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## 2012 WATERFOWL HARVEST SURVEY

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### ABSTRACT

*A sample of waterfowl hunters was contacted after the 2012 hunting seasons to estimate hunting activity and determine opinions and satisfaction with hunting regulations. Waterfowl hunting license sales increased nearly 4% between 2011 and 2012. The estimated number of people going afield to hunt ducks and geese increased significantly by 6% between 2011 and 2012. In 2012, about 48,644 people hunted waterfowl in Michigan (nearly 42,427 duck hunters and 35,751 goose hunters). Duck harvest and duck hunting effort increased significantly by 31% and 16%, respectively, between 2011 and 2012. Hunting effort by goose hunters (26%) and goose harvest (17%) also increased significantly statewide between 2011 and 2012. The regular Canada goose hunting season in Michigan increased from 45 days in 2011 to 92 days in 2012. The doubling of regular season length likely contributed to the increase in goose hunting effort and harvest. Expanding the goose season probably also increased duck hunting effort and harvest because most Michigan waterfowl hunters prefer to hunt ducks and geese together. Satisfaction with the duck season dates and the number of geese seen and harvested was significantly greater between 2011 and 2012. Duck hunters were asked to indicate their preferred opening date for the 2013 duck hunting season (i.e., September 21, September 28, October 5, or October 12). Among hunters that preferred to hunt in the South Zone, nearly equal proportions preferred to begin the 2013 duck hunting season on October 5 or October 12. Among hunters who preferred to hunt in the Middle Zone, nearly equal proportions preferred to begin the 2013 duck hunting season on September 21, September 28, or October 5. Among hunters that preferred to hunt in the North Zone, the most popular date to begin the 2013 duck hunting*



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season was September 21. Waterfowl hunters spent an estimated \$22.7 million on hunting trips primarily to hunt waterfowl in Michigan during 2012.

## INTRODUCTION

The Michigan Natural Resources Commission and Department of Natural Resources (DNR) have authority and responsibility to protect and manage wildlife resources in the state of Michigan. This responsibility is shared with the U.S. Fish and Wildlife Service (USFWS) and other state and provincial wildlife management agencies for the management of migratory birds such as ducks (*Anatinae*) and geese (*Branta* and *Anser* spp.). Harvest surveys are one of the management tools used by the Wildlife Division in developing regulations. Estimating harvest and hunting effort are among the primary objectives of these surveys. Estimates derived from harvest surveys, as well as breeding bird abundance and population models, are used to develop harvest regulations that provide sustainable recreational hunting and viewing opportunities of migratory game birds. Wildlife management agencies also consider hunter opinions when establishing regulations.

Waterfowl could be harvested during hunting seasons that occurred September 1, 2012, through February 10, 2013, (Table 1) by a person possessing both a waterfowl and a small game hunting license (includes resident, nonresident, 3-day nonresident, resident junior, and senior small game hunting licenses). Waterfowl hunters also had to obtain a federal waterfowl stamp and register with the National Migratory Bird Harvest Information Program (HIP). Hunters younger than 16 years of age could hunt waterfowl without a waterfowl hunting license or a federal waterfowl stamp; however, they still were required to purchase a small game license or mentored youth hunting license and register with the HIP.

The HIP is a cooperative effort between state wildlife agencies and the USFWS. It was implemented to improve knowledge about harvest of migratory game birds (e.g., ducks, geese, and woodcock [*Scolopax minor*]). Beginning in 1995, any person who hunted migratory game birds in Michigan was required to register with the HIP and answer several questions about their hunting experience during the previous year. The HIP provided the USFWS with a national registry of migratory bird hunters from which they can select participants for Federal harvest surveys.

State wildlife agencies select specific regulations, such as hunting season dates, within overall frameworks (e.g., number of days of hunting and bag limits) set by the USFWS. Both waterfowl population status and hunter attitudes are used when developing Michigan waterfowl hunting regulations. Although estimating harvest, hunter numbers, and hunting effort were the primary objectives of the waterfowl harvest survey, this survey also provided an opportunity to collect information about management issues. Questions were added to the questionnaire to estimate hunters' opinions and satisfaction with hunting regulations and waterfowl numbers. Questions were also added to estimate annual waterfowl hunting trip expenditures.

## METHODS

Following the 2012 hunting seasons, a questionnaire (Appendix A) was sent to 6,476 randomly selected people that were eligible to hunt waterfowl in Michigan. The people selected were grouped into one of two strata on the basis of their age, licenses purchased, and whether they had registered with the HIP. The first stratum consisted of people at least 16 years old that had purchased a waterfowl hunting license. The second stratum consisted of people less than 16 years old during September 1, 2012, and February 10, 2013, that had registered with the HIP by February 10, 2013. The overall sample consisted of 5,054 people from the first stratum (N=57,614), and 1,422 people from the second stratum (N=16,569).

Questionnaires were mailed initially in mid-March. Up to two follow-up questionnaires were sent to non-respondents. Hunters were asked to report whether they hunted, locations hunted (county and management zone), type of land on which hunt occurred (public or private lands), number of days spent afield, and number of waterfowl harvested. Hunters were also asked to rate their overall hunting experience and indicate satisfaction with hunting regulations (e.g., season dates and bag limits). Questionnaires were undeliverable to 151 people, primarily because of changes in residence. Questionnaires were returned by 3,115 of 6,301 people receiving the questionnaire (49% response rate).

Estimates were calculated using a stratified random sampling design (Cochran 1977). Using stratification, hunters were placed into similar groups (strata) based on their age, licenses purchased, and whether they had registered with the HIP. Then estimates were derived for each group separately. The statewide estimate was then derived by combining group estimates so the influence of each group matched the proportion its members occurred in the statewide population of hunters. The primary reason for using a stratified sampling design was to produce more precise estimates. Improved precision means similar estimates should be obtained if this survey were to be repeated.

Estimates were derived separately for the Upper Peninsula (UP), northern Lower Peninsula (NLP), and southern Lower Peninsula (SLP, Figure 1). These areas are consistent with areas used for estimation in previous years, although they do not match formal management zones. Estimates were also calculated separately for waterfowl management zones. Hunting effort and birds harvested from unknown locations were allocated among areas in proportion to the known effort and harvest. Estimates were calculated along with their 95% confidence limit (CL). In theory, this CL can be added and subtracted from the estimate to calculate the 95% confidence interval. The confidence interval is a measure of the precision associated with the estimate and implies the true value would be within this interval 95 times out of 100. Unfortunately, there are several other possible sources of error in surveys that are probably more serious than theoretical calculations of sampling error. They include failure of participants to provide answers (nonresponse bias), question wording, and question order. It is difficult to measure these biases. Thus, estimates were not adjusted for possible bias.

