a principle components analysis (PROC PRINCOMP; SAS Institute 2003) of the correlation matrix of RLAT, RLONG, and LOGRDATE to determine scores for principle components 1 and 2 (PC1 and PC2) for each recovery. PC1 and PC2 accounted for 86.1% of the variation for recovery variables. We exported scores for PC1 and PC2 and ran separate ANOVAs (PROC GLM) to ensure that they differed by population stratum and calculated Tukey-adjusted least-square means (LS Means; [PC1] $P < 0.001$, $F_{44, 23234} = 19.25$; [PC2] $P < 0.001$, $F_{44, 23234} = 808.97$). We then plotted LS Means for PC1 on LS Means for PC2 for each population stratum and visually grouped strata to form BRAs based on proximity to each other, continuity on the plot, geographic location, geographic size of combined strata, and number of recoveries (Figs. 5 and 6).

Development of Harvest Areas

We delineated minor harvest areas based primarily on harvest management jurisdictions (e.g., Alberta, Canada), or broader regional groupings of states or countries (e.g., Caribbean) and numbers of recoveries within them. Minor harvest areas were then pooled into larger harvest jurisdictions to summarize harvest in major harvest areas. Broader waterfowl harvest management in the U.S. is delivered by administrative "Flyways" that are based on the migration and settling patterns of waterfowl. Therefore, the U.S. portions of the four Flyways (i.e., Atlantic, Central, Mississippi, and Pacific) were a natural fit for pooling minor harvest areas into major harvest areas. Although Canadian provinces are members of Flyways, they generally have distinctly different harvest regulations from the U.S. Therefore, we pooled Canadian minor harvest areas together at the country scale to form the major harvest area "Canada". Minor harvest areas south of the U.S. were pooled to form the major harvest area "Latin America".

Calculation of Distribution and Derivation of the Harvest

Distribution of the harvest is simply the proportion of the total weighted recoveries from a BRA that are harvested in a given harvest area. Derivation of the harvest reflects the proportion of total weighted recoveries in a harvest area that came from a given BRA (Munro and Kimball 1982).

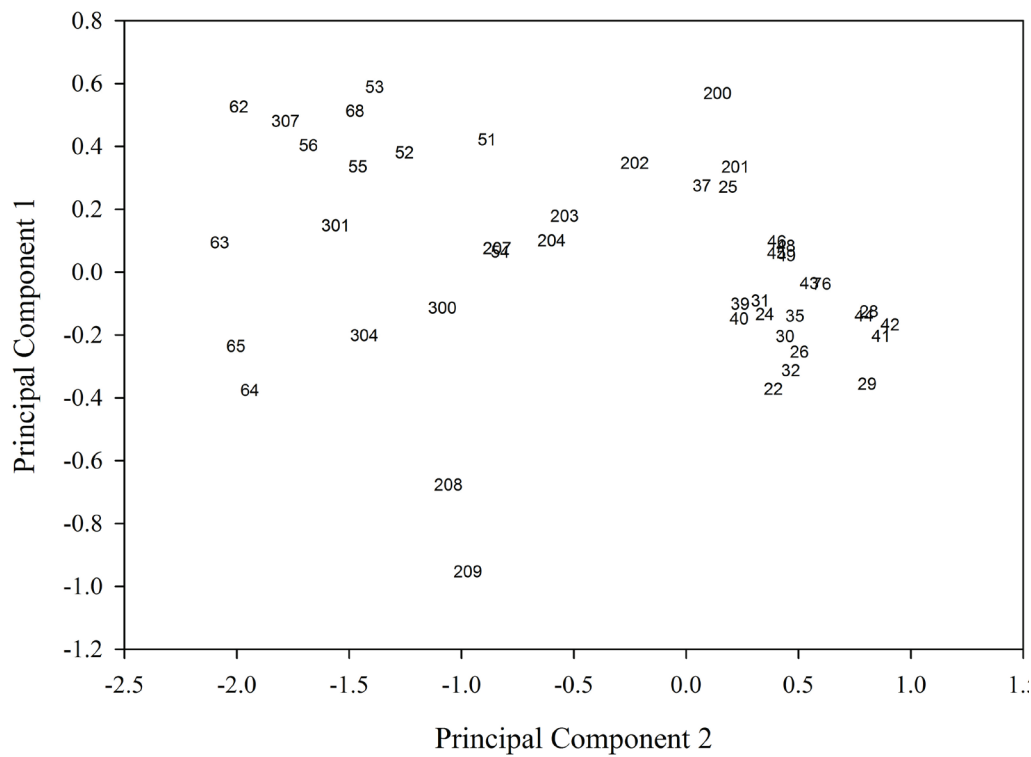


Figure 5. Least squares means of principal component 1 vs. least squares means of principal component 2 derived from recovery latitude, longitude, and log-transformed recovery date of Blue-winged Teal ($n = 23,279$) by their breeding population strata of the Waterfowl Breeding Population and Habitat Survey (U.S. Fish and Wildlife Service 2009). States or regions treated as strata were given unique numbers (200 = Minnesota, 201 = Iowa, 202 = Wisconsin, 203 = Michigan, 204 = Ohio, 207 = Pennsylvania, 208 = Maryland, 209 = Delaware, 300 = New York, 301 = Vermont, 304 = Massachusetts, and 307 = Gaspé Peninsula region of Quebec).

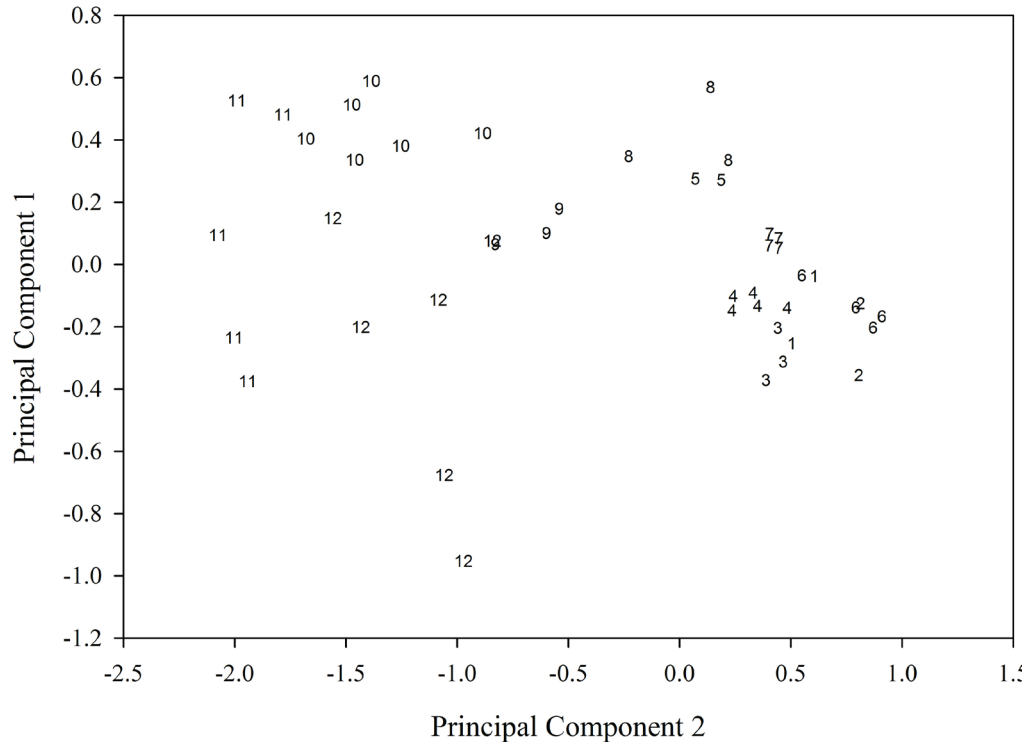


Figure 6. Least squares means of principal component 1 vs. least squares means of principal component 2 derived from recovery latitude, longitude, and log-transformed recovery date of Blue-winged Teal ($n = 23,279$) by their breeding population strata of the Waterfowl Breeding Population and Habitat Survey (U.S. Fish and Wildlife Service 2009), after grouping into breeding reference areas (BRAs; 1 = Central Alberta, 2 = Southern Alberta, 3 = Western Saskatchewan, 4 = Eastern Saskatchewan/Southwest Manitoba, 5 = Westcentral Manitoba, 6 = Northern Great Plains, 7 = Eastern Dakotas, 8 = Upper Midwest, 9 = U.S. Great Lakes, 10 = Eastern Ontario/Southern Quebec, 11 = Maritimes/Maine, and 12 = Northeast States).

Recovery weights

Breeding population sizes and banding efforts have varied among years within and among BRAs. To more accurately reflect the representativeness of each recovered band, recoveries must be weighted to account for spatial and temporal differences in bird abundance and banding effort. We used methodology similar to that described by Munro and Kimball (1982) to weight recoveries for analysis. Using this methodology requires four main types of data: (1) breeding population estimates; (2) harvest estimates; (3) banding and band recovery data; and (4) band-reporting rates.

Pooling data among years

Most BRAs had low numbers of recoveries in some years due to sporadic banding efforts across time, and greatly reduced harvest effort (i.e., no September teal seasons) during some years. Therefore, we pooled data within each of four time periods (i.e., 1970 – 1979, 1980 – 1986, 1987 – 1993, and 1994 – 2003) based on wetland conditions in the primary breeding range of BWTE. Wetland count data by the USFWS for the north-central U.S. (i.e., strata 41 – 49 of the May Survey; Fig. 2) began to be corrected for visibility bias in 1974; however, the North Dakota Game and Fish Department (NDGFD) began wetland count estimates in North Dakota in 1948 and for 1970 – 1973, we used

a simple regression (Fig. 7; $R^2 = 0.72$) using wetland survey data from NDGFD (1974 – 2008) to predict USFWS count estimates for the north-central U.S. during those years. We then estimated mean numbers of wetlands in north-central U.S. and Prairie Canada (Strata 26 – 40; Figs. 2 and 8).

Band-reporting rates

Band-reporting rate studies have not been conducted for BWTE. Therefore, we used reporting rates as described for Mallards (Henny and Burnham 1976, Nichols et al. 1991, C. Moore, pers. comm.) and Wood Ducks (*Aix sponsa*; P. R. Garrettson, pers. comm.). Moreover, band-reporting rates from Latin America are unknown. Differing languages, lack of English literacy or exposure to the English language, and lack of telephones or computers available by individuals recovering bands in many areas of Latin America is a barrier to reporting of recovered bands (Botero 1992). Therefore, we assumed that recoveries in Latin American countries were being reported at one-half the rate of recoveries in the U.S. This assumption is a compromise between not including Latin American recoveries, which are numerous, and assuming that Latin American band-reporting rates are equal to those in the U.S. For example, if a reporting rate in the U.S. for a given band type \times reporting method was 32% the reporting rate for a recovery of the same

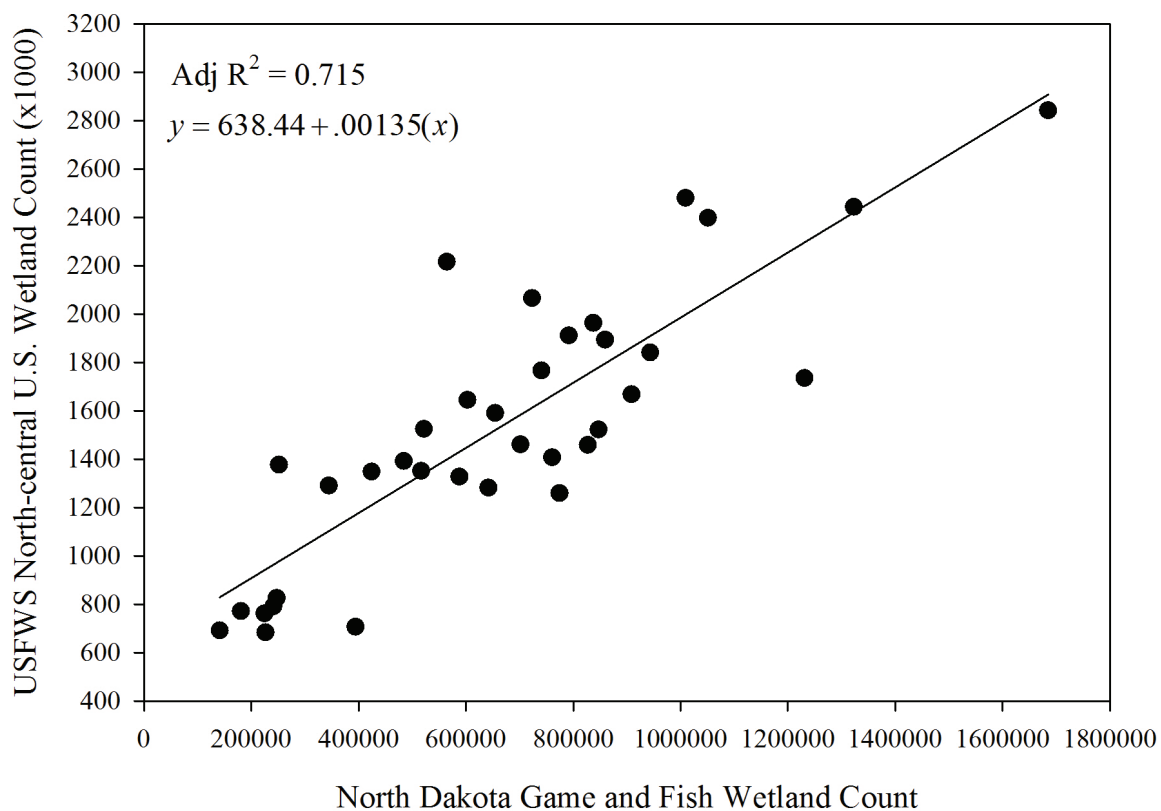


Figure 7. May pond counts in North Dakota, 1974 – 2008, from the North Dakota Game and Fish Breeding Duck Survey (M. A. Johnson, pers. comm.) and the Waterfowl Breeding Population and Habitat Survey (Strata 41 – 49; Smith 1995, U.S. Fish and Wildlife Service 2009) used to estimate numbers of ponds in the north-central U.S. prior to 1974.

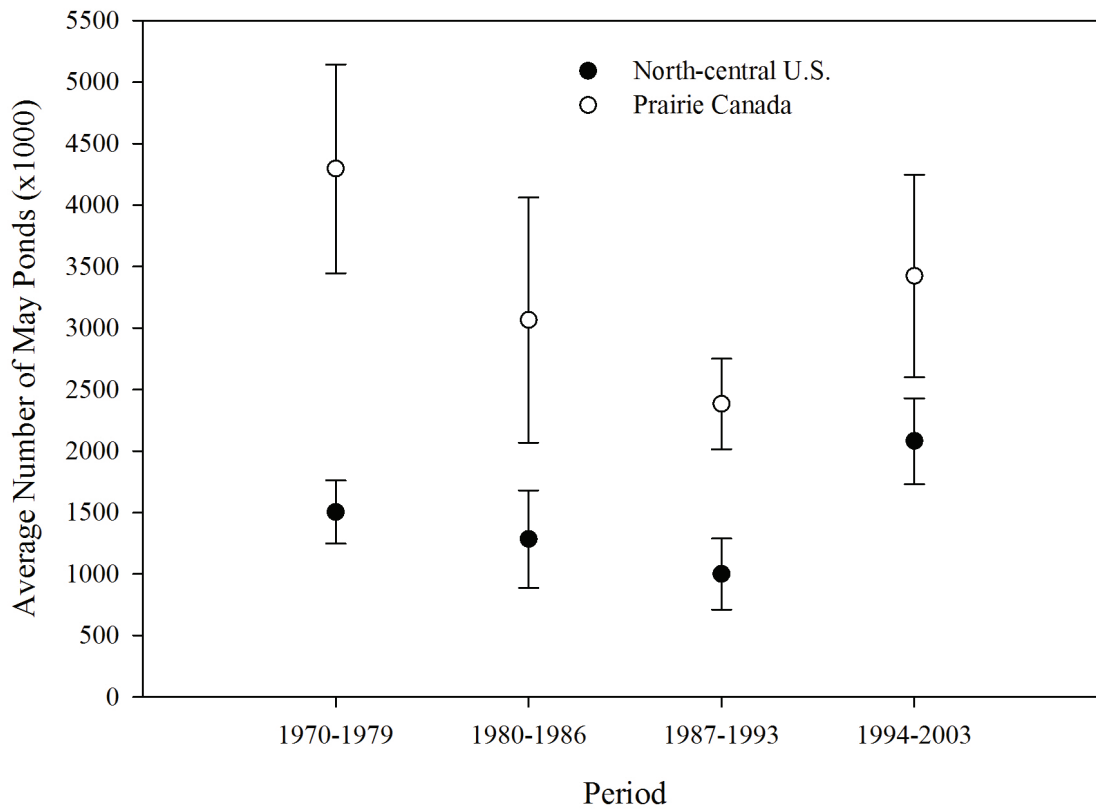


Figure 8. Average numbers (\pm 95% CL) of May ponds in Prairie Canada (Strata 25 – 40) and North-central U.S. (strata 41 – 49) from the Waterfowl Breeding Population and Habitat Survey (Smith 1995, U.S. Fish and Wildlife Service 2009) by time period.

band type \times reporting method in a Latin American country would be 16%. Reporting rates for solicited recoveries remained 100%, regardless of area. Although our assumptions for reporting rates in Latin America could be challenged, professionals who have worked in these areas believe that band-reporting rates in Latin America are quite low (Botero 1992).

Accurate estimates of band-reporting rates are required to calculate harvest rates. Over the 34-year period, band types and reporting methods have changed numerous times, resulting in different reporting rates (Henny and Burnham 1976, Nichols et al. 1995). Reporting rates for Mallards also varied spatially and temporally (e.g., Nichols et al. 1995). Since we pooled data across time with different band types used and banding efforts within and among BRAs, we had additional need to reconcile reporting rates (Fig. 9). We used a composite reporting rate (P. R. Garrettson, pers. comm.) to calculate reporting rates for each time period, BRA, and age/sex class. The composite reporting rate is essentially a weighted average, in which the summed actual recoveries are divided by the summed expected recoveries for a subset of recoveries in question. The number of expected recoveries for each band type/reporting method combination would be the number of recoveries multiplied by the inverse of that band type/reporting method's band-reporting rate.

Estimation of the age and sex structure of the preseason population

Because age/sex classes are rarely banded in proportion to their abundance, we needed to estimate their relative preseason abundance (\hat{N}) just prior to the hunting season to account for differences in banding effort. Breeding population indices are comprised of unknown compositions of adult males and females. Moreover, estimates of production are needed to represent young birds in the fall flight. For these estimations, we combined LOC birds with HY birds. We used Lincoln's (1930) method to obtain independent estimates of each of the four age/sex class's abundance (N) prior to the hunting season for time period (t) using harvest estimates (H) and harvest rates (h):

$$N_{t, \text{age/sex class}} = H_{t, \text{age/sex class}} / h_{t, \text{age/sex class}}.$$

Thus, the direct recovery rate (f) is determined by the sum of direct recoveries (d) for each age/sex class within each BRA (i), during a time period (t), over years (y), divided by total bandings (b) for each age/sex class. Harvest rate for a time period is the product of the proportional contribution of a BRA's breeding population ($Bpop_i$) to the overall population size ($Bpop$) during a time period and the BRA's direct recovery rate for a time period ($f_{i,t}$) divided by the BRA's composite reporting rate during the time period ($\Lambda_{Comp i,t}$) and then summed over the 12 BRAs. All parameters were calculated separately for each of the four age/sex classes.

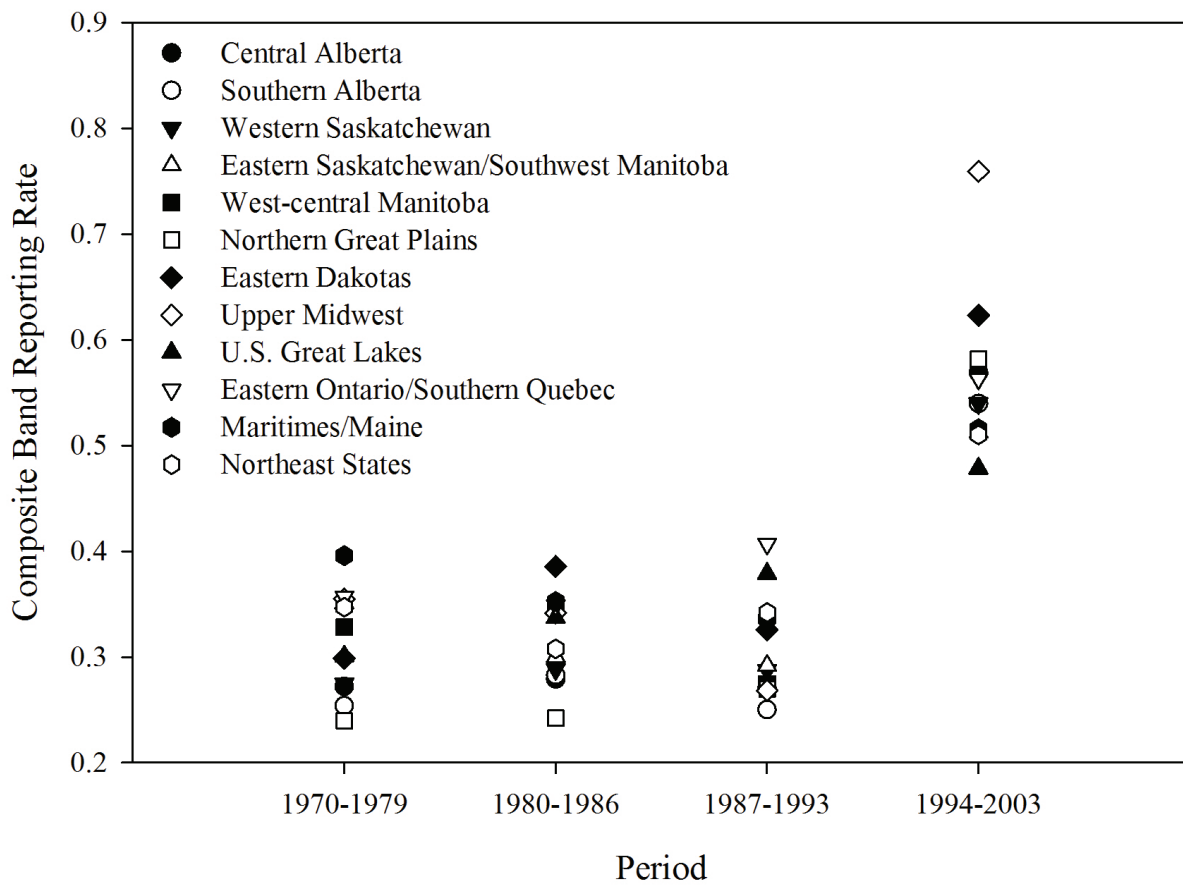


Figure 9. Composite band-reporting rates for Blue-winged Teal by breeding reference area and time period. Composite band-reporting rates are the weighted average of reporting rates for different reporting methods used to report recoveries.

Band-recovery weights are the quotient of the preseason population estimate of each age/sex class divided by the number of each age/sex class banded specific to each time period and BRA and multiplied by the inverse of the appropriate composite reporting rate.

For example, the calculation for adult males was:

$$f_{i,t,AM} = \left(\sum_{y=1970-1979}^{10} d_{i,y,AM} / \sum_{y=1970-1979}^{10} b_{i,y,AM} \right)$$

and,

$$h_{i,AM} = \sum_{i=1}^{12} [(f_{i,t,AM} / \lambda_{Comp\ i, t, AM}) \left(\sum_{y=1970-1979}^{10} Bpop_{i,y} / \sum_{y=1970-1979}^{10} Bpop_y \right)]$$

where $i = 1, 2, \dots, 12$ breeding reference areas.

Thus, to determine preseason estimates of adult male and female abundance:

$$\hat{N}_{t,i,AM} = (N_{t,i,AM} / (N_{t,i,AM} + N_{t,i,AF})) * Bpop_{i,t}$$

$$\hat{N}_{t,i,AF} = (N_{t,i,AF} / (N_{t,i,AM} + N_{t,i,AF})) * Bpop_{i,t}$$

The immature preseason population estimate is presumed to be split equally between sexes and is the age ratio of the indirect population estimates for time period (t) multiplied by $Bpop_{i,t}$.

For each sex:

$$\hat{N}_{t,i,Juv} = [(N_{t,i,IM} + N_{t,i,IF} / (N_{t,i,AM} + N_{t,i,AF})) * Bpop_{i,t}] * 0.5$$

Assumptions (Munroe and Kimball 1982) that pertain to the above calculations are: (1) the populations (in our case, birds within BRAs) remain unchanged during the preseason banding period; (2) the banded samples are representative of the populations with respect to mortality, movement and migration; (3) the harvest area is large enough to include an adequate sample from all banded populations; (4) recruitment is uniform among all populations; (5) the adult sex ratio is uniform among all populations; and (6) band-reporting rates are accurately estimated.

Spatial Analysis of Recoveries

We conducted simple density analyses of direct recoveries using Spatial Analyst in ArcGIS (Environmental Systems Research Institute 2009). We used the weighted recoveries (as calculated above) as the population field, a search radius of 41 km, and output cell size of 5 km x 5 km. We then classified cell values into relative percentiles (lower percentile equals a lower density), specific to each map. That is, a harvest density percentile for each BRA, larger area, or bi-weekly period, depending on breakdown of data was used for each map.

Results and Discussion

Breeding Reference Areas and Harvest Areas

The analysis of data from population survey strata suggested 12 BRAs (Fig. 10). Numbers of direct recoveries from each BRA (1970 – 2003) ranged from 592 in the Northeast States BRA to 3,168 from the Eastern Saskatchewan/Southwest Manitoba BRA (Appendix A). The mean of the total number of direct recoveries from all BRAs equaled 1,258.25 (SE = 206.28).

We delineated six major harvest areas (Canada, Pacific Flyway, Central Flyway, Mississippi Flyway, Atlantic Flyway, and Latin America) for summarization of recovery data. Additionally, we used 22 minor harvest

areas to summarize harvest at a finer scale (Fig. 11). Minor harvest areas had considerable range in area based on harvest density, but were also designed to align with boundaries used in harvest management. For example, the Mississippi Flyway – Gulf Coast minor harvest area had high numbers of recoveries, but is only 64,676 km², whereas the Quebec minor harvest area had somewhat low numbers of recoveries and is 2,652,642 km².

Recovery Weight Components

Composite reporting rates

For purposes of illustration and simplicity, we describe overall composite reporting rates, whereas

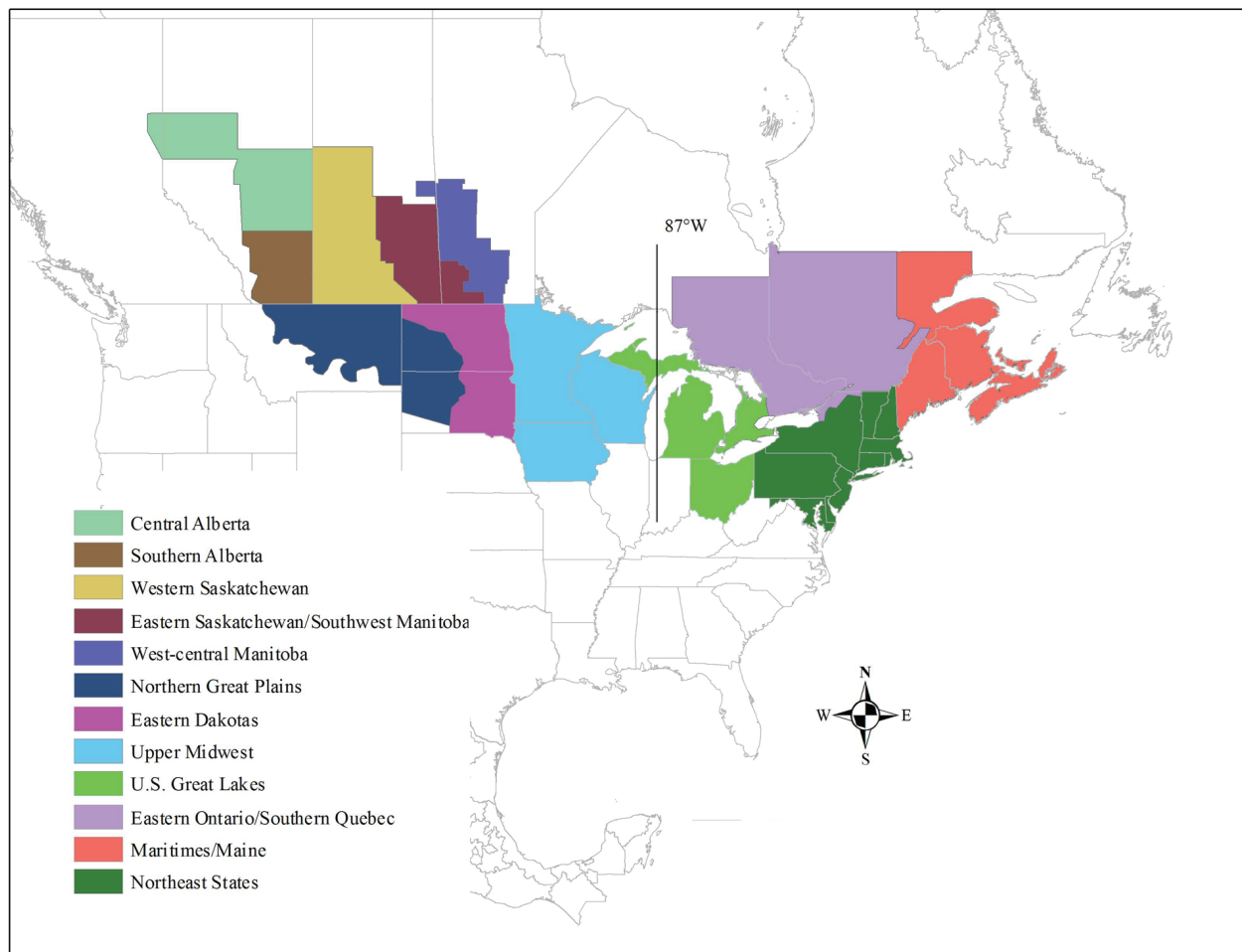


Figure 10. Map showing breeding reference areas for Blue-winged Teal. Breeding reference areas are geographically aggregated portions of the population that have similar band recovery distributions).

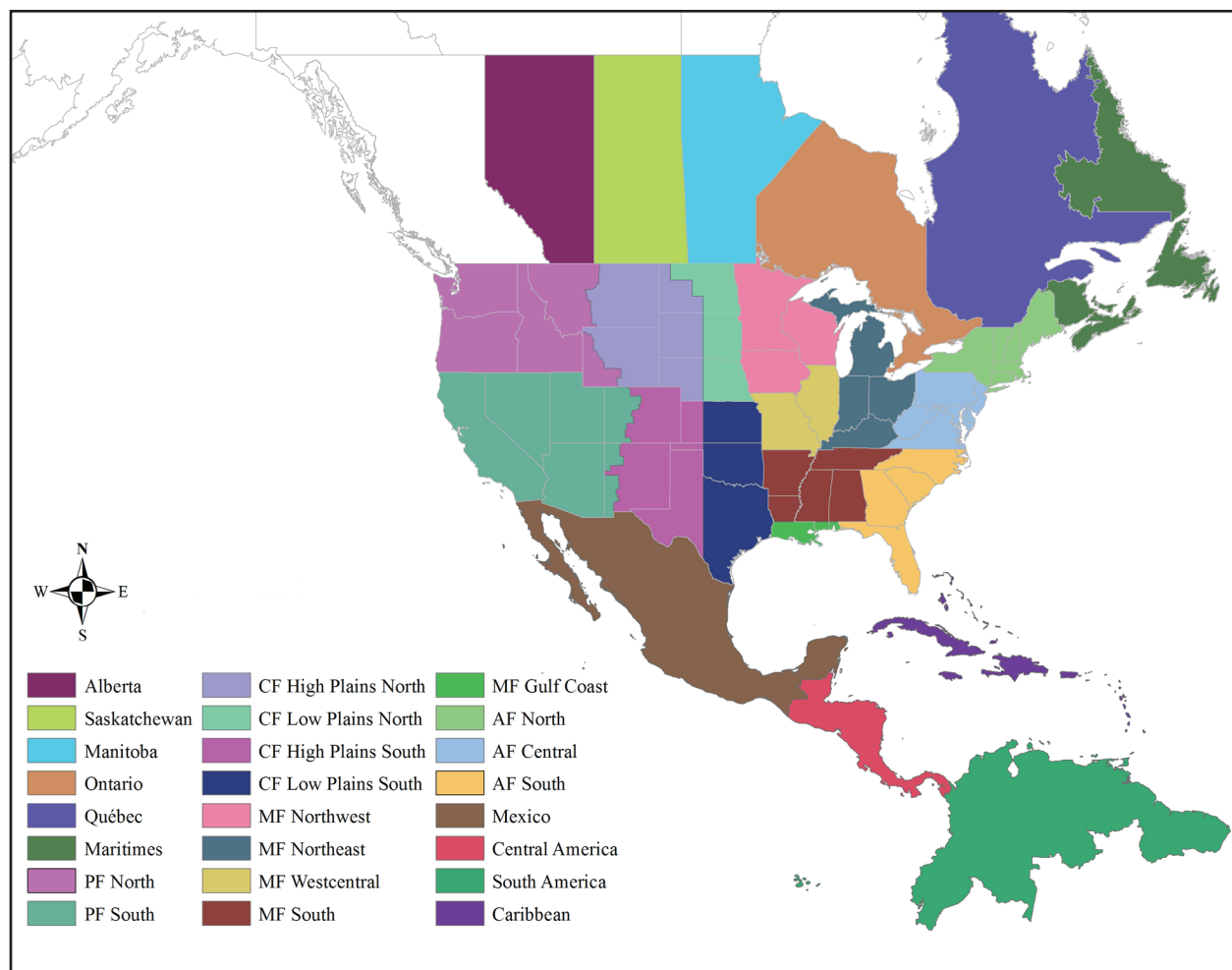


Figure 11. Map showing minor harvest areas for Blue-winged Teal. Minor harvest areas are based on harvest jurisdictions such as states, or portions of Flyways (PF = Pacific Flyway, CF = Central Flyway, MF = Mississippi Flyway, AF = Atlantic Flyway). Flyways are aggregations of states, parts of states, and provinces and are the delivery mechanism for harvest management. Only U.S. portions of Flyways and Canadian portions are described separately.

in calculations for determining harvest rates, we used composite rates specific to age/sex classes.

Overall, composite reporting rates varied across BRAs and time period (Fig. 9). The range of composite reporting rates was similar during the first three time periods (1970 – 1979, 1980 – 1986, and 1987 – 1993), ranging from 0.24 (Northern Great Plains BRA, 1979 – 1979) to 0.41 (Eastern Ontario/Southern Quebec BRA, 1987 – 1993). Within these time periods, composite reporting rates for some BRAs did not vary (e.g., Eastern Saskatchewan/Southwestern Manitoba BRA, 0.30 [1970 – 1979], 0.30 [1980 – 1986], 0.29 [1987 – 1993]), while composite reporting rates fluctuated among time periods for other BRAs (e.g., Eastern Dakotas BRA, 0.30 [1970 – 1979], 0.39 [1980 – 1986], 0.33 [1987 – 1993]). During 1994 – 2004, composite reporting rates increased substantially, ranging from 0.48 (U.S. Great Lakes BRA) to 0.76 (Upper Midwest BRA), coincident with deployment of toll-free bands on Mallards.

We did not apply slight regional differences (e.g., 0.29 versus 0.34) in reporting rates in the U.S. or Canada, as described for Mallards (Nichols et al. 1995). These

regional rates likely have changed with the advent of more user-friendly reporting methods (i.e., toll-free telephone numbers, and websites). More recently, Otis et al. (2008) described fairly drastic differences in regional reporting rates in the U.S. for Mourning Doves (*Zenaidura macroura*). However, we did not feel that it was appropriate to apply these differences to a waterfowl species and expect that regional differences in reporting rates for BWTE are similar to those for Mallards, but must acknowledge that large regional differences in reporting rates for BWTE could exist.

Well-defined estimates of reporting rates from Latin America do not exist, so we made the assumption that those reporting rates were 50% of the defined U.S. reporting rate. Band-reporting rates, excluding solicited bands which always have a reporting rate of 1, under this assumption would range from 0.16 for mail address (i.e., AVISE bands, which had only “Write Washington DC” etched on them) bands reported by mail to 0.37 for toll-free telephone number bands that were reported via telephone. We felt that making this “crude” assumption was necessary to include bands that were recovered in

Latin American countries as they accounted for 13.2% of all direct recoveries, and even higher proportions for some BRAs. Our estimate that reporting rates were 50% of those defined in the U.S. may still be higher than actual reporting rates in Latin America and underestimate harvests of BWTE in Latin America, and importance of harvest in those areas to some BRAs. Based on bands recovered by hunters in a small village, Botero (1992) surmised that reporting rates in Latin America are substantially lower than U.S. reporting rates. Remote areas in Latin America that lack telephones or internet likely have very low reporting rates (Botero and Rusch 1988, Botero 1992), whereas areas in Mexico or the Caribbean where wealthy, often English-literate hunters are guided, likely have higher band-reporting.

Harvest rates

Harvest rates varied substantially among BRAs, time periods, and cohorts (Appendix B). Overall, harvest rates were similar between immature male and female BWTE from the same BRA and time period. As expected, immature BWTE almost always had higher harvest rates than adults. Harvest rates for adult female BWTE were often similar to, but occasionally higher than those of males from the same BRA and time period. Although males comprise a majority of the September teal season harvest, females periodically exceed males in the regular season harvest. Early departure of many male BWTE may result in greater harvest exposure on remaining female BWTE during regular duck seasons, which occur from late-September through January in the U.S. Regular duck hunting seasons have about four times as many days available for hunting and bag limits that are generally higher than those during September teal seasons.

Harvest rates were higher for birds originating from BRAs east of 87°W than those originating from BRAs west of that line, compared within time periods, but regardless of age/sex class. Harvest rates were highest during the 1970 – 1979 time period, followed by the 1980 – 1986 time period. Harvest rates were similar between the 1987 – 1993 and 1994 – 2003 time periods, and were approximately half of those observed during the 1970 – 1979 time period. These reductions in harvest rates for birds in eastern harvest areas were likely the result of significant restrictions in BWTE harvest frameworks in Quebec, beginning in 1991, that reduced the daily bag limit of BWTE to 1 or 2 BWTE/day from a daily bag limit that was formerly equal to the overall duck bag limit (generally 6 – 8 ducks/day). Annual harvest of BWTE in Quebec averaged 35,326 during 1970 – 1979, 11,306 during 1980 – 1986, 5,327 during 1987 – 1993, and 4,192 during 1994 – 2003.

