2010 Western Gulf Coast Mottled Duck Survey

USFWS Division of Migratory Birds, Branch of Population and Habitat Assessment

This report summarizes the 2010 status of the breeding mottled duck population along the Gulf Coast in Louisiana and Texas. These results are based on an aerial survey conducted as a joint effort of USFWS Division of Migratory Bird Management, Texas Department of Parks and Wildlife, and Louisiana Department of Wildlife and Fisheries within the species' range in both states from 2008 to the present. During this 3-year period the survey design has been modified in order to achieve better precision in the visibility correction factor (VCF) and the resulting population estimates. We report here the population estimates for 2010, and compare these to estimates from 2008-09 derived from a subset of transect data common to all three years' survey effort.

Methods

The mottled duck survey is a visibility-corrected aerial survey. The survey area covers 10,300 sq mi in Louisiana and 16,700 sq mi in Texas (including the Laguna Madre strata which was not surveyed in 2010; Figure 1). Survey transects are flown by airplane, with a subsample of

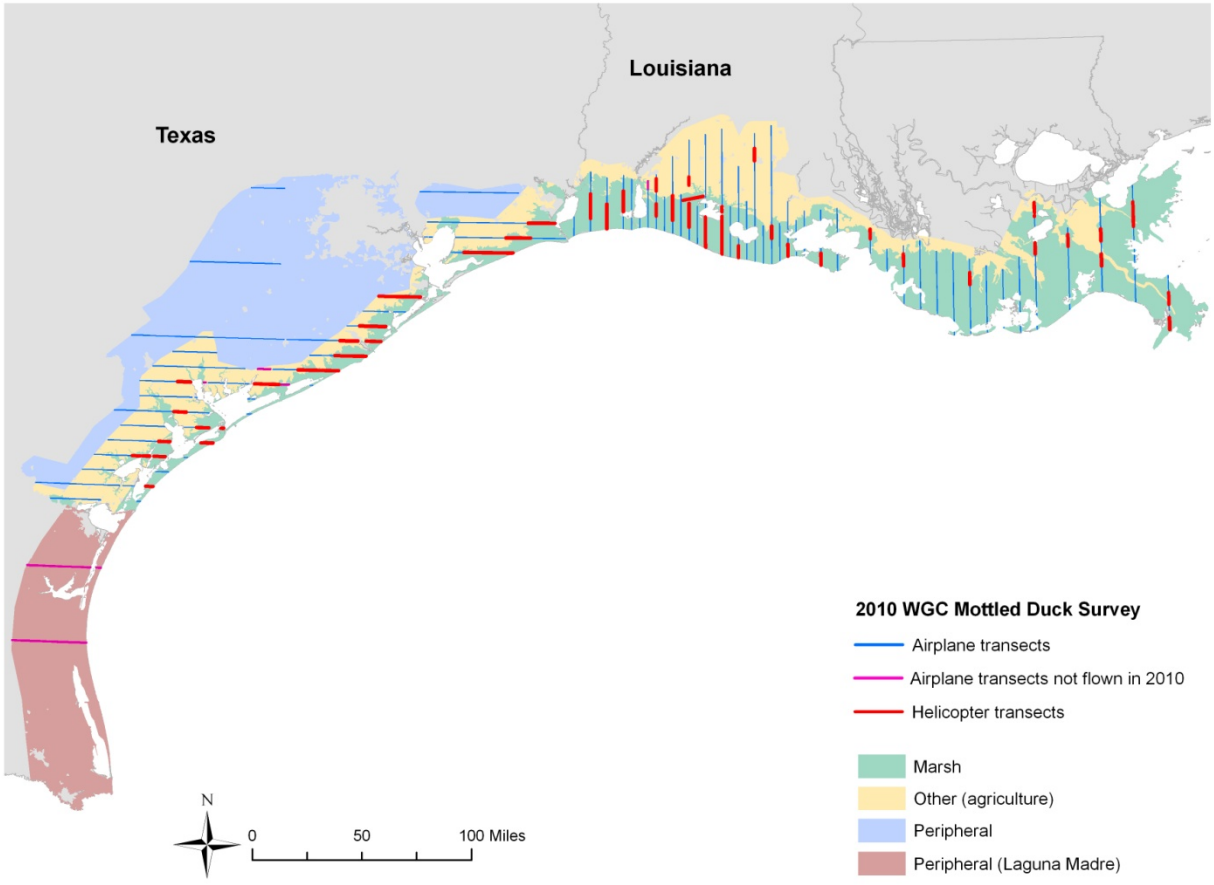

Figure 1. 2010 western Gulf Coast mottled duck survey design.

transects reflown by helicopter. Total transect area surveyed by airplane in 2010 in Louisiana was 233 sq mi and in Texas, 207 sq mi. Airplanes flew each transect at approximately 100 mph at 30-50 m altitude. Two observers, one on either side of the plane, recorded all mottled ducks seen within 200 m of the transect. Helicopter transects were surveyed after the airplane, using a "beat out" pattern of flying tight curves low to the ground. In 2010, 45 sq mi were surveyed by helicopter in Louisiana, and 48 sq mi were surveyed in Texas. Observers on either side of the helicopter recorded all ducks seen within the same transect strip width. The helicopter observations were used to calculate a visibility-correction factor, to correct for birds missed by the airplane observers.