Statistical tests are used routinely to determine the likelihood that differences among estimates are larger than expected by chance alone. The overlap of 95% confidence intervals was used to determine whether estimates differed. Non-overlapping 95% confidence intervals was equivalent to stating the difference between the means was larger

than would be expected 995 out of 1,000 times ( $P < 0.005$ ), if the study had been repeated (Payton et al. 2003).

## **RESULTS**

### **License sales and hunter participation**

In 2012, 57,805 people purchased a Michigan waterfowl hunting license, and this was a 3.7% increase compared to numbers of license purchasers in 2011 seasons (Table 2). The average age of people that purchased a waterfowl hunting license was 43 years (Figure 2). About 2% (1,024) of waterfowl license buyers were younger than 17 years old. Hunters less than 16 years of age could legally hunt waterfowl without a waterfowl hunting license; thus, the count of youth license buyers failed to count all youth waterfowl hunters. About 97% of the waterfowl hunting license buyers were males.

An estimated 48,644 people went afield to hunt waterfowl in 2012, which was a significant increase of 6% from 2011 (Table 3). The mean age of the active waterfowl hunter was 40 years, and about 12% of the active hunters were less than 17 years old (5,655 youth hunters). About  $66 \pm 2\%$  of the people eligible to hunt waterfowl (strata 1 and 2 combined) spent time hunting ducks or geese. About  $74 \pm 2\%$  of the people that had purchased a waterfowl hunting license (stratum 1) hunted waterfowl. In contrast,  $38 \pm 4\%$  of the people less than 16 years old that had registered with the HIP (stratum 2) hunted waterfowl. An estimated 42,427 duck hunters spent 339,470 days afield; while an estimated 35,751 goose hunters spent 294,400 days afield (Tables 4 and 5). About  $40 \pm 2\%$  ( $29,535 \pm 1,223$ ) of those eligible to hunt waterfowl attempted hunting both ducks and geese.

An estimated  $2,829 \pm 521$  youth hunters (less than 16 years old) participated during the 2-day youth waterfowl hunting season (Figure 3). About  $24 \pm 4\%$  of the youth hunters eligible to hunt during the youth season actually participated.

### **Harvest and hunting trends**

The number of active duck hunters statewide (all seasons combined) and both their hunting effort and harvest increased significantly between 2011 and 2012 (Tables 4-7). The number of goose hunters, their hunting effort, and harvest also increased significantly statewide (all seasons combined) between 2011 and 2012 (Tables 4-6 and 8).

### **Hunter opinions**

An estimated 59% of the Michigan duck hunters were satisfied with their duck hunting experience in 2012, 21% had a neutral opinion about their experience, while 19% of duck hunters were dissatisfied (Table 9). Satisfaction among goose hunters with their goose hunting experience was similar to the satisfaction levels reported for duck hunting. In addition, overall satisfaction among duck and goose hunters in 2012 was not significantly different from 2011 (Figure 4).

About 31% of duck hunters were satisfied with the number of ducks they harvested, and 35% of goose hunters were satisfied with the number of geese harvested (Table 9). The proportion of ducks hunters satisfied with the number of ducks seen in 2012 was not significantly different from 2011 (46% versus 42% satisfied, Figure 4). The proportion of duck hunters satisfied with the duck season dates in 2012 increased significantly from 2011 (48% versus 40% satisfied). An increased proportion of goose hunters were satisfied by the number of geese seen and the number of geese harvested in 2012 than in 2011 (Figure 4).

Most ( $66 \pm 2\%$ ) duck hunters preferred to hunt in the South Zone, while  $20 \pm 2\%$  of duck hunters preferred to hunt in the Middle Zone and  $10 \pm 1\%$  preferred to hunt in the North Zone. About  $3 \pm 1\%$  of the duck hunters did not indicate a preferred hunt zone. Among hunters that preferred to hunt in the South Zone, nearly equal proportions preferred to begin the 2013 duck hunting season on October 5 or October 12 (Table 10). Among hunters who preferred to hunt in the Middle Zone, nearly equal proportions preferred to begin the 2013 duck hunting season on September 21, September 28, or October 5. Among hunters that preferred to hunt in the North Zone, the most popular date to begin the 2013 duck hunting season was September 21.

Duck hunters were asked to indicate whether it was more important to (1) open the goose season as early as allowed by the USFWS or (2) open it on the same date as the duck season. Among hunters that preferred to hunt in the Middle and South zones, the option to open the goose season on the same date as the duck season was the preferred option (Table 11). Among UP hunters, both options were equally preferred.

### **Waterfowl hunting expenditures**

Among waterfowl hunters (duck and goose hunters combined) that participated in 2012, the average hunter devoted  $7.6 \pm 0.4$  hunting trips during the year to hunt waterfowl. The trips included hunts that took place during a single day and hunts that required an overnight stay away from home. All waterfowl hunters combined took  $371,665 \pm 20,419$  waterfowl hunting trips in Michigan during 2012. Among hunters that reported their expenditures, active hunters spent an average of  $\$463 \pm \$34$  per year on hunting trips. Expenditures on long trips included the costs of food, travel, and lodging, while short trips may have only included the cost of fuel. Collectively, waterfowl hunters spent  $\$22.7$  million ( $\pm \$1.7$  million) on hunting trips primarily to hunt waterfowl in Michigan during 2012. In comparison, waterfowl hunters in Michigan spent an estimated  $\$21.7$  million in 2006 (Frawley 2007).

### **DISCUSSION**

The regular Canada goose season in Michigan increased from 45 days in 2011 to 92 days in 2012; this occurred as part of a Mississippi Flyway-wide change in Canada goose harvest strategy. The doubling of regular season length likely contributed to the increase in goose hunting effort and harvest in the LP in 2012. Expanding the goose season probably also increased duck hunting effort and harvest because most Michigan waterfowl hunters prefer to hunt ducks and geese together.

Raftovich and Wilkins (2013) reported estimates of harvest, hunter numbers, and hunting effort of Michigan waterfowl hunters in 2012 from a USFWS survey. These estimates were based on responses received from a random sample of HIP registrants. Estimates of duck and goose hunter numbers from the current survey and the USFWS survey were not significantly different (Table 12). In contrast, estimates of hunting effort and harvest of both duck and goose hunters were significantly different between the surveys. These differences may reflect variations in the way the surveys were implemented.

Wright (1978) and Frawley (2012, 2013) compared estimates of waterfowl hunting activity and harvest of waterfowl hunters derived from mail surveys to information reported at mandatory check stations. Estimates of waterfowl harvest were overestimated by 100-212%, and the number of hunting trips was overestimated by 35-73%. Wright attributed the largest source of bias associated with the harvest estimate to hunters reporting the take of hunting partners, rather than only reporting their harvest.