Birds originating from some eastern BRAs experienced much higher harvest rates during the 1970 – 1979 time period (e.g., immature males from Eastern Ontario/Southern Quebec BRA, 0.35; Appendix B) as compared to much lower harvest rates for birds from western BRAs during the same

time period (e.g., immature males from the Central Alberta BRA, 0.05; Appendix B). Nonetheless, birds from some western BRAs also experienced relatively high harvest rates during the 1970s (e.g., immature females from the West-central Manitoba BRA, 0.14; Appendix B). Harvest rates declined substantially for most areas over the next two time periods, often hitting low-points during the 1987 – 1993 time period when no September teal seasons were held. Harvest rates experienced during the 1994 – 2003 time period were nearly identical to the 1987 – 1993 time period despite resuming September teal seasons. These two most recent time periods had exceptionally low harvest rates (often less than 0.03 in western BRAs; Appendix B), with the exception of eastern BRAs. Birds from eastern BRAs were still harvested at rates nearly twice as high as birds from western BRAs (Appendix B).

We did not calculate estimates of reporting rates that varied geographically (other than that already described for Latin America) as have some researchers for other species (Henny and Burnham 1976, Nichols et al. 1995, Otis et al. 2008). We believe that these effects would be more likely for birds originating in western BRAs; however, the cumulative effects on harvest rates likely would be negligible given low harvest rates for birds originating west of 87°W. Moreover, given that reporting rates in Latin America may be quite low (Botero 1992), reporting rates that we used for recoveries in Latin America (0.16 – 0.37) may be liberally high and underestimate the importance of Latin American areas to the harvest of BWTE.

Preseason population structure

Because we pooled data into time periods, we present preseason population structures for the four time periods: 1970 – 1979, 1980 – 1986, 1987 – 1993, and 1994 – 2003. Our population estimates prior to the hunting season for adults were 1.62, 2.81, 1.86, and 2.59 times larger, respectively, than population estimates obtained from the May Survey. Our indirect population estimates could be higher than those from the May survey for several reasons: (1) the May population estimates are biased low and our estimates are correct; (2) harvest estimates may be biased high which would inflate our indirect population estimates (Padding and Royle 2012); (3) reporting rates may be underestimated, resulting in harvest rates that are biased low and inflate our indirect population estimates; (4) BWTE outside of areas represented by banding information, and inclusion in harvest rate calculations, have an extremely large contribution to harvest estimates; and (5) some unknown combination of the preceding scenarios.

Based on harvest survey data from the U.S. and Canada, sex ratios (male/female) used to determine adult male and female composition of the population prior to the hunting season were: 1.2, 1.72, 2.22, and 1.64, respectively for the four time periods listed above. Based on harvest survey data from the U.S. and Canada, age ratios (immature/adult) used to determine

the size of the immature population prior to hunting seasons were: 1.01, 0.82, 1.08, and 1.13, respectively for the four time periods listed above.

Band recovery weights

Recovery weights varied substantially among BRAs and time periods (Appendix C). Some BRAs such as the Northern Great Plains BRA, Eastern Dakotas BRA, and Upper Midwest BRA were, at times, grossly under-represented in bandings relative to population size. Conversely, BWTE in other BRAs were banded disproportionately greater than population size. For example, BWTE in BRAs east of 87°W represented 25.4% of direct recoveries before weighting, and only 5.6% after weighting. Generally, weightings were most consistent for bands from the Southern Alberta and Western Saskatchewan BRAs where banding efforts have been relatively constant over time.

Distribution and Relative Density of the Blue-winged Teal Harvest from Breeding Reference Areas to Major and Minor Harvest Areas, 1970 – 2003.

Blue-winged Teal begin their southward migration in the fall as early as late August. Birds typically follow the flyway most near their nesting area, although some crossing over from one flyway to another occurs. The majority of the birds use the Mississippi and Central flyways; relatively small numbers migrate down the Pacific and Atlantic flyways. The flights within flyways are not straight north and south, but rather follow natural waterways (Bennett 1938). The birds spend about 6-8 weeks in migration before reaching their wintering areas.

The migration patterns influence the geographic distribution of the harvest, with birds using the Mississippi and Central flyways comprising the majority of the annual harvest. Although less is known about the ecology and harvest of birds south of the U.S. border, significant concentrations occur in many areas of Mexico, Central America, and South America. Following are descriptions of the distribution and derivation of harvests.

All age/sex classes

The Mississippi Flyway (44%), Latin America (29.5%), and the Central Flyway (15.6%) were the most important major harvest areas for BWTE. Mississippi Flyway – Gulf Coast (19.2%), Mississippi Flyway – Northwest (17.4%), Mexico (13%), and Central Flyway Low Plains – South (11.5%) were the most important minor harvest areas for BWTE (Table 1). Overall, the greatest harvest densities for BWTE occurred along the Gulf Coast region of Louisiana and Texas, followed by north-central Iowa, east-central Wisconsin, and west-central Minnesota (Fig. 12).

Breeding reference areas west of 87°W

The Mississippi Flyway (46%), Latin America (29.9%), and the Central Flyway (16.5%) were the most important major harvest areas for BWTE originating west of 87°W. Mississippi Flyway – Gulf Coast (20.2%), Mississippi Flyway – Northwest (18.4%), Mexico (13.8%), and Central Flyway Low Plains – South (12.2%) were the most important minor harvest areas for BWTE originating west of 87°W (Fig. 13). *Central Alberta BRA.*—Latin America (45.7%) was the most important major harvest area for BWTE from the Central Alberta BRA. Mexico (25.3%), Mississippi Flyway – Gulf Coast (18.0%), Central America (11.2%), and Central Flyway Low Plains – South (11.3%) were important minor harvest areas for birds originating from this area. Few BWTE from this area were harvested in Caribbean countries (2.6%; Table 1; Fig. 14). The highest harvest densities of BWTE from this area occurred in the Gulf Coast region of Louisiana and Texas, and areas of Mexico (Fig. 15).

Southern Alberta BRA.—Of the major harvest areas, Latin America harvested the highest proportion (52.5%) of BWTE from this area. Unlike BWTE from the Central Alberta BRA, many birds originating from this area (11.2%) were harvested in Alberta. Mexico (36.1%) and Mississippi Flyway – Gulf Coast (13.2%) were important minor harvest areas. Similar to harvest distribution from the Central Alberta BRA, Central America (10.9%) was also an important minor harvest area, and few (1.4%) birds were harvested in Caribbean countries (Table 1, Fig. 16). The highest harvest densities of BWTE from this area occurred in southern Alberta, the Gulf Coast region of Louisiana and Texas, and areas of Mexico (Fig. 17).

Western Saskatchewan BRA.—Latin America (38.5%) and the Mississippi Flyway (37.7%) were equally important major harvest areas for BWTE from the Western Saskatchewan BRA. Mississippi Flyway – Gulf Coast (20.4%), Mexico (19.5%), Central Flyway Low Plains – South (13.3%), and Mississippi Flyway – Northwest (10.0%) were important minor harvest areas for these birds (Table 1, Fig. 18). The highest harvest densities of BWTE from this region occurred in the Gulf Coast region of Louisiana and Texas, and the Central Highlands of Mexico (Fig. 19).

Eastern Saskatchewan/Southwest Manitoba BRA.—The Mississippi Flyway (44.3%) was the most important major harvest area for BWTE from this area. Mississippi Flyway – Gulf Coast (21.7%), Mississippi Flyway – Northwest (14.2%), Mexico (11.7%), and Central Flyway Low Plains – South (10.6%) were the most important minor harvest areas for birds originating in this area (Table 1, Fig. 20). Southwest Manitoba and the Gulf Coast region of Louisiana and Texas are areas of highest harvest density of BWTE from this region, with moderate harvest densities in many other areas (Fig. 21).

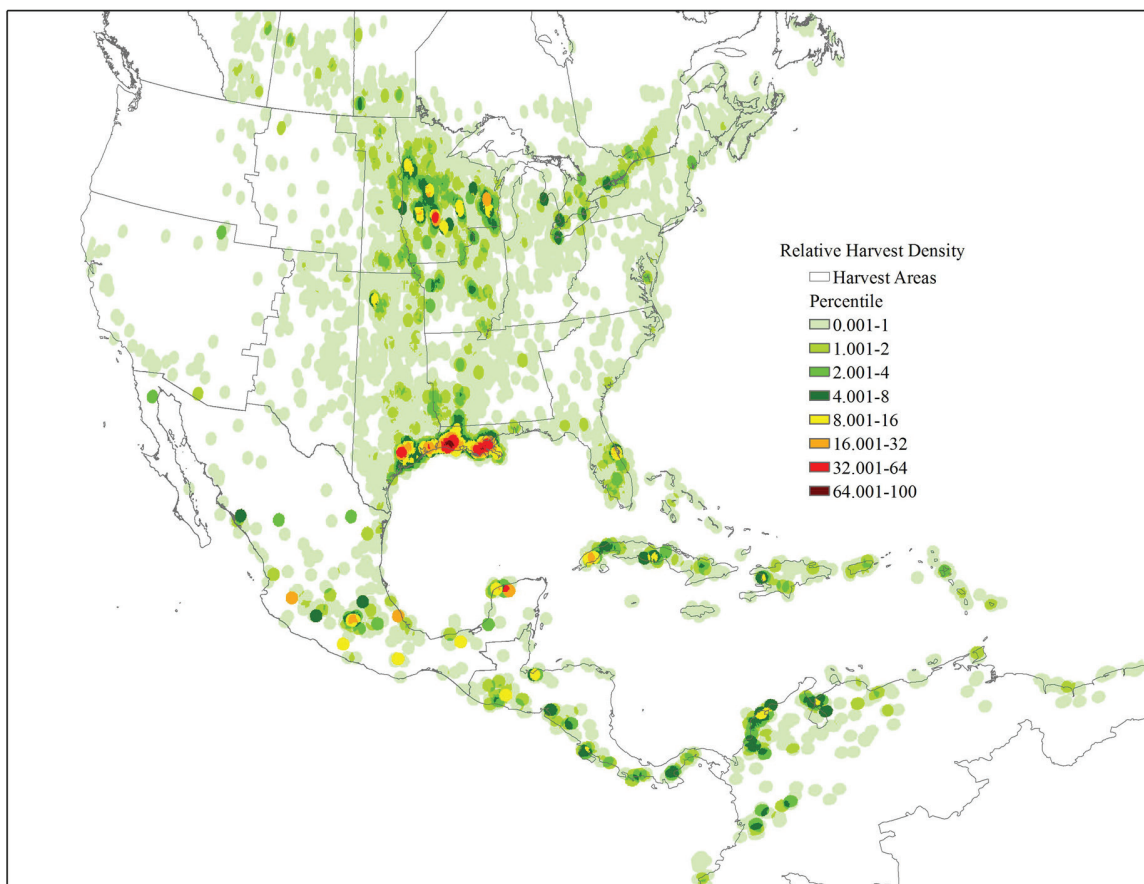


Figure 12. Relative harvest density derived from direct recoveries ($n = 15,099$) of Blue-winged Teal from all breeding reference areas and all sex/age classes, 1970 – 2003.

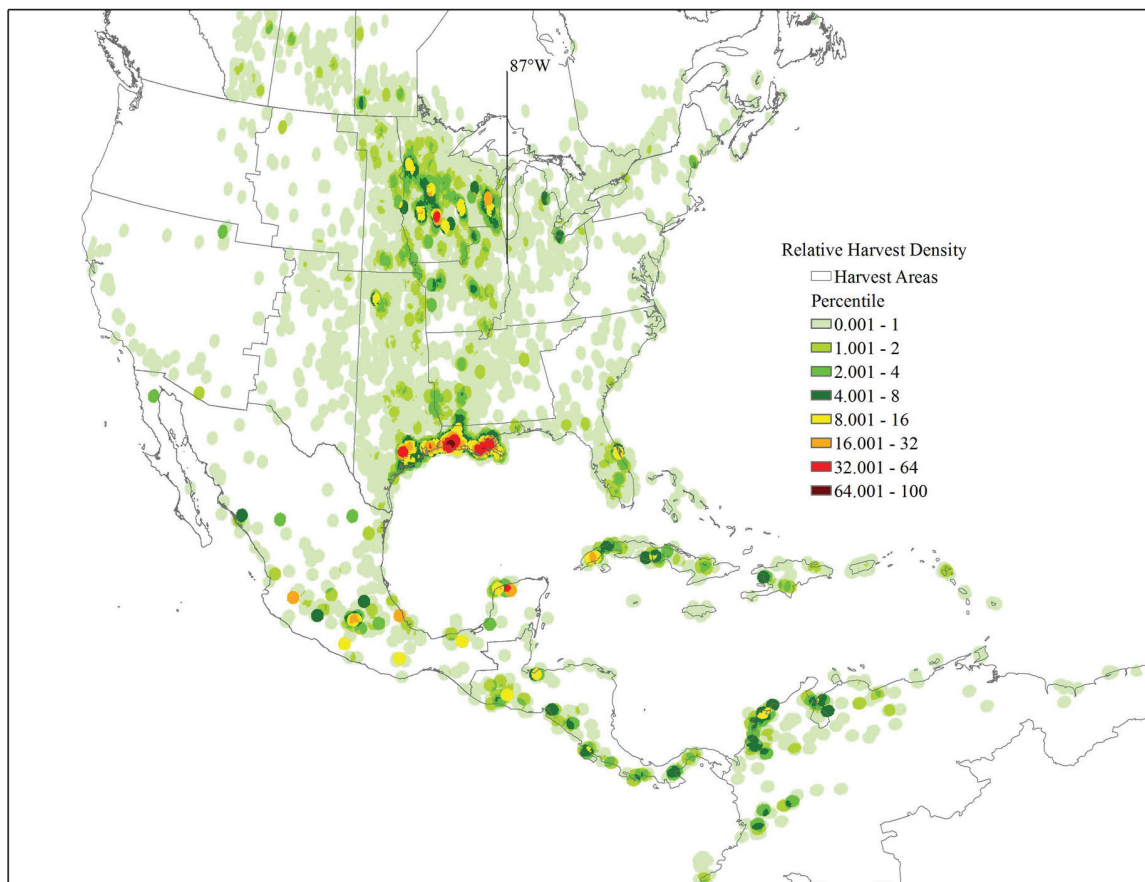


Figure 13. Relative harvest density derived from direct recoveries ($n = 11,254$) of Blue-winged Teal banded in breeding reference areas west of 87°W for all age/sex classes, 1970 – 2003.



Figure 14. Distribution of the Blue-winged Teal harvest based on direct recoveries ($n = 756$), from the Central Alberta Breeding Reference Area (shaded) for all age/sex classes, 1970 – 2003.

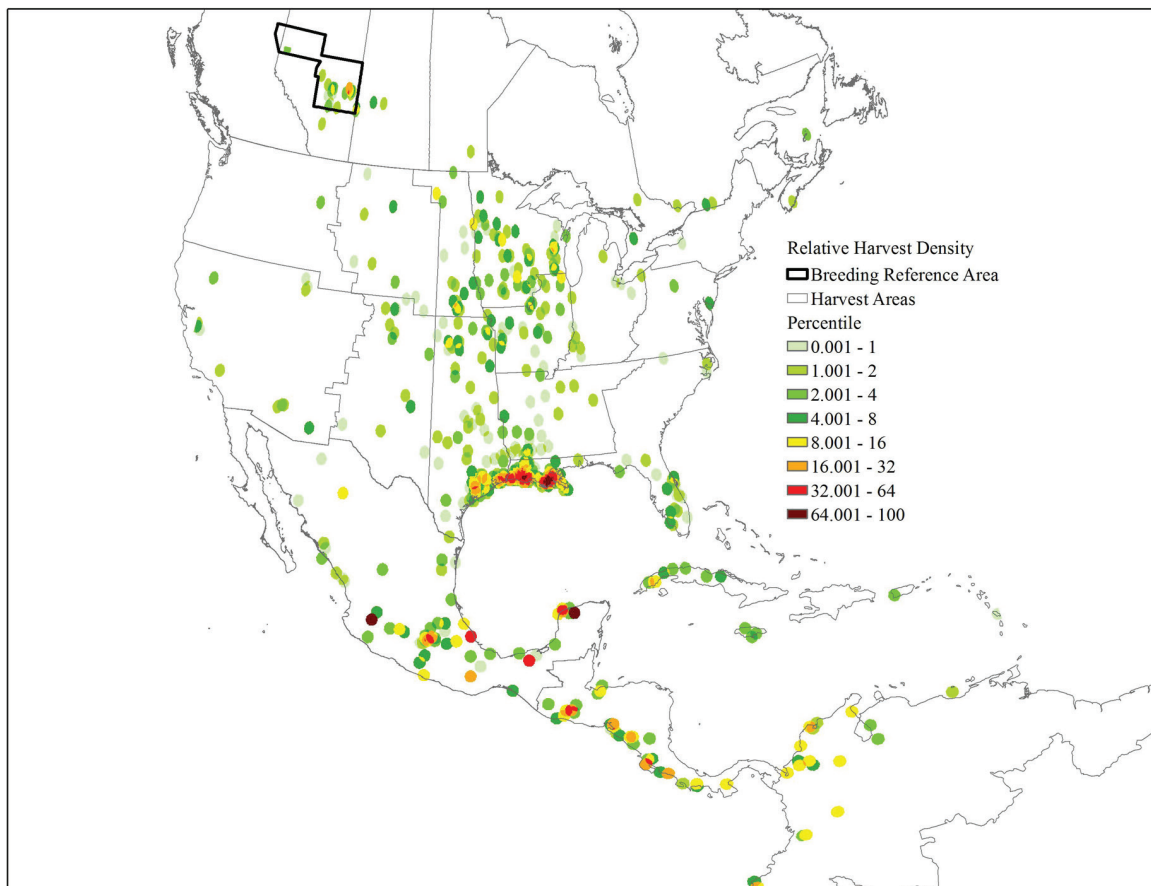


Figure 15. Relative harvest density derived from direct recoveries ($n = 756$) of Blue-winged Teal banded in the Central Alberta Breeding Reference Area for all age/sex classes, 1970 – 2003.



Figure 16. Distribution of the Blue-winged Teal harvest, based on direct recoveries ($n = 819$), from the Southern Alberta Breeding Reference Area (shaded) for all age/sex classes, 1970 – 2003.

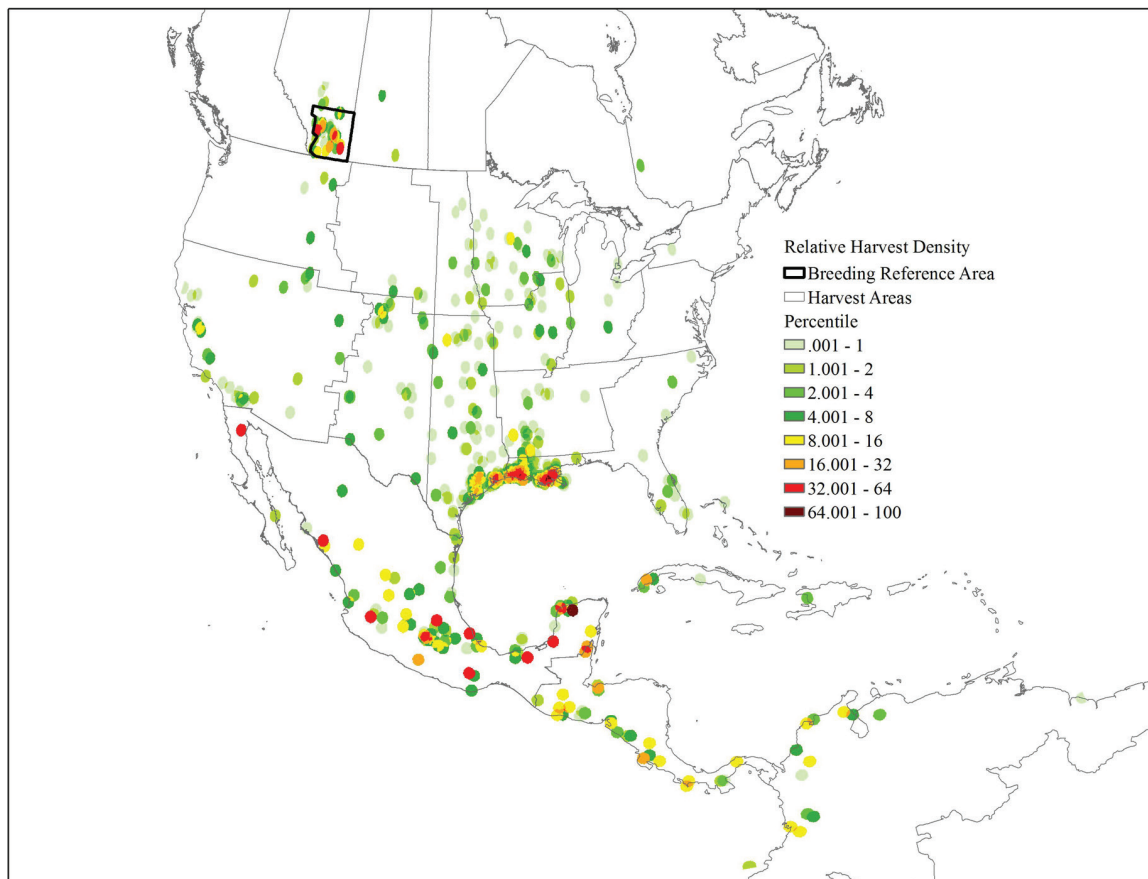


Figure 17. Relative harvest density derived from direct recoveries ($n = 819$) of Blue-winged Teal banded in the Southern Alberta Breeding Reference Area for all age/sex classes, 1970 – 2003.

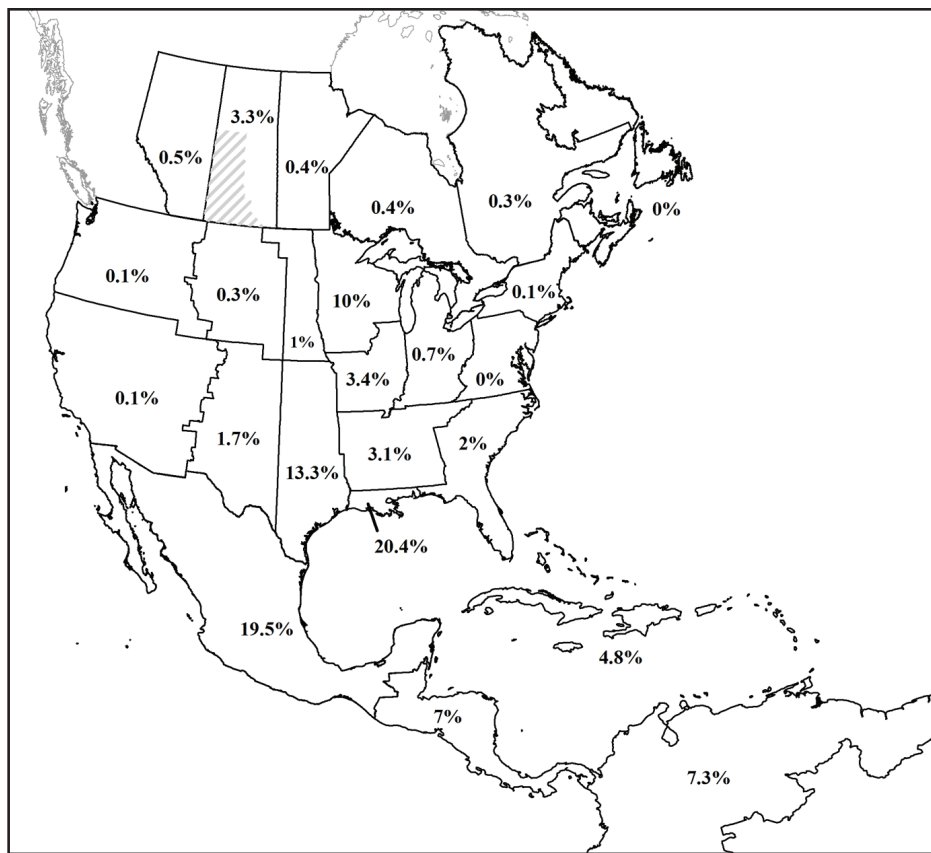


Figure 18. Distribution of the Blue-winged Teal harvest, based on direct recoveries ($n = 1,140$), from the Western Saskatchewan Breeding Reference Area (shaded) for all age/sex classes, 1970 – 2003.

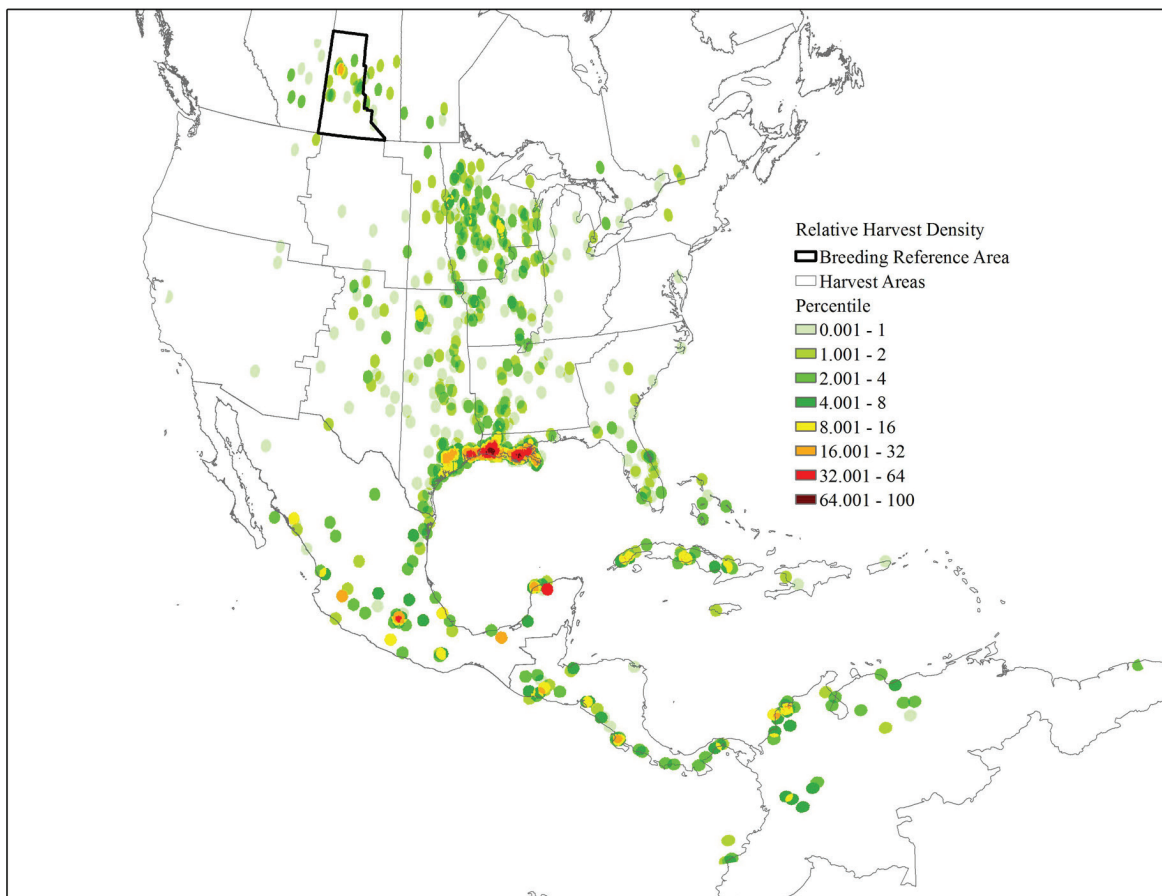


Figure 19. Relative harvest density derived from direct recoveries ($n = 1,140$) of Blue-winged Teal banded in the Western Saskatchewan Breeding Reference Area for all age/sex classes, 1970 – 2003.



Figure 20. Distribution of the Blue-winged Teal harvest, based on direct recoveries ($n = 3,168$), from the Eastern Saskatchewan/Southwest Manitoba Breeding Reference Area (shaded) for all age/sex classes, 1970 – 2003.

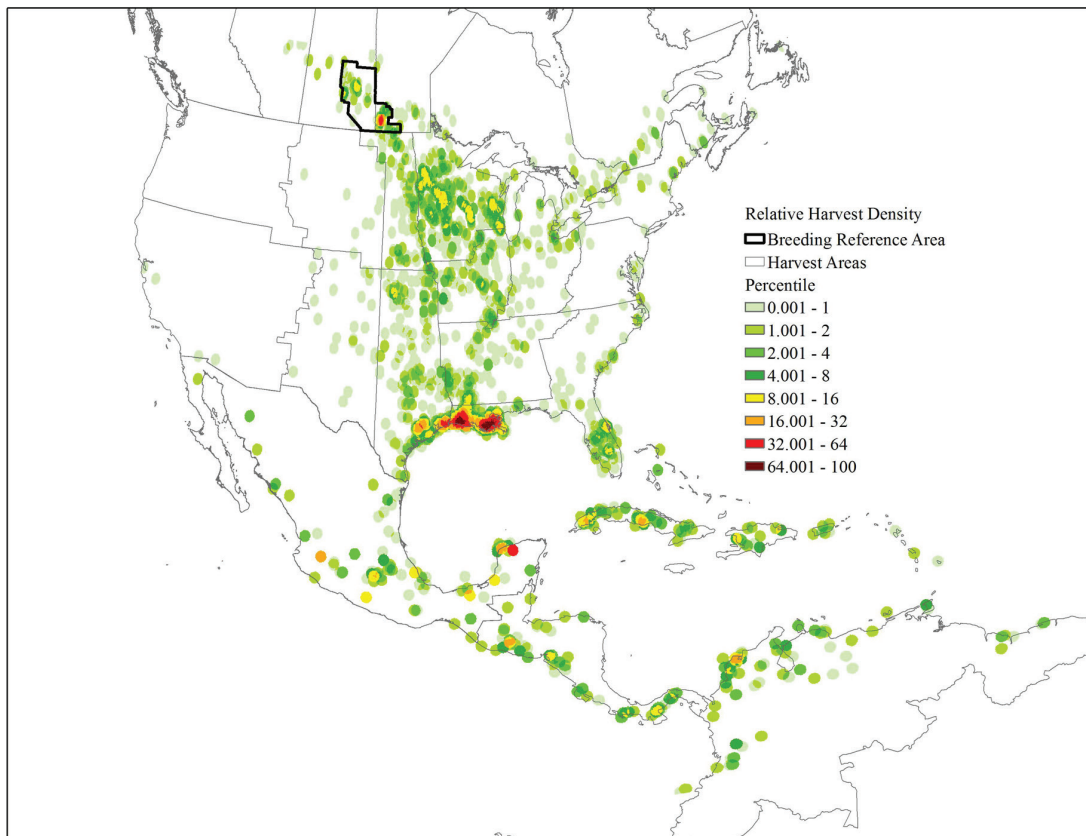


Figure 21. Relative harvest density derived from direct recoveries ($n = 3,168$) of Blue-winged Teal banded in the Eastern Saskatchewan/Southwest Manitoba Breeding Reference Area for all age/sex classes, 1970 – 2003.

West-central Manitoba BRA.—Similar to BWTE from the eastern Saskatchewan/Southwest Manitoba BRA, 53.7% of the BWTE from this area were harvested in the Mississippi Flyway major harvest area. Mississippi Flyway – Northwest (31.0%), Mississippi Flyway – Gulf Coast (14.6%), and Caribbean countries (8.4%) were the most important minor harvest areas for these birds (Table 1, Fig. 22). The highest harvest densities of BWTE from west-central Manitoba occurred in south-central Manitoba, south-central Minnesota, east-central Wisconsin, the Gulf Coast region of Louisiana, and Haiti (Fig. 23). Blue-winged Teal from this BRA appear to have considerably more exposure to harvest than birds from most other BRAs west of 87°W (Table 1, Fig. 23).

Northern Great Plains BRA.—Similar to birds from Alberta, 50.9% of BWTE from this area were harvested in the Latin America major harvest area; however, Caribbean countries only accounted for 2.1% of the total harvest of BWTE from the Northern Great Plains BRA. Central Flyway Low Plains – South (15.6%) and Mississippi Flyway – Gulf Coast (10.9%) were the most important minor harvest areas for these birds (Table 1, Fig. 24). The highest harvest densities of BWTE from this region occurred in the Gulf Coast region of western Louisiana into Texas, and throughout Mexico (Fig. 25).

Table 1. Distribution of the Blue-winged Teal harvest for all age/sex classes, 1970 - 2003.

Harvest Area	Breeding Reference Area												Total
	Central Alberta	S. Alberta ^a	W. SK ^b	E. SK / SW MB ^c	WC MB ^d	N. Grt. Plains ^e	Eastern Dakotas	Upper Midwest	U.S. Great Lakes	E. ON / S. PQ ^f	Maritimes / Maine	NE States ^g	
Alberta	2.9%	11.2%	0.5%	0.1%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.7%
Saskatchewan	0.7%	0.3%	3.3%	1.9%	0.8%	0.7%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.9%
Manitoba	0.1%	0.0%	0.4%	3.0%	6.7%	0.0%	0.1%	0.0%	0.1%	0.0%	0.0%	0.0%	1.0%
Ontario	0.4%	0.0%	0.4%	1.1%	2.2%	0.1%	0.3%	0.4%	41.0%	44.6%	0.3%	1.5%	2.6%
Quebec	0.5%	0.1%	0.3%	0.6%	0.9%	0.0%	0.0%	0.4%	2.0%	19.8%	12.1%	2.3%	0.8%
Maritimes	0.1%	0.0%	0.0%	0.3%	0.1%	0.0%	0.0%	0.1%	1.1%	2.3%	32.9%	0.5%	0.2%
Canada	4.5%	11.6%	5.0%	7.0%	10.7%	0.7%	0.6%	0.9%	44.2%	66.7%	45.2%	4.3%	6.2%
PF North ^h	0.2%	0.6%	0.1%	0.0%	0.0%	0.2%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.1%
PF South	1.1%	0.6%	0.1%	0.0%	0.0%	1.5%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.5%
Pacific Flyway	1.2%	3.7%	0.3%	0.1%	0.0%	1.8%	0.5%	0.0%	0.0%	0.0%	0.0%	0.0%	0.5%
CF HP North ⁱ	0.7%	0.4%	0.3%	0.1%	0.1%	3.5%	0.5%	0.0%	0.0%	0.0%	0.0%	0.0%	0.5%
CF LP North ^j	2.5%	0.3%	1.0%	2.8%	1.7%	4.0%	5.5%	0.0%	0.0%	0.0%	0.0%	0.0%	2.8%
CF HP South	1.3%	2.5%	1.7%	0.5%	0.3%	2.6%	0.4%	0.0%	0.0%	0.0%	0.0%	0.0%	0.8%
CF LP South	11.3%	8.8%	13.3%	10.6%	6.3%	15.6%	17.1%	3.7%	0.3%	0.0%	0.1%	1.5%	11.5%
Central Flyway	15.8%	12.0%	16.3%	14.0%	8.3%	25.7%	23.5%	3.7%	0.3%	0.0%	0.1%	1.5%	15.6%
MF Northwest ^k	7.4%	2.2%	10.0%	14.2%	31.0%	4.3%	14.5%	54.6%	0.5%	0.1%	0.1%	0.0%	17.4%
MF Northeast	0.5%	0.4%	0.7%	1.7%	2.5%	0.6%	2.0%	2.4%	10.6%	0.8%	0.1%	1.7%	1.8%
MF West-central	2.7%	1.4%	3.4%	3.9%	3.3%	1.4%	3.3%	3.2%	0.4%	0.5%	0.1%	0.3%	3.0%
MF South	1.8%	2%	3.1%	2.8%	2.2%	2.7%	2.6%	2.7%	0.3%	0.5%	0.1%	0.3%	2.5%
MF Gulf Coast	18.0%	13.2%	20.4%	21.7%	14.6%	10.9%	26.6%	13.1%	4.2%	2.6%	1.7%	0.8%	19.2%
Mississippi Flyway	30.5%	19.4%	37.7%	44.3%	53.7%	19.9%	49.1%	76.0%	15.9%	4.5%	2.1%	3.0%	44.0%
AF North ^l	0.0%	0.0%	0.1%	0.6%	1.2%	0.1%	0.5%	0.1%	2.4%	11.4%	15.1%	22.1%	0.9%
AF Central	0.3%	0.0%	0.0%	0.3%	0.9%	0.0%	0.5%	0.1%	2.7%	1.6%	1.4%	25.6%	0.6%
AF South	1.9%	0.7%	2%	3.3%	4.7%	0.8%	2.6%	3.6%	7.2%	2.9%	2.4%	8.5%	2.8%
Atlantic Flyway	2.2%	0.8%	2.2%	4.2%	6.8%	0.9%	3.7%	3.8%	12.4%	15.9%	18.8%	56.1%	4.3%
Mexico	25.3%	36.1%	19.5%	11.7%	4.0%	39.6%	8.5%	1.9%	0.1%	0.2%	0.1%	0.6%	13.0%
Central America	11.2%	10.9%	7.0%	5.6%	2.5%	5.3%	3.6%	0.9%	0.6%	0.0%	0.0%	0.6%	4.7%
South America	6.7%	4.1%	7.3%	5.9%	5.5%	3.9%	5.0%	7.0%	9.8%	2.5%	11.2%	7.5%	5.8%
Caribbean	2.6%	1.4%	4.8%	7.2%	8.4%	2.1%	5.5%	5.7%	16.6%	10.2%	22.3%	26.3%	5.9%
Latin America	45.7%	52.5%	38.5%	30.4%	20.4%	50.9%	22.7%	15.6%	27.1%	12.9%	33.7%	35.0%	29.5%

^a = Southern Alberta; ^b = Western Saskatchewan; ^c = Eastern Saskatchewan / Southwest Manitoba; ^d = West-central Manitoba; ^e = Northern Great Plains;

^f = Eastern Ontario / Southern Quebec; ^g = Northeast States; ^h = Pacific Flyway; ⁱ = Central Flyway High Plains; ^j = Central Flyway Low Plains

^k = Mississippi Flyway; ^l = Atlantic Flyway



Figure 22. Distribution of the Blue-winged Teal harvest, based on direct recoveries ($n = 1,802$), from the West-central Manitoba Breeding Reference Area (shaded) for all age/sex classes, 1970 – 2003.