Calculation of Population Estimate

Mottled duck population estimates and variances were calculated following Smith (1995). The visibility correction factor (VCF) was calculated as the ratio of the total number of ducks counted by helicopter observers to the total number counted by airplane observers in those segments surveyed by both helicopter and airplane. The total indicated birds (TIBs)/area surveyed was calculated from the raw airplane count data [TIBs = (2 x singles) + (2 x pairs) + (1 x groups)], and multiplied by the VCF to give a visibility-corrected density. Due to substantial differences in bird density between marsh and upland (agriculture) habitats, densities were calculated separately for each habitat type, and scaled to the total area of that habitat within the survey area. In Louisiana, densities were calculated within two habitat strata: marsh, consisting of both freshwater-intermediate and salt-brackish marsh, and "other," consisting mostly of agriculture. In Texas, three habitat strata were used: core marsh, consisting of the two marsh types, core "other," consisting mostly of agriculture, and peripheral, consisting mostly of agriculture but located farther from the coast than the core strata (Figure 1). Urban areas were excluded from the analysis in both states. An additional area in Texas, the Laguna Madre, also contained a marsh stratum (Laguna Madre combined marsh) and an "other" stratum; however, this area was not surveyed in 2010. The total population estimate for each state was the sum of the populations in each habitat type.

Airboat survey

In Louisiana in 2009 and 2010 an airboat survey was conducted to provide additional mottled duck counts on a subset of transects surveyed by helicopter. These counts were used to evaluate the efficacy of the helicopter beat-out technique for detecting mottled ducks in marsh habitat. Preliminary results from the airboat surveys suggest that the helicopter platform is effective in detecting at least as many, and possibly more, ducks than a ground-based airboat survey. A full analysis of the two years of airboat and helicopter data is currently being undertaken. The VCFs calculated for this report do not include counts from segments where the airboat surveyed prior to the helicopter, due to potential lower helicopter counts in these segments from increased disturbance.

Table 1. Population estimates, visibility-correction factors (VCF), and area estimates from the 2010 WGC mottled duck survey.

	Texas			Louisiana		Total
	Core Marsh	Core Other	Peripheral	Marsh	Other	
Population estimate	18,360 ± 5,518	1,649 ± 671	5,491 ± 2,866	81,871 ± 16,958	21,836 ± 6,675	129,207 ± 22,125
VCF	2.58 ± 0.53	2.58 ± 0.53	2.58 ± 0.53	2.89 ± 0.5	2.89 ± 0.5	
TIBs	222	20	14	766	120	1142
Area surveyed	53.5 sq mi	102.0 sq mi	51.4 sq mi	176.5 sq mi	56.7 sq mi	440.1 sq mi
Stratum area	1713.6 sq mi	3255.2 sq mi	7807.3 sq mi	6534.8 sq mi	3576.1 sq mi	22887 sq mi

Results

The 2010 total mottled duck population estimate was 129,207 ± 22,125 [SE] birds (coefficient of variation (CV) = 17%; Table 1). In Louisiana the total estimate was 103,707 ± 20,948 (CV = 20%, and in Texas the estimate was 25,500 ± 7,122 (CV = 28%). The 2010 VCF was 2.89 ± 0.50 (CV = 17%) in Louisiana, and 2.58 ± 0.53 (CV = 21%) in Texas. In both states, mottled duck density was much higher in marsh than "other" habitats (i.e., agriculture; Table 1).

Comparison of 2010 estimates with 2008-2009: 3-year analysis

(Note: In the interest of making full use of the first two years of data from this experimental survey, we attempted to derive estimates of population size for 2008-2009 comparable to the 2010 estimates. However, these should be viewed with caution due to changes in survey coverage and analytical methods during this preliminary period.)

Several changes were made to the survey design in the three years in which this experimental survey has been conducted. In Texas, the survey design in 2008 consisted of transects used for midwinter waterfowl surveys. Transect placement was modified in 2009 to more consistently sample the gradient of land-cover within mottled duck breeding habitat along the coast using a set of east—west transects. The allocation of helicopter transects was shifted in 2010 to provide better coverage in marsh habitat. In Louisiana, the survey design in 2008 consisted of north—south transects used for midwinter waterfowl surveys. In 2009, one of these transects was adjusted to avoid disturbance to colonial wading bird rookeries. In 2010, transects in the Chenier Plain region were extended north to more fully cover agricultural habitat within mottled duck range, and an additional 15 north—south transects located between existing

Table 2. Three-year comparison of mottled duck population estimates (± SE) and VCFs (± SE) for 2008-2010.