Despite the short-term increase in license buyers in 2012 compared to 2011, the number of people buying a waterfowl hunting license in 2012 declined by about 10% compared to the number of license buyers in 2002 (57,805 people purchased a license in 2012 versus 64,582 in 2002). There were fewer license buyers for the age classes between 27 and 48 years of age in 2012, compared to 2002 (Figure 5). However, there were increased hunter numbers among the oldest age classes in 2012. The increased hunter numbers in the oldest age classes likely represented the rising share of older people in the population as the baby-boom generation aged and life expectancies have increased.

Since 1954, the highest numbers of duck and goose hunters recorded in Michigan occurred in 1970 (Figure 6). From this peak, the current number of people hunting ducks has declined 69% (average annual decline = 2.8%), while the number of people hunting geese has declined 45% (average annual decline = 1.4%). Declining numbers of small game hunters, including waterfowl hunters, has been noted previously in Michigan and throughout the United States since the mid-1970s (Enck et al. 2000, U.S. Department of the Interior 2002, Aiken 2004, Frawley 2006). Many factors are responsible for declining waterfowl hunter numbers including increased urbanization of the human population, increased competition between hunting and other recreational activities, decreased access to private land for hunting, and loss of waterfowl habitat. Although the number of duck hunters and duck harvest has decreased since 1970, duck harvest per day of hunting effort has increased (Figure 7). Goose harvest and the mean number of geese taken per day of hunting effort also have increased gradually since the 1970s (Figure 7).

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Table 1. Waterfowl hunting seasons in Michigan, 2012-2013.

Species, season, and area <sup>a</sup>	Season dates
Ducks <sup>b</sup>	
North Zone (UP)	Sept. 22 – Nov. 16 and Nov. 22 – 25
Middle Zone	Sept. 29 – Nov. 25 and Dec. 15 – 16
South Zone	Oct. 6 – Nov. 30 and Dec. 29 – Jan. 1
Canada geese <sup>b,c</sup>	
Early seasons	
North Zone (UP)	Sept. 1 – 10
Middle and South zones (LP)	Sept. 1 – 15
Regular seasons	
North Zone (UP)	Sept. 22 – Dec. 22
Middle Zone	Sept. 29 – Dec. 29
South Zone	Sept. 22 – 23, Oct. 6 – Nov. 30, and Dec. 29 – Jan. 1
Late season	
South Zone	Jan. 12 – Feb. 10

<sup>a</sup>See Figure 1 for boundaries of hunt areas.

<sup>b</sup>Ducks and geese could also be taken during a special 2-day Youth Season (September 15-16).

<sup>c</sup>Special goose hunting seasons also occurred on Goose Management Units, but these seasons affected a relatively small area.

Table 2. Number of waterfowl hunting licenses sold in Michigan, 2008-2012.

Item	Year					2011-2012 % Change
	2008	2009	2010	2011	2012	
Number of licenses sold <sup>a</sup>	58,526	58,663	57,162	56,270	58,370	3.7
Number of people buying a hunting license <sup>a,b,c</sup>	58,036	58,209	56,689	55,721	57,805	3.7

<sup>a</sup>The number of licenses sold is higher than the number of people buying licenses because some people purchased multiple licenses. The mentored youth hunting license was created in 2012 and was valid for hunting small game, waterfowl, turkey, and deer. Although these license buyers (N=10,406) were eligible to hunt waterfowl, they were not included in license sales total.

<sup>b</sup>A person was counted only once, regardless of how many licenses they purchased.

<sup>c</sup>Hunters less than 16 years of age could legally hunt waterfowl without a waterfowl hunting license.

Table 3. Estimated number, sex, and mean age of active waterfowl hunters, and proportion and number of youth waterfowl hunters in Michigan, 2008-2012.<sup>a</sup>

Hunters	2008	2009	2010	2011	2012	
					Estimate	95% CL
Waterfowl <sup>b</sup>	47,384	50,064	47,788	45,786	48,644*	1,170
Males (%)	94.2	97.0	97.2	96.4	96.5	0.8
Females (%)	3.0	3.0	2.8	3.6	3.5	0.8
Mean age (Years)	41.4	41.4	41.7	41.5	40.3	0.7
Youth (%) <sup>c</sup>	10.2	12.6	10.9	11.5	11.6	1.3
Youth (No.) <sup>c</sup>	4,819	6,299	5,191	5,245	5,655	669

<sup>a</sup>Analyses included only those people that hunted.

<sup>b</sup>People that hunted ducks or geese (active hunters).

<sup>c</sup>Hunters less than 17 years of age.

\*Non-overlapping 95% confidence intervals indicated estimates differed significantly between 2011 and 2012 (P<0.005).

Table 4. Estimated number of waterfowl hunters by season and region in Michigan, 2009-2012.<sup>a</sup>

Species and area (stratum)	2009	2010	2011	2012		2011-2012 % Change
				No.	95% CL	
<b>Ducks (First split)</b>						
UP	5,749	5,649	5,349	5,422	647	1
NLP	17,936	17,083	15,480	17,831	1,067	15*
SLP	23,268	22,374	20,986	22,901	1,145	9
Statewide	41,930	40,238	38,146	41,156	1,234	8*
<b>Ducks (Second split)</b>						
UP	463		636	501	204	-21
NLP	1,899	1,686	3,140	2,862	483	-9
SLP	7,022	6,537	6,726	8,657	794	29*
Statewide	9,158	8,160	10,258	11,788	919	15
<b>Ducks (Seasons combined)</b>						
UP	5,801	5,666	5,442	5,432	647	0
NLP	18,288	17,265	15,900	18,226	1,075	15*
SLP	24,078	23,241	21,602	24,560	1,166	14*
Statewide	42,554	40,865	38,783	42,427	1,227	9*
<b>Geese (Early season)</b>						
UP	1,564	1,761	1,775	1,405	336	-21
NLP	7,376	7,033	6,488	7,190	741	11
SLP	13,782	12,059	11,831	13,481	961	14
Statewide	22,023	20,331	19,603	21,523	1,144	10
<b>Geese (Regular season)</b>						
UP	3,169	2,879	2,919	2,515	450	-14
NLP	10,776	10,687	9,394	10,763	875	15
SLP	14,548	14,840	13,820	16,788	1,030	21*
Statewide	27,106	27,007	25,094	28,523	1,211	14*
<b>Geese (Late season)</b>						
UP	NA	NA	NA	NA	NA	NA
NLP	507	225	663	521	208	-21
SLP	6,206	6,054	6,491	5,421	642	-16
Statewide	6,653	6,259	7,113	5,920	677	-17
<b>Geese (Seasons combined)</b>						
UP	3,559	3,586	3,545	2,998	488	-15
NLP	13,637	13,319	11,609	13,195	951	14
SLP	21,665	20,723	19,395	22,288	1,131	15*
Statewide	36,202	34,724	32,685	35,751	1,244	9*

<sup>a</sup>The number of hunters does not add up to the statewide total because hunters can hunt in more than one region. Regions did not match hunting zones; see Tables 7 and 8 for estimates by hunting zones.