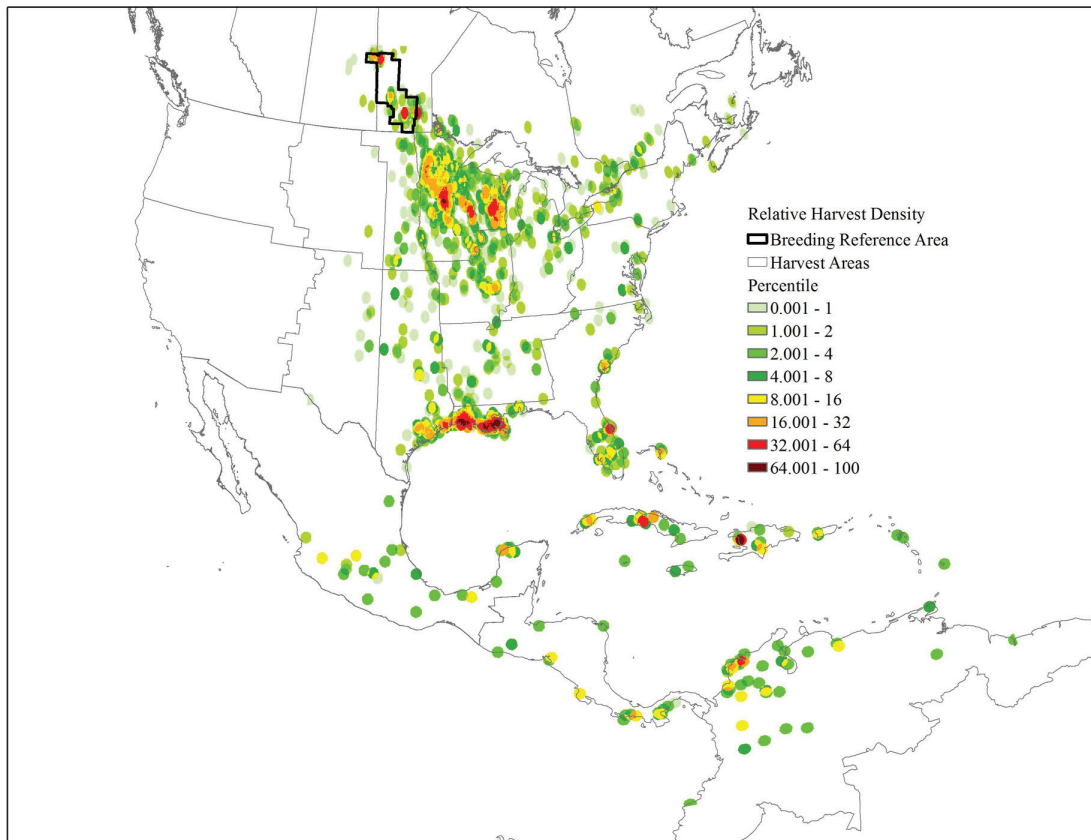
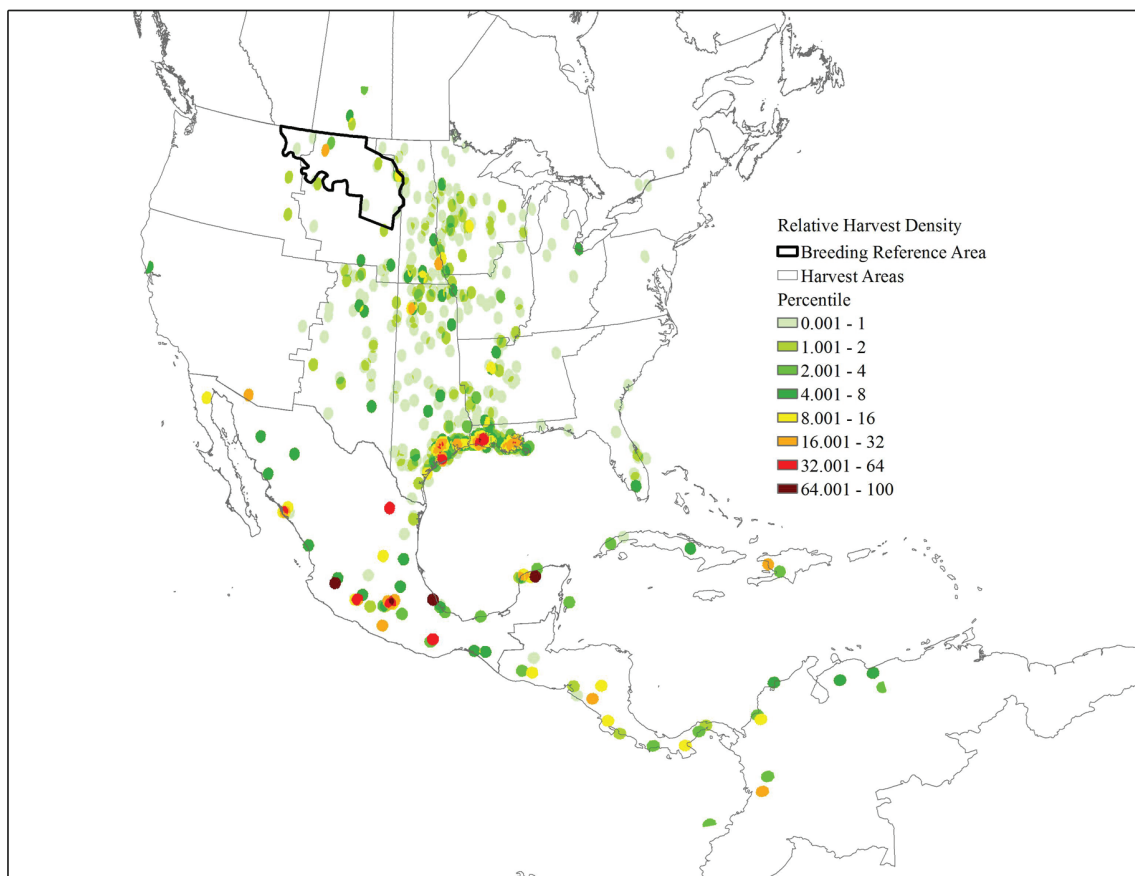


Figure 23. Relative harvest density derived from direct recoveries ($n = 1,802$) of Blue-winged Teal banded in the West-central Manitoba Breeding Reference Area for all age/sex classes, 1970 – 2003.



Eastern Dakotas BRA.—The Mississippi Flyway (49.1%) was the most important major harvest area for BWTE from this area. However, the Central Flyway and Latin America major harvest areas also accounted for 23.5% and 22.7%, respectively, of the total harvest of BWTE originating in the Eastern Dakotas BRA. Mississippi Flyway – Gulf Coast (26.6%), Central Flyway Low Plains – South (17.1%), and Mississippi Flyway – Northwest (14.5%) were the most important minor harvest areas for these birds (Table 1, Fig. 26). Blue-winged Teal from this BRA are harvested at their highest densities in the Gulf Coast region of Louisiana and Texas, and east-central Wisconsin, with many other areas experiencing relatively low harvest densities (Fig. 27).

Upper Midwest BRA.—The Mississippi Flyway (76.0%) was by far the most important major harvest area for BWTE from this area. Mississippi Flyway – Northwest (54.6%) and Mississippi Flyway – Gulf Coast (13.1%) were the most important minor harvest areas for these birds. This BRA is unique in that most of the birds harvested in this area originated within the BRA (Table 1, Fig. 28). Given that most BWTE recoveries from this BRA also occurred in the same harvest area, it is not surprising that the highest harvest density for these birds occurred in north-central Iowa, with relatively moderate harvest densities also occurring throughout Minnesota, east-central Wisconsin, and the Gulf Coast region of Louisiana (Fig. 29). Blue-winged Teal from this BRA, along with those from west-central Manitoba, appear to have considerably more exposure to harvest than birds from other BRAs west of 87°W (Table 1).

Breeding reference areas east of 87°W

Canada (48.2%), the Atlantic Flyway (22.9%), and Latin America (18.9%) were the most important minor harvest areas for BWTE originating east of 87°W. Ontario (36.2%), Caribbean countries (15.5%), and Quebec (9.2%) were the most important harvest areas for BWTE originating east of 87°W (Table 1, Fig. 30). The highest harvest densities of BWTE east of 87°W were along the St. Lawrence River, and eastern Great Lakes. The Gulf Coast region of eastern Louisiana and much of the eastern Caribbean also had relatively moderate harvest densities of BWTE from east of 87°W (Fig. 30).

U.S. Great Lakes BRA.—This area is the westernmost BRA east of 87°W, which represents a major division in the distribution of harvest of BWTE. Canada (44.3%) was the most important major harvest areas for BWTE from this BRA. However, 27.1% of the total harvest of this area's birds occurred in Latin America. Ontario (41%), Caribbean countries (16.6%), Mississippi Flyway – Northeast (10.6%), and South America (9.8%) were the most important minor harvest areas for these birds (Table 1, Fig. 31). High harvest density areas for these birds occurred mostly along the St. Lawrence River and eastern Great Lakes, with areas of moderate harvest density in the Gulf Coast region of eastern Louisiana and Haiti. Much of Michigan, southern Florida, and the

Caribbean had areas with relatively low harvest densities of BWTE from the U.S. Great Lakes BRA (Fig. 32).

Eastern Ontario/Southern Quebec BRA.—Similar to the U.S. Great Lakes BRA, Canada (64.4%) was the most important major harvest area for birds originating in the Eastern Ontario/Southern Quebec BRA. Ontario (44.6%), Quebec (19.8%), Atlantic Flyway – North (11.4%), and Caribbean countries (10.2%) were the most important minor harvest areas for these birds (Table 1, Fig. 33). Similar to birds from the U.S. Great Lakes BRA, high harvest density areas for BWTE from this region occurred mostly along the St. Lawrence River and eastern Great Lakes, with areas of low harvest density in the Gulf Coast region of eastern Louisiana and across the Caribbean (Fig. 34).

Maritimes/Maine BRA.—Similar to the two aforementioned BRAs, Canada (45.2%) was the most important major harvest area for birds originating in the Maritimes/Maine BRA. Latin America (33.7%) was also an important major harvest area for birds from this BRA; however, virtually no BWTE from this area were harvested in Mexico or Central America. The Maritimes provinces (32.9%), Caribbean countries (22.3%), Atlantic Flyway – North (15.1%), Quebec (12.1%), and South America (11.2%) were the most important minor harvest areas for these birds (Table 1, Fig. 35). Highest harvest density areas of BWTE from this region occurred along the Atlantic coast of the southern Maritimes and southern Maine, and in the eastern Lesser Antilles Islands. Areas of relatively moderate harvest density of BWTE from the Maritimes and Maine occurred near the St. Lawrence River, the Gulf Coast region of eastern Louisiana, and across the eastern Caribbean (Fig. 36).

Northeast States BRA.—The Atlantic Flyway (56.1%) was the most important major harvest area for BWTE from this area. However, Latin America (35.0%) also accounted for a large portion of the harvest of these birds. Caribbean countries (26.3%), Atlantic Flyway – Central (25.6%), and Atlantic Flyway – North (22.1%) were the most important minor harvest areas for these birds (Table 1, Fig. 37). Highest harvest density areas for BWTE from the Northeast States BRA occurred near Long Point, Ontario, Chesapeake Bay, and Haiti. Relatively moderate harvest density for these birds occurred in the Finger Lakes Region of New York, and across the eastern Caribbean, particularly the Lesser Antilles Islands (Fig. 38).

All breeding reference areas by age/sex class

Adult males.—The Mississippi Flyway (46.5%), Latin America (34.7%), and the Central Flyway (11.6%) were the most important major harvest areas for adult male BWTE. Mississippi Flyway – Gulf Coast (25.9%), Mexico (16.5%), Mississippi Flyway – Northwest (15%), and Central Flyway Low Plains – South (10%) were the most important minor harvest areas for adult male BWTE (Table 2).



Figure 26. Distribution of the Blue-winged Teal harvest, based on direct recoveries ($n = 1,852$), from the Eastern Dakotas Breeding Reference Area (shaded) for all age/sex classes, 1970 – 2003.

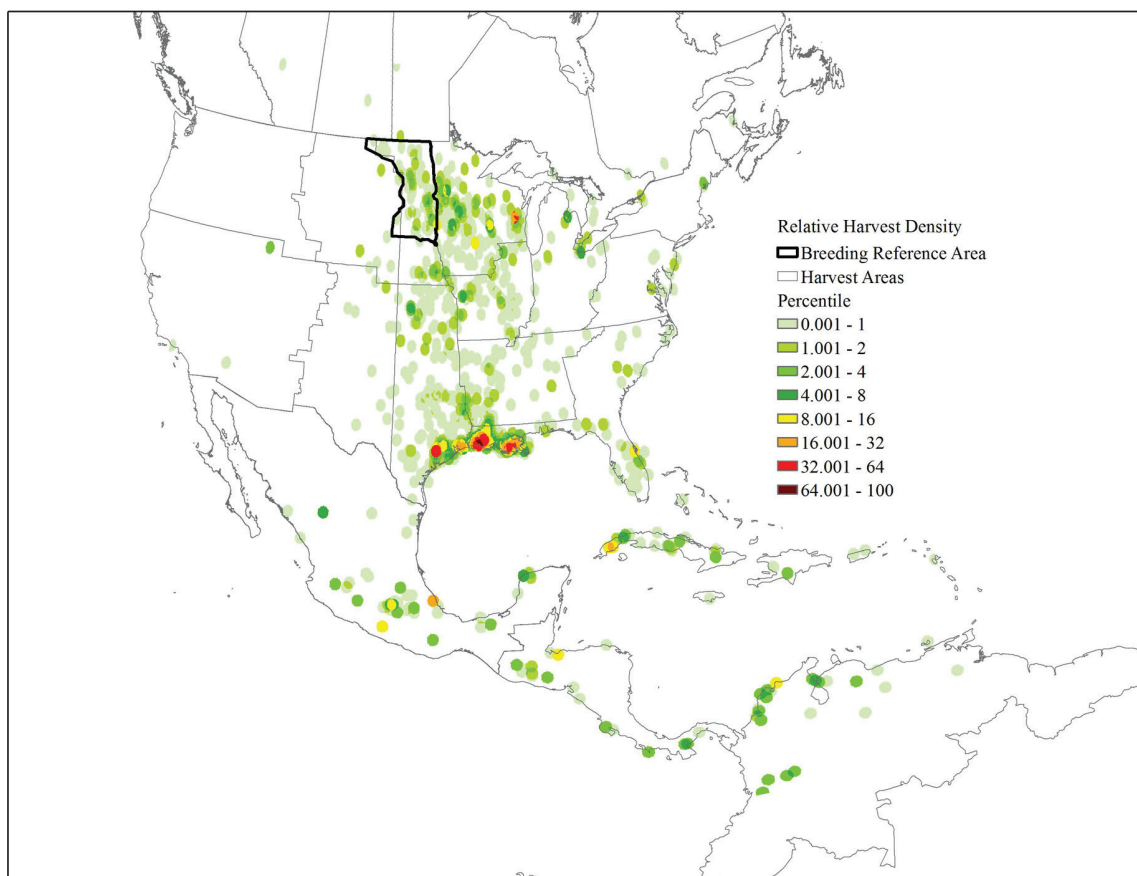


Figure 27. Relative harvest density derived from direct recoveries ($n = 1,852$) of Blue-winged Teal banded in the Eastern Dakotas Breeding Reference Area for all age/sex classes, 1970 – 2003.



Figure 28. Distribution of the Blue-winged Teal harvest, based on direct recoveries ($n = 902$), from the Upper Midwest Breeding Reference Area (shaded) for all age/sex classes, 1970 – 2003.

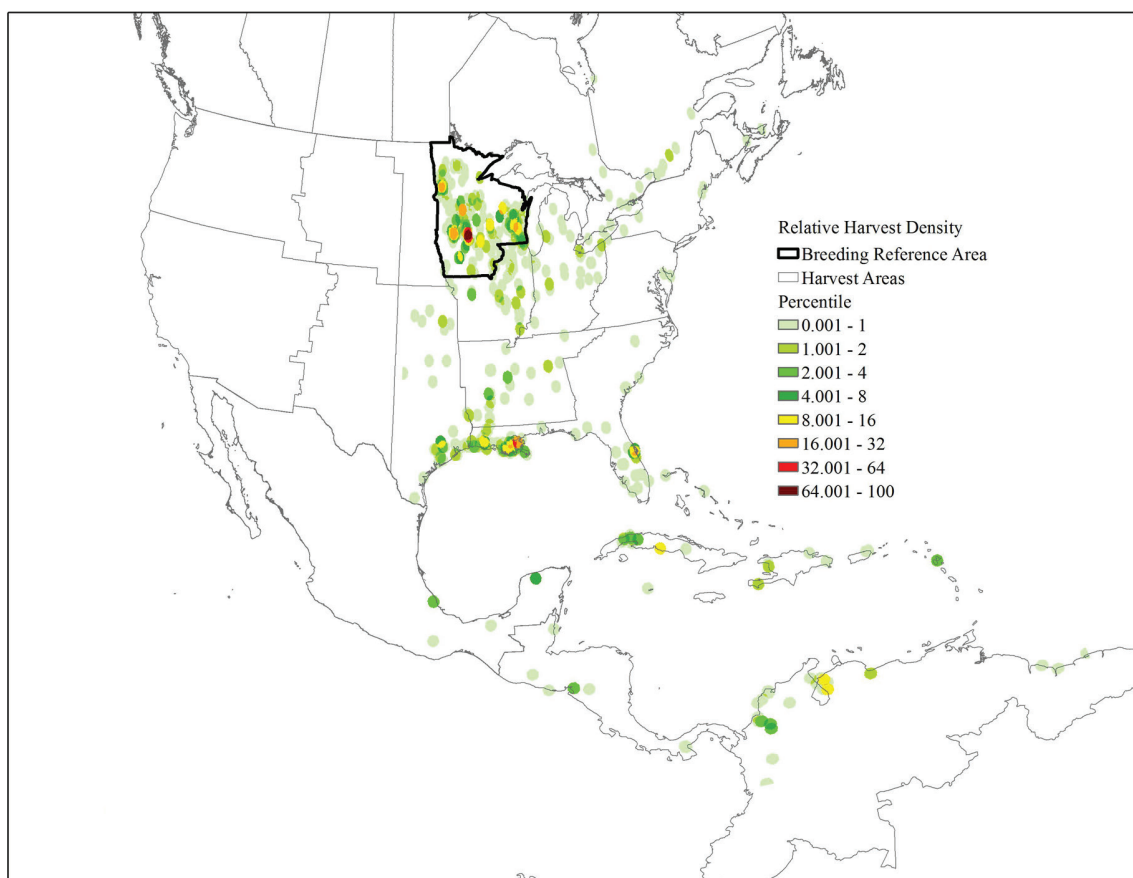


Figure 29. Relative harvest density derived from direct recoveries ($n = 902$) of Blue-winged Teal banded in the Upper Midwest Breeding Reference Area for all age/sex classes, 1970 – 2003.

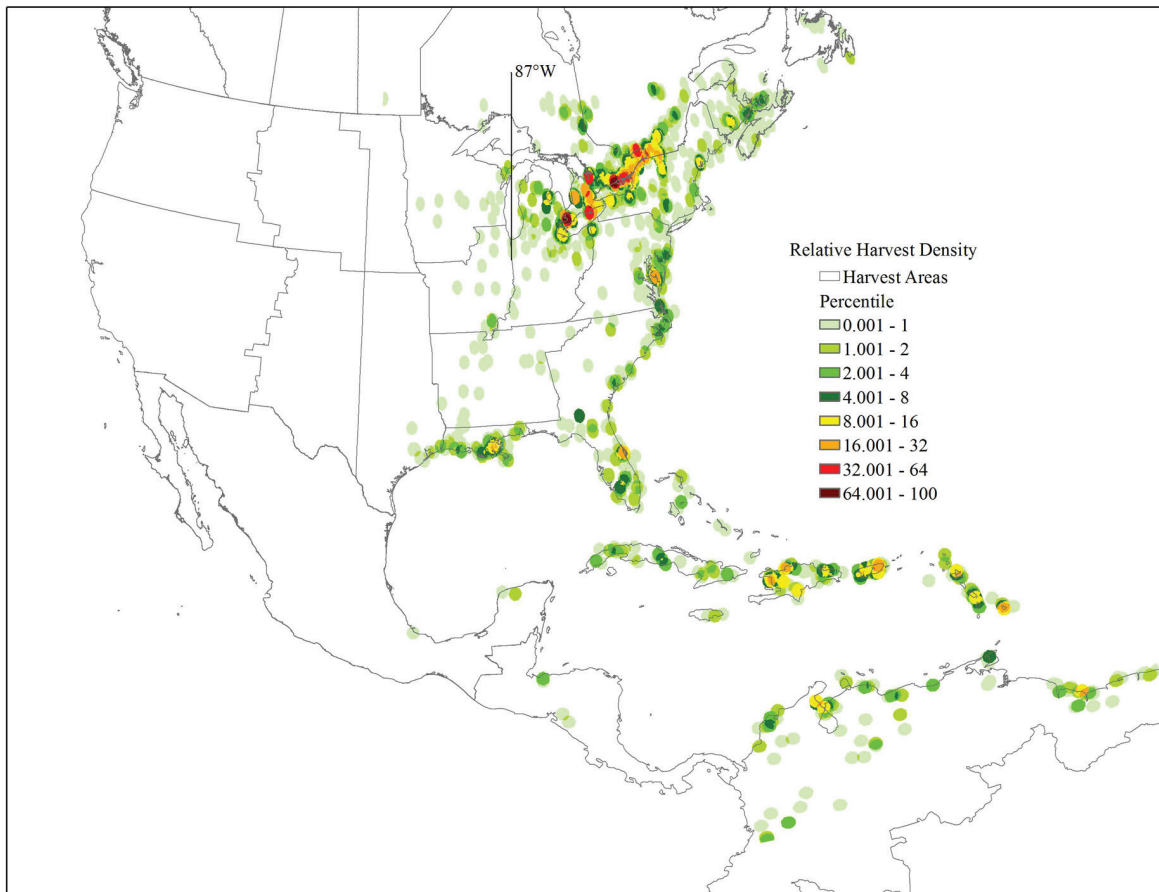


Figure 30. Relative harvest density derived from direct recoveries ($n = 3,845$) of Blue-winged Teal banded in breeding reference areas east of 87°W for all age/sex classes, 1970 – 2003.



Figure 31. Distribution of the Blue-winged Teal harvest, based on direct recoveries ($n = 1,033$), from the U.S. Great Lakes Breeding Reference Area (shaded) for all age/sex classes, 1970 – 2003.

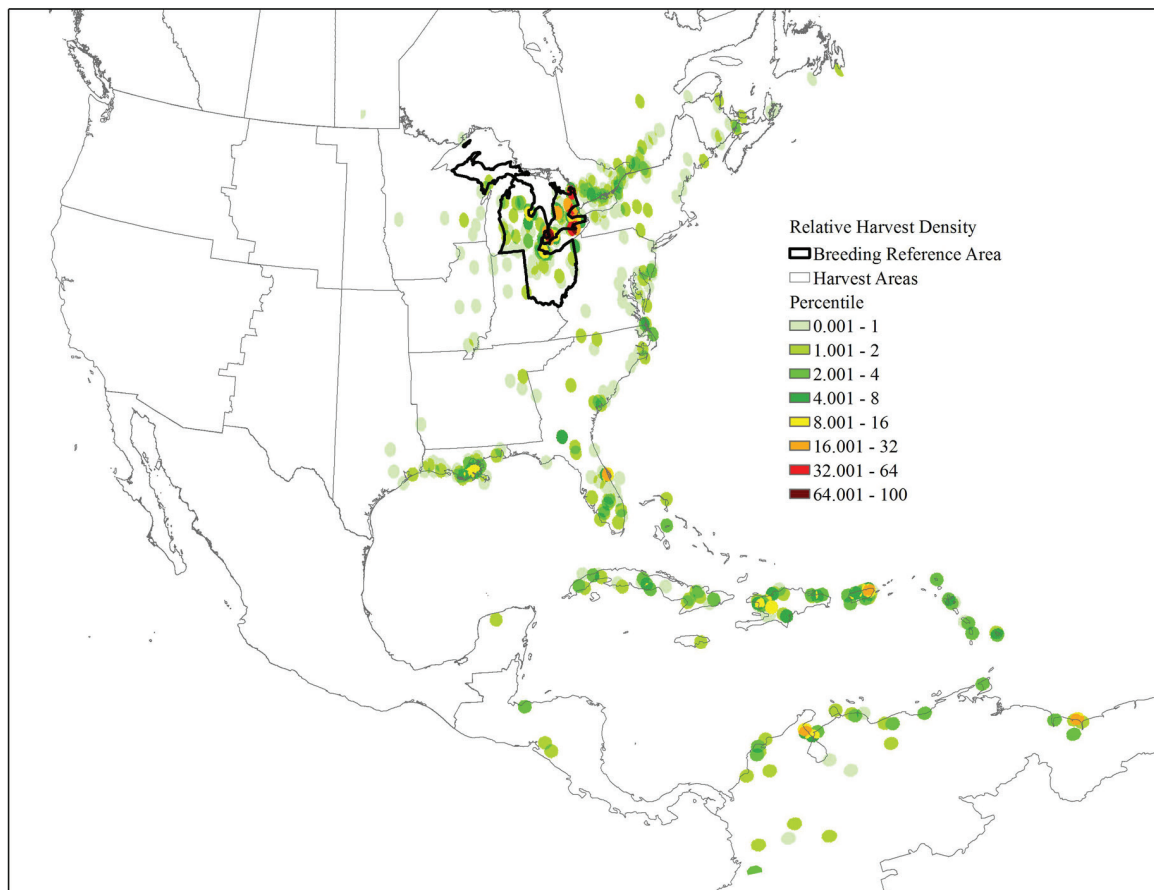


Figure 32. Relative harvest density derived from direct recoveries ($n = 1,033$) of Blue-winged Teal banded in the U.S. Great Lakes Breeding Reference Area for all age/sex classes, 1970 – 2003.



Figure 33. Distribution of the Blue-winged Teal harvest, based on direct recoveries ($n = 1,093$), from the Eastern Ontario/Southern Quebec Breeding Reference Area (shaded) for all age/sex classes, 1970 – 2003.

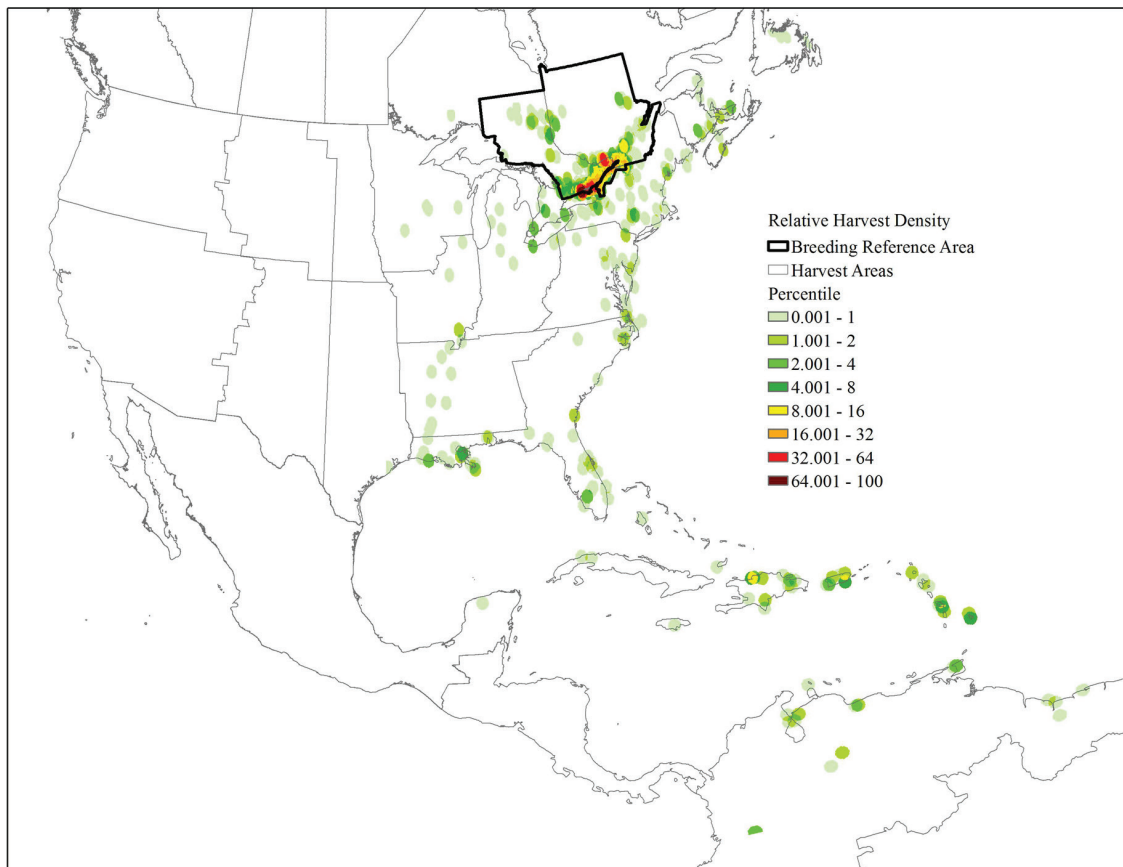


Figure 34. Relative harvest density derived from direct recoveries ($n = 1,093$) of Blue-winged Teal banded in the Eastern Ontario/Southern Quebec Breeding Reference Area for all age/sex classes, 1970 – 2003.



Figure 35. Distribution of the Blue-winged Teal harvest, based on direct recoveries ($n = 1,127$), from the Maritimes/Maine Breeding Reference Area (shaded) for all age/sex classes, 1970 – 2003.

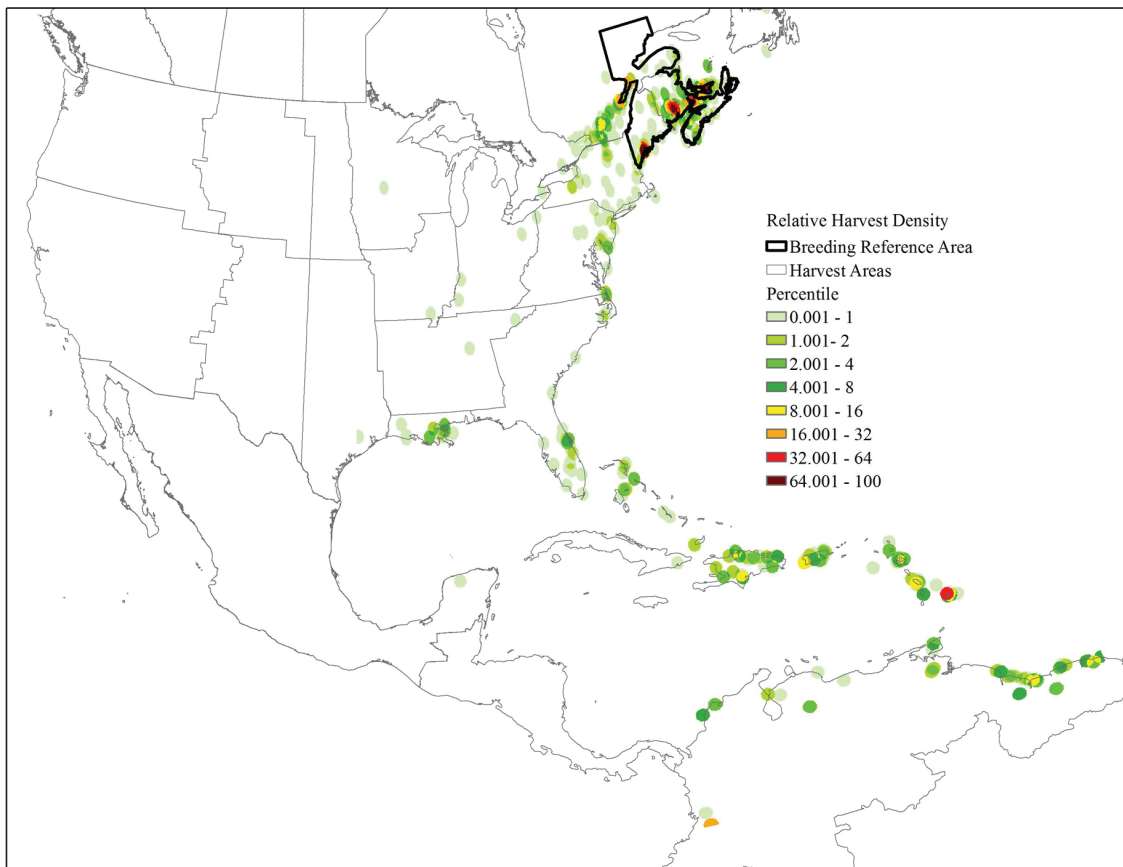


Figure 36. Relative harvest density derived from direct recoveries ($n = 1,127$) of Blue-winged Teal banded in the Maritimes/Maine Breeding Reference Area for all age/sex classes, 1970 – 2003.



Figure 37. Distribution of the Blue-winged Teal harvest, based on direct recoveries ($n = 592$), from the Northeast States Breeding Reference Area (shaded) for all age/sex classes, 1970 – 2003.

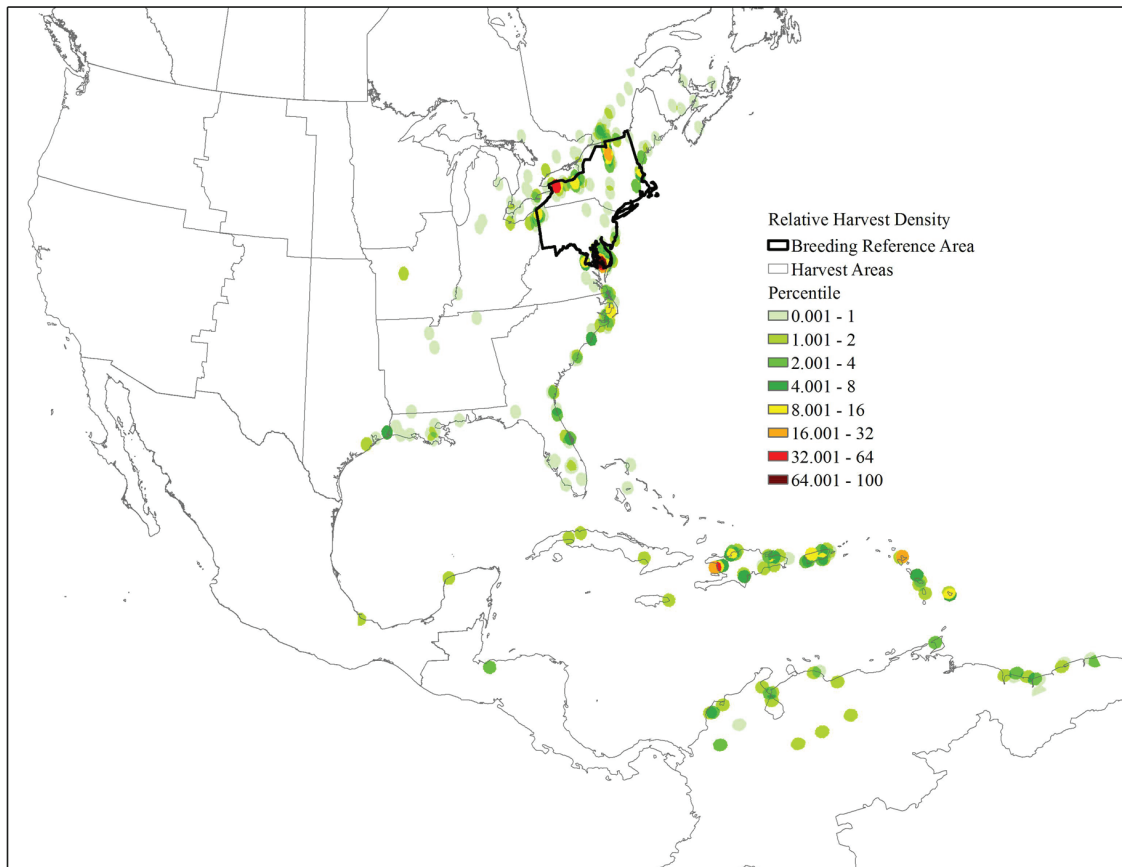


Figure 38. Relative harvest density derived from direct recoveries ($n = 592$) of Blue-winged Teal banded in the Northeast States Breeding Reference Area for all age/sex classes, 1970 – 2003.

Adult females.—The Mississippi Flyway (43.5%), Central Flyway (22.5%), and Latin America (24.2%) were the most important major harvest areas for adult female BWTE. Central Flyway Low Plains – South (19.9%), Mississippi Flyway – Gulf Coast (18.4%), and Mississippi Flyway – Northwest (17.3%) were the most important minor harvest areas for adult female BWTE (Table 3).

Immature males.—The Mississippi Flyway (41.3%), Latin America (29.8%), and the Central Flyway (17.3%) were the most important major harvest areas for immature male BWTE. Mississippi Flyway – Northwest (17.4%), Mississippi Flyway – Gulf Coast (16.2%), Mexico (13.5%), and Central Flyway Low Plains – South (11.1%) were the most important minor harvest areas for immature male BWTE (Table 4).

Immature females.—The Mississippi Flyway (44.7%), Latin America (28%), and the Central Flyway (13.5%) were the most important major harvest areas for immature female BWTE. Mississippi Flyway – Northwest (19.4%), Mississippi Flyway – Gulf Coast (17.2%), and Mexico (12.7%) were the most important minor harvest areas for immature female BWTE (Table 5).

Derivation of the Blue-winged Teal Harvest from Breeding Reference Areas, 1970 – 2003

All age/sex classes

The Eastern Dakotas BRA contributed the most (29.8%) to the total BWTE harvest for all years. Blue-winged Teal from the Eastern Saskatchewan/Southwestern Manitoba (16.9%), Upper Midwest (12.1%), and Western Saskatchewan (11.0%) BRAs were also important contributors to the total BWTE harvest from 1970 – 2003 (Table 6).

Canada

Alberta.—Alberta is on the northern and western portion of the BWTE primary breeding range. It is not surprising to find that Southern Alberta (51%) and Central Alberta (36.8%) were the most important BRAs for BWTE harvest in Alberta (Table 6, Fig. 39).

Saskatchewan.—Western Saskatchewan (43.1%) and Eastern Saskatchewan/Southwest Manitoba (37.2%) were the most important BRAs determining BWTE harvest in this province (Table 6, Fig. 40).

Manitoba.—Eastern Saskatchewan/Southwest Manitoba (49.2%) and West-central Manitoba (41.3%) were the most important BRAs determining BWTE harvest in Manitoba (Table 6, Fig. 41).

Ontario.—Blue-winged Teal harvest in this province was most dictated by birds coming from the U.S. Great Lakes (41.6%) and Eastern Ontario/Southern Quebec (36.4%) BRAs (Table 6, Fig. 42).

Quebec.—Quebec (51.4%) and Eastern Saskatchewan/Southwest Manitoba (13.5%) were the most important BRAs determining harvest in this province (Table 6, Fig. 43).

Maritimes Provinces.—This area derived much of its BWTE harvest from the Maritimes/Maine (30.3%) BRA. Eastern Ontario/Southern Quebec (19.8%), Eastern Saskatchewan/Southwest Manitoba (19.2%), and U.S. Great Lakes (12.2%) BRAs were also important in determining harvest for this area (Table 6, Fig. 44).

Pacific Flyway

Less than 1% of the total BWTE harvest occurs in this flyway and the percentages are based on relatively few actual band recoveries ($n = 79$; Table 6).

Table 2. Distribution of the adult male Blue-winged Teal harvest, 1970 – 2003.