	Texas			Louisiana		Total
	Core Marsh	Core Other	Peripheral	Marsh	Other	
2008:						
Pop. estimate	10,839 ± 3,627	2,323 ± 1,137	3,660 ± 1,971	83,310 ± 16,956	15,608 ± 4,004	115,740 ± 18,994
VCF*	2.78 ± 0.5	2.78 ± 0.5	2.78 ± 0.5	3.13 ± 0.37	3.13 ± 0.37	
2009:						
Pop. estimate	13,521 ± 7,180	10,057 ± 7,507	11,196 ± 9,312	88,340 ± 18,765	45,165 ± 15,683	168,280 ± 33,012
VCF	4.1± 1.74	4.1± 1.74	4.1 ± 1.74	3.6 ± 0.53**	3.6 ± 0.53**	
2010:						
Pop. estimate	18,360 ± 5,518	1,649 ± 671	5,491 ± 2,866	81,871 ± 16,958	21,836 ± 6,675	129,207 ± 22,125
VCF	2.58 ± 0.53	2.58 ± 0.53	2.58 ± 0.53	2.89 ± 0.5	2.89 ± 0.5	

*VCF for 2008 was pooled using data from 2009 and 2010.
**VCF was calculated without data from Lacassine pool segment in Louisiana.

transects were added to increase the area of marsh habitat surveyed by airplane. The number of helicopter transects was also increased, with an additional 15.7 sq mi allocated to the Mississippi River coastal wetlands. In addition, modifications were made in 2009 and 2010 to the boundaries of the stratum areas used to scale the population estimates in both states, in order to more closely approximate the actual range boundary of the species (Wilson 2007). Due to these modifications, it is not meaningful to compare the 2010 mottled duck population estimates with those reported from 2008 and 2009. However, a subsample of transect counts from those areas surveyed in all 3 years was used to estimate population densities for each year, which were then scaled to current stratum boundaries so that the resulting population estimates were comparable (Figure 2). Due to substantial differences in the way in which VCF data were collected in 2008, only data from 2009 and 2010 were used in VCF calculations for the 3-year analysis. For 2008 estimates, VCFs were calculated by pooling data collected in both 2009 and 2010. Estimates for 2009 and 2010 were calculated using individual VCFs for each year (Table 2). In Louisiana, one helicopter/airplane segment – the Lacassine pool segment -- was considered to be an outlier and removed for this analysis, due to concern that the correction factor in this segment (helicopter TIBs = 234; airplane TIBs = 12; 234/12 = 19.5) was

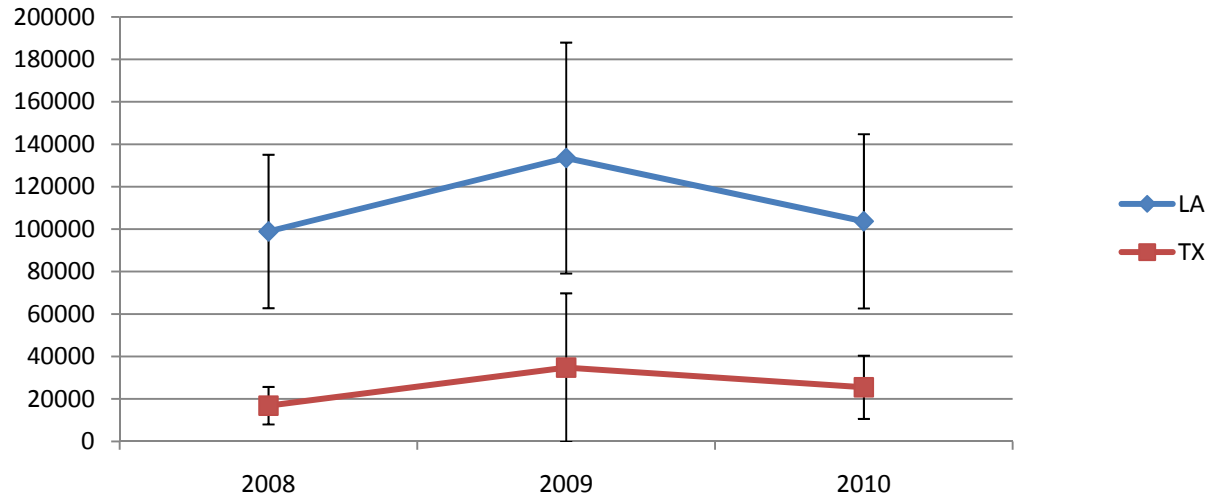

Figure 2. Mottled duck population trend and associated confidence intervals for 2008-2010 derived from a subsample of counts from the WGC breeding mottled duck survey (using a pooled 2009-2010 VCF for 2008, and individual VCFs for 2009 and 2010).

not representative of that observed across the survey area. This segment was highly influential in the calculation of the 2009 Louisiana VCF; with the segment included the VCF was 5.24 ± 1.83; without the segment the VCF dropped to 3.6 ± 0.53. Also, we did not include data from the Laguna Madre in the 3-year analysis, to allow for comparison with 2010. The results of the 3-year analysis show a similar trend in Louisiana and Texas (Figure 2).