\*Non-overlapping 95% confidence intervals indicated estimates differed significantly between 2011 and 2012 (P<0.005).

Table 5. Estimated amount of waterfowl hunter effort (days afield) by season and region, 2009-2012.<sup>a</sup>

Species and area (stratum)	2009	2010	2011	2012		2011-2012 % Change
				No.	95% CL	
Ducks (First split)						
UP	34,669	32,293	30,676	34,916	6,137	14
NLP	118,951	117,629	98,528	121,253	11,742	23*
SLP	158,734	167,107	145,025	159,732	13,241	10
Statewide	312,353	317,029	274,230	315,900	17,623	15*
Ducks (Second split)						
UP	1,259		1,184	1,061	488	-10
NLP	2,966	2,584	5,548	5,150	947	-7
SLP	9,802	9,995	10,512	17,359	1,910	65*
Statewide	14,027	12,579	17,244	23,570	2,167	37*
Ducks (Seasons combined)						
UP	35,927	32,301	31,862	35,980	6,392	13
NLP	121,914	120,225	104,078	126,412	12,191	21*
SLP	168,539	177,082	155,533	177,079	14,097	14
Statewide	326,380	329,608	291,474	339,470	18,516	16*
Geese (Early season)						
UP	6,073	6,185	6,029	5,033	1,412	-17
NLP	27,868	26,897	24,992	28,967	3,905	16
SLP	51,787	44,615	45,411	50,862	4,857	12
Statewide	85,727	77,697	76,432	84,862	6,184	11
Geese (Regular season)						
UP	20,484	18,598	18,354	15,661	3,892	-15
NLP	62,943	67,146	53,729	75,608	10,127	41*
SLP	79,795	87,075	76,409	98,981	10,009	30*
Statewide	163,222	172,819	148,493	190,250	14,368	28*
Geese (Late season)						
UP	NA	NA	NA	NA	NA	NA
NLP	1,592	512	1,863	1,417	753	-24
SLP	20,609	20,925	24,521	17,871	3,054	-27
Statewide	22,201	21,437	26,384	19,288	3,150	-27*
Geese (Seasons combined)						
UP	26,502	24,762	24,439	20,677	4,661	-15
NLP	92,303	94,512	80,653	105,932	12,692	31*
SLP	152,345	152,679	146,217	167,791	14,496	15
Statewide	271,150	271,954	251,309	294,400	19,029	17*

<sup>a</sup>Regions did not match hunting zones; see Tables 7 and 8 for estimates by hunting zones.

\*Non-overlapping 95% confidence intervals indicated estimates differed significantly between 2011 and 2012 (P<0.005).

Table 6. Estimated waterfowl harvest by season and region in Michigan, 2009-2012.<sup>a</sup>

Species and area (stratum)	2009	2010	2011	2012		2011- 2012 %
				No.	95% CL	
Ducks (First split)						
UP	37,196	35,459	32,720	46,193	10,793	41
NLP	149,538	149,797	120,127	155,333	19,116	29*
SLP	190,827	196,846	171,984	211,574	25,271	23
Statewide	377,561	382,102	324,831	413,100	33,260	27*
Ducks (Second split)						
UP	1,599		1,391	3,131	1,639	125
NLP	4,870	4,628	7,721	8,505	2,150	10
SLP	15,568	20,635	16,462	33,458	5,233	103*
Statewide	22,036	25,263	25,575	45,093	5,898	76*
Ducks (Seasons combined)						
UP	38,790	35,482	34,117	49,330	11,720	45
NLP	154,380	154,476	127,858	163,863	20,017	28*
SLP	206,427	217,407	188,431	245,001	27,753	30*
Statewide	399,598	407,365	350,406	458,193	36,108	31*
Geese (Early season)						
UP	3,644	4,329	4,841	6,043	2,445	25
NLP	31,537	28,367	24,219	32,208	5,941	33
SLP	53,530	51,763	50,700	61,926	7,849	22
Statewide	88,712	84,459	79,760	100,178	10,055	26*
Geese (Regular season)						
UP	9,531	8,943	6,968	6,644	2,256	-5
NLP	31,815	35,145	23,291	37,398	7,288	61*
SLP	47,274	47,902	40,001	52,975	7,696	32
Statewide	88,620	91,989	70,261	97,017	10,795	38*
Geese (Late season)						
UP	NA	NA	NA	NA	NA	NA
NLP	814	899	1,482	1,272	1,227	-14
SLP	16,113	22,970	18,174	15,208	3,551	-16
Statewide	16,927	23,869	19,655	16,480	3,751	-16
Geese (Seasons combined)						
UP	13,165	13,245	11,810	12,663	4,127	7
NLP	64,146	64,406	48,928	70,779	12,243	45*
SLP	116,948	122,666	108,938	130,233	15,595	20
Statewide	194,259	200,317	169,676	213,675	19,945	26*

<sup>a</sup>Regions did not match hunting zones; see Tables 7 and 8 for estimates by hunting zones.

\*Non-overlapping 95% confidence intervals indicated estimates differed significantly between 2011 and 2012 (P<0.005).

Table 7. Estimated number of duck hunters, hunting effort, and ducks harvested, summarized by season and management zone in Michigan, 2012.

Season and waterfowl zone <sup>a</sup>	Hunters		Effort		Harvest	
	No.	95% CL	No.	95% CL	No.	95% CL
First split						
North	5,423	652	34,769	6,138	45,706	10,794
Middle	11,039	896	63,668	8,337	72,653	11,713
South	29,789*	1,221	217,464*	15,277	294,741*	28,939
Statewide	41,156*	1,234	315,900*	17,623	413,100*	33,260
Second split						
North	567	221	1,111	502	3,095	1,639
Middle	2,088	421	3,629	768	7,014	1,966
South	9,342*	828	18,830*	1,986	34,985*	5,309
Statewide	11,788	919	23,570*	2,167	45,093*	5,898
Seasons combined						
North	5,483	655	35,878	6,394	48,808	11,721
Middle	11,362	906	67,295	8,728	79,671	12,757
South	31,141*	1,227	236,297*	16,104	329,715*	31,246
Statewide	42,427*	1,227	339,470*	18,516	458,193*	36,108

<sup>a</sup>Estimates for the zones do not equal estimates for the areas in Tables 4-6 because hunting effort and birds harvested from unknown locations were allocated among areas in proportion to the known effort and harvest.

\*Non-overlapping 95% confidence intervals indicated estimates declined significantly between 2011 and 2012 (P<0.005).