Harvest Area	Breeding Reference Area												Total
	Central Alberta	S. Alberta ^a	W. SK ^b	E. SK / SW MB ^c	WC MB ^d	N. Grt. Plains ^e	Eastern Dakotas	Upper Midwest	U.S. Great Lakes	E. ON / S. PQ ^f	Maritimes / Maine	NE States ^g	
Alberta	1.3%	1.9%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.2%
Saskatchewan	0.0%	0.0%	0.6%	0.5%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.2%
Manitoba	0.0%	0.0%	0.2%	0.7%	1.8%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.2%
Ontario	0.0%	0.0%	0.5%	0.4%	1.3%	0.0%	0.0%	0.0%	30.1%	47.9%	0.0%	0.0%	1.8%
Quebec	0.9%	0.0%	0.4%	1.3%	0.0%	0.0%	0.0%	0.0%	1.1%	8.5%	11.5%	0.4%	0.5%
Maritimes	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	2.8%	0.4%	10.3%	0.0%	0.1%
Canada	2.2%	1.9%	1.7%	2.3%	3.3%	0.0%	0.0%	0.0%	34.0%	56.9%	21.8%	0.4%	3.0%
PF North ^h	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%
PF South	0.2%	0.3%	0.0%	0.0%	0.0%	3.7%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.3%
Pacific Flyway	0.2%	0.3%	0.0%	0.0%	0.0%	3.7%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.3%
CF HP North ⁱ	0.3%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%
CF LP North ^j	0.6%	0.2%	1.2%	1.4%	1.8%	4.5%	1.3%	0.0%	0.0%	0.0%	0.0%	0.0%	1.2%
CF HP South	0.2%	2.6%	0.5%	0.2%	0.7%	0.4%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.3%
CF LP South	14.8%	15.5%	15.9%	10.9%	7.5%	12.7%	9.5%	2.6%	0.0%	0.0%	0.0%	5.3%	10.0%
Central Flyway	16.0%	18.3%	17.5%	12.5%	10.0%	17.6%	10.8%	2.6%	0.0%	0.0%	0.0%	5.3%	11.6%
MF Northwest ^k	4.3%	1.1%	3.9%	5.9%	14.0%	3.4%	18.2%	56.0%	0.0%	0.0%	0.0%	0.0%	15.0%
MF Northeast	1.1%	0.4%	0.6%	1.2%	1.7%	0.1%	2.8%	3.5%	3.0%	0.0%	0.0%	0.0%	1.8%
MF West-central	2.8%	2.6%	3.2%	3.9%	4.1%	0.6%	2.0%	0.9%	0.2%	1.3%	0.0%	1.1%	2.3%
MF South	2.5%	3.3%	2.6%	2.0%	2.1%	0.8%	0.9%	0.0%	0.2%	0.0%	0.0%	0.0%	1.4%
MF Gulf Coast	28.4%	23.5%	27.1%	26.1%	23.7%	9.7%	32.3%	28.9%	3.1%	6.6%	2.1%	0.7%	25.9%
Mississippi Flyway	39.2%	31.0%	37.4%	39.1%	45.6%	14.6%	56.2%	89.3%	6.5%	7.9%	2.1%	3.2%	46.5%
AF North ^l	0.0%	0.1%	0.0%	0.4%	0.9%	0.0%	0.9%	0.0%	1.1%	17.0%	27.1%	3.7%	0.8%
AF Central	0.9%	0.0%	0.1%	0.1%	1.5%	0.0%	0.0%	0.0%	1.1%	1.3%	0.0%	22.9%	0.4%
AF South	2.9%	0.9%	2.0%	4.7%	12.5%	0.4%	0.4%	0.9%	16.7%	2.1%	3.7%	16.6%	2.7%
Atlantic Flyway	3.8%	0.9%	2.2%	5.2%	14.9%	0.4%	1.3%	0.9%	18.9%	20.5%	30.7%	43.2%	3.9%
Mexico	23.1%	36.5%	19.0%	15.0%	5.1%	49.6%	13.6%	2.3%	0.0%	0.0%	0.0%	1.0%	16.5%
Central America	5.1%	4.4%	7.4%	6.0%	1.1%	0.2%	8.2%	0.0%	1.7%	0.0%	0.0%	2.2%	5.0%
South America	6.5%	5.0%	7.5%	8.7%	6.5%	7.8%	1.0%	2.6%	22.3%	2.6%	21.6%	13.0%	5.3%
Caribbean	4.0%	1.6%	7.3%	11.2%	13.4%	6.0%	8.8%	2.3%	16.5%	12.1%	23.8%	31.7%	8.0%
Latin America	38.6%	47.6%	41.2%	40.9%	26.2%	63.7%	31.7%	7.2%	40.5%	14.7%	45.4%	48.0%	34.7%

^a = Southern Alberta; ^b = Western Saskatchewan; ^c = Eastern Saskatchewan / Southwest Manitoba; ^d = West-central Manitoba; ^e = Northern Great Plains;

^f = Eastern Ontario / Southern Quebec; ^g = Northeast States; ^h = Pacific Flyway; ⁱ = Central Flyway High Plains; ^j = Central Flyway Low Plains

^k = Mississippi Flyway; ^l = Atlantic Flyway

Table 3. Distribution of the adult female Blue-winged Teal harvest, 1970 – 2003.

Harvest Area	Breeding Reference Area												Total
	Central Alberta	S. Alberta ^a	W. SK ^b	E. SK / SW MB ^c	WC MB ^d	N. Grt. Plains ^e	Eastern Dakotas	Upper Midwest	U.S. Great Lakes	E. ON / S. PQ ^f	Maritimes / Maine	NE States ^g	
Alberta	2.2%	15.7%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.7%
Saskatchewan	0.0%	0.0%	0.7%	0.7%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.2%
Manitoba	0.0%	0.0%	0.0%	4.3%	6.3%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	1.1%
Ontario	0.5%	0.0%	0.0%	0.7%	0.0%	0.0%	0.0%	0.4%	48.2%	50.2%	0.0%	0.0%	2.3%
Quebec	1.3%	0.0%	0.0%	1.0%	0.0%	0.0%	0.0%	1.2%	1.6%	27.4%	10.6%	0.0%	1.1%
Maritimes	0.0%	0.0%	0.0%	0.8%	0.0%	0.0%	0.3%	0.0%	0.9%	8.3%	44.6%	0.0%	0.5%
Canada	4.1%	15.7%	0.7%	7.5%	6.3%	0.0%	0.3%	1.6%	50.8%	85.9%	55.2%	0.0%	5.8%
PF North ^h	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%
PF South	0.2%	0.4%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%
Pacific Flyway	0.2%	0.4%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%
CF HP North ⁱ	0.2%	0.3%	0.0%	0.0%	0.0%	11.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.6%
CF LP North ^j	3.2%	0.4%	1.0%	3.4%	1.4%	0.8%	1.5%	0.0%	0.0%	0.0%	0.0%	0.0%	1.5%
CF HP South	1.5%	1.1%	0.1%	0.1%	0.0%	3.4%	0.3%	0.0%	0.0%	0.0%	0.0%	0.0%	0.5%
CF LP South	13.2%	12.7%	14.9%	11.9%	9.7%	21.4%	40.2%	7.3%	0.0%	0.0%	0.0%	0.0%	19.9%
Central Flyway	18.1%	14.5%	16.1%	15.4%	11.1%	36.6%	42.0%	7.3%	0.0%	0.0%	0.0%	0.0%	22.5%
MF Northwest ^k	8.8%	5.1%	14.1%	15.3%	35.8%	8.3%	4.3%	57.5%	0.0%	0.0%	0.0%	0.0%	17.3%
MF Northeast	0.4%	0.2%	1.3%	1.4%	3.9%	0.8%	5.0%	1.6%	14.1%	2.4%	0.0%	0.2%	2.8%
MF West-central	3.6%	0.9%	4.7%	3.0%	2.0%	0.8%	4.3%	1.2%	0.8%	0.0%	0.0%	0.0%	3.0%
MF South	1.1%	6.0%	2.3%	3.5%	3.2%	2.0%	2.1%	0.0%	0.2%	0.0%	0.0%	0.0%	2.0%
MF Gulf Coast	15.0%	18.5%	27.1%	24.8%	10.5%	19.5%	24.0%	5.1%	3.4%	1.4%	3.8%	0.0%	18.4%
Mississippi Flyway	28.9%	30.6%	49.5%	48.0%	55.4%	31.5%	39.7%	65.4%	18.2%	3.8%	3.8%	0.2%	43.5%
AF North ^l	0.2%	0.0%	0.0%	0.0%	1.4%	0.4%	0.3%	0.0%	5.8%	4.3%	20.1%	29.6%	0.7%
AF Central	0.0%	0.0%	0.0%	0.0%	1.4%	0.0%	0.3%	0.0%	5.1%	0.0%	0.0%	24.1%	0.5%
AF South	0.4%	0.5%	1.4%	3.2%	1.0%	0.4%	6.3%	0.0%	3.3%	0.0%	0.0%	4.1%	2.8%
Atlantic Flyway	0.6%	0.5%	1.4%	3.2%	3.8%	0.8%	6.8%	0.0%	14.1%	4.3%	20.1%	57.8%	3.9%
Mexico	27.8%	19.9%	7.6%	10.1%	0.0%	29.2%	0.3%	4.8%	0.0%	0.0%	0.0%	0.0%	7.8%
Central America	12.5%	13.3%	8.3%	2.7%	2.8%	0.0%	0.3%	2.0%	0.0%	0.0%	0.0%	0.0%	3.4%
South America	2.8%	4.8%	7.5%	5.1%	2.8%	1.9%	0.0%	4.4%	3.2%	0.0%	10.2%	1.5%	3.0%
Caribbean	5.1%	0.2%	9.0%	8.0%	17.9%	0.0%	10.6%	14.6%	13.7%	6.0%	10.7%	40.5%	9.9%
Latin America	48.1%	38.2%	32.4%	26.0%	23.4%	31.1%	11.1%	25.7%	16.9%	6.0%	20.9%	41.9%	24.2%

^a = Southern Alberta; ^b = Western Saskatchewan; ^c = Eastern Saskatchewan / Southwest Manitoba; ^d = West-central Manitoba; ^e = Northern Great Plains;

^f = Eastern Ontario / Southern Quebec; ^g = Northeast States; ^h = Pacific Flyway; ⁱ = Central Flyway High Plains; ^j = Central Flyway Low Plains

^k = Mississippi Flyway; ^l = Atlantic Flyway

Table 4. Distribution of the immature male Blue-winged Teal harvest, 1970 – 2003.

Harvest Area	Breeding Reference Area												Total
	Central Alberta	S. Alberta ^a	W. SK ^b	E. SK / SW MB ^c	WC MB ^d	N. Grt. Plains ^e	Eastern Dakotas	Upper Midwest	U.S. Great Lakes	E. ON / S. PQ ^f	Maritimes / Maine	NE States ^g	
Alberta	2.3%	17.3%	0.4%	0.2%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.8%
Saskatchewan	1.7%	0.0%	6.8%	1.5%	0.7%	2.2%	0.1%	0.0%	0.0%	0.0%	0.0%	0.0%	1.4%
Manitoba	0.0%	0.0%	0.0%	2.8%	8.1%	0.0%	0.5%	0.0%	0.0%	0.0%	0.0%	0.0%	1.2%
Ontario	0.0%	0.0%	0.0%	1.4%	2.7%	0.1%	0.1%	0.5%	37.1%	41.5%	0.6%	3.1%	2.6%
Quebec	0.2%	0.0%	0.4%	0.6%	1.9%	0.1%	0.0%	0.5%	2.3%	21.2%	13.0%	3.5%	1.0%
Maritimes	0.0%	0.0%	0.0%	0.4%	0.0%	0.0%	0.0%	0.5%	1.0%	2.0%	36.3%	0.2%	0.3%
Canada	4.3%	17.3%	7.6%	6.9%	13.4%	2.4%	0.8%	1.5%	40.5%	64.6%	50.0%	6.9%	7.2%
PF North ^h	0.7%	0.9%	0.4%	0.0%	0.0%	0.4%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.2%
PF South	2.4%	3.3%	0.2%	0.2%	0.0%	1.7%	0.1%	0.0%	0.0%	0.0%	0.0%	0.0%	0.5%
Pacific Flyway	3.0%	4.2%	0.7%	0.2%	0.0%	2.1%	0.1%	0.0%	0.0%	0.0%	0.0%	0.0%	0.6%
CF HP North ⁱ	0.7%	0.0%	0.4%	0.1%	0.0%	4.6%	1.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.7%
CF LP North ^j	2.4%	0.0%	1.1%	3.2%	1.3%	5.7%	10.3%	0.0%	0.0%	0.0%	0.0%	0.0%	4.4%
CF HP South	1.1%	3.8%	2.8%	0.8%	0.4%	4.4%	0.6%	0.0%	0.0%	0.0%	0.0%	0.0%	1.1%
CF LP South	12.2%	5.6%	11.5%	11.7%	4.8%	17.9%	15.7%	4.9%	0.4%	0.1%	0.5%	0.1%	11.1%
Central Flyway	16.4%	9.4%	15.8%	15.7%	6.6%	32.6%	27.5%	4.9%	0.4%	0.1%	0.5%	0.1%	17.3%
MF Northwest ^k	5.2%	1.2%	13.6%	15.5%	32.6%	3.8%	17.2%	44.3%	0.9%	0.3%	0.5%	0.0%	17.4%
MF Northeast	0.2%	0.1%	0.7%	1.2%	2.5%	0.0%	1.0%	3.1%	10.5%	1.1%	0.3%	2.6%	1.5%
MF West-central	4.2%	1.9%	3.9%	3.3%	3.1%	3.8%	3.7%	4.3%	0.3%	0.5%	0.0%	0.0%	3.5%
MF South	2.0%	0.3%	3.9%	3.6%	1.9%	2.3%	2.8%	2.8%	0.6%	1.1%	0.2%	0.8%	2.7%
MF Gulf Coast	17.2%	7.4%	14.5%	18.7%	14%	9.1%	21.3%	13.2%	6.0%	1.5%	0.9%	1.5%	16.2%
Mississippi Flyway	28.8%	10.9%	36.7%	42.3%	54.1%	18.9%	46.1%	67.7%	18.3%	4.5%	1.9%	4.9%	41.3%
AF North ^l	0.0%	0.0%	0.4%	0.9%	1.4%	0.0%	0.5%	0.2%	1.6%	10.7%	9.9%	23.2%	0.9%
AF Central	0.0%	0.0%	0.0%	0.5%	0.9%	0.0%	0.6%	0.1%	2.2%	1.7%	3.8%	29.0%	0.7%
AF South	0.2%	1.5%	1.2%	2.1%	4.2%	0.4%	1.2%	5.7%	6.1%	4.3%	3.0%	7.0%	2.2%
Atlantic Flyway	0.2%	1.5%	1.6%	3.5%	6.5%	0.4%	2.3%	6.0%	9.9%	16.6%	16.8%	59.2%	3.8%
Mexico	22.3%	42.2%	22.9%	11.4%	5.1%	36.8%	11.5%	0.7%	0.4%	0.5%	0.3%	1.2%	13.5%
Central America	13.3%	11.5%	7.2%	7.3%	4.1%	1.2%	1.4%	1.8%	0.9%	0.0%	0.0%	0.0%	4.6%
South America	11.7%	3.1%	5.3%	6.1%	4.7%	4.4%	8.5%	11.9%	9.3%	3.1%	5.4%	7.5%	7.6%
Caribbean	0.0%	0.0%	2.2%	6.7%	5.4%	1.1%	1.8%	5.4%	20.3%	10.6%	25.2%	20.1%	4.1%
Latin America	47.3%	56.8%	37.6%	31.4%	19.4%	43.6%	23.2%	19.8%	30.9%	14.2%	30.9%	28.9%	29.8%

^a = Southern Alberta; ^b = Western Saskatchewan; ^c = Eastern Saskatchewan / Southwest Manitoba; ^d = West-central Manitoba; ^e = Northern Great Plains;

^f = Eastern Ontario / Southern Quebec; ^g = Northeast States; ^h = Pacific Flyway; ⁱ = Central Flyway High Plains; ^j = Central Flyway Low Plains

^k = Mississippi Flyway; ^l = Atlantic Flyway

Table 5. Distribution of the immature female Blue-winged Teal harvest, 1970 – 2003.

Harvest Area	Breeding Reference Area												Total
	Central Alberta	S. Alberta ^a	W. SK ^b	E. SK / SW MB ^c	WC MB ^d	N. Grt. Plains ^e	Eastern Dakotas	Upper Midwest	U.S. Great Lakes	E. ON / S. PQ ^f	Maritimes / Maine	NE States ^g	
Alberta	4.7%	11.2%	1.5%	0.1%	0.0%	0.0%	0.1%	0.0%	0.0%	0.0%	0.0%	0.0%	1.0%
Saskatchewan	0.7%	1.0%	4.0%	4.0%	1.7%	0.4%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	1.3%
Manitoba	0.2%	0.0%	1.3%	4.3%	8.5%	0.0%	0.0%	0.0%	0.2%	0.0%	0.0%	0.0%	1.4%
Ontario	0.8%	0.0%	1.1%	1.6%	3.5%	0.1%	0.9%	0.5%	47.7%	41.9%	0.4%	2.6%	3.3%
Quebec	0.0%	0.3%	0.1%	0.5%	0.8%	0.0%	0.0%	0.2%	2.3%	23.8%	12.5%	4.7%	0.8%
Maritimes	0.2%	0.0%	0.0%	0.1%	0.5%	0.0%	0.0%	0.0%	0.5%	1.0%	41.0%	1.5%	0.2%
Canada	6.6%	12.6%	8.0%	10.5%	14.9%	0.5%	1.0%	0.7%	50.7%	66.8%	54.0%	8.7%	7.9%
PF North ^h	0.0%	1.1%	0.0%	0.0%	0.0%	0.3%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.1%
PF South	1.0%	6.6%	0.4%	0.1%	0.0%	0.1%	1.4%	0.0%	0.0%	0.0%	0.0%	0.0%	0.8%
Pacific Flyway	1.0%	7.7%	0.4%	0.1%	0.0%	0.4%	1.4%	0.0%	0.0%	0.0%	0.0%	0.0%	0.8%
CF HP North ⁱ	1.2%	1.0%	0.6%	0.2%	0.2%	2.7%	0.9%	0.0%	0.0%	0.0%	0.0%	0.0%	0.7%
CF LP North ^j	3.5%	0.7%	0.6%	3.1%	2.0%	3.6%	6.5%	0.0%	0.0%	0.0%	0.0%	0.0%	3.2%
CF HP South	2.3%	1.8%	2.7%	0.5%	0.2%	3.1%	0.5%	0.0%	0.0%	0.0%	0.0%	0.0%	1.0%
CF LP South	6.9%	4.4%	11.9%	8.7%	5.1%	14.4%	12.0%	1.1%	0.6%	0.0%	0.0%	0.5%	8.5%
Central Flyway	13.9%	7.9%	15.9%	12.5%	7.5%	23.8%	19.8%	1.1%	0.6%	0.0%	0.0%	0.5%	13.5%
MF Northwest ^k	10.9%	2.7%	9.8%	18.6%	36.6%	3.9%	14.6%	60.5%	0.4%	0.2%	0.0%	0.0%	19.4%
MF Northeast	0.4%	0.8%	0.4%	2.7%	2.0%	1.4%	0.8%	1.6%	13.5%	0.4%	0.2%	2.0%	1.6%
MF West-central	0.9%	0.3%	2.4%	5.0%	3.8%	0.6%	3.4%	5.2%	0.4%	0.0%	0.3%	0.0%	3.1%
MF South	1.4%	0.6%	3.2%	2.2%	2.1%	4.9%	4.1%	6.6%	0.2%	0.5%	0.2%	0.2%	3.4%
MF Gulf Coast	13.0%	7.5%	16.3%	20.2%	12.4%	10.0%	28.5%	5.7%	3.3%	1.0%	0.8%	0.7%	17.2%
Mississippi Flyway	26.6%	11.9%	32.1%	48.7%	57.0%	20.8%	51.5%	79.6%	17.9%	2.1%	1.4%	2.9%	44.7%
AF North ^l	0.0%	0.0%	0.0%	0.7%	1.2%	0.0%	0.5%	0.1%	2.7%	11.3%	6.9%	33.1%	0.9%
AF Central	0.3%	0.0%	0.0%	0.4%	0.2%	0.1%	0.8%	0.2%	3.2%	2.5%	1.1%	25.7%	0.6%
AF South	3.3%	0.1%	3.2%	3.5%	2.8%	1.7%	3.7%	6.1%	4.6%	3.6%	2.1%	5.4%	3.6%
Atlantic Flyway	3.7%	0.1%	3.2%	4.6%	4.2%	1.8%	5.0%	6.5%	10.4%	17.4%	10.2%	64.2%	5.1%
Mexico	28.1%	38.4%	23.3%	10.3%	4.6%	36.7%	6.2%	0.8%	0.0%	0.0%	0.0%	0.0%	12.7%
Central America	13.0%	14.6%	5.6%	4.9%	1.5%	14.9%	3.9%	0.3%	0.0%	0.0%	0.0%	0.0%	5.4%
South America	4.8%	3.8%	8.8%	3.9%	7.3%	1.0%	7.5%	8.0%	6.2%	3.3%	8.8%	6.7%	6.2%
Caribbean	2.3%	3.0%	2.7%	4.4%	3.1%	0.1%	3.8%	3.0%	14.2%	10.5%	25.7%	16.9%	3.8%
Latin America	48.3%	59.8%	40.4%	23.5%	16.4%	52.7%	21.4%	12.1%	20.4%	13.7%	34.5%	23.7%	28.0%

^a = Southern Alberta; ^b = Western Saskatchewan; ^c = Eastern Saskatchewan / Southwest Manitoba; ^d = West-central Manitoba; ^e = Northern Great Plains;

^f = Eastern Ontario / Southern Quebec; ^g = Northeast States; ^h = Pacific Flyway; ⁱ = Central Flyway High Plains; ^j = Central Flyway Low Plains

^k = Mississippi Flyway; ^l = Atlantic Flyway

Table 6. Derivation of the Blue-winged Teal harvest for all age/sex classes, 1970 – 2003.

Harvest Area	Breeding Reference Area											
	Central Alberta	S. Alberta ^a	W. SK ^b	E. SK / SW MB ^c	WC MB ^d	N. Grt. Plains ^e	Eastern Dakotas	Upper Midwest	U.S. Great Lakes	E. ON / S. PQ ^f	Maritimes / Maine	NE States ^g
Alberta	36.8%	51.0%	8.9%	2.5%	0.0%	0.0%	0.8%	0.0%	0.0%	0.0%	0.0%	0.0%
Saskatchewan	7.1%	1.1%	43.1%	37.2%	5.8%	5.0%	0.5%	0.0%	0.0%	0.0%	0.0%	0.0%
Manitoba	0.5%	0.0%	4.5%	49.2%	41.3%	0.0%	4.3%	0.0%	0.2%	0.0%	0.0%	0.0%
Ontario	1.2%	0.0%	1.9%	7.3%	5.4%	0.2%	3.9%	1.7%	41.6%	36.4%	0.0%	0.4%
Quebec	5.4%	0.4%	3.7%	13.5%	7.0%	0.2%	0.4%	6.5%	6.5%	51.4%	3.4%	1.8%
Maritimes	2.2%	0.0%	0.0%	19.2%	3.8%	0.0%	5.3%	6.0%	12.2%	19.8%	30.3%	1.2%
Canada	6.4%	5.8%	9.0%	19.2%	11.0%	0.8%	2.8%	1.8%	18.6%	22.6%	1.7%	0.4%
PF North ^h	25.5%	29.1%	22.1%	0.0%	0.0%	23.3%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%
PF South	19.7%	20.7%	4.2%	4.1%	0.0%	21.5%	29.8%	0.0%	0.0%	0.0%	0.0%	0.0%
Pacific Flyway	20.4%	21.7%	6.3%	3.6%	0.0%	21.7%	26.3%	0.0%	0.0%	0.0%	0.0%	0.0%
CF HP North ⁱ	11.1%	2.1%	6.2%	4.2%	0.7%	43.9%	31.7%	0.0%	0.0%	0.0%	0.0%	0.0%
CF LP North ^j	7.7%	0.4%	3.8%	16.7%	3.7%	9.2%	58.5%	0.0%	0.0%	0.0%	0.0%	0.0%
CF HP South	15.3%	9.9%	25.0%	10.3%	2.6%	22.5%	14.3%	0.0%	0.0%	0.0%	0.0%	0.0%
CF LP South	8.5%	2.4%	12.8%	15.6%	3.5%	8.8%	44.3%	3.9%	0.1%	0.0%	0.0%	0.1%
Central Flyway	8.8%	2.4%	11.5%	15.2%	3.4%	10.7%	45.0%	2.8%	0.1%	0.0%	0.0%	0.1%
MF Northwest ^k	3.7%	0.4%	6.3%	13.8%	11.2%	1.6%	24.9%	38.0%	0.1%	0.0%	0.0%	0.0%
MF Northeast	2.5%	0.7%	4.3%	15.4%	8.6%	2.2%	33.1%	16.3%	15.3%	1.0%	0.0%	0.6%
MF West-central	7.9%	1.5%	12.5%	21.7%	6.9%	3.0%	33.0%	12.8%	0.3%	0.4%	0.0%	0.1%
MF South	6.3%	2.5%	13.6%	19.1%	5.7%	7.0%	31.7%	13.3%	0.3%	0.4%	0.0%	0.1%
MF Gulf Coast	8.2%	2.1%	11.7%	19.1%	4.8%	4.8%	41.2%	8.3%	0.6%	0.3%	0.0%	0.0%
Mississippi Flyway	6.0%	1.4%	9.4%	17.0%	7.7%	2.9%	33.3%	21.0%	0.9%	0.2%	0.0%	0.0%
AF North ^l	0.4%	0.1%	1.5%	12.0%	9.1%	0.4%	19.2%	1.5%	7.5%	28.0%	4.0%	16.4%
AF Central	5.0%	0.0%	0.6%	9.2%	9.9%	0.4%	24.5%	2.1%	12.8%	5.9%	0.6%	29.1%
AF South	5.7%	0.8%	7.9%	19.4%	10.5%	1.9%	27.8%	15.2%	6.6%	2.1%	0.2%	1.9%
Atlantic Flyway	4.6%	0.5%	5.7%	16.6%	10.1%	1.4%	25.6%	10.8%	7.6%	7.8%	1.0%	8.4%
Mexico	16.9%	8.5%	16.5%	15.2%	1.9%	19.7%	19.4%	1.8%	0.0%	0.0%	0.0%	0.0%
Central America	20.5%	7.1%	16.2%	20.0%	3.3%	7.3%	22.8%	2.4%	0.3%	0.0%	0.0%	0.0%
South America	10.0%	2.1%	13.7%	17.0%	6.0%	4.4%	25.7%	14.6%	4.4%	0.9%	0.4%	0.8%
Caribbean	3.8%	0.7%	9.0%	20.8%	9.0%	2.3%	27.9%	11.8%	7.3%	3.6%	0.9%	2.8%
Latin America	13.5%	5.5%	14.4%	17.4%	4.4%	11.2%	22.9%	6.4%	2.4%	0.9%	0.3%	0.8%
Total	8.7%	3.1%	11.0%	16.9%	6.3%	6.5%	29.8%	12.1%	2.6%	2.1%	0.2%	0.6%

^a = Southern Alberta; ^b = Western Saskatchewan; ^c = Eastern Saskatchewan / Southwest Manitoba; ^d = West-central Manitoba; ^e = Northern Great Plains;

^f = Eastern Ontario / Southern Quebec; ^g = Northeast States; ^h = Pacific Flyway; ⁱ = Central Flyway High Plains; ^j = Central Flyway Low Plains

^k = Mississippi Flyway; ^l = Atlantic Flyway



Figure 39. Derivation of Blue-winged Teal harvested in Alberta (shaded) based on direct recoveries ($n = 140$) of all age/sex classes, 1970 – 2003.



Figure 40. Derivation of Blue-winged Teal harvested in Saskatchewan (shaded) based on direct recoveries ($n = 162$) of all age/sex classes, 1970 – 2003.



Figure 41. Derivation of Blue-winged Teal harvested in Manitoba (shaded) based on direct recoveries ($n = 236$) of all age/sex classes, 1970 – 2003.

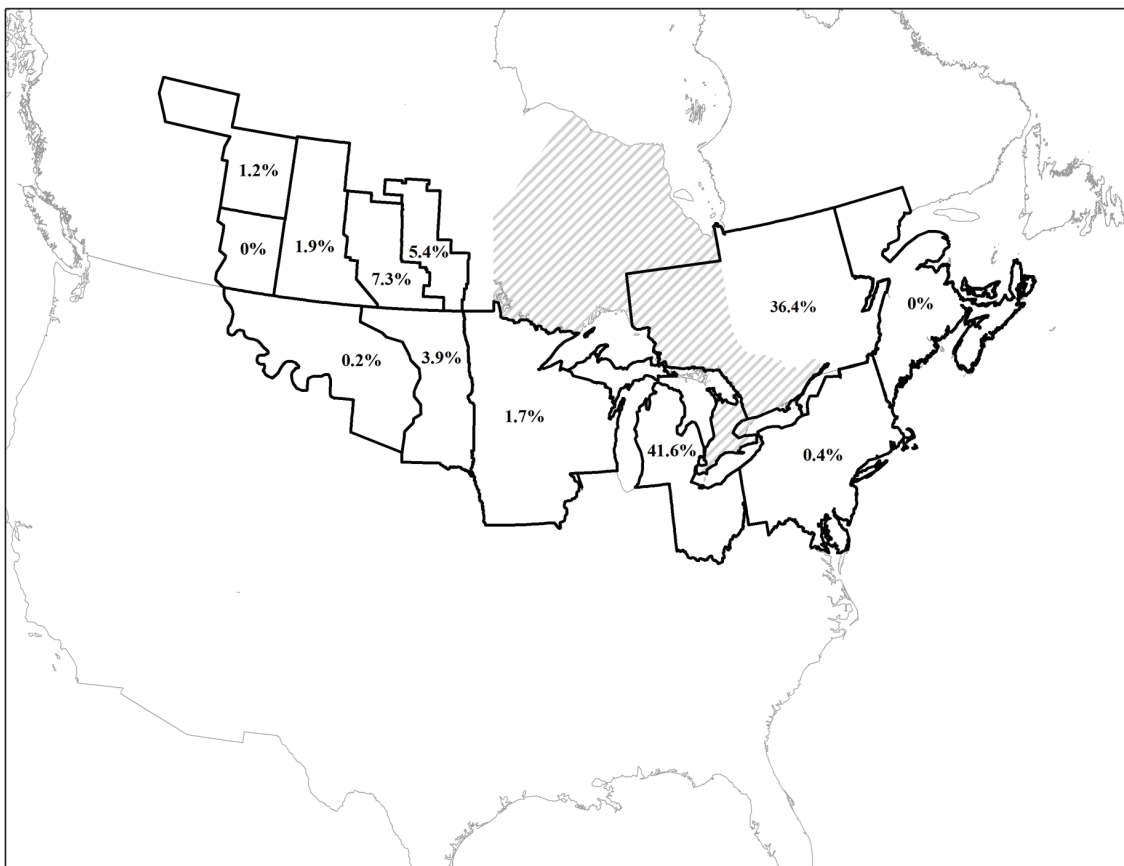


Figure 42. Derivation of Blue-winged Teal harvested in Ontario (shaded) based on direct recoveries ($n = 1,114$) of all age/sex classes, 1970 – 2003.



Figure 43. Derivation of Blue-winged Teal harvested in Quebec (shaded) based on direct recoveries ($n = 536$) of all age/sex classes, 1970 – 2003.



Figure 44. Derivation of Blue-winged Teal harvested in the Maritimes (shaded) based on direct recoveries ($n = 613$) of all age/sex classes, 1970 – 2003.

Pacific Flyway – North.—Four BRAs contributed relatively equally to harvest of BWTE in this area: Central Alberta (25.5%); Southern Alberta (29.1%); Western Saskatchewan (22.1%); and Northern Great Plains BRAs (23.3%; Table 6, Fig. 45).

Pacific Flyway – South.—The Eastern Dakotas (29.8%) was the most important BRA in determining harvest in this area. However, Northern Great Plains (21.5%), Southern Alberta (20.7%), and Central Alberta (19.7%) were also important BRAs for this harvest area (Table 6, Fig. 46).

Central Flyway

Central Flyway High Plains – North.—The Northern Great Plains (43.9%) and Eastern Dakotas (31.7%) were the most important BRAs in determining BWTE harvest in this area (Table 6, Fig. 47).

Central Flyway Low Plains – North.—The Eastern Dakotas (58.5%) and Eastern Saskatchewan/Southwest Manitoba (16.7%) were the most important BRAs for determining harvest for this area (Table 6, Fig. 48).

Central Flyway High Plains – South.—This harvest area received large portions of its BWTE from several BRAs: Western Saskatchewan (25%); Northern Great Plains (22.5%); Central Alberta (15.3%); Eastern Dakotas (14.3%); Eastern Saskatchewan/Southwestern Manitoba (10.3%); and Southern Alberta BRAs (9.9%; Table 6, Fig. 49).

Central Flyway Low Plains – South.—The Eastern Dakotas (44.3%), Eastern Saskatchewan/Southwestern Manitoba (15.6%), and Western Saskatchewan (12.8%) were the most important BRAs in determining this area's BWTE harvest (Table 6, Fig. 50).

Mississippi Flyway

Mississippi Flyway – Northwest.—The Upper Midwest (38%), Eastern Dakotas (24.9%), Eastern Saskatchewan/Southwestern Manitoba (13.8%), and West-central Manitoba (11.2%) were the most important BRAs in dictating BWTE harvest in this important harvest area (Table 6, Fig. 51).

Mississippi Flyway – Northeast.—The Eastern Dakotas (33.1%), Upper Midwest (16.3%), Eastern Saskatchewan/Southwestern Manitoba (15.4%), and U.S. Great Lakes (15.3%) were the most important BRAs for harvest of BWTE in this area (Table 6, Fig. 52).

Mississippi Flyway – West-central.—The Eastern Dakotas (33%), Eastern Saskatchewan/Southwestern Manitoba (21.7%), Upper Midwest (12.8%), and Western Saskatchewan (12.5%) were the most important BRAs for harvest in this area (Table 6, Fig. 53).

Mississippi Flyway – South.—The Eastern Dakotas (31.7%), Eastern Saskatchewan/Southwestern Manitoba (19.1%), Upper Midwest (13.3%), and Western Saskatchewan (13.6%) were the most important BRAs for harvest in this area (Table 6, Fig. 54).

Mississippi Flyway – Gulf Coast.—The Eastern Dakotas (41.2%), Eastern Saskatchewan/Southwestern Manitoba (19.1%), and Western Saskatchewan (11.7%) were the most important BRAs for this high harvest area for BWTE (Table 6, Fig. 55).

Atlantic Flyway

Atlantic Flyway – North.—Eastern Ontario/Southern Quebec (28%), Eastern Dakotas (19.2%), Northeast States (16.4%), and Eastern Saskatchewan/Southwest Manitoba (12%) were the most important BRAs for BWTE harvest in this area (Table 6, Fig. 56).

Atlantic Flyway – Central.—This was the only harvest area where the Northeast States BRA (29.1%) was the most important BRA for dictating harvest. Other important BRAs for this harvest area were the Eastern Dakotas (24.5%) and U.S. Great Lakes BRAs (12.8%; Table 6, Fig. 57).

Atlantic Flyway – South.—The Eastern Dakotas (27.8%), Eastern Saskatchewan/Southwestern Manitoba (19.4%), and Upper Midwest (15.2%) were the most important BRAs in determining BWTE harvest in this area (Table 6, Fig. 58).

Latin America

Mexico.—Several BRAs contributed heavily to this country's BWTE harvest: Northern Great Plains (19.7%); Eastern Dakotas (19.4%); Central Alberta (16.9%); Western Saskatchewan (16.5%); and Eastern Saskatchewan/Southwestern Manitoba BRAs (15.2%; Table 6, Fig. 59).

Central America.—Several BRAs contributed heavily to this region's BWTE harvest: Eastern Dakotas (22.8%); Central Alberta (20.5%); Eastern Saskatchewan/Southwestern Manitoba (20%); and Western Saskatchewan BRAs (16.2%; Table 6, Fig. 60).

South America.—Several BRAs contributed heavily to BWTE harvest on the northern tier of this continent: Eastern Dakotas (25.7%); Eastern Saskatchewan/Southwestern Manitoba (17%); Upper Midwest (14.6%); Western Saskatchewan (13.7%); and Central Alberta BRAs (10%; Table 6, Fig. 61).

Caribbean Countries.—Many BRAs contributed to this region's BWTE harvest; however, the Eastern Dakotas (27.9%) and Eastern Saskatchewan/Southwestern Manitoba (20.8%) BRAs were the most important for determining BWTE harvest in the region (Table 6, Fig. 62).



Figure 45. Derivation of Blue-winged Teal harvested in the northern Pacific Flyway (shaded) based on direct recoveries ($n = 11$) of all age/sex classes, 1970 – 2003.

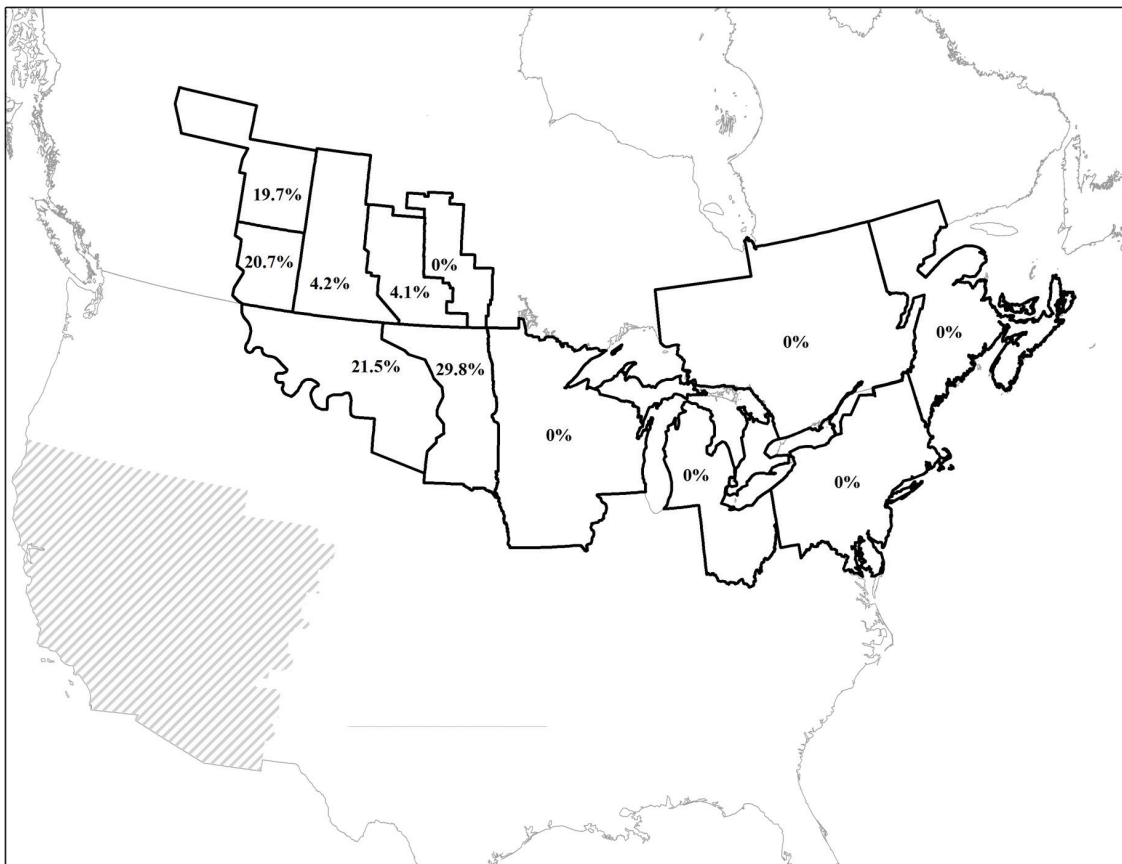


Figure 46. Derivation of Blue-winged Teal harvested in the southern Pacific Flyway (shaded) based on direct recoveries ($n = 68$) of all age/sex classes, 1970 – 2003.