Comparison using pooled VCFs

Although the traditional method of estimating population size employs an annual, rather than pooled, VCF (Smith 1995), the high variance associated with the annual VCF in the mottled duck survey contributes to a lower overall precision in population estimates. Annual variability in the mottled duck VCF is partially due to the low numbers of ducks observed in most segments. Pooling the VCF data among years may provide a better overall estimate of the VCF, when annual variability is caused by random noise in the observations. We calculated a second set of 3-year population estimates using the pooled VCF data from 2009-2010, with one VCF for each state for the 3-year period (Figure 3). This analysis also omitted the Lacassine pool segment in Louisiana.

The 2-year pooled VCF in Texas was 2.78 ± 0.5 (CV = 18%), and in Louisiana, 3.13 ± 0.37 (CV = 12%). Using a pooled VCF rather than individual VCFs changed the direction of the population trend in Texas: the 2010 population estimate increased, rather than decreased, from the 2009 estimate, although neither of these trends was significant due to the substantial variance of the estimates.

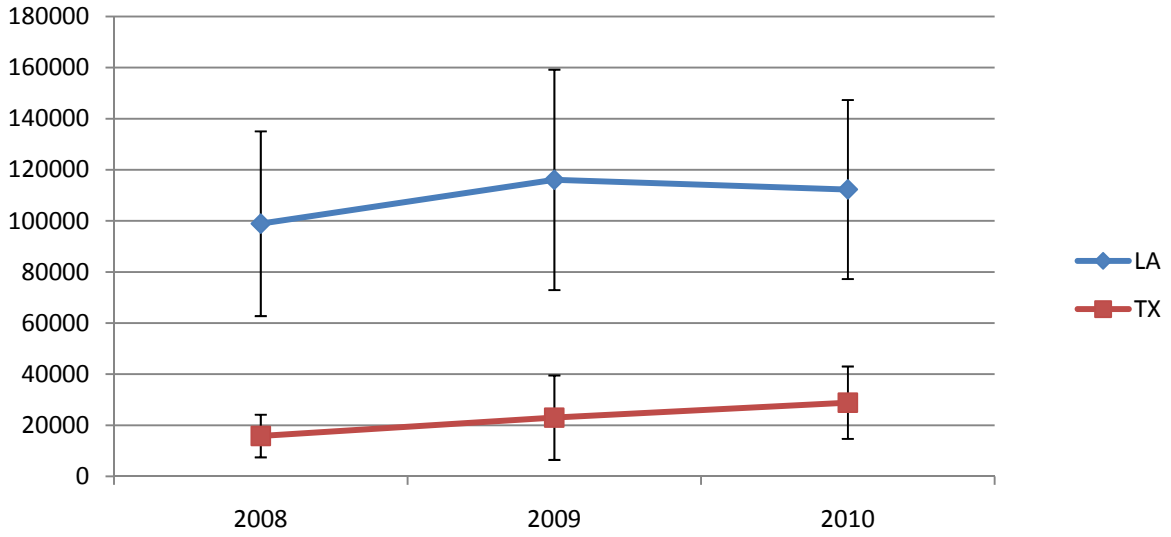

Figure 3. Three-year mottled duck population trend and 95% confidence intervals using a pooled 2-year VCF (using data from 2009 and 2010).

Conclusions

The experimental WGC mottled duck survey has been conducted for 3 years. During this time, changes in survey design, effort, and analysis have helped to increase the precision of VCF and population estimates. Helicopter VCFs from this survey exhibit substantial annual variability, either due to random variation or annual changes in visibility. We will continue to work with states to refine the survey design and estimation procedures, and investigate alternative methods of incorporating visibility-correction data (e.g., pooling VCFs).

Literature Cited

Smith, G. W. 1995. A critical review of the aerial and ground surveys of breeding waterfowl in North America. U.S. Department of Interior Biological Science Report 5, Washington, D.C.

Wilson, B.C. 2007. North American Waterfowl Management Plan, Gulf Coast Joint Venture: Mottled Duck Conservation Plan. North American Waterfowl Management Plan, Albuquerque, NM.