Table 8. Estimated number of goose hunters, hunting effort, and geese harvested, summarized by season and management zone in Michigan, 2012.

Season and waterfowl zone <sup>a</sup>	Hunters		Effort		Harvest	
	No.	95% CL	No.	95% CL	No.	95% CL
Early						
North	1,571	336	5,615	1,412	6,505	2,445
Middle	3,537	503	14,697	2,737	16,087	4,614
South	17,101*	1,010	64,550	5,139	77,586	8,406
Statewide	21,523	1,144	84,862	6,184	100,178*	10,055
Regular						
North	2,819	450	17,410	3,892	7,224	2,256
Middle	5,271	604	36,362	6,554	18,950	5,790
South	22,038*	1,089	136,478*	11,262	70,844*	8,397
Statewide	28,523*	1,211	190,250*	14,368	97,017*	10,795
Late						
North	NA	NA	NA	NA	NA	NA
Middle	NA	NA	NA	NA	NA	NA
South	5,920	677	19,288*	3,150	16,480	3,751
Statewide	5,920	677	19,288*	3,150	16,480	3,751

<sup>a</sup>Estimates for the zones do not equal estimates for the areas in Tables 4-6 because hunting effort and birds harvested from unknown locations were allocated among areas in proportion to the known effort and harvest.

\*Non-overlapping 95% confidence intervals indicated estimates differed significantly between 2011 and 2012 (P<0.005).

Table 9. Level of satisfaction among waterfowl hunters with the 2011 and 2012 waterfowl hunting seasons and hunting regulations in Michigan (summarized as the proportion of active waterfowl hunters reporting various levels of satisfaction).<sup>a</sup>

Hunting experience or regulation	Level of satisfaction and year											
	Very satisfied or somewhat satisfied			Neutral			Somewhat dissatisfied or strongly dissatisfied			No answer		
	2011	2012		2011	2012		2011	2012		2011	2012	
	%	%	95% CL	%	%	95% CL	%	%	95% CL	%	%	95% CL
Ducks seen	42	46	2	19	20	2	38	33	2	1	1	0
Ducks harvested	28	31	2	21	23	2	44	42	2	6	4*	1
Duck hunting experience	56	59	2	19	21	2	20	19	2	2	1	0
Duck season dates	40	48*	2	27	27	2	30	23*	2	3	2	1
Length of duck season	49	53	2	26	26	2	22	20	2	3	2	1
Daily duck limit	58	62	2	27	26	2	10	10	1	3	2	1
Geese seen	56	61*	2	15	16	2	27	22*	2	2	2	1
Geese harvested	30	35*	2	23	22	2	40	36	2	7	6	1
Goose hunting experience	53	55	2	21	24	2	24	19*	2	3	1	1
Days in goose season	NA	61	2	NA	21	2	NA	16	2	NA	2	1
Goose season dates	NA	57	2	NA	24	2	NA	17	2	NA	3	1
Daily goose limit	NA	48	2	NA	23	2	NA	26	2	NA	3	1

<sup>a</sup>Estimates associated with duck hunting were derived from answers provided by people that had hunted ducks, while estimates associated with goose hunting were derived from answers received from people that had hunted geese.

\*Non-overlapping 95% confidence intervals indicated estimates differed significantly between 2011 and 2012 (P<0.005).

Table 10. Preferred opening date of the 2013 duck hunting season in Michigan among active 2012 duck hunters, summarized by their preferred waterfowl hunting zone.

Opening date	Preferred hunt zone <sup>a</sup>											
	North Zone				Middle Zone				South Zone			
	Hunters (%)	95% CL	Hunters (No.)	95% CL	Hunters (%)	95% CL	Hunters (No.)	95% CL	Hunters (%)	95% CL	Hunters (No.)	95% CL
Sep. 21	40	7	1,748	389	26	4	2,261	437	18	2	5,120	643
Sep. 28	24	6	1,030	294	26	4	2,243	433	12	2	3,394	527
Oct. 5	18	5	767	251	23	4	1,957	416	26	2	7,431	752
Oct. 12	4	3	187	128	11	3	924	275	24	2	6,718	716
Undecided	9	4	410	186	10	3	883	275	11	2	3,215	520
Other	3	2	120	104	2	2	196	135	6	1	1,646	373
No answer	2	2	67	74	2	1	156	113	2	1	540	217

<sup>a</sup>Excluded duck hunters that failed to report preferred zone to hunt waterfowl.

Table 11. Preferred opening date for goose hunting season in Michigan among active 2012 duck hunters, summarized by their preferred waterfowl hunting zone.

Goose season opening date	Preferred hunt zone <sup>a</sup>											
	North Zone				Middle Zone				South Zone			
	Hunters (%)	95% CL	Hunters (No.)	95% CL	Hunters (%)	95% CL	Hunters (No.)	95% CL	Hunters (%)	95% CL	Hunters (No.)	95% CL
Earliest possible	40	7	1,726	380	31	5	2,706	479	33	3	9,376	833
Same as duck	34	7	1,481	354	45	5	3,898	565	46	3	12,774	948
Undecided	17	5	749	255	18	4	1,552	366	15	2	4,223	589
Other	4	3	179	121	2	2	196	135	3	1	901	281
No answer	5	3	196	135	3	2	268	148	3	1	790	255

<sup>a</sup>Excluded duck hunters that failed to report preferred zone to hunt waterfowl.

Table 12. Comparison of estimates of waterfowl hunter numbers, hunting effort, and harvest in Michigan during 2012 from the USFWS harvest survey and the Michigan waterfowl harvest survey.

Estimate	USFWS survey <sup>a</sup>		Michigan survey		Difference (%)
	No.	95% CL	No.	95% CL	
<b>Ducks</b>					
Hunters	37,200	4,092	42,427	1,227	14
Hunting effort	229,900	36,784	339,470	18,516	48*
Harvest	320,200	48,030	458,193	36,108	43*
<b>Geese</b>					
Hunters	31,900	3,509	35,751	1,244	12
Hunting effort	183,300	27,495	294,400	19,029	61*
Harvest	144,700	26,046	213,675	19,945	48*
<b>Ducks and geese combined</b>					
Hunters	44,200	4,420	48,644	1,170	10

<sup>a</sup> Raftovich and Wilkins (2013).

\*Non-overlapping 95% confidence intervals indicated estimates from the surveys were significantly different (P<0.005).