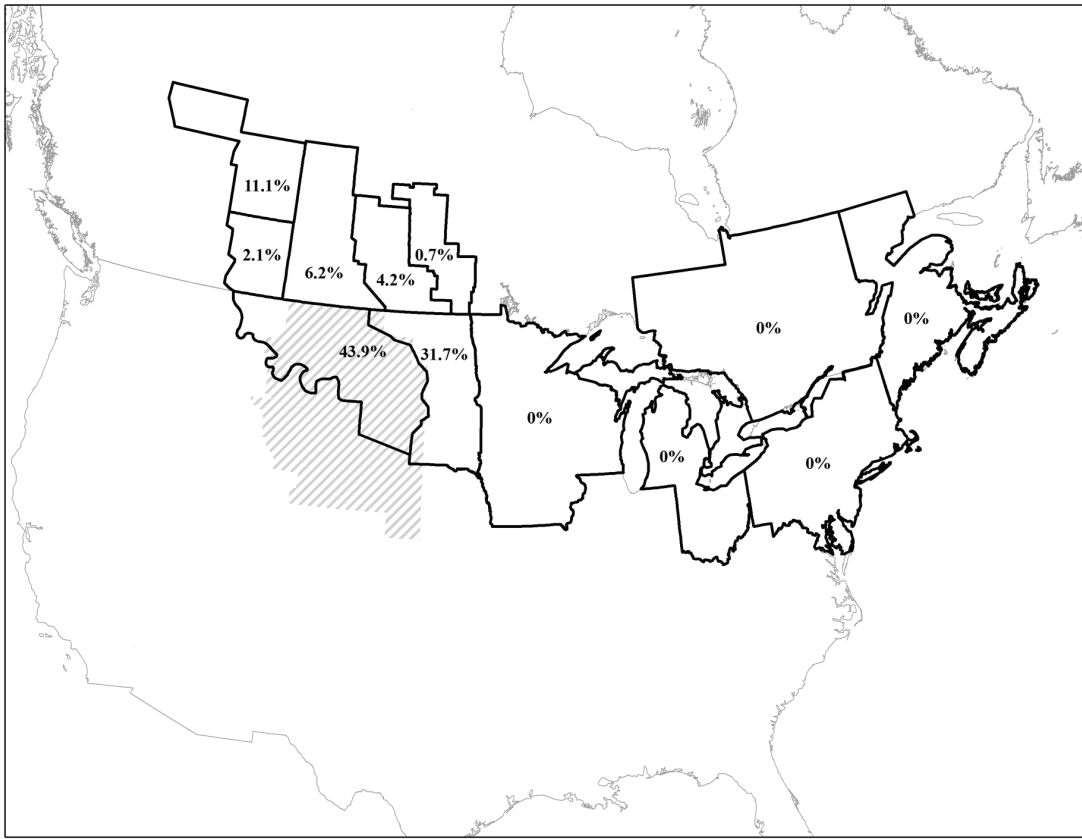


Figure 47. Derivation of Blue-winged Teal harvested in the northern portion of the Central Flyway High Plains Unit (shaded) based on direct recoveries ($n = 84$) of all age/sex classes, 1970 – 2003.

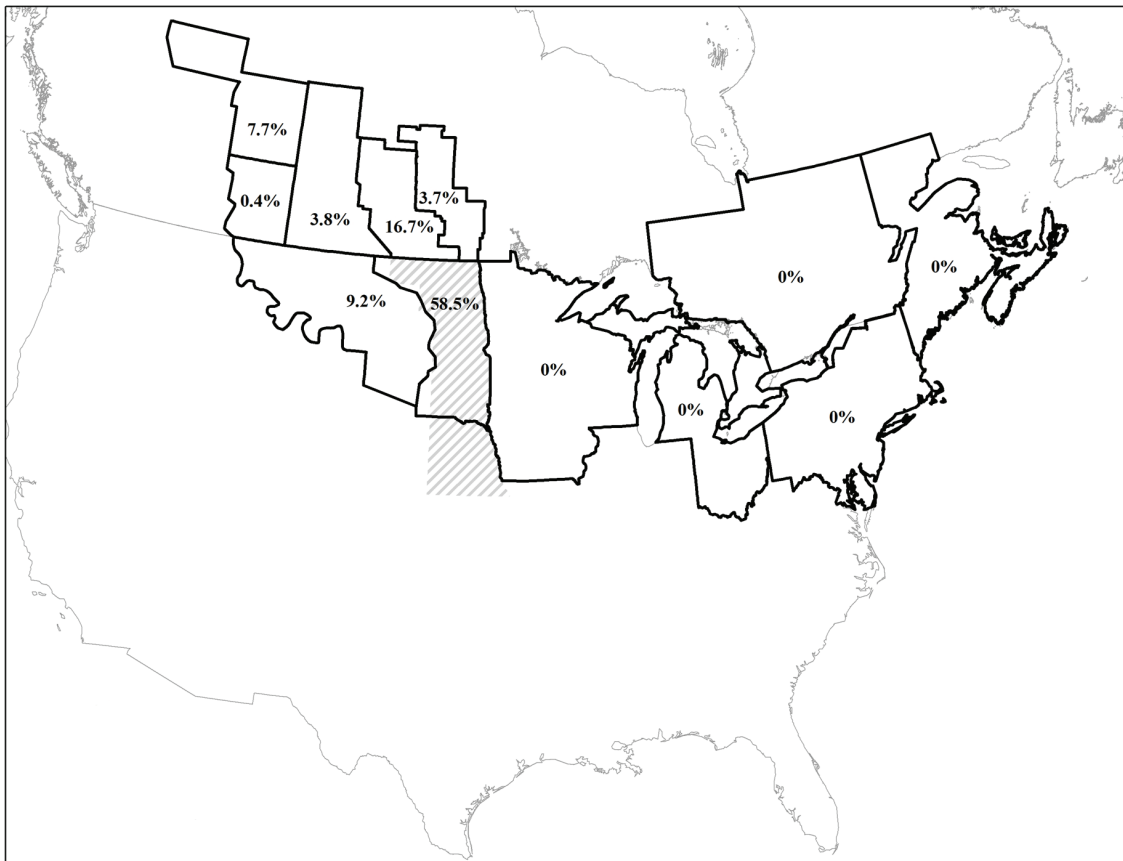


Figure 48. Derivation of Blue-winged Teal harvested in the northern portion of the Central Flyway Low Plains Unit (shaded) based on direct recoveries ($n = 360$) of all age/sex classes, 1970 – 2003.



Figure 49. Derivation of Blue-winged Teal harvested in the southern portion of the Central Flyway High Plains Unit (shaded) based on direct recoveries ($n = 147$) of all age/sex classes, 1970 – 2003.



Figure 50. Derivation of Blue-winged Teal harvested in the southern portion of the Central Flyway Low Plains Unit (shaded) based on direct recoveries ($n = 1,732$) of age/sex classes, 1970 – 2003.



Figure 53. Derivation of Blue-winged Teal harvested in the west-central portion of the Mississippi Flyway (shaded) based on direct recoveries ($n = 501$) of all age/sex classes, 1970 – 2003.



Figure 54. Derivation of Blue-winged Teal harvested in the southern portion of the Mississippi Flyway (shaded) based on direct recoveries ($n = 458$) of all age/sex classes, 1970 – 2003.



Figure 57. Derivation of Blue-winged Teal harvested in the central portion of the Atlantic Flyway (shaded) based on direct recoveries ($n = 294$) of all age/sex classes, 1970 – 2003.

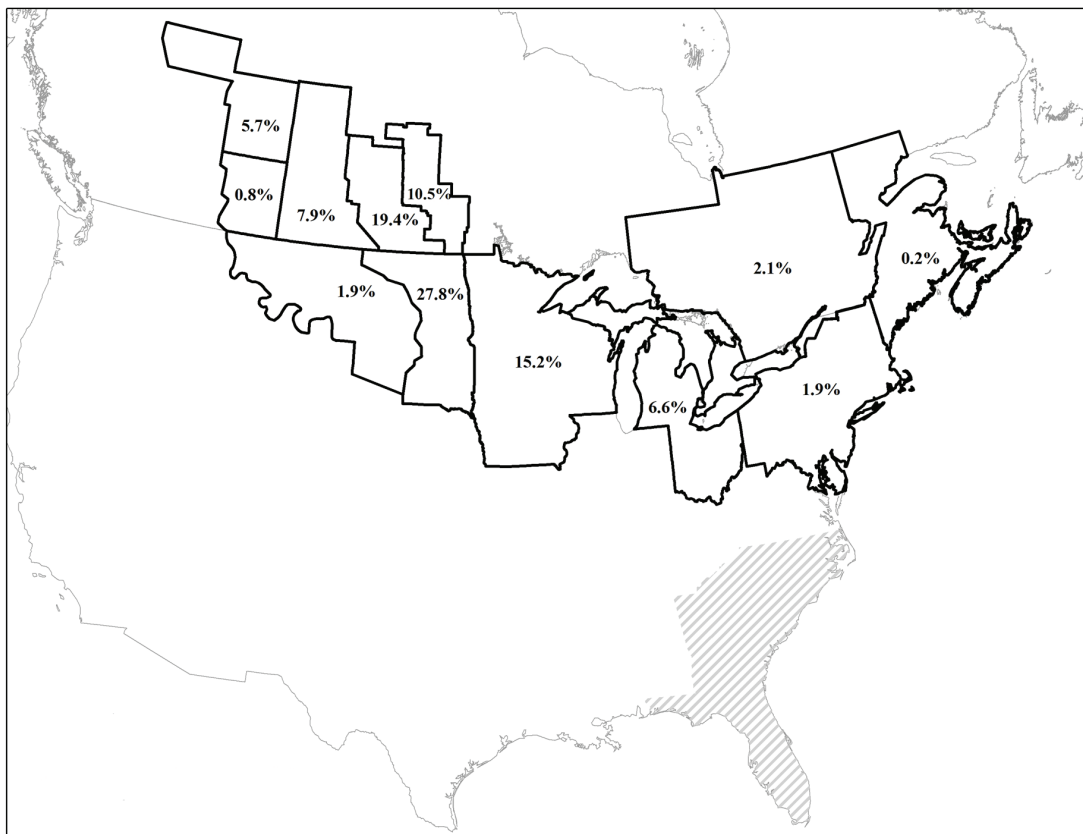


Figure 58. Derivation of Blue-winged Teal harvested in the southern portion of the Atlantic Flyway (shaded) based on direct recoveries ($n = 592$) of all age/sex classes, 1970 – 2003.

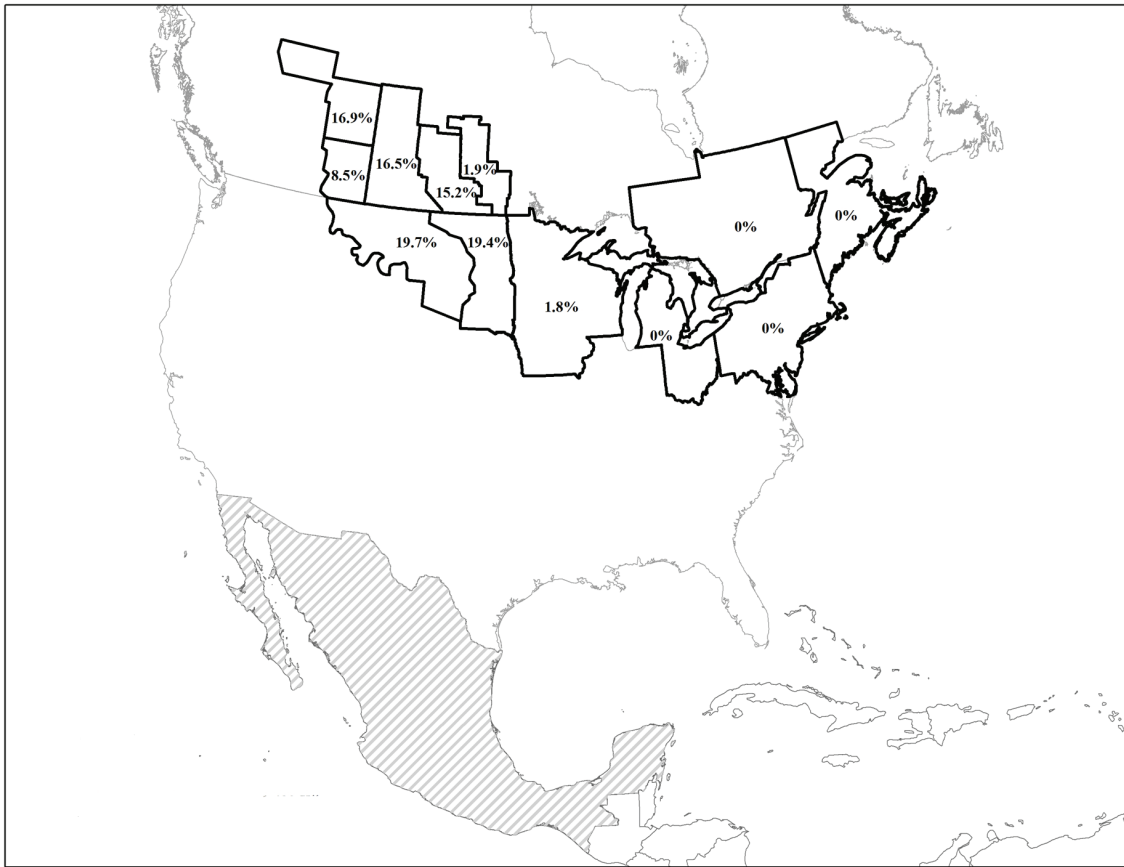


Figure 59. Derivation of Blue-winged Teal harvested in Mexico (shaded) based on direct recoveries ($n = 714$) of all age/sex classes, 1970 – 2003.

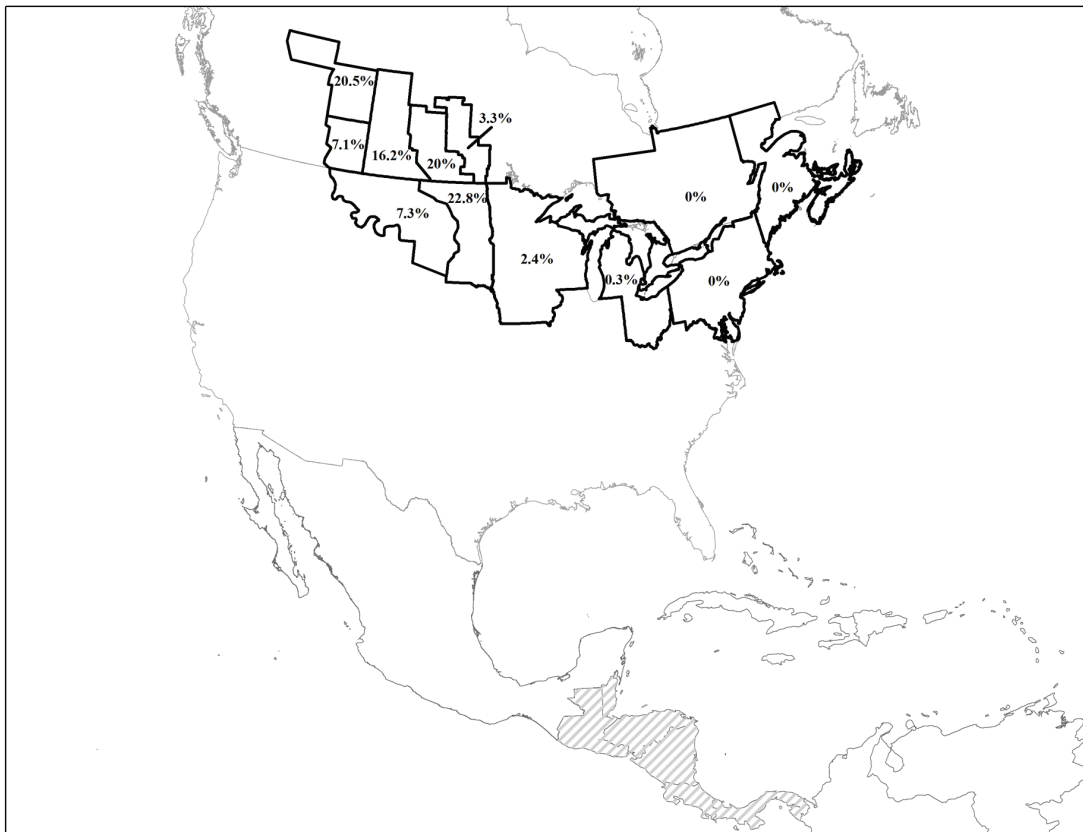


Figure 60. Derivation of Blue-winged Teal harvested in Central America (shaded) based on direct recoveries ($n = 277$) of all age/sex classes, 1970 – 2003.

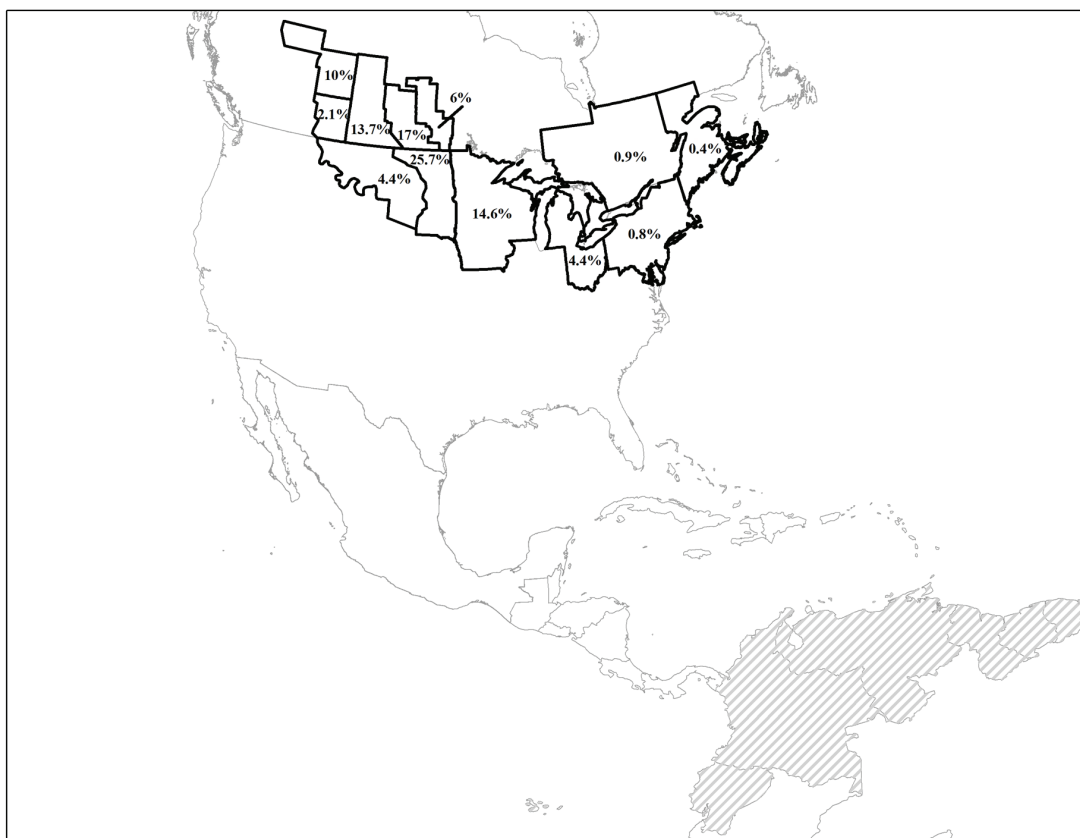


Figure 61. Derivation of Blue-winged Teal harvested in South America (shaded) based on direct recoveries ($n = 398$) of all age/sex classes, 1970 – 2003.

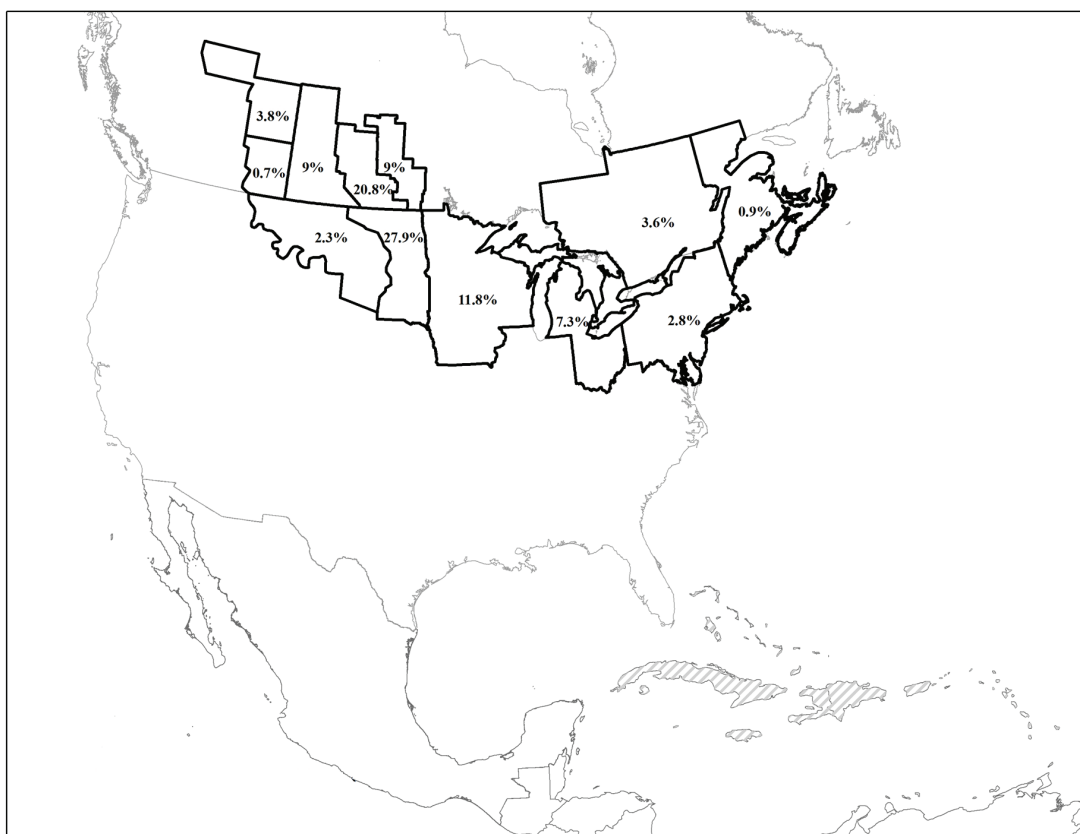


Figure 62. Derivation of Blue-winged Teal harvested in the Caribbean (shaded) based on direct recoveries ($n = 612$) of all age/sex classes, 1970 – 2003.

All harvest areas by age/sex class

Adult males.—The Eastern Dakotas BRAs contributed the most (29.6%) to the total adult male BWTE harvest for all years. Adult male BWTE from Eastern Saskatchewan/Southwestern Manitoba (16%), Western Saskatchewan (12.3%), and Upper Midwest (12.2%) BRAs were also important contributors to the harvest from 1970 – 2003 (Table 7).

Adult females.—The Eastern Dakotas BRA contributed the most (29.8%) to the total adult female BWTE harvest for all years. Adult female BWTE from Eastern Saskatchewan/Southwestern Manitoba (15.4%), Upper Midwest (14.3%), and Western Saskatchewan (11%) BRAs were also important contributors to the harvest from 1970 – 2003 (Table 8).

Immature males.—The Eastern Dakotas BRA contributed the most (29.6%) to the total immature male BWTE harvest for all years. Immature male BWTE from Eastern Saskatchewan/Southwestern Manitoba (19.5%), Upper Midwest (11.1%), and Western Saskatchewan (10.8%) BRAs were also important contributors to the harvest from 1970 – 2003 (Table 9).

Immature females.—The Eastern Dakotas BRA contributed the most (30.2%) to the total immature female BWTE harvest for all years. Immature female BWTE from Eastern Saskatchewan/Southwestern Manitoba (16%), Upper Midwest (11.9%), and Western Saskatchewan (10.3%) BRAs were also important contributors to the harvest from 1970 – 2003 (Table 10).

Changes in Distribution of the Blue-winged Teal Harvest between Time Periods

Distribution of the BWTE harvest by time period can be found in Appendices (D – G). Below are changes that we felt were more pronounced than others. We did not make comparisons to harvest survey data collected over the same time period because data from Latin America is sparse or non-existent, and USFWS and Canadian Wildlife Service harvest estimates based on the parts collection survey cannot discriminate between BWTE and Cinnamon Teal, biasing BWTE harvest estimates upward in the Pacific Flyway.

The proportion of the BWTE harvest during the 1994 – 2003 time period that was distributed to Latin American countries (18.6%) was substantially lower than that observed during 1970 – 1979, 1980 – 1986, and 1987 – 1993 (36.7%, 25.6%, and 36.8%, respectively). It is possible that the distribution of harvest to Latin America had a steady linear downward trend over the four time periods. However, closure of September teal seasons in the U.S. during four of the seven years during the 1987 – 1993 time

period may have resulted in much of the harvest being re-distributed to Latin America, perhaps resulting in the non-linear results. South America represented somewhat low (<3.3%) proportions of the total harvest, with the exception of the 1970 – 1979 (7.5%) and 1987 – 1993 (13%) time periods. Proportional BWTE harvest in Mexico, while remaining high, has declined from 16.9% during the 1970 – 1979 time periods to 8% during the 1994 – 2003 time periods in a somewhat linear fashion. Kramer et al. (1995) speculated that waterfowl harvests in Mexico had been declining for some time due to increased prices of firearms, ammunition, and hunting licenses, to the increased difficulty for American citizens to hunt in Mexico, and to greatly reduced habitat due to Hurricane Gilberto in the mid-1980s. As we have documented here, aside from the increase in South America's take of the total harvest during 1987 – 1993, the trend among the four time periods for Latin America's portion of the harvest appears to be a decline with the largest decline occurring post-1993. This may be the result of BWTE harvest being re-distributed back to U.S. harvest areas with resumption of the 9-day September teal seasons in 1992, and beginning in 1998, 16-day September teal seasons.

Another potential explanation for the most recent decline in Latin America's proportional take in the BWTE harvest could be temporal heterogeneity in band-reporting rates that differ from those in the U.S. Band-reporting rates in the U.S. increased substantially following initial deployment (ca. 1995) of bands inscribed with a toll-free telephone number for hunters to call to report bands (Royle and Garrettson 2005). We assumed a constant differential reduction in reporting rates in Latin America that was one-half of U.S. reporting rates. If, in reality, band-reporting rates did not increase in Latin America, distribution of the harvest to this region would have been underestimated. There were concerns that hunters attempting to report bands in Latin America initially had difficulty using the toll-free telephone number that was inscribed on bands. As a result, a separate operating system was implemented to handle recoveries in Mexico (J. Haskins, pers. comm.). However, the ineffectiveness of toll-free bands at increasing band-reporting rates likely would have been muted somewhat, because a portion of the harvest in many areas of Latin America is taken by U.S. citizens who had the opportunity to report bands upon re-entering the U.S.

Changes in Derivation of the Blue-winged Teal Harvest between Time Periods

The Eastern Dakotas BRA has maintained a strong contribution to the harvest of BWTE during all time periods (17.3% – 42.6%; Appendices H – K). This region was the most important BRA for BWTE in all time periods except 1987 – 1993, when the U.S. prairies experienced extreme drought conditions. Mid-summer rains beginning in 1993 ended the

Table 7. Derivation of the adult male Blue-winged Teal harvest, 1970 – 2003.

Harvest Area	Breeding Reference Area											
	Central Alberta	S. Alberta ^a	W. SK ^b	E. SK / SW MB ^c	WC MB ^d	N. Grt. Plains ^e	Eastern Dakotas	Upper Midwest	U.S. Great Lakes	E. ON / S. PQ ^f	Maritimes / Maine	NE States ^g
Alberta	63.8%	36.2%	0.0%	0.0%	0.0%	0.0%	0.8%	0.0%	0.0%	0.0%	0.0%	0.0%
Saskatchewan	0.0%	0.0%	48.9%	51.1%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%
Manitoba	0.0%	0.0%	10.7%	51.0%	38.3%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%
Ontario	0.0%	0.0%	3.2%	3.7%	3.4%	0.0%	0.0%	0.0%	33.3%	56.4%	0.0%	0.0%
Quebec	16.0%	0.0%	11.0%	21.4%	2.8%	0.0%	0.0%	0.0%	4.7%	38.1%	5.4%	0.5%
Maritimes	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	63.5%	10.1%	26.4%	0.0%
Canada	6.3%	2.1%	7.1%	12.3%	5.5%	0.0%	0.0%	0.0%	23.4%	41.5%	1.7%	0.1%
PF North ^h	-	-	-	-	-	-	-	-	-	-	-	-
PF South	6.2%	3.0%	0.0%	0.0%	0.0%	90.9%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%
Pacific Flyway	6.2%	3.0%	0.0%	0.0%	0.0%	90.9%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%
CF HP North ⁱ	65.6%	0.0%	0.0%	34.4%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%
CF LP North ^j	4.1%	0.6%	11.5%	17.5%	7.0%	29.4%	29.9%	0.0%	0.0%	0.0%	0.0%	0.0%
CF HP South	7.8%	33.3%	23.9%	10.7%	12.5%	11.8%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%
CF LP South	12.5%	5.1%	19.4%	17.4%	3.7%	10.2%	28.1%	3.1%	0.0%	0.0%	0.0%	0.4%
Central Flyway	11.7%	5.2%	18.6%	17.3%	4.2%	12.3%	27.6%	2.7%	0.0%	0.0%	0.0%	0.3%
MF Northwest ^k	2.4%	0.2%	3.2%	6.3%	4.5%	1.8%	35.9%	45.6%	0.0%	0.0%	0.0%	0.0%
MF Northeast	5.4%	0.8%	4.3%	10.4%	4.7%	0.6%	46.0%	23.8%	3.4%	0.0%	0.0%	0.6%
MF West-central	10.2%	3.7%	16.9%	26.8%	8.6%	2.0%	25.2%	4.8%	0.2%	1.2%	0.0%	0.3%
MF South	15.5%	7.9%	22.6%	23.0%	7.5%	4.5%	18.6%	0.0%	0.3%	0.0%	0.0%	0.0%
MF Gulf Coast	9.3%	3.0%	12.8%	16.1%	4.5%	3.0%	36.8%	13.6%	0.2%	0.6%	0.0%	0.0%
Mississippi Flyway	7.2%	2.2%	9.9%	13.5%	4.8%	2.5%	35.7%	23.5%	0.3%	0.4%	0.0%	0.0%
AF North ^l	0.0%	0.3%	0.0%	7.0%	5.1%	0.0%	31.1%	0.0%	2.6%	43.6%	7.4%	3.0%
AF Central	20.1%	0.0%	3.7%	4.7%	18.3%	0.0%	0.0%	0.0%	5.7%	7.3%	0.0%	40.2%
AF South	9.1%	1.1%	9.4%	28.4%	22.9%	1.2%	4.8%	4.2%	12.8%	1.7%	0.3%	4.2%
Atlantic Flyway	8.2%	0.8%	6.8%	21.4%	18.6%	0.8%	10.0%	2.9%	9.9%	11.3%	1.8%	7.5%
Mexico	11.9%	7.3%	14.2%	14.6%	1.5%	24.3%	24.4%	1.7%	0.0%	0.0%	0.0%	0.0%
Central America	8.7%	2.9%	18.2%	19.1%	1.1%	0.3%	48.7%	0.0%	0.7%	0.0%	0.0%	0.3%
South America	10.5%	3.2%	17.5%	26.6%	6.0%	12.0%	5.7%	6.2%	8.7%	1.1%	0.9%	1.7%
Caribbean	4.2%	0.7%	11.1%	22.5%	8.2%	6.1%	32.7%	3.5%	4.2%	3.3%	0.7%	2.7%
Latin America	9.4%	4.5%	14.6%	18.9%	3.7%	14.8%	27.0%	2.5%	2.4%	0.9%	0.3%	0.9%
Total	8.5%	3.3%	12.3%	16.0%	4.9%	8.1%	29.6%	12.2%	2.0%	2.2%	0.2%	0.7%

^a = Southern Alberta; ^b = Western Saskatchewan; ^c = Eastern Saskatchewan / Southwest Manitoba; ^d = West-central Manitoba; ^e = Northern Great Plains;

^f = Eastern Ontario / Southern Quebec; ^g = Northeast States; ^h = Pacific Flyway; ⁱ = Central Flyway High Plains; ^j = Central Flyway Low Plains

^k = Mississippi Flyway; ^l = Atlantic Flyway

Table 8. Derivation of the adult female Blue-winged Teal harvest, 1970 – 2003.

Harvest Area	Breeding Reference Area											
	Central Alberta	S. Alberta ^a	W. SK ^b	E. SK / SW MB ^c	WC MB ^d	N. Grt. Plains ^e	Eastern Dakotas	Upper Midwest	U.S. Great Lakes	E. ON / S. PQ ^f	Maritimes / Maine	NE States ^g
Alberta	31.3%	68.7%	0.0%	0.0%	0.0%	0.0%	0.8%	0.0%	0.0%	0.0%	0.0%	0.0%
Saskatchewan	0.0%	0.0%	43.3%	56.7%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%
Manitoba	0.0%	0.0%	0.0%	60.4%	39.6%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%
Ontario	2.2%	0.0%	0.0%	4.6%	0.0%	0.0%	0.0%	2.4%	46.3%	44.5%	0.0%	0.0%
Quebec	11.4%	0.0%	0.0%	14.5%	0.0%	0.0%	0.0%	16.1%	3.3%	52.1%	2.5%	0.0%
Maritimes	0.0%	0.0%	0.0%	24.6%	0.0%	0.0%	15.8%	0.0%	3.9%	33.3%	22.4%	0.0%
Canada	6.5%	7.9%	1.4%	19.9%	7.5%	0.0%	1.4%	3.9%	19.2%	30.0%	2.4%	0.0%
PF North ^h	-	-	-	-	-	-	-	-	-	-	-	-
PF South	64.0%	36.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%
Pacific Flyway	64.0%	36.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%
CF HP North ⁱ	2.5%	1.6%	0.0%	0.0%	0.0%	95.9%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%
CF LP North ^j	19.2%	0.7%	7.4%	34.1%	6.2%	2.7%	29.6%	0.0%	0.0%	0.0%	0.0%	0.0%
CF HP South	30.5%	6.8%	2.8%	3.8%	0.0%	38.8%	17.2%	0.0%	0.0%	0.0%	0.0%	0.0%
CF LP South	6.2%	1.9%	8.3%	9.2%	3.4%	5.7%	60.3%	5.3%	0.0%	0.0%	0.0%	0.0%
Central Flyway	7.5%	1.9%	7.9%	10.5%	3.4%	8.6%	55.7%	4.6%	0.0%	0.0%	0.0%	0.0%
MF Northwest ^k	4.7%	0.9%	9.0%	13.6%	14.4%	2.5%	7.5%	47.5%	0.0%	0.0%	0.0%	0.0%
MF Northeast	1.3%	0.2%	5.3%	7.8%	9.8%	1.5%	53.1%	8.1%	11.1%	1.7%	0.0%	0.1%
MF West-central	11.2%	0.9%	17.1%	15.4%	4.5%	1.4%	43.2%	5.7%	0.5%	0.0%	0.0%	0.0%
MF South	5.3%	8.5%	12.3%	26.5%	10.9%	5.2%	31.4%	0.0%	0.0%	0.0%	0.0%	0.0%
MF Gulf Coast	7.5%	2.9%	16.2%	20.6%	4.0%	5.6%	38.7%	3.9%	0.4%	0.2%	0.1%	0.0%
Mississippi Flyway	6.2%	2.0%	12.5%	16.9%	8.8%	3.8%	27.2%	21.4%	0.9%	0.2%	0.0%	0.0%
AF North ^l	2.9%	0.0%	0.0%	0.0%	13.5%	3.0%	11.2%	0.0%	17.7%	12.3%	7.1%	32.3%
AF Central	0.0%	0.0%	0.0%	0.0%	20.4%	0.0%	16.8%	0.0%	23.4%	0.0%	0.0%	39.4%
AF South	1.2%	0.5%	5.4%	17.6%	2.6%	0.8%	68.1%	0.0%	2.6%	0.0%	0.0%	1.2%
Atlantic Flyway	1.4%	0.4%	3.8%	12.3%	6.7%	1.1%	51.7%	0.0%	7.8%	2.2%	1.3%	11.4%
Mexico	32.9%	7.3%	10.7%	19.8%	0.0%	19.6%	1.0%	8.7%	0.0%	0.0%	0.0%	0.0%
Central America	33.7%	11.2%	26.7%	12.3%	5.6%	0.0%	2.3%	8.1%	0.0%	0.0%	0.0%	0.0%
South America	8.6%	4.6%	27.1%	25.9%	6.4%	3.2%	0.0%	20.6%	2.3%	0.0%	0.9%	0.4%
Caribbean	4.7%	0.1%	9.9%	12.4%	12.5%	0.0%	31.8%	21.0%	3.0%	1.2%	0.3%	3.1%
Latin America	18.4%	4.6%	14.7%	16.5%	6.7%	6.7%	13.7%	15.1%	1.5%	0.5%	0.2%	1.3%
Total	9.3%	2.9%	11.0%	15.4%	6.9%	5.3%	29.8%	14.3%	2.2%	2.0%	0.3%	0.8%

^a = Southern Alberta; ^b = Western Saskatchewan; ^c = Eastern Saskatchewan / Southwest Manitoba; ^d = West-central Manitoba; ^e = Northern Great Plains;

^f = Eastern Ontario / Southern Quebec; ^g = Northeast States; ^h = Pacific Flyway; ⁱ = Central Flyway High Plains; ^j = Central Flyway Low Plains

^k = Mississippi Flyway; ^l = Atlantic Flyway

Table 9. Derivation of the immature male Blue-winged Teal harvest, 1970 – 2003.

Harvest Area	Breeding Reference Area											
	Central Alberta	S. Alberta ^a	W. SK ^b	E. SK / SW MB ^c	WC MB ^d	N. Grt. Plains ^e	Eastern Dakotas	Upper Midwest	U.S. Great Lakes	E. ON / S. PQ ^f	Maritimes / Maine	NE States ^g
Alberta	24.7%	65.0%	5.7%	4.6%	0.0%	0.0%	0.8%	0.0%	0.0%	0.0%	0.0%	0.0%
Saskatchewan	10.4%	0.0%	53.9%	22.1%	3.7%	8.7%	1.2%	0.0%	0.0%	0.0%	0.0%	0.0%
Manitoba	0.0%	0.0%	0.0%	43.8%	44.0%	0.0%	12.2%	0.0%	0.0%	0.0%	0.0%	0.0%
Ontario	0.0%	0.0%	0.0%	10.3%	7.1%	0.2%	1.7%	2.3%	42.7%	34.8%	0.1%	0.7%
Quebec	1.8%	0.0%	4.6%	12.3%	13.5%	0.5%	1.2%	5.7%	7.3%	47.9%	3.0%	2.3%
Maritimes	0.0%	0.0%	0.0%	28.3%	0.0%	0.0%	0.0%	17.8%	10.7%	15.0%	27.7%	0.5%
Canada	4.9%	7.0%	11.4%	18.7%	12.7%	1.8%	3.1%	2.3%	16.7%	19.4%	1.5%	0.6%
PF North ^h	36.0%	16.9%	31.2%	0.0%	0.0%	15.9%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%
PF South	40.3%	20.1%	5.3%	8.8%	0.0%	18.7%	6.7%	0.0%	0.0%	0.0%	0.0%	0.0%
Pacific Flyway	39.3%	19.3%	11.5%	6.7%	0.0%	18.1%	5.1%	0.0%	0.0%	0.0%	0.0%	0.0%
CF HP North ⁱ	8.3%	0.0%	6.8%	3.1%	0.3%	37.7%	43.8%	0.0%	0.0%	0.0%	0.0%	0.0%
CF LP North ^j	4.5%	0.0%	2.7%	14.3%	2.1%	6.9%	69.5%	0.0%	0.0%	0.0%	0.0%	0.0%
CF HP South	7.9%	10.1%	27.6%	13.8%	2.4%	21.5%	16.7%	0.0%	0.0%	0.0%	0.0%	0.0%
CF LP South	8.9%	1.4%	11.1%	20.4%	2.9%	8.5%	41.6%	4.9%	0.1%	0.0%	0.0%	0.0%
Central Flyway	7.7%	1.6%	9.9%	17.8%	2.6%	10.0%	47.2%	3.1%	0.1%	0.0%	0.0%	0.0%
MF Northwest ^k	2.4%	0.2%	8.5%	17.4%	12.7%	1.1%	29.3%	28.2%	0.2%	0.0%	0.0%	0.0%
MF Northeast	1.2%	0.3%	5.2%	15.3%	11.5%	0.0%	19.9%	23.1%	20.7%	1.6%	0.0%	1.1%
MF West-central	9.9%	1.6%	12.2%	18.3%	6.1%	5.8%	31.9%	13.7%	0.2%	0.3%	0.0%	0.0%
MF South	5.9%	0.3%	15.5%	25.4%	4.8%	4.5%	30.5%	11.4%	0.7%	0.9%	0.0%	0.2%
MF Gulf Coast	8.6%	1.3%	9.6%	22.5%	5.8%	35.0%	38.8%	9.0%	1.1%	0.2%	0.0%	0.1%
Mississippi Flyway	5.7%	0.8%	9.6%	19.9%	8.9%	2.4%	33.0%	18.1%	1.3%	0.2%	0.0%	0.1%
AF North ^l	0.0%	0.0%	4.6%	19.5%	10.0%	0.0%	16.1%	2.8%	5.0%	24.4%	2.3%	15.3%
AF Central	0.0%	0.0%	0.0%	15.2%	9.4%	0.0%	28.1%	2.5%	10.2%	5.6%	1.3%	27.7%
AF South	0.8%	1.9%	6.1%	18.3%	13.0%	1.0%	16.2%	28.3%	8.1%	4.1%	0.3%	2.0%
Atlantic Flyway	0.5%	1.1%	4.7%	18.1%	11.6%	0.6%	18.2%	17.6%	7.7%	9.4%	1.0%	9.7%
Mexico	13.4%	9.0%	18.2%	16.4%	2.5%	14.5%	25.1%	0.6%	0.1%	0.1%	0.0%	0.1%
Central America	23.5%	7.3%	16.9%	30.8%	6.1%	1.4%	9.2%	4.2%	0.6%	0.0%	0.0%	0.0%
South America	12.6%	1.2%	7.6%	15.5%	4.2%	3.1%	33.2%	17.3%	3.6%	0.9%	0.2%	0.6%
Caribbean	0.0%	0.0%	5.7%	31.8%	9.0%	1.4%	12.8%	14.7%	14.7%	5.6%	1.3%	3.1%
Latin America	12.9%	5.5%	13.6%	20.5%	4.4%	7.8%	23.0%	7.3%	3.1%	1.0%	0.2%	0.6%
Total	8.1%	2.9%	10.8%	19.5%	6.8%	5.3%	29.6%	11.1%	3.0%	2.2%	0.2%	0.6%

^a = Southern Alberta; ^b = Western Saskatchewan; ^c = Eastern Saskatchewan / Southwest Manitoba; ^d = West-central Manitoba; ^e = Northern Great Plains;

^f = Eastern Ontario / Southern Quebec; ^g = Northeast States; ^h = Pacific Flyway; ⁱ = Central Flyway High Plains; ^j = Central Flyway Low Plains

^k = Mississippi Flyway; ^l = Atlantic Flyway

Table 10. Derivation of the immature female Blue-winged Teal harvest, 1970 – 2003.

Harvest Area	Breeding Reference Area											
	Central Alberta	S. Alberta ^a	W. SK ^b	E. SK / SW MB ^c	WC MB ^d	N. Grt. Plains ^e	Eastern Dakotas	Upper Midwest	U.S. Great Lakes	E. ON / S. PQ ^f	Maritimes / Maine	NE States ^g
Alberta	44.1%	36.2%	15.8%	2.1%	0.0%	0.0%	1.9%	0.0%	0.0%	0.0%	0.0%	0.0%
Saskatchewan	5.1%	2.5%	31.9%	49.4%	8.9%	2.3%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%
Manitoba	1.3%	0.0%	9.3%	48.8%	40.2%	0.0%	0.0%	0.0%	0.4%	0.0%	0.0%	0.0%
Ontario	2.2%	0.0%	3.4%	7.7%	7.0%	0.2%	8.8%	1.9%	42.6%	25.8%	0.0%	0.4%
Quebec	0.0%	1.4%	1.9%	10.3%	6.6%	0.0%	0.0%	3.5%	8.6%	61.1%	3.4%	3.2%
Maritimes	9.4%	0.0%	0.0%	5.6%	15.8%	0.0%	0.0%	0.0%	7.3%	11.0%	46.8%	4.2%
Canada	7.6%	5.0%	10.4%	21.3%	12.5%	0.5%	3.9%	1.1%	18.7%	17.0%	1.5%	0.6%
PF North ^h	0.0%	58.6%	0.0%	0.0%	0.0%	41.4%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%
PF South	11.5%	26.5%	5.0%	2.8%	0.0%	0.9%	53.3%	0.0%	0.0%	0.0%	0.0%	0.0%
Pacific Flyway	10.7%	28.7%	4.6%	2.6%	0.0%	3.7%	49.6%	0.0%		0.0%	0.0%	0.0%
CF HP North ⁱ	15.1%	4.3%	8.8%	5.6%	1.5%	27.5%	37.2%	0.0%	0.0%	0.0%	0.0%	0.0%
CF LP North ^j	10.0%	0.7%	2.0%	15.1%	4.1%	7.9%	60.2%	0.0%	0.0%	0.0%	0.0%	0.0%
CF HP South	20.7%	5.7%	27.9%	8.2%	1.5%	21.8%	14.1%	0.0%	0.0%	0.0%	0.0%	0.0%
CF LP South	7.4%	1.6%	14.4%	16.3%	4.0%	11.9%	42.7%	1.6%	0.2%	0.0%	0.0%	0.0%
Central Flyway	9.4%	1.8%	12.1%	14.9%	3.7%	12.5%	44.5%	1.0%	0.1%	0.0%	0.0%	0.0%
MF Northwest ^k	5.1%	0.4%	5.2%	15.4%	12.5%	1.4%	22.8%	37.1%	0.1%	0.0%	0.0%	0.0%
MF Northeast	2.2%	1.6%	2.5%	26.8%	8.3%	6.1%	15.1%	11.5%	24.6%	0.5%	0.0%	0.7%
MF West-central	2.7%	0.3%	7.9%	25.6%	8.1%	1.5%	33.5%	20.0%	0.4%	0.0%	0.0%	0.0%
MF South	3.9%	0.5%	9.8%	10.7%	4.1%	10.3%	36.8%	23.3%	0.2%	0.3%	0.0%	0.0%
MF Gulf Coast	6.9%	1.4%	9.7%	18.7%	4.8%	4.1%	49.9%	3.9%	0.6%	0.1%	0.0%	0.0%
Mississippi Flyway	5.4%	0.8%	7.4%	17.4%	8.4%	3.3%	34.8%	21.2%	1.2%	0.1%	0.0%	0.0%
AF North ^l	0.0%	0.0%	0.0%	13.5%	9.1%	0.0%	16.8%	2.0%	9.1%	26.9%	1.7%	20.8%
AF Central	4.8%	0.0%	0.0%	9.1%	2.4%	1.1%	35.4%	3.4%	14.3%	7.8%	0.4%	21.3%
AF South	8.4%	0.1%	9.3%	15.5%	5.1%	3.3%	31.3%	20.3%	3.8%	2.0%	0.1%	0.8%
Atlantic Flyway	6.6%	0.1%	6.5%	14.3%	5.4%	2.5%	29.4%	15.1%	6.0%	6.9%	0.4%	6.8%
Mexico	20.2%	9.5%	18.9%	13.0%	2.4%	20.5%	14.7%	0.8%	0.0%	0.0%	0.0%	0.0%
Central America	22.1%	8.5%	10.7%	14.7%	1.8%	19.6%	22.0%	0.6%	0.0%	0.0%	0.0%	0.0%
South America	7.1%	1.9%	14.7%	10.1%	7.8%	1.1%	37.0%	15.4%	2.9%	1.1%	0.3%	0.6%
Caribbean	5.7%	2.5%	7.3%	18.6%	5.4%	0.2%	30.3%	9.5%	11.0%	5.6%	1.5%	2.4%
Latin America	15.7%	6.7%	14.9%	13.4%	3.9%	13.3%	23.1%	5.1%	2.1%	1.0%	0.3%	0.5%
Total	9.1%	3.1%	10.3%	16.0%	6.6%	7.1%	30.2%	11.9%	2.9%	2.0%	0.2%	0.5%

^a = Southern Alberta; ^b = Western Saskatchewan; ^c = Eastern Saskatchewan / Southwest Manitoba; ^d = West-central Manitoba; ^e = Northern Great Plains;

^f = Eastern Ontario / Southern Quebec; ^g = Northeast States; ^h = Pacific Flyway; ⁱ = Central Flyway High Plains; ^j = Central Flyway Low Plains

^k = Mississippi Flyway; ^l = Atlantic Flyway

drought in the Eastern Dakotas BRA, and initiated an unprecedented wet-cycle that continued until the mid-2000s (Fig. 8). Superb breeding conditions in the Eastern Dakotas BRA persisted upon the return of excellent wetland conditions, coupled with 1.2 – 1.4 million ha (3 – 3.5 million ac) of large blocks of undisturbed perennial grass provided by the Conservation Reserve Program which has provided secure nesting habitat. As a result, 42.6% of the total BWTE harvest originated in the Eastern Dakotas BRA during the 1994 – 2003 time period. Although, as previously mentioned, some birds banded in the Eastern Dakotas BRA likely are early migrants from Canada, this does not account for the doubling of the percentage of BWTE harvest that originated in the Eastern Dakotas BRA from previous time periods. Extreme drought conditions in the Eastern Dakotas BRA during the 1987 – 1993 time periods appeared to significantly affect derivation of the BWTE harvest in the southern Central Flyway Low Plains.

Percentage of the harvest in the southern Central Flyway Low Plains derived from the Eastern Dakotas BRA dropped from 35.7% and 46.4% during the 1970 – 1979 and 1980 – 1986 time periods, respectively, and to 25.3% during 1987 – 1993 (Appendices H – K). Conversely, contribution to the BWTE harvest in the southern Central Flyway Low Plains from the Eastern Dakotas BRA rebounded considerably to 53.3% during the 1994 – 2003 time period.

The contribution of 2 BRAs declined substantially during the 1994 – 2003 time period from prior the time periods. Percentage of the BWTE harvest derived from the Central Alberta BRA decreased from 8.7%, 12.4%, and 14.1% during the 1970 – 1979, 1980 – 1986, and 1987 – 1993 time periods, respectively, to 4.8% during the 1994 – 2003 time period. Similarly, percentage of the BWTE harvest derived from the West-central Manitoba BRA decreased from 7.9%, 7.9%, and 6.1% during the 1970 – 1979, 1980 – 1986, and 1987 – 1993 time periods, respectively, to 3.1% during the 1994 – 2003 time period (Appendices H – K). These decreases in contribution are coincident with ideal breeding conditions in the Eastern Dakotas BRA, which likely attracted breeding BWTE away from these other areas, particularly given the nomadic nature of breeding area selection by BWTE (Johnson and Grier 1988). However, the two aforementioned Canadian BRAs have also endured serious wetland losses over the years through drainage and subsequent conversion to agriculture, and frequent drought in western areas (Khandekar 2004). The derivation of BWTE harvest from the West-central Manitoba BRA in several minor harvest areas has shown substantial declines over time. The percentage of BWTE harvest in the Mississippi Flyway – Northwest that is derived from the West-central Manitoba BRA has declined steadily over the four time periods (16.7% during 1970 – 1979 to 4.2% during 1994 – 2003; Appendices H – K). Similarly, the percentage of BWTE harvest in the Mississippi

Flyway – West-central that is derived from the West-central Manitoba BRA declined sharply in the two most recent time periods (9.6% and 11.9% during 1970 – 1979 and 1980 – 1986, respectively, to 1.7% and 2.6% during 1987 – 1993 and 1994 – 2003, respectively; Appendices H – K).

Grouping Breeding Reference Areas for Future Analyses

We defined BRAs at spatial scales that we felt would be of interest for waterfowl managers across North America. Using BRAs at relatively small spatial scales for distribution and derivation of the harvest required that we pool data from multiple years and age/sex classes. Other analyses, particularly survival analyses, generally require data that are parsed annually and by age/sex class. Grouping some BRAs in a north-to-south fashion will also alleviate violations of assumptions pertaining to origins of BWTE, particularly those ignoring the early migration strategy of this species. For example, many adult male BWTE begin migration in mid to late-August, and undoubtedly, are banded south of the BRA from which they departed. Our recommendation to pool certain BRAs is also important from the standpoint of including habitat covariates in other analyses. Ideally, particularly from a habitat covariate standpoint, BRAs would not need to be grouped into larger breeding regions; however, reduced sample sizes due to significant gaps in banding in some BRAs will necessitate some grouping.

A well-defined split occurs in the distribution and derivation of the BWTE harvest relative to BRAs east and west of 87°W. Using these two groups should be the coarsest that BWTE banding data are analyzed. However, finer groupings can occur; provided sufficient banding and recovery data is available. Blue-winged Teal bandings and recoveries from the Central Alberta, Southern Alberta, Western Saskatchewan, and Northern Great Plains BRAs should be grouped as the Western Prairies BWTE breeding region. Blue-winged Teal bandings and recoveries from the Eastern Saskatchewan/Southwestern Manitoba, Eastern Dakotas, West-central Manitoba, and Upper Midwest BRAs should be combined as the Eastern Prairies BWTE breeding region. The most important distinction between these two breeding regions is their contributions to harvest in Mexico, Central America, and the Mississippi Flyway – Northwest. Ideally, the Upper Midwest BRA would be maintained as its own breeding region, given the unique harvest distribution of BWTE from within its borders, relatively large geographic size, and representation of both large expanses of prairie and forest and associated ecotone. Unfortunately, large annual variation and occasional lack of preseason BWTE bandings within this BRA preclude its ability to

be used individually for survival analyses. Finally, BWTE bandings and recoveries originating from all areas east of 87°W (i.e., the U.S. Great Lakes, Eastern Ontario/Southern Quebec, Maritimes/Maine, and Northeast States BRAs) should be grouped to form the Eastern BWTE breeding region. This breeding region is much larger in size than desired, but small sample sizes of banded birds preclude separating distinct breeding regions east of 87°W where all BRAs could remain separate, with the exception of the combination of the Maritimes/Maine and Northeast States BRAs.

Bi-weekly Harvest of Blue-winged Teal

Managers are often interested in the progression of the BWTE harvest through time as well as across geographic regions. Harvest opportunities for BWTE progress in a somewhat bifurcated fashion during the first two months of waterfowl hunting seasons. Duck hunting seasons in western Canadian provinces generally open the first of September and September teal seasons generally open the second Saturday of September in teal non-breeding U.S.

states. Teal harvest occurs primarily in Canada and states south of about 43°N in much of September (Appendices L and M). Duck hunting seasons then open in northern breeding areas of the U.S. and eastern Canadian provinces during the last week of September, sometimes slightly overlapping (usually a weekend) with September teal seasons in southern states. As a result, the relative harvest density increases dramatically in the northern U.S. states, although relatively high numbers of teal still are taken in some areas of the Gulf Coast (Appendices N and O). From the end of October through November, December, and finally January when hunting seasons in the U.S. close, harvest density is highest in the southern states of the U.S. and primarily along the Gulf Coast (Appendices P – V), denoting the quick departure of teal from northern breeding areas to wintering areas in the southern U.S. and points farther south. During this same period, harvests south of the U.S. are relatively high. Finally, after the first of February only areas south of the U.S. have open hunting seasons, so all harvest occurs in Mexico, Central and South America, and Caribbean countries (Appendix W).



Photo by Michael Szymanski



Management Implications

We have provided the first comprehensive review of BWTE banding and recovery data that links BWTE breeding areas with harvest areas. We developed easily recognizable BRAs that waterfowl managers can use to guide their work. Exceptionally wet conditions in the U.S. prairies that were accompanied by a perennial grass cover program constituted breeding habitat that provided a substantial increase to the BWTE fall flight, based on the substantial increase in contribution to harvest during the 1994 – 2003 time period by the Eastern Dakotas BRA. Although BRAs east of 87°W distributed much of their harvest to harvest areas in eastern Canada or the Atlantic Flyway, many of the BWTE harvested

in those areas were derived from BRAs west of 87°W. Harvest of BWTE from eastern BRAs will be most influenced by harvest management decisions in eastern Canada and Atlantic Flyway states, but some buffering of the effects of harvest by BWTE originating west of 87°W should be expected.

Generally, managers desiring to influence breeding habitat for BWTE should focus on the U.S. prairies and also breeding habitat in Saskatchewan, Canada. However, managers can use this publication to direct management efforts based on the location of their jurisdiction as it falls within BRAs, or minor harvest areas.

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Appendices

Appendix A. Numbers of Blue-winged Teal banded and direct recoveries by breeding reference area, time period, and age/sex class.

Breeding Reference Area	Period	Number Banded				Total	Direct Recoveries				
		AM ^a	AF ^b	IM ^c	IF ^d		AM	AF	IM	IF	Total
Central Alberta	1970-1979	3,457	1,454	2,920	2,639	10,470	37	18	43	44	142
Central Alberta	1980-1986	8,374	3,217	2,659	2,058	16,308	81	38	43	42	204
Central Alberta	1987-1993	10,261	3,840	2,867	2,213	19,181	48	19	21	23	111
Central Alberta	1994-2003	9,335	4,144	4,169	3,807	21,455	136	54	55	54	299
Central Alberta	1970-2003	31,427	12,655	12,615	10,717	67,414	302	129	162	163	756
Southern Alberta	1970-1979	3,282	1,719	4,094	3,154	12,249	34	18	52	57	161
Southern Alberta	1980-1986	6,132	2,862	3,338	2,680	15,012	61	23	43	40	167
Southern Alberta	1987-1993	8,174	3,062	2,232	1,772	15,240	37	11	11	10	69
Southern Alberta	1994-2003	14,536	5,480	6,375	5,348	31,739	194	81	80	67	422
Southern Alberta	1970-2003	32,124	13,123	16,039	12,954	74,240	326	133	186	174	819
Western Saskatchewan	1970-1979	6,667	2,893	6,209	5,440	21,209	72	26	98	95	291
Western Saskatchewan	1980-1986	9,335	4,688	3,654	3,031	20,708	102	59	49	48	258
Western Saskatchewan	1987-1993	12,473	4,723	3,790	3,041	24,027	54	29	34	14	131
Western Saskatchewan	1994-2003	13,219	5,239	8,166	6,792	33,416	175	76	111	98	460
Western Saskatchewan	1970-2003	41,964	17,543	21,819	18,304	99,360	403	190	292	255	1,140
E. Sask. / SW Manitoba ^e	1970-1979	11,358	5,200	13,295	10,976	40,829	143	63	316	222	744
E. Sask. / SW Manitoba	1980-1986	9,268	4,248	6,766	5,172	25,454	96	56	150	120	422
E. Sask. / SW Manitoba	1987-1993	19,361	8,427	12,625	9,712	50,125	112	61	95	84	352
E. Sask. / SW Manitoba	1994-2003	31,796	11,736	27,290	24,388	95,210	423	172	563	492	1,650
E. Sask. / SW Manitoba	1970-2003	71,783	29,611	59,976	50,248	211,618	774	352	1,124	918	3,168
West-central Manitoba	1970-1979	2,732	1,491	10,002	8,213	22,438	48	49	422	369	888
West-central Manitoba	1980-1986	3,200	1,563	7,210	6,123	18,096	46	22	237	205	510
West-central Manitoba	1987-1993	2,761	1,255	1,927	1,576	7,519	19	9	17	15	60
West-central Manitoba	1994-2003	1,693	1,312	5,618	5,616	14,239	31	23	173	171	398
West-central Manitoba	1970-2003	10,386	5,621	24,757	21,528	62,292	144	103	849	760	1,856
Northern Great Plains	1970-1979	420	312	1,084	997	2,813	8	5	22	23	58
Northern Great Plains	1980-1986	480	351	974	860	2,665	4	2	10	12	28
Northern Great Plains	1987-1993	1,427	665	794	726	3,612	9	2	3	6	20
Northern Great Plains	1994-2003	6,723	4,388	12,382	10,119	33,612	91	78	271	269	709
Northern Great Plains	1970-2003	9,050	5,716	15,234	12,702	42,702	112	87	306	310	815

^a = Adult Male; ^b = Adult Female; ^c = Immature Male; ^d = Immature Female; ^e = Eastern Saskatchewan / Southwest Manitoba

Appendix A. (continued)

Breeding Reference Area	Period	Number Banded					Number of Direct Recoveries				
		AM	AF	IM	IF	Total	AM	AF	IM	IF	Total
Eastern Dakotas	1970-1979	756	542	3,503	3,552	8,353	12	7	82	90	191
Eastern Dakotas	1980-1986	115	86	194	185	580	1	2	2	3	8
Eastern Dakotas	1987-1993	650	511	484	485	2,130	4	5	2	3	14
Eastern Dakotas	1994-2003	10,127	7,296	30,889	25,390	73,702	129	116	760	634	1,639
Eastern Dakotas	1970-2003	11,648	8,435	35,070	29,612	84,765	146	130	846	730	1,852
Upper Midwest	1970-1979	1,408	1,392	9,198	8,360	20,358	29	34	324	358	745
Upper Midwest	1980-1986	1,066	724	1,411	1,352	4,553	13	16	41	44	114
Upper Midwest	1987-1993	83	124	232	300	739	1	3	3	5	12
Upper Midwest	1994-2003	48	61	261	266	636	3	3	10	15	31
Upper Midwest	1970-2003	2,605	2,301	11,102	10,278	26,286	46	56	378	422	902
U.S. Great Lakes	1970-1979	2,008	1,197	4,202	4,015	11,422	40	35	176	205	456
U.S. Great Lakes	1980-1986	347	258	997	890	2,492	8	6	62	51	127
U.S. Great Lakes	1987-1993	501	415	1,873	1,665	4,454	8	13	67	67	155
U.S. Great Lakes	1994-2003	1,948	1,002	3,717	3,280	9,947	29	28	101	137	295
U.S. Great Lakes	1970-2003	4,804	2,872	10,789	9,850	28,315	85	82	406	460	1,033
Eastern Ontario / Southern Quebec	1970-1979	530	384	2,032	2,206	5,152	50	29	244	254	577
Eastern Ontario / Southern Quebec	1980-1986	214	206	1,139	1,268	2,827	13	15	106	122	256
Eastern Ontario / Southern Quebec	1987-1993	136	208	992	1,050	2,386	3	7	28	39	77
Eastern Ontario / Southern Quebec	1994-2003	139	275	1,732	1,844	3,990	1	9	85	88	183
Eastern Ontario / Southern Quebec	1970-2003	1,019	1,073	5,895	6,368	14,355	67	60	463	503	1,093
Maritimes / Maine	1970-1979	857	513	4,268	4,142	9,780	66	36	294	269	665
Maritimes / Maine	1980-1986	572	307	1,980	1,756	4,615	14	13	101	101	229
Maritimes / Maine	1987-1993	366	264	1,688	1,573	3,891	6	6	37	46	95
Maritimes / Maine	1994-2003	295	244	995	1,104	2,638	5	13	56	64	138
Maritimes / Maine	1970-2003	2,090	1,328	8,931	8,575	20,924	91	68	488	480	1,127
Northeast States	1970-1979	1,310	721	2,752	2,718	7,501	23	13	89	129	254
Northeast States	1980-1986	1,879	951	2,988	2,842	8,660	34	25	72	111	242
Northeast States	1987-1993	936	471	1,135	849	3,391	10	4	25	11	50
Northeast States	1994-2003	206	143	660	690	1,699	5	6	22	13	46
Northeast States	1970-2003	4,331	2,286	7,535	7,099	21,251	72	48	208	264	592

Appendix B. Average annual harvest rates of Blue-winged Teal by breeding reference area, time period, and age/sex class.

Breeding Reference Area	Period	Harvest Rate (Standard Error) ^a							
		Adult Male		Adult Female		Immature Male		Immature Female	
Central Alberta	1970-1979	0.036	(0.003)	0.049	(0.006)	0.053	(0.004)	0.065	(0.005)
Southern Alberta	1970-1979	0.043	(0.004)	0.036	(0.005)	0.055	(0.004)	0.066	(0.004)
Western Saskatchewan	1970-1979	0.043	(0.002)	0.031	(0.003)	0.055	(0.003)	0.062	(0.003)
E. Sask. / SW Manitoba ^b	1970-1979	0.045	(0.002)	0.039	(0.003)	0.080	(0.002)	0.063	(0.002)
West-central Manitoba	1970-1979	0.054	(0.004)	0.106	(0.008)	0.127	(0.003)	0.137	(0.004)
Northern Great Plains	1970-1979	0.097	(0.014)	0.053	(0.013)	0.077	(0.008)	0.102	(0.010)
Eastern Dakotas	1970-1979	0.061	(0.009)	0.046	(0.009)	0.078	(0.005)	0.083	(0.005)
Upper Midwest	1970-1979	0.060	(0.006)	0.072	(0.007)	0.103	(0.003)	0.116	(0.003)
U.S. Great Lakes	1970-1979	0.067	(0.006)	0.078	(0.008)	0.124	(0.005)	0.138	(0.005)
E. Ontario / S. Quebec ^c	1970-1979	0.270	(0.019)	0.205	(0.021)	0.345	(0.011)	0.314	(0.010)
Maritimes / Maine	1970-1979	0.182	(0.013)	0.149	(0.016)	0.173	(0.006)	0.172	(0.006)
Northeast States	1970-1979	0.063	(0.007)	0.053	(0.008)	0.098	(0.006)	0.126	(0.006)
Total ^d	1970-1979	0.054	(0.005)	0.049	(0.006)	0.078	(0.004)	0.082	(0.004)
Central Alberta	1980-1986	0.035	(0.002)	0.041	(0.003)	0.066	(0.005)	0.065	(0.005)
Southern Alberta	1980-1986	0.033	(0.002)	0.028	(0.003)	0.049	(0.004)	0.054	(0.004)
Western Saskatchewan	1980-1986	0.037	(0.002)	0.043	(0.003)	0.048	(0.004)	0.057	(0.004)
E. Sask. / SW Manitoba	1980-1986	0.040	(0.002)	0.039	(0.003)	0.073	(0.003)	0.072	(0.004)
West-central Manitoba	1980-1986	0.043	(0.004)	0.043	(0.005)	0.095	(0.003)	0.094	(0.004)
Northern Great Plains	1980-1986	0.039	(0.009)	0.012	(0.006)	0.036	(0.006)	0.068	(0.009)
Eastern Dakotas	1980-1986	0.027	(0.015)	0.048	(0.023)	0.032	(0.013)	0.039	(0.014)
Upper Midwest	1980-1986	0.032	(0.005)	0.063	(0.009)	0.092	(0.008)	0.091	(0.008)
U.S. Great Lakes	1980-1986	0.078	(0.014)	0.056	(0.014)	0.195	(0.013)	0.158	(0.012)
E. Ontario / S. Quebec	1980-1986	0.175	(0.026)	0.176	(0.027)	0.273	(0.013)	0.276	(0.013)
Maritimes / Maine	1980-1986	0.089	(0.012)	0.108	(0.018)	0.150	(0.008)	0.153	(0.009)
Northeast States	1980-1986	0.068	(0.006)	0.084	(0.009)	0.077	(0.005)	0.123	(0.006)
Total	1980-1986	0.036	(0.007)	0.044	(0.010)	0.058	(0.007)	0.063	(0.008)
Central Alberta	1987-1993	0.019	(0.001)	0.015	(0.002)	0.023	(0.003)	0.042	(0.004)
Southern Alberta	1987-1993	0.018	(0.001)	0.011	(0.002)	0.021	(0.003)	0.027	(0.004)
Western Saskatchewan	1987-1993	0.015	(0.001)	0.022	(0.002)	0.030	(0.003)	0.018	(0.002)
E. Sask. / SW Manitoba	1987-1993	0.020	(0.001)	0.024	(0.002)	0.027	(0.001)	0.029	(0.002)
West-central Manitoba	1987-1993	0.029	(0.003)	0.024	(0.004)	0.030	(0.004)	0.032	(0.004)
Northern Great Plains	1987-1993	0.023	(0.004)	0.009	(0.004)	0.013	(0.004)	0.034	(0.007)
Eastern Dakotas	1987-1993	0.019	(0.005)	0.031	(0.008)	0.009	(0.004)	0.021	(0.007)
Upper Midwest	1987-1993	0.038	(0.021)	0.101	(0.027)	0.054	(0.015)	0.055	(0.013)
U.S. Great Lakes	1987-1993	0.039	(0.009)	0.060	(0.012)	0.101	(0.007)	0.105	(0.008)
E. Ontario / S. Quebec	1987-1993	0.053	(0.019)	0.054	(0.016)	0.070	(0.008)	0.097	(0.009)
Maritimes / Maine	1987-1993	0.028	(0.009)	0.102	(0.019)	0.066	(0.006)	0.086	(0.007)
Northeast States	1987-1993	0.038	(0.006)	0.033	(0.008)	0.065	(0.007)	0.025	(0.005)
Total	1987-1993	0.022	(0.005)	0.032	(0.007)	0.027	(0.005)	0.033	(0.006)

^a = Standard errors calculated as $\sqrt{((1-\text{harvest rate}) \times \text{harvest rate}) / \text{number banded}}$; ^b = Eastern Saskatchewan / Southwest Manitoba; ^c = Eastern Ontario / Southern Quebec; ^d = Total harvest rates and standard errors for periods are weighted by contribution to total population and summed (Munro and Kimball 1982)

Appendix C. Blue-winged Teal recovery weights by breeding reference area, time period and age/sex class.

Breeding Reference Area	Period	Recovery Weights			
		AM ^a	AF ^b	IM ^c	IF ^d
Central Alberta	1970-1979	882.55	1,752.63	965.25	1,068.03
Central Alberta	1980-1986	256.82	388.91	525.43	678.87
Central Alberta	1987-1993	270.05	314.99	746.48	967.09
Central Alberta	1994-2003	270.33	371.17	551.55	604.00
Southern Alberta	1970-1979	394.68	629.39	292.29	379.40
Southern Alberta	1980-1986	135.84	169.32	162.12	201.92
Southern Alberta	1987-1993	84.61	98.59	239.32	301.45
Southern Alberta	1994-2003	64.71	104.61	134.44	160.25
Western Saskatchewan	1970-1979	604.15	1162.91	599.29	684.01
Western Saskatchewan	1980-1986	274.15	317.58	455.00	548.52
Western Saskatchewan	1987-1993	211.96	244.35	538.77	671.77
Western Saskatchewan	1994-2003	375.49	577.46	553.85	665.89
E. Sask. / SW Manitoba ^c	1970-1979	508.95	928.51	401.67	486.53
E. Sask. / SW Manitoba	1980-1986	289.24	367.11	257.38	336.71
E. Sask. / SW Manitoba	1987-1993	125.37	125.73	148.49	193.03
E. Sask. / SW Manitoba	1994-2003	191.76	316.66	203.58	227.81
West-central Manitoba	1970-1979	491.35	751.99	123.98	150.99
West-central Manitoba	1980-1986	315.62	375.92	91.00	107.16
West-central Manitoba	1987-1993	372.55	357.77	412.28	504.10
West-central Manitoba	1994-2003	564.85	444.25	155.10	155.16
Northern Great Plains	1970-1979	3,433.83	3,860.90	1,229.08	1,336.33
Northern Great Plains	1980-1986	2,366.10	1,882.37	757.51	857.92
Northern Great Plains	1987-1993	759.07	711.03	1053.68	1152.37
Northern Great Plains	1994-2003	408.73	381.69	202.22	247.44

^a = Adult Male; ^b = Adult Female; ^c = Immature Male; ^d = Immature Female;

^e = Eastern Saskatchewan / Southwest Manitoba

Appendix C. (continued)

Reference Area	Period	Recovery Weights			
		AM	AF	IM	IF
Eastern Dakotas	1970-1979	9366.77	10,912.58	1,867.47	1,841.71
Eastern Dakotas	1980-1986	47,832.23	37,209.85	18,419.98	19,316.08
Eastern Dakotas	1987-1993	7,024.94	3,900.62	7,286.68	7,271.65
Eastern Dakotas	1994-2003	1,702.04	1,439.93	508.46	618.58
Upper Midwest	1970-1979	1,583.85	1,338.12	223.98	246.43
Upper Midwest	1980-1986	1,271.78	1,089.35	624.19	651.42
Upper Midwest	1987-1993	23,350.23	6,822.54	6,452.09	4,989.62
Upper Midwest	1994-2003	45,104.39	21,632.38	7,558.34	7,416.27
U.S. Great Lakes	1970-1979	197.62	276.90	87.24	91.30
U.S. Great Lakes	1980-1986	750.41	587.15	169.67	190.07
U.S. Great Lakes	1987-1993	919.41	484.51	189.95	213.68
U.S. Great Lakes	1994-2003	125.85	149.13	60.10	68.11
E. Ontario / S. Quebec ^f	1970-1979	322.42	371.69	77.69	71.56
E. Ontario / S. Quebec	1980-1986	523.98	316.66	63.96	57.45
E. Ontario / S. Quebec	1987-1993	1396.82	398.67	147.91	139.74
E. Ontario / S. Quebec	1994-2003	788.85	243.02	57.69	54.18
Maritimes / Maine	1970-1979	27.08	37.79	5.02	5.18
Maritimes / Maine	1980-1986	26.62	28.86	5.00	5.63
Maritimes / Maine	1987-1993	42.10	25.48	7.05	7.57
Maritimes / Maine	1994-2003	119.83	88.30	32.37	29.18
Northeast States	1970-1979	85.52	129.78	37.61	38.08
Northeast States	1980-1986	39.12	44.97	15.98	16.80
Northeast States	1987-1993	84.30	73.12	53.69	71.78
Northeast States	1994-2003	743.12	652.48	211.34	202.16

^f = Eastern Ontario / Southern Quebec

Appendix D. Distribution of the Blue-winged Teal harvest for all age/sex classes, 1970 – 1979.

Harvest Area	Breeding Reference Area												Total
	Central Alberta	S. Alberta ^a	W. SK ^b	E. SK / SW MB ^c	WC MB ^d	N. Grt. Plains ^e	Eastern Dakotas	Upper Midwest	U.S. Great Lakes	E. ON / S. PQ ^f	Maritimes / Maine	NE States ^g	
Alberta	2.5%	14.9%	1.0%	0.1%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.9%
Saskatchewan	0.5%	0.5%	4.5%	1.6%	0.2%	1.4%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	1.0%
Manitoba	0.0%	0.0%	0.6%	4.4%	9.3%	0.0%	0.3%	0.0%	0.2%	0.0%	0.0%	0.0%	1.7%
Ontario	0.6%	0.0%	0.4%	1.2%	1.9%	0.0%	0.7%	0.9%	35.0%	46.0%	0.4%	1.5%	2.8%
Quebec	0.8%	0.0%	0.6%	1.0%	1.2%	0.0%	0.0%	1.1%	3.7%	16.1%	4.2%	5.8%	1.1%
Maritimes	0.0%	0.0%	0.0%	0.5%	0.1%	0.0%	0.0%	0.0%	2.0%	2.2%	28.9%	0.9%	0.3%
Canada	4.4%	15.4%	7.1%	8.8%	12.7%	1.4%	1.0%	2.0%	40.9%	64.3%	33.5%	8.2%	7.7%
PF North ^h	0.0%	1.0%	0.1%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%
PF South	0.6%	2.3%	0.0%	0.1%	0.0%	3.3%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.4%
Pacific Flyway	0.6%	3.4%	0.1%	0.1%	0.0%	3.3%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.4%
CF HP N. ⁱ	0.6%	0.0%	0.5%	0.0%	4.8%	1.1%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.7%
CF LP N. ^j	4.3%	0.2%	1.1%	3.7%	1.7%	6.1%	4.1%	0.0%	0.0%	0.0%	0.0%	0.0%	2.8%
CF HP S.	1.3%	2.4%	1.9%	0.2%	0.0%	2.4%	0.3%	0.0%	0.0%	0.0%	0.0%	0.0%	0.7%
CF LP S.	9.7%	4.8%	9.6%	8.7%	5.4%	9.1%	10.7%	3.8%	0.4%	0.0%	0.0%	1.2%	8.0%
Central Flyway	15.9%	7.4%	13.1%	12.7%	7.1%	22.4%	16.2%	3.8%	0.4%	0.0%	0.0%	1.2%	12.3%
MF Northwest ^k	8.7%	0.8%	12.7%	16.6%	34.7%	0.3%	11.1%	50.4%	0.6%	0.0%	0.0%	0.0%	16.5%
MF Northeast	0.0%	0.5%	0.3%	1.4%	2.1%	0.9%	4.4%	3.5%	13.9%	0.9%	0.2%	2.1%	2.4%
MF West-central	2.5%	1.3%	2.7%	4.2%	3.4%	0.9%	2.2%	4.5%	0.6%	0.7%	0.0%	0.8%	2.8%
MF South	0.6%	2.2%	2.8%	1.6%	1.8%	1.9%	1.3%	1.4%	0.4%	0.5%	0.2%	0.3%	1.5%
MF Gulf Coast	15.5%	9.7%	13.3%	18.8%	9.1%	3.6%	21.4%	13.4%	5.4%	3.1%	1.5%	1.3%	15.0%
Mississippi Flyway	27.2%	14.4%	31.7%	42.6%	51.2%	7.6%	40.4%	73.3%	20.9%	5.2%	2.0%	4.6%	38.3%
AF North ^l	0.0%	0.0%	0.3%	0.9%	1.9%	0.0%	1.2%	0.3%	4.5%	13.9%	32.4%	39.0%	1.5%
AF Central	0.7%	0.0%	0.0%	0.4%	1.0%	0.0%	0.7%	0.2%	2.8%	1.5%	0.9%	7.7%	0.6%
AF South	1.2%	0.0%	1.8%	2.1%	3.8%	0.9%	4.2%	1.8%	3.9%	1.2%	1.8%	5.4%	2.5%
Atlantic Flyway	2.0%	0.0%	2.0%	3.3%	6.7%	0.9%	6.1%	2.3%	11.2%	16.5%	35.1%	52.1%	4.6%
Mexico	27.2%	40.8%	21.5%	12.8%	4.2%	55.1%	13.9%	4.7%	0.4%	0.3%	0.0%	0.0%	16.9%
Central America	12.8%	14.6%	9.2%	6.7%	2.8%	7.6%	6.0%	1.4%	1.6%	0.0%	0.0%	1.5%	6.4%
South America	9.9%	3.1%	10.9%	7.6%	6.8%	1.7%	7.9%	6.3%	10.9%	2.7%	14.3%	10.7%	7.5%
Caribbean	0.0%	1.0%	4.3%	5.4%	8.4%	0.0%	8.5%	6.2%	13.8%	11.0%	15.2%	21.8%	5.9%
Latin America	49.9%	59.4%	46.0%	32.5%	22.3%	64.4%	36.3%	18.6%	26.7%	13.9%	29.4%	34.0%	36.7%

^a = Southern Alberta; ^b = Western Saskatchewan; ^c = Eastern Saskatchewan / Southwest Manitoba; ^d = West-central Manitoba; ^e = Northern Great Plains;

^f = Eastern Ontario / Southern Quebec; ^g = Northeast States; ^h = Pacific Flyway; ⁱ = Central Flyway High Plains; ^j = Central Flyway Low Plains

^k = Mississippi Flyway; ^l = Atlantic Flyway

Appendix E. Distribution of the Blue-winged Teal harvest for all age/sex classes, 1980 – 1986.