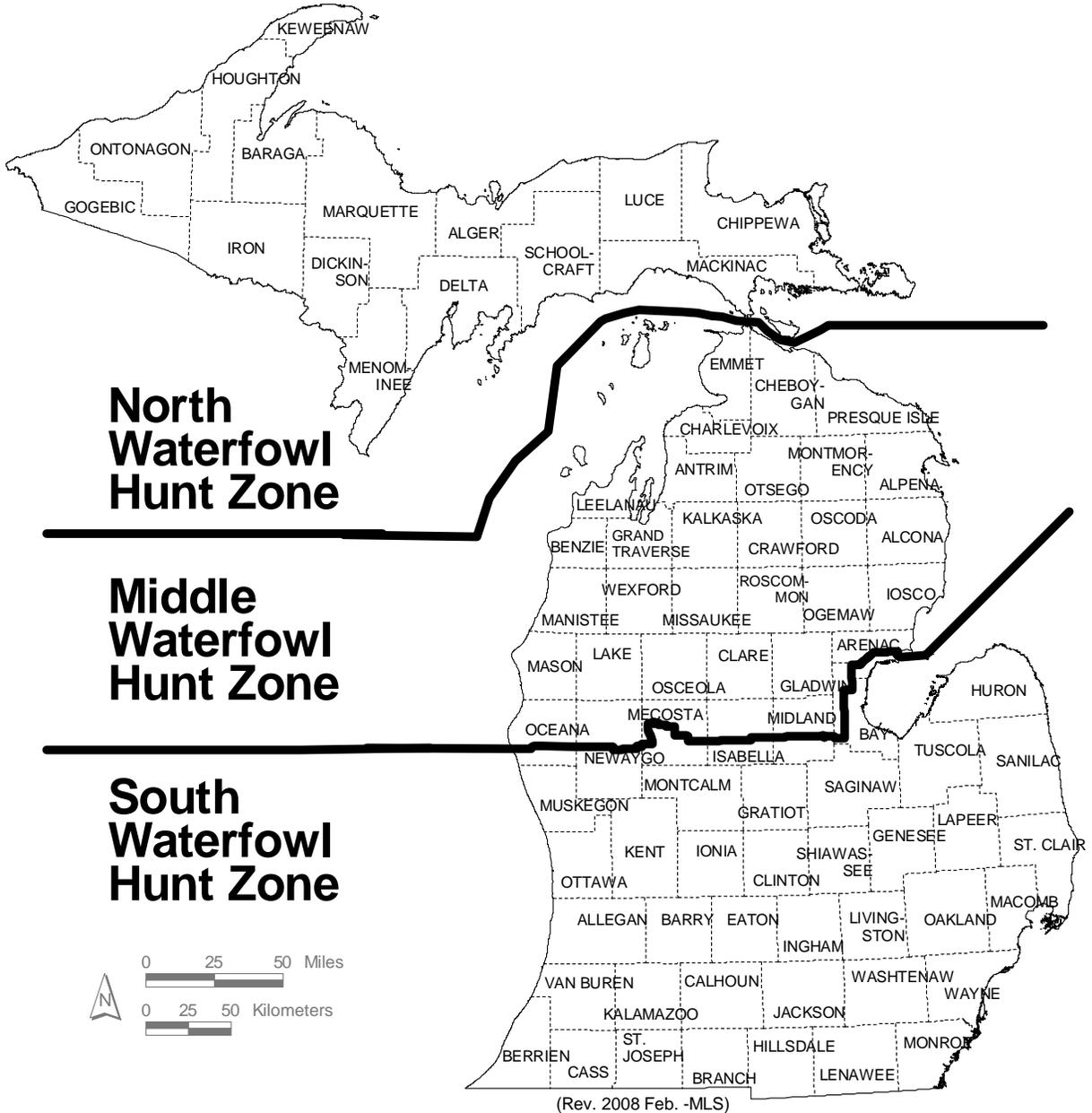


Figure 1. Areas used to summarize the waterfowl survey data for the 2012 waterfowl hunting seasons in Michigan. Regional boundaries did not match the waterfowl management hunting zones.

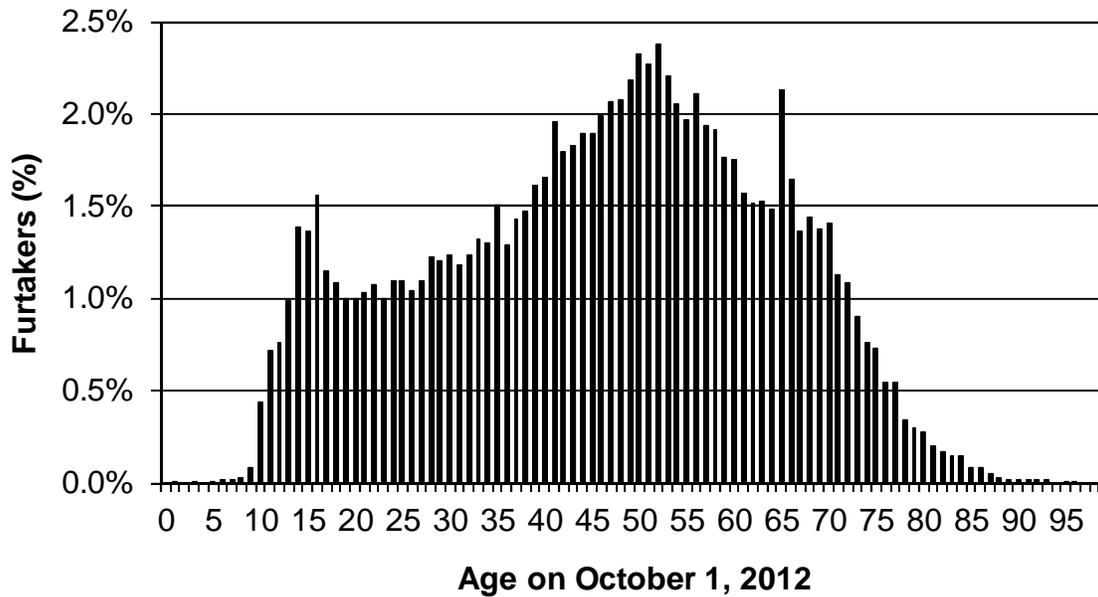


Figure 2. Age of people that purchased a waterfowl hunting license in Michigan for the 2012 hunting seasons ( $\bar{x}$  = 43 years). Hunters less than 16 years of age could legally hunt waterfowl without a waterfowl hunting license.