Harvest Area	Breeding Reference Area												Total
	Central Alberta	S. Alberta ^a	W. SK ^b	E. SK / SW MB ^c	WC MB ^d	N. Grt. Plains ^e	Eastern Dakotas	Upper Midwest	U.S. Great Lakes	E. ON / S. PQ ^f	Maritimes / Maine	NE States ^g	
Alberta	4.3%	6.7%	0.0%	0.1%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.8%
Saskatchewan	0.0%	0.3%	2.1%	0.5%	0.6%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.4%
Manitoba	0.0%	0.0%	0.8%	3.0%	4.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.9%
Ontario	0.4%	0.0%	0.3%	1.5%	2.8%	0.0%	0.0%	0.0%	34.8%	35.2%	0.1%	0.9%	2.8%
Quebec	0.4%	0.0%	0.0%	0.2%	0.5%	0.0%	0.0%	0.0%	0.0%	32.9%	22.7%	0.8%	1.1%
Maritimes	0.0%	0.0%	0.0%	0.0%	0.2%	0.0%	0.0%	0.8%	0.2%	1.9%	32.7%	0.7%	0.2%
Canada	5.1%	7.0%	3.2%	5.3%	8.1%	0.0%	0.0%	0.8%	35.0%	70.0%	55.4%	2.4%	6.3%
PF North ^h	0.0%	0.0%	0.4%	0.0%	0.0%	1.3%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.1%
PF South	0.0%	4.2%	0.0%	0.0%	0.0%	0.0%	3.5%	0.0%	0.0%	0.0%	0.0%	0.0%	0.9%
Pacific Flyway	0.0%	4.2%	0.4%	0.0%	0.0%	1.3%	3.5%	0.0%	0.0%	0.0%	0.0%	0.0%	1.1%
CF HP N. ⁱ	0.3%	0.0%	0.0%	0.0%	0.0%	0.6%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.1%
CF LP N. ^j	1.6%	0.7%	0.8%	2.2%	1.2%	0.0%	10.3%	0.0%	0.0%	0.0%	0.0%	0.0%	3.1%
CF HP S.	2.2%	4.1%	2.1%	0.7%	0.6%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.9%
CF LP S.	11.0%	12.1%	11.8%	11.8%	6.4%	17.4%	27.5%	2.8%	0.6%	0.1%	0.0%	0.0%	13.3%
Central Flyway	15.1%	16.9%	14.7%	14.8%	8.3%	18.0%	37.8%	2.8%	0.6%	0.1%	0.0%	0.0%	17.4%
MF Northwest ^k	7.8%	5.0%	9.5%	14.1%	32.9%	11.2%	37.1%	47.5%	0.6%	0.0%	0.0%	0.0%	21.3%
MF Northeast	0.7%	0.4%	0.8%	2.8%	4.3%	0.0%	0.0%	7.3%	10.4%	0.3%	0.3%	1.7%	2.2%
MF West-central	3.8%	2.5%	5.9%	4.0%	4.6%	0.0%	0.0%	5.7%	0.0%	0.3%	0.0%	0.0%	3.0%
MF South	4.4%	1.7%	2.1%	3.7%	2.4%	2.1%	0.0%	5.7%	0.6%	0.0%	0.0%	0.8%	2.4%
MF Gulf Coast	19.2%	15.7%	21.6%	20.6%	18.3%	0.0%	21.6%	14.5%	2.3%	0.9%	2.2%	1.5%	17.3%
Mississippi Flyway	35.8%	25.3%	40.0%	45.2%	62.6%	13.2%	58.7%	80.8%	14.0%	1.5%	2.5%	3.9%	46.2%
AF North ^l	0.0%	0.0%	0.0%	0.1%	0.9%	0.0%	0.0%	0.0%	1.5%	10.3%	3.7%	12.5%	0.5%
AF Central	0.0%	0.0%	0.0%	0.2%	1.0%	0.0%	0.0%	0.0%	4.6%	1.1%	1.0%	36.0%	0.6%
AF South	0.9%	1.4%	1.6%	3.6%	6.1%	0.0%	0.0%	2.4%	11.1%	3.7%	1.4%	7.9%	2.3%
Atlantic Flyway	0.9%	1.4%	1.6%	3.8%	7.9%	0.0%	0.0%	2.4%	17.2%	15.1%	6.1%	56.4%	3.4%
Mexico	27.5%	31.0%	27.0%	14.6%	3.5%	36.1%	0.0%	0.2%	0.0%	0.0%	0.6%	1.3%	12.9%
Central America	10.5%	10.3%	6.0%	3.8%	1.7%	8.4%	0.0%	2.7%	0.0%	0.0%	0.0%	0.0%	4.0%
South America	2.4%	3.1%	3.6%	3.6%	1.3%	11.5%	0.0%	4.2%	11.6%	1.7%	2.5%	8.8%	3.2%
Caribbean	2.6%	0.9%	3.5%	8.9%	6.6%	11.5%	0.0%	6.2%	21.7%	11.6%	32.8%	27.1%	5.5%
Latin America	43.1%	45.2%	40.1%	31.0%	13.1%	67.5%	0.0%	13.3%	33.2%	13.4%	35.9%	37.3%	25.6%

^a = Southern Alberta; ^b = Western Saskatchewan; ^c = Eastern Saskatchewan / Southwest Manitoba; ^d = West-central Manitoba; ^e = Northern Great Plains;

^f = Eastern Ontario / Southern Quebec; ^g = Northeast States; ^h = Pacific Flyway; ⁱ = Central Flyway High Plains; ^j = Central Flyway Low Plains;

^k = Mississippi Flyway; ^l = Atlantic Flyway

Appendix F. Distribution of the Blue-winged Teal harvest for all age/sex classes, 1987 – 1993.

Harvest Area	Breeding Reference Area												Total
	Central Alberta	S. Alberta ^a	W. SK ^b	E. SK / SW MB ^c	WC MB ^d	N. Grt. Plains ^e	Eastern Dakotas	Upper Midwest	U.S. Great Lakes	E. ON / S. PQ ^f	Maritimes / Maine	NE States ^g	
Alberta	3.2%	2.1%	0.3%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.5%
Saskatchewan	2.9%	0.0%	4.4%	3.6%	1.8%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	1.4%
Manitoba	0.0%	0.0%	0.0%	1.5%	4.4%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.4%
Ontario	0.0%	0.0%	0.4%	0.1%	3.5%	0.0%	0.0%	0.0%	50.7%	55.6%	0.0%	3.0%	5.3%
Quebec	0.0%	0.0%	0.0%	0.1%	0.0%	0.0%	0.0%	0.0%	2.0%	15.2%	17.8%	0.0%	0.6%
Maritimes	0.0%	0.0%	0.0%	0.1%	0.0%	0.0%	0.0%	0.0%	0.8%	3.6%	22.6%	0.0%	0.2%
Canada	6.1%	2.1%	5.1%	5.3%	9.6%	0.0%	0.0%	0.0%	53.5%	74.3%	40.4%	3.0%	8.5%
PF North ^h	1.1%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.2%
PF South	0.7%	0.0%	0.3%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.1%
Pacific Flyway	1.8%	0.0%	0.3%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.3%
CF HP N. ⁱ	1.1%	2.5%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.2%
CF LP N. ^j	0.0%	0.0%	1.9%	1.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.3%
CF HP S.	0.0%	0.0%	1.0%	0.8%	1.3%	4.8%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.5%
CF LP S.	7.5%	13.5%	14.6%	6.5%	6.2%	25.4%	13.3%	6.6%	0.0%	0.0%	0.0%	0.0%	11.5%
Central Flyway	8.6%	16.0%	17.5%	8.3%	7.5%	30.1%	13.3%	6.6%	0.0%	0.0%	0.0%	0.0%	10.2%
MF Northwest ^k	1.8%	0.2%	5.3%	9.5%	13.6%	3.4%	22.5%	16.3%	0.0%	0.0%	0.0%	0.0%	10.4%
MF Northeast	0.4%	0.0%	1.4%	1.5%	0.0%	0.0%	0.0%	0.0%	6.1%	1.2%	0.0%	0.0%	0.8%
MF West-central	2.0%	0.0%	0.1%	2.4%	0.4%	0.0%	4.7%	0.0%	0.0%	0.0%	0.0%	0.0%	1.4%
MF South	0.1%	1.3%	2.0%	2.2%	4.8%	0.0%	2.8%	1.5%	0.0%	0.0%	0.0%	0.0%	1.6%
MF Gulf Coast	18.8%	18.3%	22.9%	24.7%	21.0%	22.2%	39.0%	29.0%	4.4%	0.4%	0.8%	0.0%	24.3%
Mississippi Flyway	23.1%	19.8%	31.8%	40.3%	39.9%	25.7%	69.0%	46.8%	10.5%	1.5%	0.8%	0.0%	38.6%
AF North ^l	0.0%	0.0%	0.0%	0.3%	0.0%	0.0%	0.0%	0.0%	0.7%	5.3%	1.5%	8.3%	0.3%
AF Central	0.0%	0.0%	0.0%	0.2%	0.0%	0.0%	0.0%	0.0%	0.9%	2.2%	0.8%	46.1%	0.4%
AF South	3.2%	2.4%	2.4%	4.5%	4.3%	0.0%	0.0%	11.1%	8.8%	7.6%	9.2%	13.0%	4.9%
Atlantic Flyway	3.2%	2.4%	2.4%	5.1%	4.3%	0.0%	0.0%	11.1%	10.3%	15.1%	11.5%	67.4%	5.6%
Mexico	25.9%	41.6%	19.0%	16.5%	2.6%	44.2%	0.0%	0.0%	0.0%	0.0%	0.0%	3.5%	11.1%
Central America	14.7%	4.9%	5.3%	8.2%	5.7%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	4.1%
South America	8.7%	12.0%	10.6%	6.4%	12.2%	0.0%	17.7%	22.2%	9.1%	4.6%	11.8%	17.9%	13.0%
Caribbean	7.8%	1.3%	7.8%	10.0%	18.2%	0.0%	0.0%	13.2%	16.6%	4.5%	35.5%	8.2%	8.6%
Latin America	57.2%	59.7%	42.8%	41.0%	38.6%	44.2%	17.7%	35.4%	25.8%	9.1%	47.3%	29.6%	36.8%

^a = Southern Alberta; ^b = Western Saskatchewan; ^c = Eastern Saskatchewan / Southwest Manitoba; ^d = West-central Manitoba; ^e = Northern Great Plains;

^f = Eastern Ontario / Southern Quebec; ^g = Northeast States; ^h = Pacific Flyway; ⁱ = Central Flyway High Plains; ^j = Central Flyway Low Plains;

^k = Mississippi Flyway; ^l = Atlantic Flyway

Appendix G. Distribution of the Blue-winged Teal harvest for all age/sex classes, 1994 – 2003.

Harvest Area	Breeding Reference Area												Total
	Central Alberta	S. Alberta ^a	W. SK ^b	E. SK / SW MB ^c	WC MB ^d	N. Grt. Plains ^e	Eastern Dakotas	Upper Midwest	U.S. Great Lakes	E. ON / S. PQ ^f	Maritimes / Maine	NE States ^g	
Alberta	1.4%	10.3%	0.3%	0.1%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.3%
Saskatchewan	0.0%	0.0%	1.9%	2.8%	2.7%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.7%
Manitoba	0.4%	0.0%	0.0%	0.8%	2.2%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.2%
Ontario	0.0%	0.0%	0.7%	1.1%	1.7%	0.2%	0.2%	0.0%	50.4%	43.9%	0.4%	1.5%	1.2%
Quebec	0.4%	0.6%	0.0%	0.4%	1.0%	0.1%	0.0%	0.0%	0.3%	16.1%	15.7%	0.0%	0.3%
Maritimes	0.4%	0.0%	0.0%	0.1%	0.1%	0.0%	0.1%	0.0%	1.1%	2.5%	41.0%	0.0%	0.2%
Canada	2.5%	10.9%	3.0%	5.3%	7.8%	0.2%	0.4%	0.0%	51.7%	62.5%	57.2%	1.5%	2.9%
PF North ^h	0.0%	0.2%	0.0%	0.0%	0.0%	0.2%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%
PF South	4.2%	5.9%	0.5%	0.2%	0.0%	0.1%	0.1%	0.0%	0.0%	0.0%	0.0%	0.0%	0.4%
Pacific Flyway	4.2%	6.2%	0.5%	0.2%	0.0%	0.3%	0.1%	0.0%	0.0%	0.0%	0.0%	0.0%	0.5%
CF HP N. ⁱ	0.9%	0.7%	0.3%	0.4%	0.0%	3.5%	0.3%	0.0%	0.0%	0.0%	0.0%	0.0%	0.5%
CF LP N. ^j	1.5%	0.7%	0.6%	2.0%	3.3%	3.6%	6.2%	0.0%	0.0%	0.0%	0.0%	0.0%	3.5%
CF HP S.	1.6%	1.8%	1.4%	0.6%	0.3%	3.6%	0.6%	0.0%	0.0%	0.0%	0.0%	0.0%	0.9%
CF LP S.	19.5%	14.5%	20.2%	14.3%	9.8%	21.7%	20.5%	2.0%	0.4%	0.0%	0.4%	3.2%	16.5%
Central Flyway	23.4%	17.7%	22.5%	17.3%	13.4%	32.3%	27.6%	2.0%	0.4%	0.0%	0.4%	3.2%	21.3%
MF Northwest ^k	9.1%	4.1%	7.8%	11.4%	25.7%	7.2%	9.9%	88.1%	0.6%	1.5%	0.4%	0.0%	18.9%
MF Northeast	1.7%	0.5%	1.1%	1.5%	2.8%	0.5%	0.7%	0.0%	10.8%	1.8%	0.0%	1.8%	1.0%
MF West-central	2.5%	1.3%	3.9%	3.5%	3.2%	2.9%	5.2%	2.0%	1.4%	0.0%	0.3%	0.0%	3.9%
MF South	2.9%	2.5%	4.8%	4.6%	1.8%	4.5%	4.7%	3.9%	0.4%	2.6%	0.0%	0.0%	4.2%
MF Gulf Coast	22.7%	18.4%	30.3%	26.7%	26.3%	22.7%	31.2%	2.0%	3.1%	7.8%	1.9%	0.0%	24.8%
Mississippi Flyway	38.9%	26.8%	47.9%	47.6%	59.9%	37.8%	51.6%	96.0%	16.2%	13.6%	2.6%	1.8%	52.9%
AF North ^l	0.2%	0.1%	0.0%	0.5%	0.0%	0.2%	0.2%	0.0%	1.8%	6.0%	1.1%	13.0%	0.3%
AF Central	0.0%	0.0%	0.1%	0.3%	0.8%	0.1%	0.5%	0.0%	3.1%	2.7%	2.5%	33.2%	0.6%
AF South	3.6%	1.3%	2.7%	4.8%	6.5%	1.2%	2.3%	2.0%	6.7%	5.4%	1.7%	10.8%	2.9%
Atlantic Flyway	3.8%	1.4%	2.8%	5.6%	7.3%	1.4%	3.0%	2.0%	11.6%	14.1%	5.3%	57.0%	3.8%
Mexico	16.4%	25.5%	10.5%	6.9%	5.0%	19.2%	7.1%	0.0%	0.0%	0.0%	0.0%	0.0%	8.0%
Central America	4.2%	4.0%	4.7%	4.2%	0.0%	2.3%	3.0%	0.0%	0.0%	0.0%	0.0%	0.0%	2.9%
South America	2.5%	4.2%	2.7%	4.2%	2.1%	4.7%	2.1%	0.0%	4.5%	0.0%	11.3%	0.0%	2.5%
Caribbean	4.1%	3.3%	5.4%	8.6%	4.6%	1.6%	5.1%	0.0%	15.5%	9.7%	23.2%	36.5%	5.2%
Latin America	27.1%	37.1%	23.4%	24.0%	11.7%	27.9%	17.3%	0.0%	20.0%	9.7%	34.5%	36.5%	18.6%

^a = Southern Alberta; ^b = Western Saskatchewan; ^c = Eastern Saskatchewan / Southwest Manitoba; ^d = West-central Manitoba; ^e = Northern Great Plains;

^f = Eastern Ontario / Southern Quebec; ^g = Northeast States; ^h = Pacific Flyway; ⁱ = Central Flyway High Plains; ^j = Central Flyway Low Plains;

^k = Mississippi Flyway; ^l = Atlantic Flyway

Appendix H. Derivation of the Blue-winged Teal harvest for all age/sex classes, 1970 – 1979.

Harvest Area	Breeding Reference Area											
	Central Alberta	S. Alberta ^a	W. SK ^b	E. SK / SW MB ^c	WC MB ^d	N. Grt. Plains ^e	Eastern Dakotas	Upper Midwest	U.S. Great Lakes	E. ON / S. PQ ^f	Maritimes / Maine	NE States ^g
Alberta	24.3%	61.4%	12.1%	2.2%	0.0%	0.0%	0.8%	0.0%	0.0%	0.0%	0.0%	0.0%
Saskatchewan	4.8%	1.9%	51.3%	30.3%	1.6%	10.1%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%
Manitoba	0.0%	0.0%	3.8%	47.9%	42.9%	0.0%	5.2%	0.0%	0.3%	0.0%	0.0%	0.0%
Ontario	1.8%	0.0%	1.5%	7.8%	5.3%	0.0%	6.3%	3.7%	28.3%	45.1%	0.0%	0.3%
Quebec	6.3%	0.0%	6.2%	16.5%	8.4%	0.0%	0.0%	10.8%	7.7%	40.3%	0.9%	2.9%
Maritimes	0.0%	0.0%	0.0%	33.8%	4.1%	0.0%	0.0%	1.2%	15.8%	21.0%	22.4%	1.7%
Canada	4.9%	7.2%	10.0%	21.0%	13.0%	1.3%	3.4%	2.9%	11.9%	22.8%	1.0%	0.6%
PF North ^h	0.0%	80.5%	19.5%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%
PF South	13.5%	22.4%	0.0%	5.1%	0.0%	59.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%
Pacific Flyway	12.0%	28.9%	2.2%	4.5%	0.0%	52.5%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%
CF HP N. ⁱ	7.0%	0.0%	7.1%	1.0%	1.0%	44.4%	39.6%	0.0%	0.0%	0.0%	0.0%	0.0%
CF LP N. ^j	13.2%	0.2%	4.1%	24.4%	4.7%	14.6%	38.7%	0.0%	0.0%	0.0%	0.0%	0.0%
CF HP S.	16.0%	12.5%	29.4%	6.5%	0.3%	22.7%	12.6%	0.0%	0.0%	0.0%	0.0%	0.0%
CF LP S.	10.5%	2.2%	13.1%	20.1%	5.3%	7.6%	35.7%	5.2%	0.1%	0.0%	0.0%	0.1%
Central Flyway	11.3%	2.2%	11.6%	19.2%	4.6%	12.3%	35.3%	3.4%	0.1%	0.0%	0.0%	0.1%
MF Northwest ^k	4.6%	0.2%	8.4%	18.6%	16.7%	0.1%	18.0%	33.5%	0.1%	0.0%	0.0%	0.0%
MF Northeast	0.0%	0.7%	1.2%	10.3%	6.9%	2.6%	48.0%	15.9%	12.9%	1.0%	0.0%	0.5%
MF West-central	7.8%	1.7%	10.4%	28.3%	9.6%	2.1%	20.9%	17.9%	0.5%	0.7%	0.0%	0.1%
MF South	3.3%	5.2%	19.8%	19.1%	9.6%	8.3%	23.1%	9.9%	0.6%	1.0%	0.0%	0.1%
MF Gulf Coast	8.9%	2.3%	9.7%	23.2%	4.8%	1.6%	38.2%	9.8%	0.8%	0.6%	0.0%	0.0%
Mississippi Flyway	6.2%	1.4%	9.0%	20.6%	10.6%	1.3%	28.2%	21.0%	1.2%	0.4%	0.0%	0.1%
AF North ^l	0.0%	0.0%	2.0%	11.5%	10.3%	0.0%	21.9%	2.0%	7.0%	26.1%	4.9%	14.3%
AF Central	11.3%	0.0%	0.0%	12.2%	14.5%	0.0%	31.3%	4.6%	11.3%	7.1%	0.4%	7.3%
AF South	4.2%	0.0%	7.7%	15.0%	12.0%	2.5%	44.9%	7.6%	3.5%	1.3%	0.2%	1.1%
Atlantic Flyway	3.7%	0.0%	4.9%	13.5%	11.8%	1.4%	35.9%	5.5%	5.5%	9.9%	1.7%	6.1%
Mexico	14.0%	8.8%	13.9%	14.0%	2.0%	22.0%	22.1%	3.1%	0.0%	0.0%	0.0%	0.0%
Central America	17.3%	8.3%	15.6%	19.4%	3.5%	7.9%	24.9%	2.4%	0.6%	0.0%	0.0%	0.1%
South America	11.5%	1.5%	16.0%	18.9%	7.3%	1.6%	28.5%	9.2%	3.3%	1.0%	0.4%	0.8%
Caribbean	0.0%	0.6%	8.0%	17.1%	11.3%	0.0%	38.6%	11.6%	5.3%	5.1%	0.6%	2.0%
Latin America	11.8%	5.9%	13.7%	16.4%	4.8%	11.8%	26.6%	5.6%	1.6%	1.0%	0.2%	0.5%
Total	8.7%	3.6%	10.9%	18.5%	7.9%	6.7%	26.8%	11.0%	2.3%	2.7%	0.2%	0.5%

^a = Southern Alberta; ^b = Western Saskatchewan; ^c = Eastern Saskatchewan / Southwest Manitoba; ^d = West-central Manitoba; ^e = Northern Great Plains; ^f = Eastern Ontario / Southern Quebec; ^g = Northeast States; ^h = Pacific Flyway; ⁱ = Central Flyway High Plains; ^j = Central Flyway Low Plains; ^k = Mississippi Flyway; ^l = Atlantic Flyway

Appendix I. Derivation of the Blue-winged Teal harvest for all age/sex classes, 1980 – 1986.

Harvest Area	Breeding Reference Area											
	Central Alberta	S. Alberta ^a	W. SK ^b	E. SK / SW MB ^c	WC MB ^d	N. Grt. Plains ^e	Eastern Dakotas	Upper Midwest	U.S. Great Lakes	E. ON / S. PQ ^f	Maritimes / Maine	NE States ^g
Alberta	66.1%	32.3%	0.0%	1.7%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%
Saskatchewan	0.0%	2.6%	66.5%	20.6%	10.4%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%
Manitoba	0.0%	0.0%	11.3%	54.9%	33.8%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%
Ontario	1.7%	0.0%	1.2%	8.9%	7.9%	0.0%	0.0%	0.0%	44.2%	35.9%	0.0%	0.2%
Quebec	4.4%	0.0%	0.0%	3.8%	3.3%	0.0%	0.0%	0.0%	0.0%	83.8%	4.3%	0.5%
Maritimes	0.0%	0.0%	0.0%	0.0%	7.6%	0.0%	0.0%	33.7%	3.3%	23.3%	30.0%	2.0%
Canada	10.0%	4.3%	6.7%	14.2%	10.0%	0.0%	0.0%	1.2%	19.7%	31.7%	1.9%	0.3%
PF North ^h	0.0%	0.0%	46.9%	0.0%	0.0%	53.1%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%
PF South	0.0%	17.3%	0.0%	0.0%	0.0%	0.0%	82.7%	0.0%	0.0%	0.0%	0.0%	0.0%
Pacific Flyway	0.0%	15.3%	5.4%	0.0%	0.0%	6.1%	73.2%	0.0%	0.0%	0.0%	0.0%	0.0%
CF HP N. ⁱ	52.4%	0.0%	0.0%	0.0%	5.1%	42.5%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%
CF LP N. ^j	6.2%	0.8%	3.5%	12.1%	3.1%	0.0%	74.3%	0.0%	0.0%	0.0%	0.0%	0.0%
CF HP S.	30.2%	18.1%	31.9%	14.1%	5.6%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%
CF LP S.	10.3%	3.6%	11.9%	15.0%	3.7%	6.7%	46.4%	2.2%	0.2%	0.0%	0.0%	0.0%
Central Flyway	10.8%	3.8%	11.3%	14.4%	3.7%	5.3%	48.9%	1.7%	0.1%	0.0%	0.0%	0.0%
MF Northwest ^k	4.6%	0.9%	6.0%	11.3%	12.0%	2.7%	39.3%	23.0%	0.1%	0.0%	0.0%	0.0%
MF Northeast	4.2%	0.8%	5.0%	21.9%	15.4%	0.0%	0.0%	34.5%	17.1%	0.4%	0.0%	0.6%
MF West-central	15.6%	3.3%	26.6%	22.7%	11.9%	0.0%	0.0%	19.7%	0.0%	0.3%	0.0%	0.0%
MF South	22.3%	2.7%	11.7%	26.0%	7.7%	4.5%	0.0%	24.0%	0.9%	0.0%	0.0%	0.3%
MF Gulf Coast	13.8%	3.5%	16.8%	20.2%	8.2%	0.0%	28.1%	8.6%	0.5%	0.1%	0.0%	0.1%
Mississippi Flyway	9.7%	2.1%	11.6%	16.6%	10.5%	1.5%	28.7%	18.0%	1.1%	0.1%	0.0%	0.1%
AF North ^l	0.0%	0.0%	0.0%	2.0%	12.8%	0.0%	0.0%	0.0%	9.9%	56.4%	1.5%	17.4%
AF Central	0.0%	0.0%	0.0%	5.7%	13.1%	0.0%	0.0%	0.0%	29.0%	5.5%	0.4%	46.4%
AF South	5.2%	2.4%	9.6%	26.7%	20.7%	0.0%	0.0%	10.7%	17.4%	4.6%	0.1%	2.5%
Atlantic Flyway	3.5%	1.6%	6.5%	19.3%	18.2%	0.0%	0.0%	7.2%	18.2%	12.8%	0.4%	12.2%
Mexico	26.5%	9.4%	28.1%	19.2%	2.1%	14.5%	0.0%	0.2%	0.0%	0.0%	0.0%	0.1%
Central America	32.9%	10.0%	20.1%	16.0%	3.2%	10.8%	0.0%	6.9%	0.0%	0.0%	0.0%	0.0%
South America	9.3%	3.8%	15.2%	19.5%	3.1%	18.8%	0.0%	13.6%	13.0%	1.6%	0.2%	2.0%
Caribbean	5.9%	0.6%	8.6%	27.8%	9.4%	10.9%	0.0%	11.6%	14.1%	6.1%	1.3%	3.6%
Latin America	20.9%	6.9%	21.1%	20.6%	4.0%	13.7%	0.0%	5.3%	4.6%	1.5%	0.3%	1.1%
Total	12.4%	3.9%	13.4%	17.0%	7.9%	5.2%	22.5%	10.3%	3.6%	2.9%	0.2%	0.7%

^a = Southern Alberta; ^b = Western Saskatchewan; ^c = Eastern Saskatchewan / Southwest Manitoba; ^d = West-central Manitoba; ^e = Northern Great Plains;

^f = Eastern Ontario / Southern Quebec; ^g = Northeast States; ^h = Pacific Flyway; ⁱ = Central Flyway High Plains; ^j = Central Flyway Low Plains;

^k = Mississippi Flyway; ^l = Atlantic Flyway

Appendix J. Derivation of the Blue-winged Teal harvest for all age/sex classes, 1987 – 1993.

Harvest Area	Breeding Reference Area											
	Central Alberta	S. Alberta ^a	W. SK ^b	E. SK / SW MB ^c	WC MB ^d	N. Grt. Plains ^e	Eastern Dakotas	Upper Midwest	U.S. Great Lakes	E. ON / S. PQ ^f	Maritimes / Maine	NE States ^g
Alberta	82.5%	10.8%	6.7%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%
Saskatchewan	28.7%	0.0%	33.7%	30.2%	7.4%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%
Manitoba	0.0%	0.0%	0.0%	40.4%	59.6%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%
Ontario	0.0%	0.0%	0.8%	0.2%	4.0%	0.0%	0.0%	0.0%	66.9%	27.7%	0.0%	0.4%
Quebec	0.0%	0.0%	0.0%	1.7%	0.0%	0.0%	0.0%	0.0%	24.3%	68.0%	6.0%	0.0%
Maritimes	0.0%	0.0%	0.0%	4.2%	0.0%	0.0%	0.0%	0.0%	26.4%	47.1%	22.3%	0.0%
Canada	10.1%	0.7%	6.6%	7.5%	6.9%	0.0%	0.0%	0.0%	43.9%	23.0%	0.9%	0.2%
PF North ^h	100.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%
PF South	73.5%	0.0%	26.5%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%
Pacific Flyway	87.7%	0.0%	12.3%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%
CF HP N. ⁱ	69.2%	30.8%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%
CF LP N. ^j	0.0%	0.0%	64.4%	35.6%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%
CF HP S.	0.0%	0.0%	22.2%	19.2%	15.3%	43.3%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%
CF LP S.	11.7%	4.1%	17.5%	8.6%	4.1%	12.9%	25.3%	15.8%	0.0%	0.0%	0.0%	0.0%
Central Flyway	12.0%	4.4%	18.8%	9.8%	4.5%	13.8%	22.6%	14.1%	0.0%	0.0%	0.0%	0.0%
MF Northwest ^k	2.5%	0.1%	5.6%	11.0%	7.9%	1.5%	37.4%	34.0%	0.0%	0.0%	0.0%	0.0%
MF Northeast	6.7%	0.0%	18.3%	21.2%	0.0%	0.0%	0.0%	0.0%	50.1%	3.7%	0.0%	0.0%
MF West-central	19.6%	0.0%	1.0%	20.3%	1.7%	0.0%	57.4%	0.0%	0.0%	0.3%	0.0%	0.0%
MF South	1.1%	2.2%	13.0%	15.8%	17.8%	0.0%	29.7%	20.4%	0.0%	0.0%	0.0%	0.0%
MF Gulf Coast	10.9%	2.1%	10.3%	12.2%	5.2%	4.3%	27.8%	25.9%	1.3%	0.0%	0.0%	0.0%
Mississippi Flyway	8.5%	1.4%	9.0%	12.5%	6.3%	3.1%	30.9%	26.3%	1.9%	0.1%	0.0%	0.0%
AF North ^l	0.0%	0.0%	0.0%	14.5%	0.0%	0.0%	0.0%	0.0%	16.1%	49.3%	1.1%	19.1%
AF Central	0.0%	0.0%	0.0%	5.9%	0.0%	0.0%	0.0%	0.0%	13.3%	13.2%	0.3%	67.2%
AF South	9.1%	1.4%	5.4%	11.0%	5.4%	0.0%	0.0%	49.0%	12.5%	4.1%	0.4%	1.7%
Atlantic Flyway	7.9%	1.2%	4.7%	10.8%	4.7%	0.0%	0.0%	42.7%	12.8%	7.0%	0.4%	7.7%
Mexico	33.0%	10.5%	18.7%	17.8%	1.4%	18.5%	0.0%	0.0%	0.0%	0.0%	0.0%	0.2%
Central America	50.3%	3.3%	14.1%	23.8%	8.4%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%
South America	9.5%	2.6%	8.9%	5.9%	5.7%	0.0%	23.5%	37.0%	4.9%	0.9%	0.2%	0.9%
Caribbean	12.9%	0.4%	10.0%	14.0%	12.9%	0.0%	0.0%	33.5%	13.6%	1.4%	0.8%	0.6%
Latin America	22.0%	4.5%	12.7%	13.4%	6.4%	5.6%	8.3%	20.9%	4.9%	0.6%	0.3%	0.5%
Total	14.1%	2.8%	10.9%	12.0%	6.1%	4.6%	17.3%	21.7%	7.0%	2.6%	0.2%	0.6%

^a = Southern Alberta; ^b = Western Saskatchewan; ^c = Eastern Saskatchewan / Southwest Manitoba; ^d = West-central Manitoba; ^e = Northern Great Plains;

^f = Eastern Ontario / Southern Quebec; ^g = Northeast States; ^h = Pacific Flyway; ⁱ = Central Flyway High Plains; ^j = Central Flyway Low Plains;

^k = Mississippi Flyway; ^l = Atlantic Flyway

Appendix K. Derivation of the blue-winged teal harvest for all age/sex classes, 1994 – 2003.

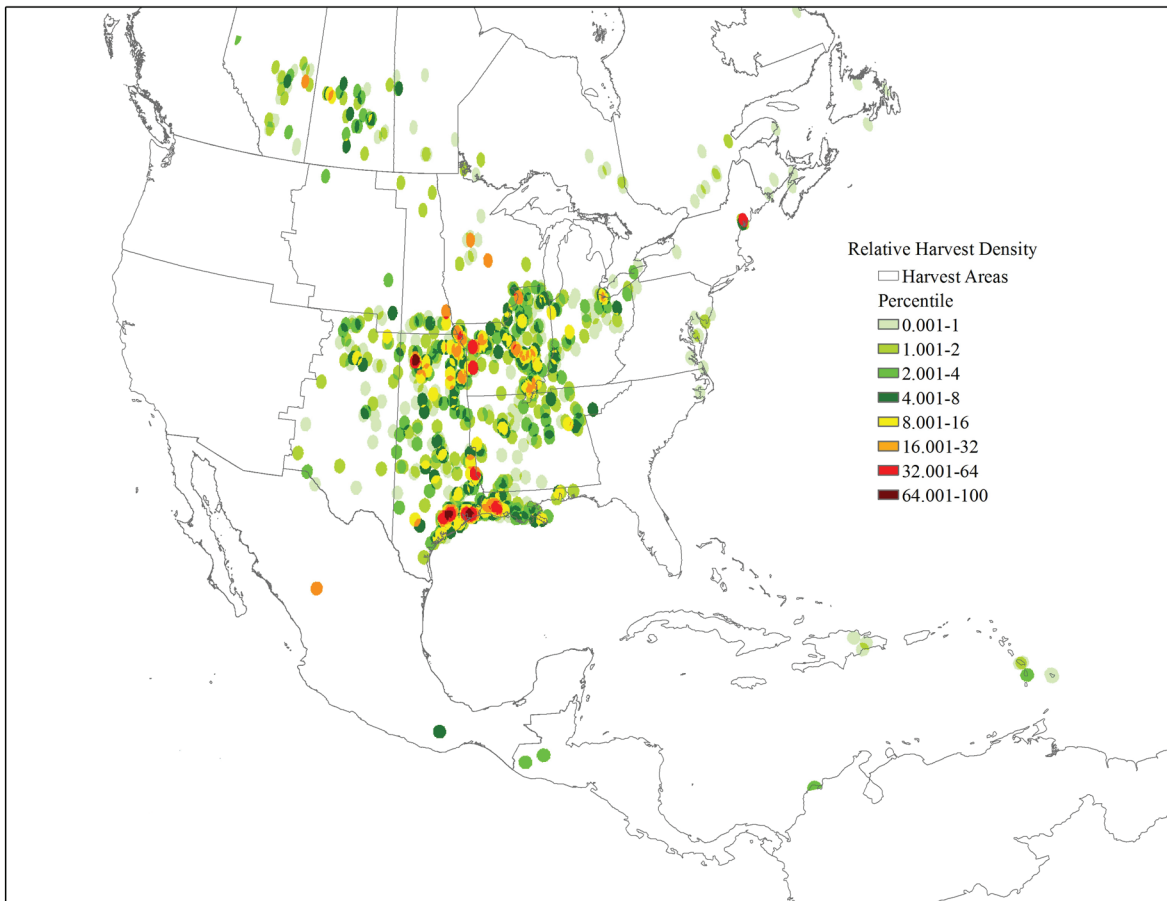
Harvest Area	Breeding Reference Area											
	Central Alberta	S. Alberta ^a	W. SK ^b	E. SK / SW MB ^c	WC MB ^d	N. Grt. Plains ^e	Eastern Dakotas	Upper Midwest	U.S. Great Lakes	E. ON / S. PQ ^f	Maritimes / Maine	NE States ^g
Alberta	20.6%	57.6%	9.8%	6.2%	0.0%	0.0%	5.8%	0.0%	0.0%	0.0%	0.0%	0.0%
Saskatchewan	0.0%	0.0%	25.7%	60.6%	11.5%	0.0%	2.1%	0.0%	0.0%	0.0%	0.0%	0.0%
Manitoba	7.8%	0.0%	0.0%	56.4%	29.3%	0.0%	6.5%	0.0%	0.0%	0.0%	0.0%	0.0%
Ontario	0.0%	0.0%	5.8%	14.6%	4.5%	1.2%	6.9%	0.0%	46.8%	19.1%	0.1%	1.0%
Quebec	6.2%	4.2%	0.0%	26.1%	11.9%	1.7%	4.3%	0.0%	1.2%	30.1%	14.3%	0.0%
Maritimes	9.1%	0.0%	0.0%	6.1%	1.7%	0.0%	21.6%	0.0%	5.8%	6.1%	49.6%	0.0%
Canada	4.1%	6.8%	9.9%	29.1%	8.3%	0.6%	6.3%	0.0%	19.0%	10.7%	4.8%	0.4%
PF North ^h	0.0%	25.9%	0.0%	0.0%	0.0%	74.1%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%
PF South	45.9%	24.9%	12.2%	8.2%	0.0%	1.7%	7.1%	0.0%	0.0%	0.0%	0.0%	0.0%
Pacific Flyway	44.3%	24.9%	11.8%	7.9%	0.0%	4.3%	6.9%	0.0%	0.0%	0.0%	0.0%	0.0%
CF HP N. ⁱ	8.2%	2.5%	5.6%	11.7%	0.0%	49.4%	22.6%	0.0%	0.0%	0.0%	0.0%	0.0%
CF LP N. ^j	2.0%	0.4%	1.8%	9.2%	2.9%	7.8%	76.0%	0.0%	0.0%	0.0%	0.0%	0.0%
CF HP S.	8.7%	4.0%	16.0%	11.0%	1.1%	31.4%	27.8%	0.0%	0.0%	0.0%	0.0%	0.0%
CF LP S.	5.7%	1.6%	12.1%	14.0%	1.9%	9.9%	53.3%	1.4%	0.0%	0.0%	0.0%	0.1%
Central Flyway	5.3%	1.5%	10.4%	13.0%	2.0%	11.4%	55.2%	1.1%	0.0%	0.0%	0.0%	0.1%
MF Northwest ^k	2.3%	0.4%	4.1%	9.7%	4.2%	2.9%	22.3%	54.0%	0.0%	0.0%	0.0%	0.0%
MF Northeast	8.3%	0.9%	10.8%	24.4%	8.9%	4.1%	28.7%	0.0%	11.7%	0.9%	0.0%	1.3%
MF West-central	3.1%	0.6%	10.0%	14.5%	2.6%	5.6%	57.3%	5.9%	0.4%	0.0%	0.0%	0.0%
MF South	3.3%	1.1%	11.0%	17.3%	1.3%	8.0%	46.8%	10.7%	0.1%	0.3%	0.0%	0.0%
MF Gulf Coast	4.4%	1.4%	12.0%	17.2%	3.3%	6.9%	53.6%	0.9%	0.1%	0.2%	0.0%	0.0%
Mississippi Flyway	3.6%	0.9%	8.9%	14.5%	3.5%	5.4%	41.7%	21.1%	0.3%	0.1%	0.0%	0.0%
AF North ^l	3.5%	0.6%	0.0%	23.9%	0.0%	3.6%	24.0%	0.0%	6.0%	9.3%	0.8%	28.4%
AF Central	0.0%	0.0%	2.0%	7.6%	4.1%	1.3%	34.6%	0.0%	5.8%	2.4%	1.1%	41.3%
AF South	6.0%	0.8%	9.0%	26.5%	6.9%	3.1%	33.7%	7.8%	2.5%	0.9%	0.1%	2.7%
Atlantic Flyway	4.8%	0.7%	7.2%	23.4%	5.9%	2.8%	33.0%	6.0%	3.3%	1.9%	0.3%	10.7%
Mexico	9.9%	5.8%	12.9%	13.9%	1.9%	18.0%	37.6%	0.0%	0.0%	0.0%	0.0%	0.0%
Central America	7.0%	2.6%	16.2%	23.5%	0.0%	6.0%	44.8%	0.0%	0.0%	0.0%	0.0%	0.0%
South America	4.7%	3.1%	10.6%	26.5%	2.6%	14.1%	35.4%	0.0%	1.9%	0.0%	1.1%	0.0%
Caribbean	3.8%	1.2%	10.4%	26.9%	2.8%	2.4%	42.1%	0.0%	3.2%	1.0%	1.1%	5.1%
Latin America	7.0%	3.7%	12.4%	20.7%	2.0%	11.3%	39.6%	0.0%	1.2%	0.3%	0.5%	1.4%
Total	4.8%	1.8%	9.8%	16.1%	3.1%	7.5%	42.6%	11.6%	1.1%	0.5%	0.2%	0.7%

^a = Southern Alberta; ^b = Western Saskatchewan; ^c = Eastern Saskatchewan / Southwest Manitoba; ^d = West-central Manitoba; ^e = Northern Great Plains;

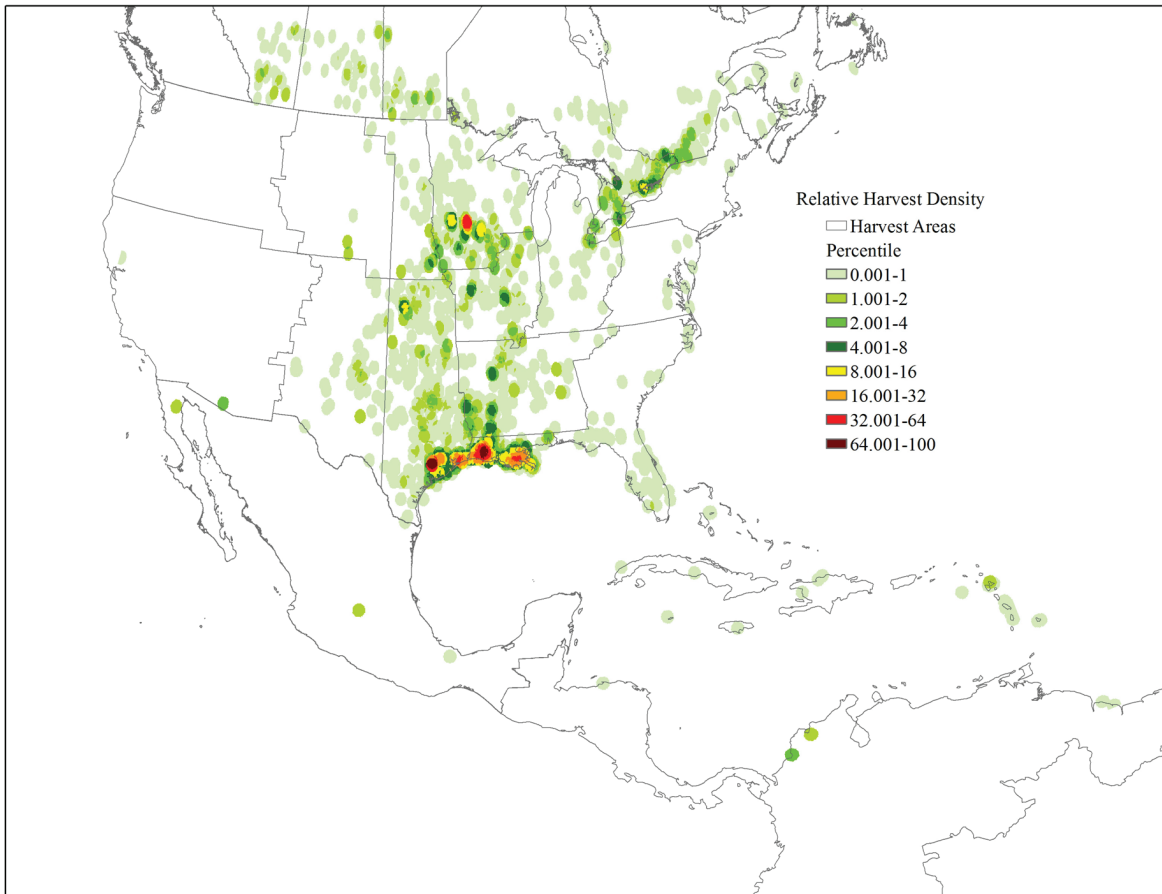
^f = Eastern Ontario / Southern Quebec; ^g = Northeast States; ^h = Pacific Flyway; ⁱ = Central Flyway High Plains; ^j = Central Flyway Low Plains;

^k = Mississippi Flyway; ^l = Atlantic Flyway

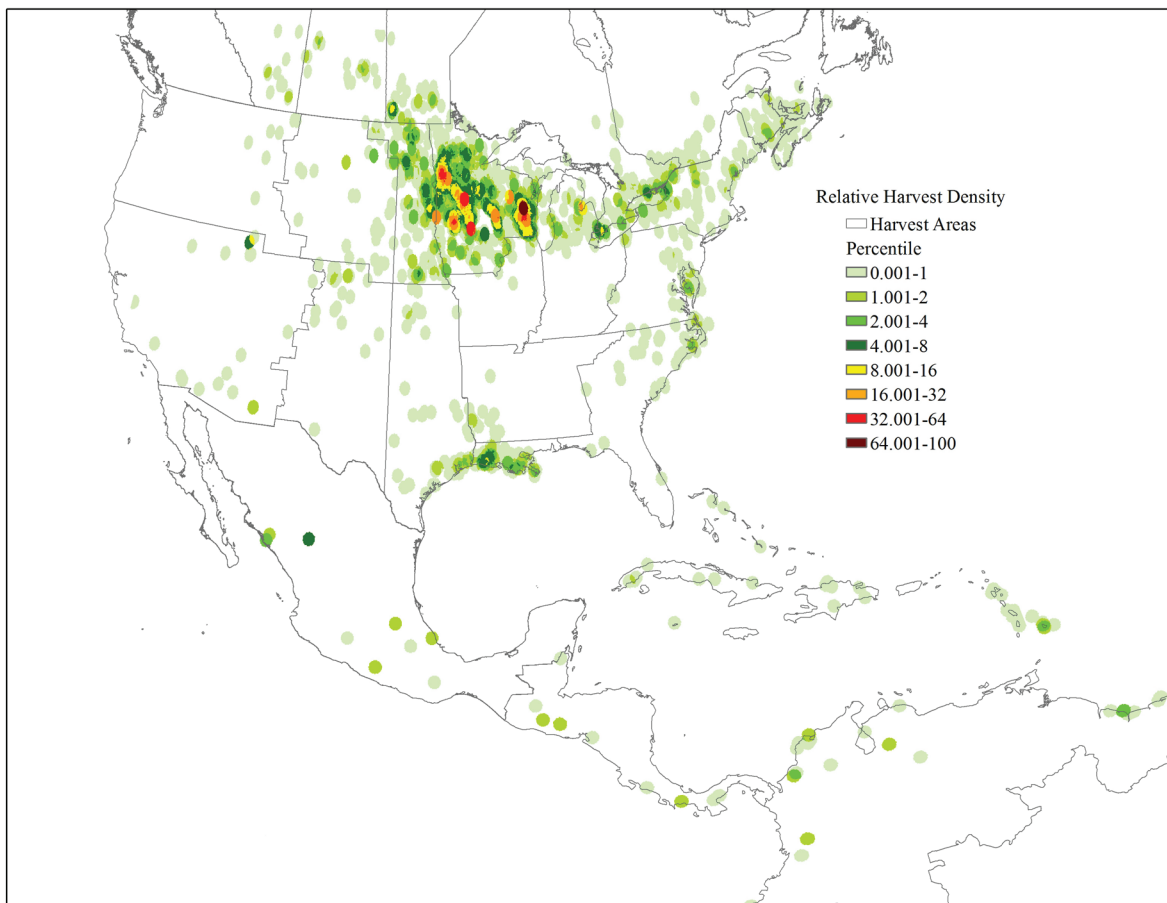
Appendix L. Relative harvest density of Blue-winged Teal derived from direct recoveries ($n = 1,242$) of all age/sex classes, 1 – 14 September, 1970 – 2003.



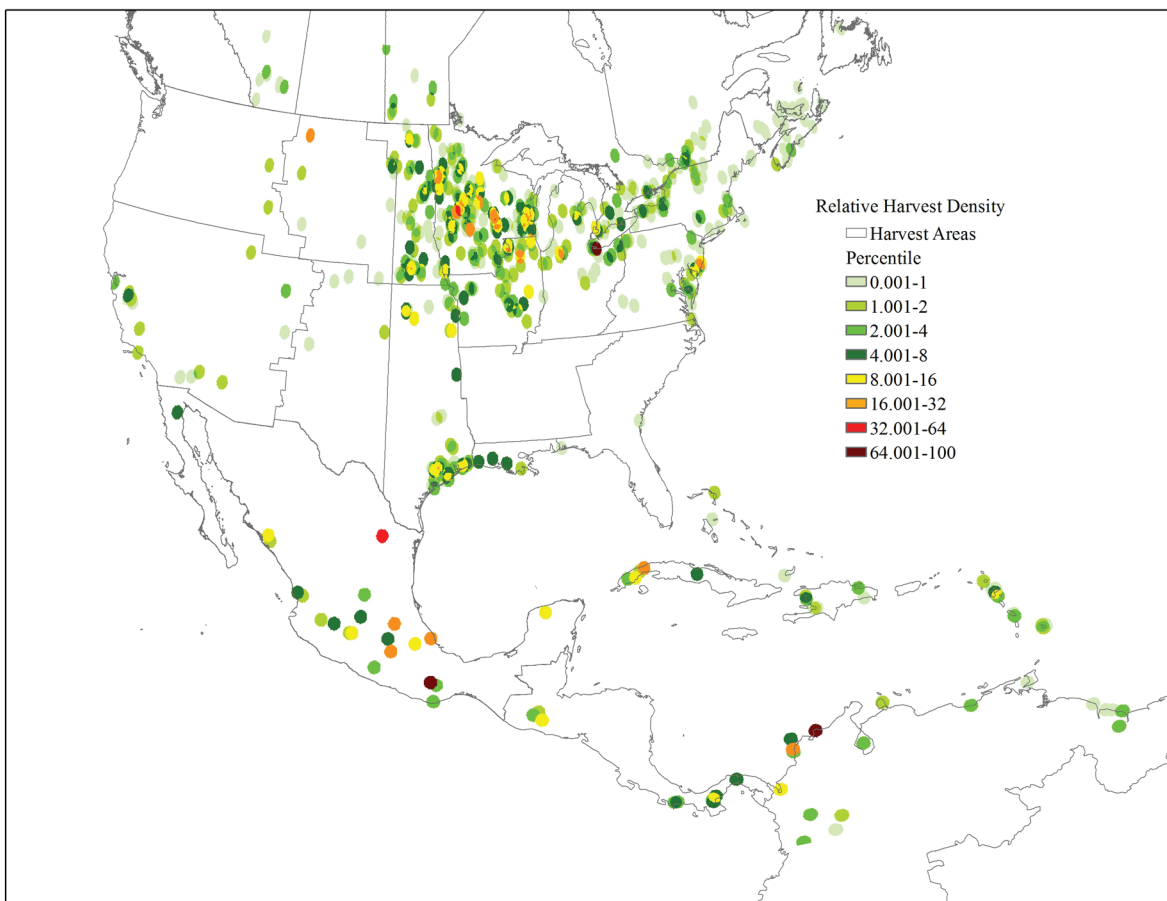
Appendix M. Relative harvest density of Blue-winged Teal derived from direct recoveries ($n = 4,092$) of all age/sex classes, 15 – 28 September, 1970 – 2003.



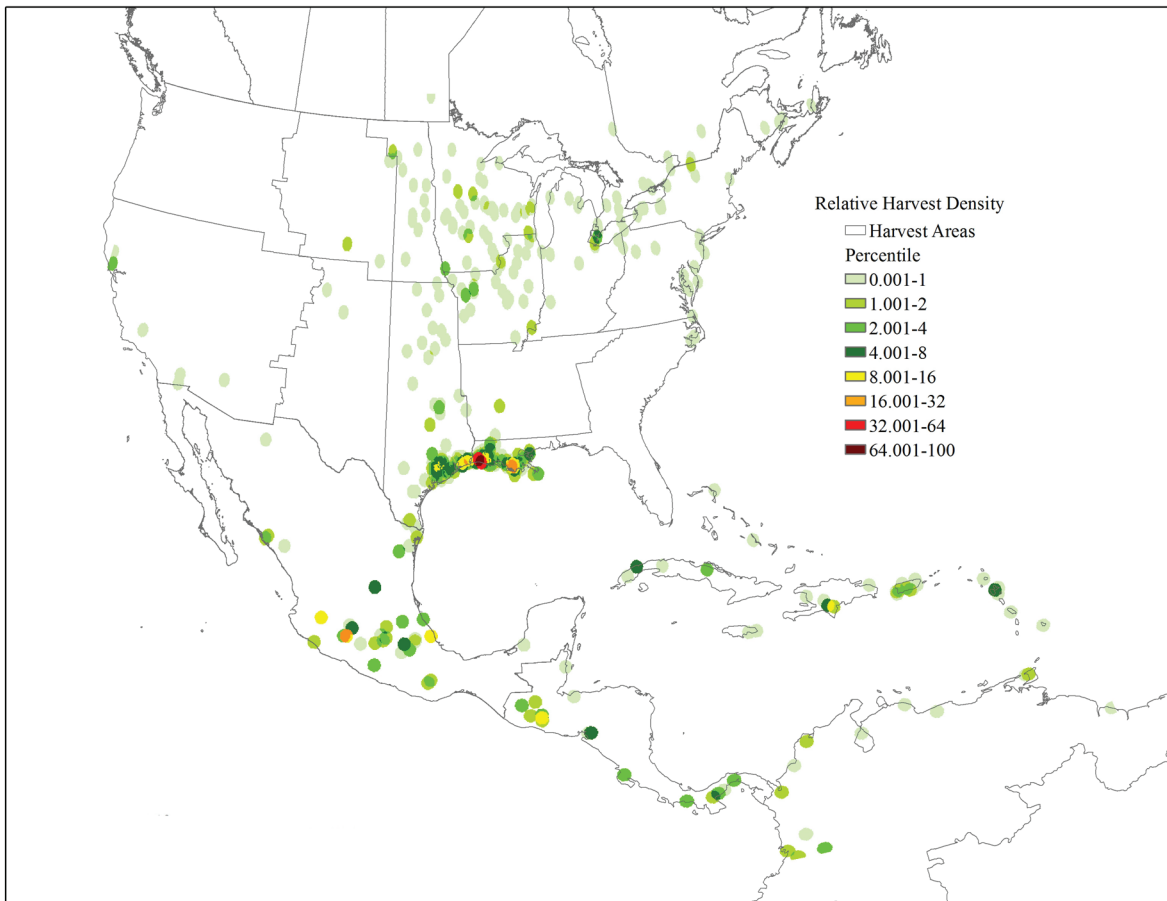
Appendix N. Relative harvest density of Blue-winged Teal derived from direct recoveries ($n = 3,546$) of all age/sex classes, 29 September – 12 October, 1970 – 2003.



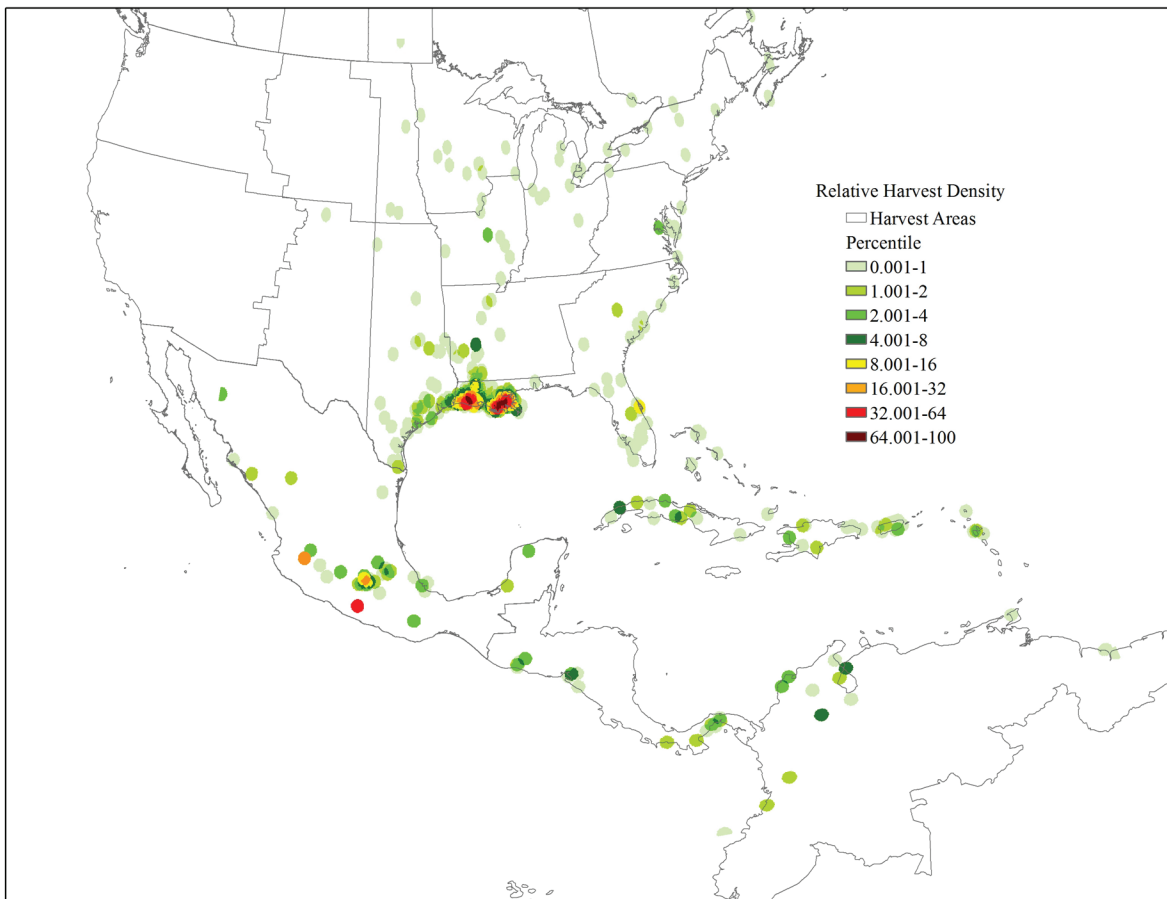
Appendix O. Relative harvest density of Blue-winged Teal derived from direct recoveries ($n = 856$) of all age/sex classes, 13 October – 26 October, 1970 – 2003.



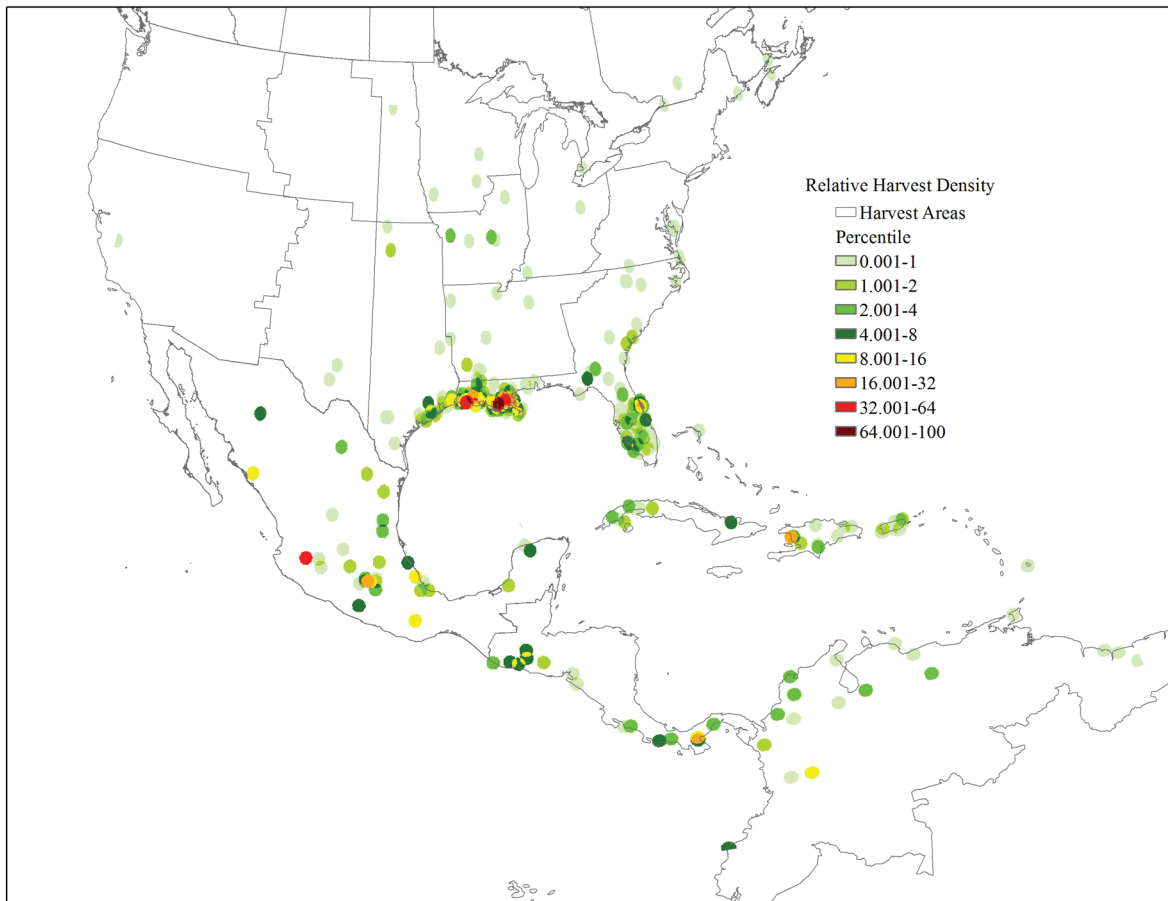
Appendix P. Relative harvest density of Blue-winged Teal derived from direct recoveries ($n = 520$) of all age/sex classes, 27 October – 9 November, 1970 – 2003.



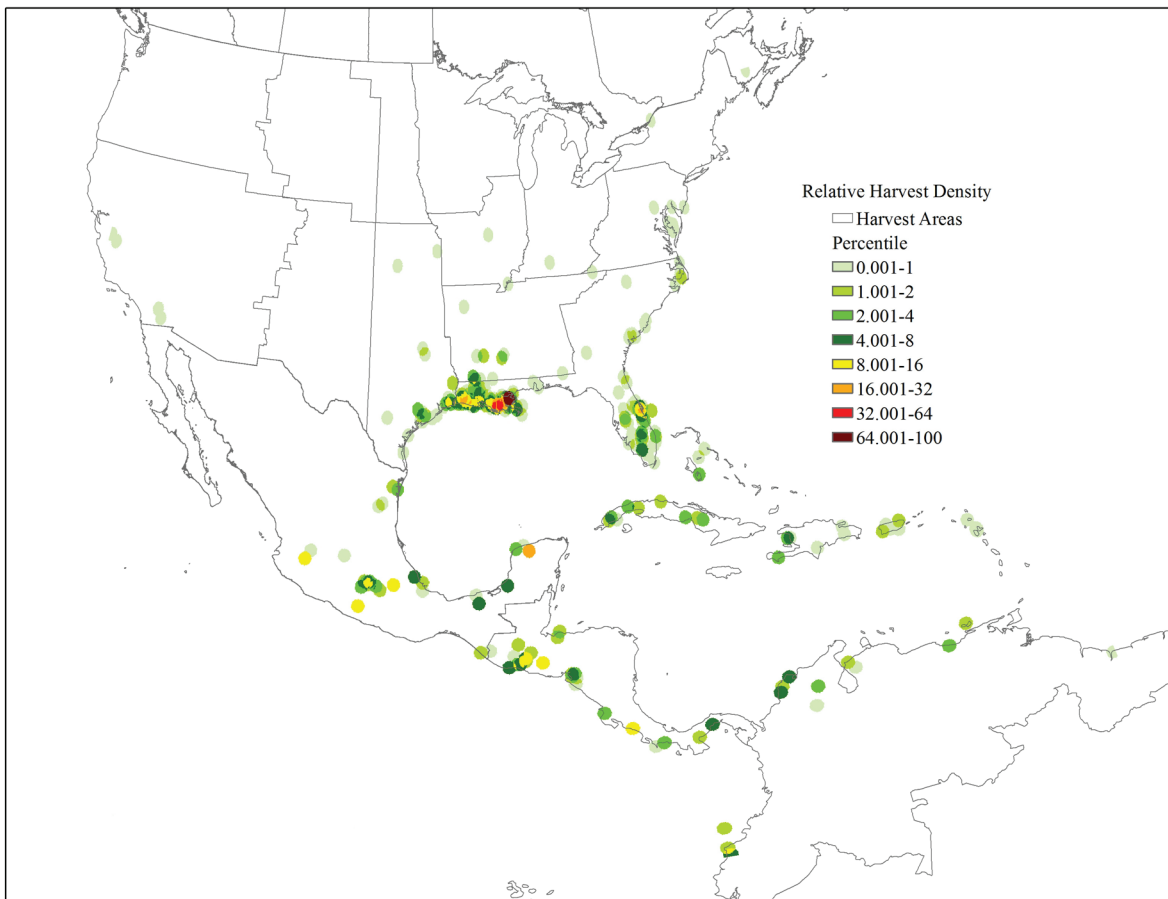
Appendix Q. Relative harvest density of Blue-winged Teal derived from direct recoveries ($n = 825$) of all age/sex classes, 10 November – 23 November, 1970 – 2003.



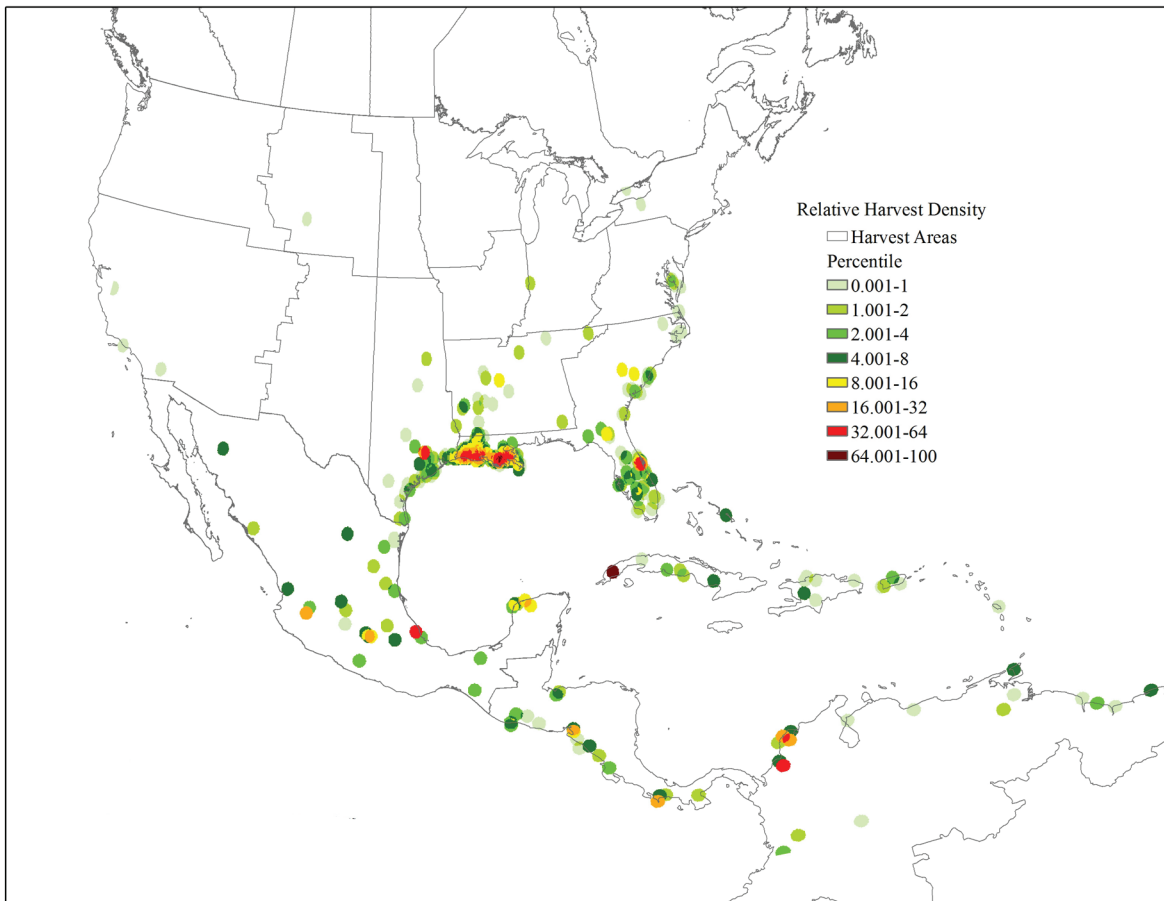
Appendix R. Relative harvest density of Blue-winged Teal derived from direct recoveries ($n = 552$) of all age/sex classes, 24 November – 7 December, 1970 – 2003.



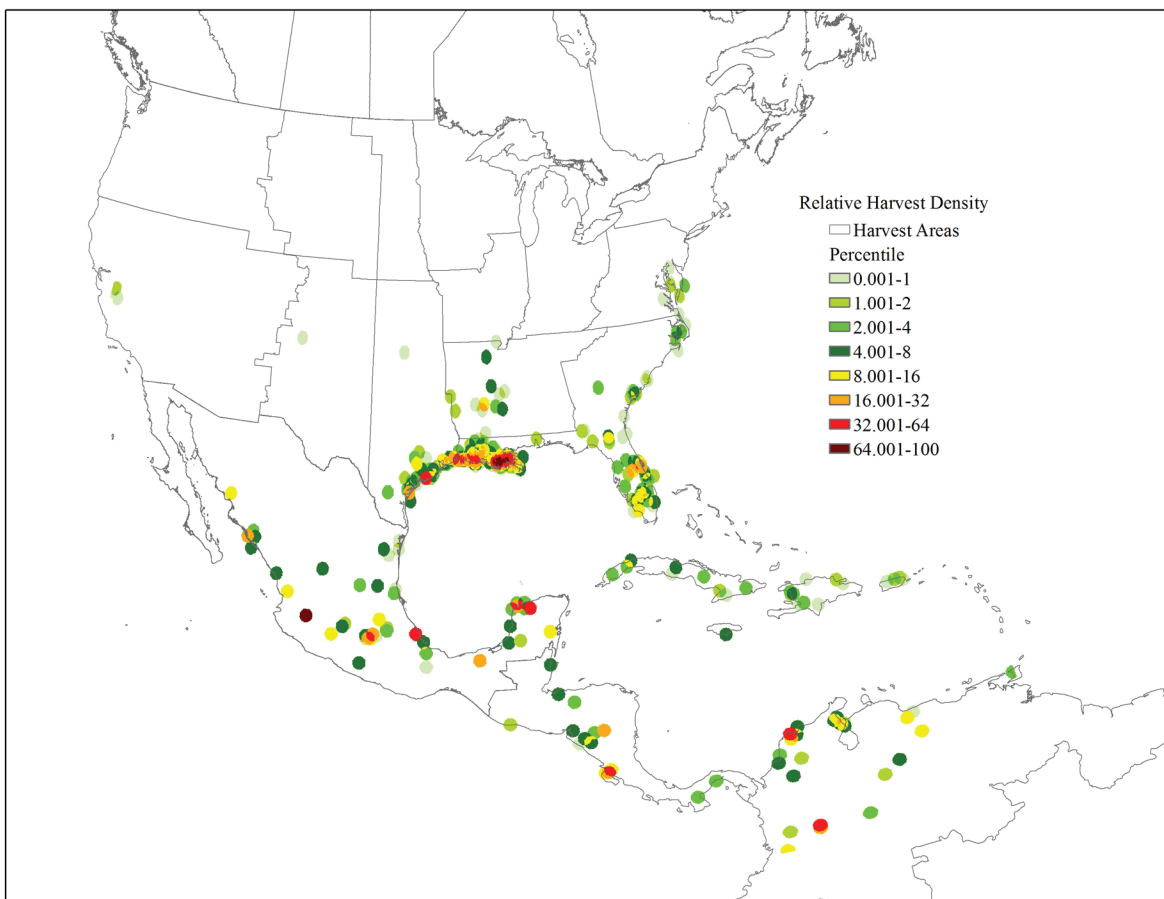
Appendix S. Relative harvest density of Blue-winged Teal derived from direct recoveries ($n = 410$) of all age/sex classes, 8 December – 21 December, 1970 – 2003.



Appendix T. Relative harvest density of Blue-winged Teal derived from direct recoveries ($n = 521$) of all age/sex classes, 22 December 1970 – 4 January 2004.



Appendix U. Relative harvest density of Blue-winged Teal derived from direct recoveries ($n = 469$) of all age/sex classes, 5 January – 18 January, 1971 – 2004.



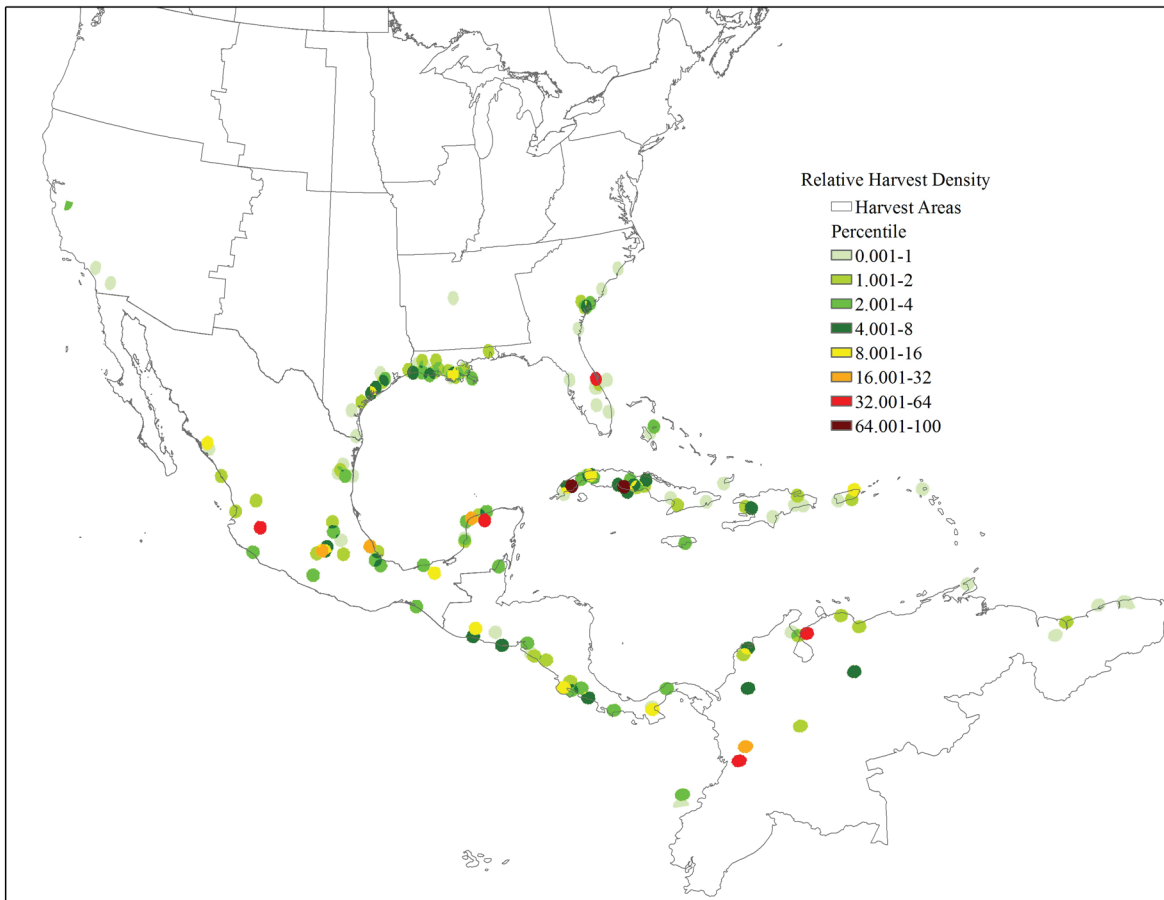
**Department of the Interior,
U.S. Fish & Wildlife Service
1849 C Street NW
Washington, DC 20240**

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August 2013



Appendix V. Relative harvest density of Blue-winged Teal derived from direct recoveries ($n = 201$) of all age/sex classes, 19 January – 1 February, 1971 – 2004.



Appendix W. Relative harvest density of Blue-winged Teal derived from direct recoveries ($n = 167$) of all age/sex classes, 2 February – 29 March, 1971 – 2004.