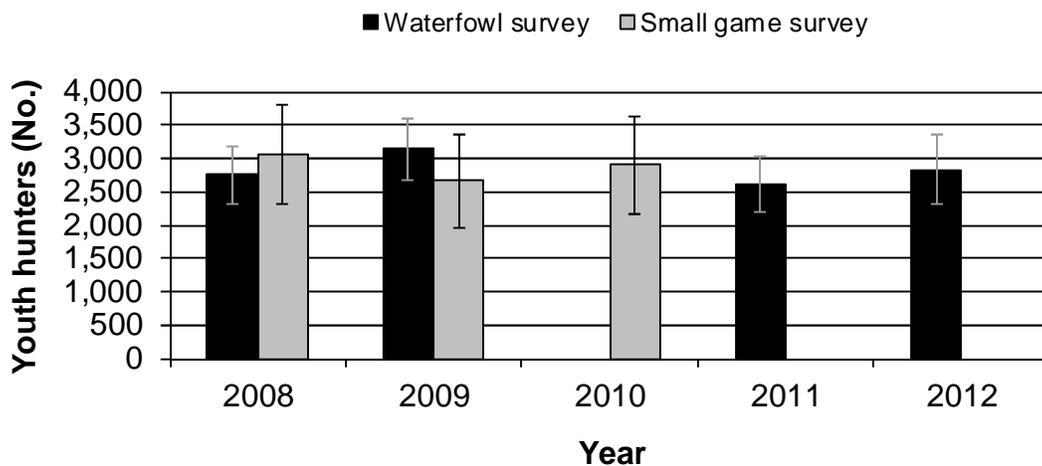


Figure 3. Estimated number of youths (10-15 years old) hunting during the youth waterfowl hunting weekend in Michigan during 2008-2012. Estimates plotted separately by the source of the estimate (waterfowl harvest survey or small game harvest survey).

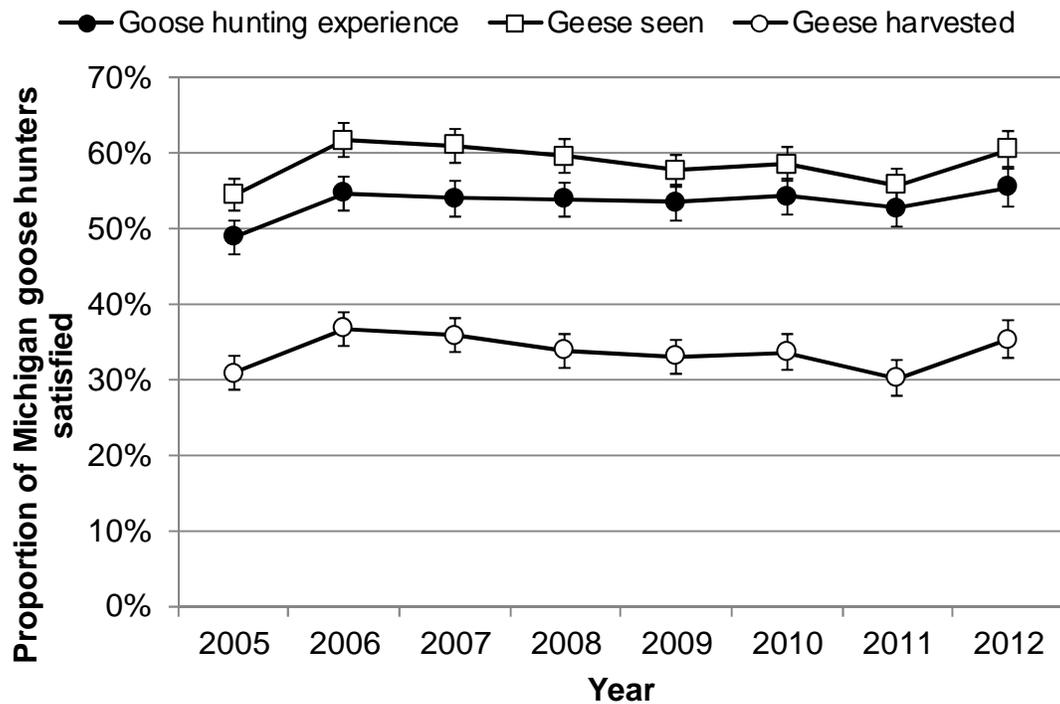
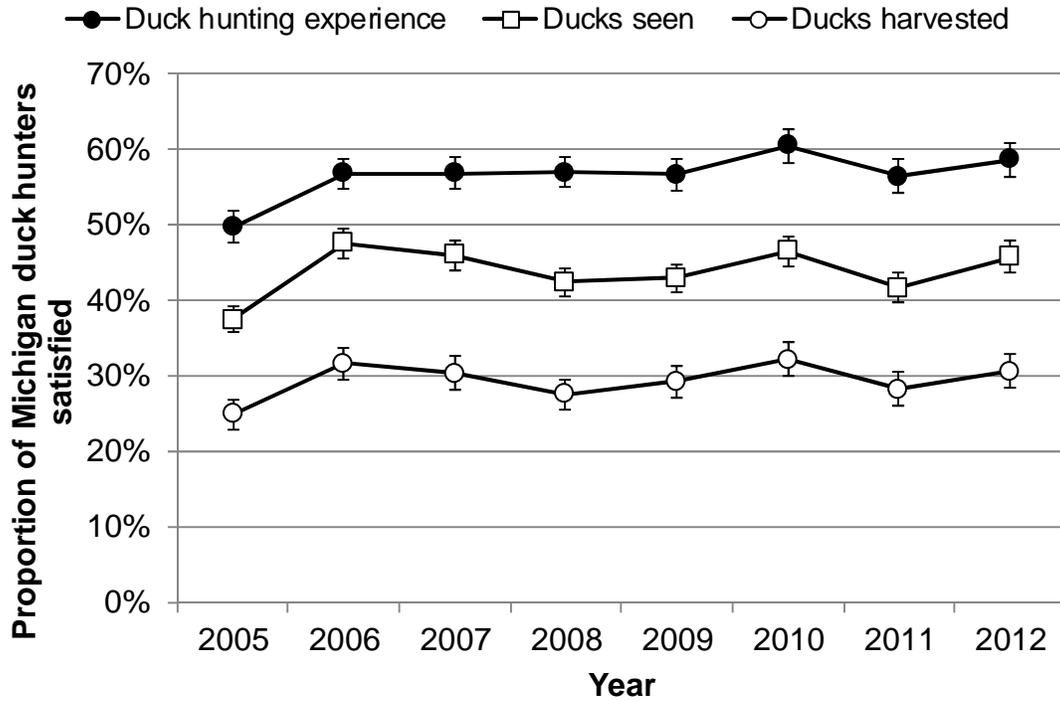


Figure 4. Proportion of Michigan goose and duck hunters satisfied with their overall hunting experience and the amount of waterfowl seen and harvested. Satisfaction measures the proportion of hunters that were very satisfied or somewhat satisfied. Error bars represent the 95% confidence limit.

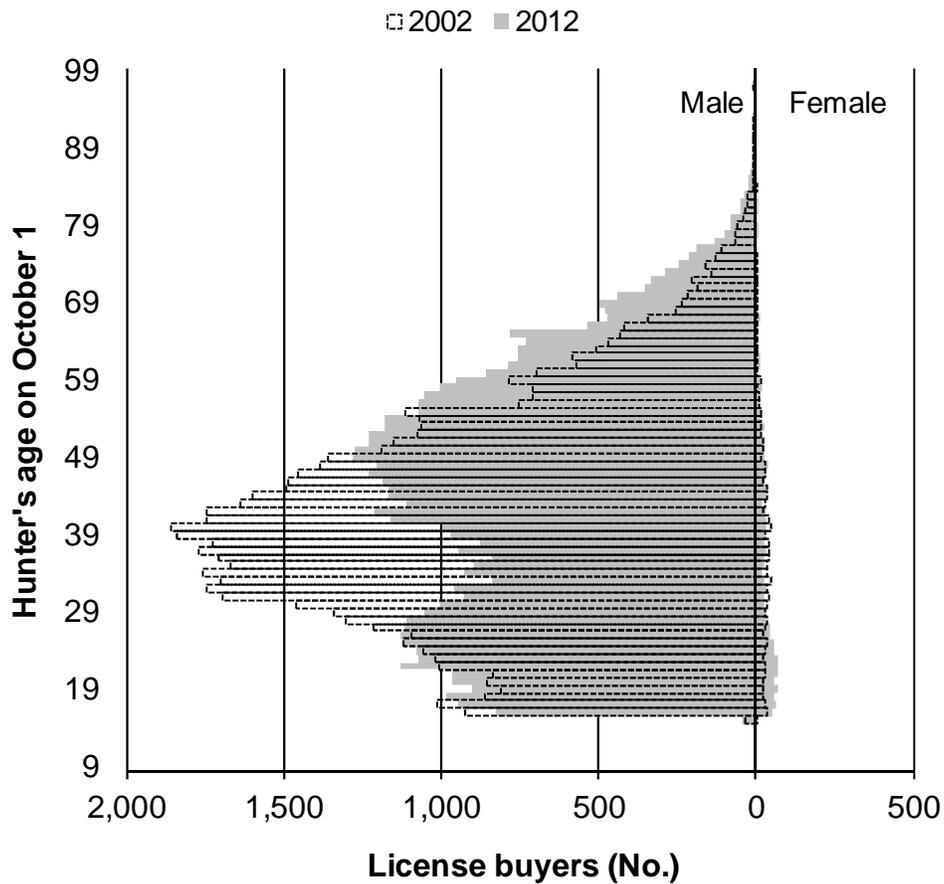


Figure 5. Number of waterfowl hunting license buyers in Michigan by age and sex during 2002 and 2012 hunting seasons. Waterfowl hunting licenses were purchased by 64,582 people in 2002 and 57,805 people in 2012. Hunters less than 16 years of age could legally hunt waterfowl without a waterfowl hunting license.

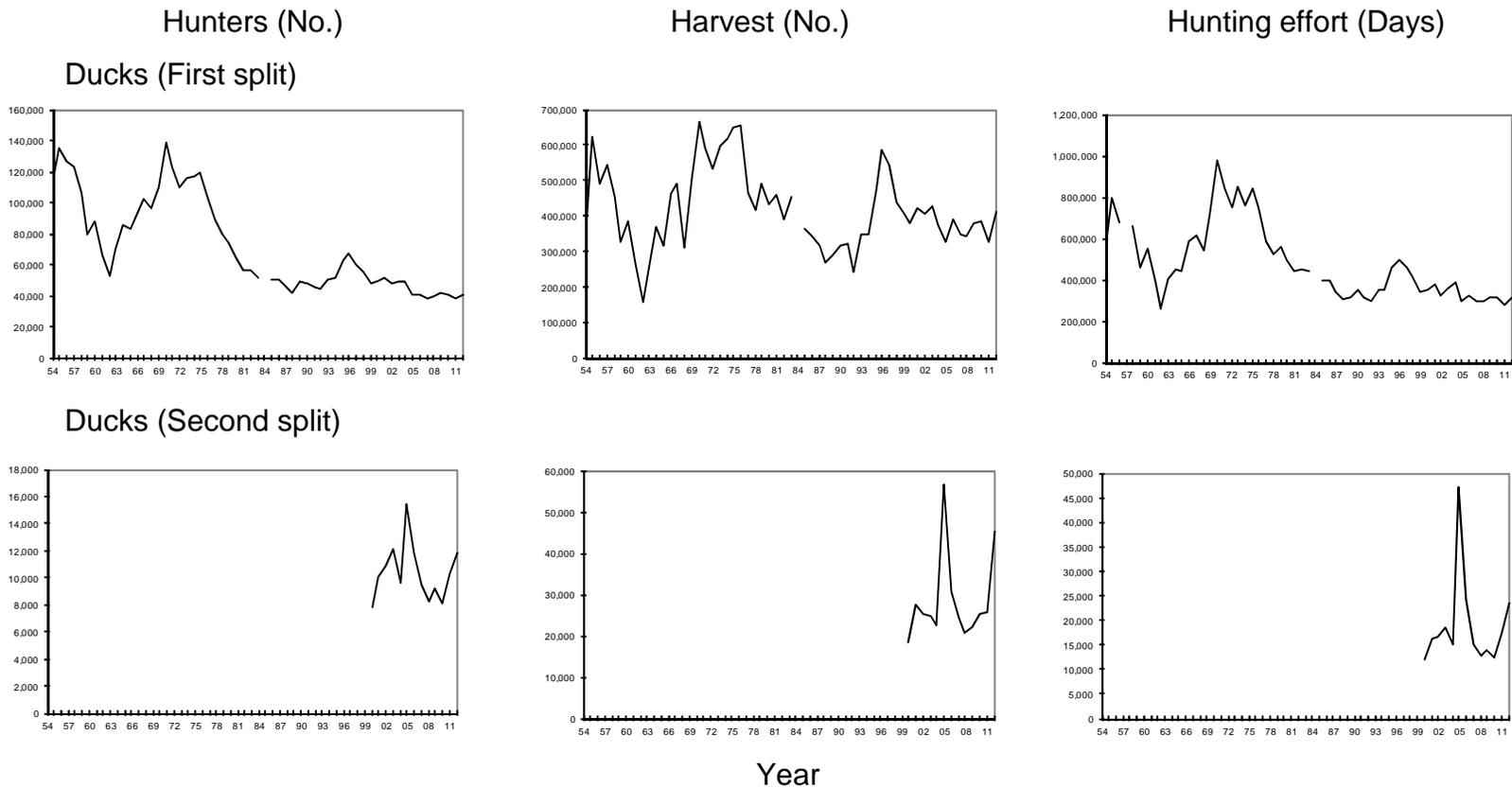


Figure 6. Estimated number of hunters, harvest, and hunting effort in Michigan during the waterfowl hunting seasons, 1954-2012. No estimates were available or no seasons existed during years when no data are plotted.

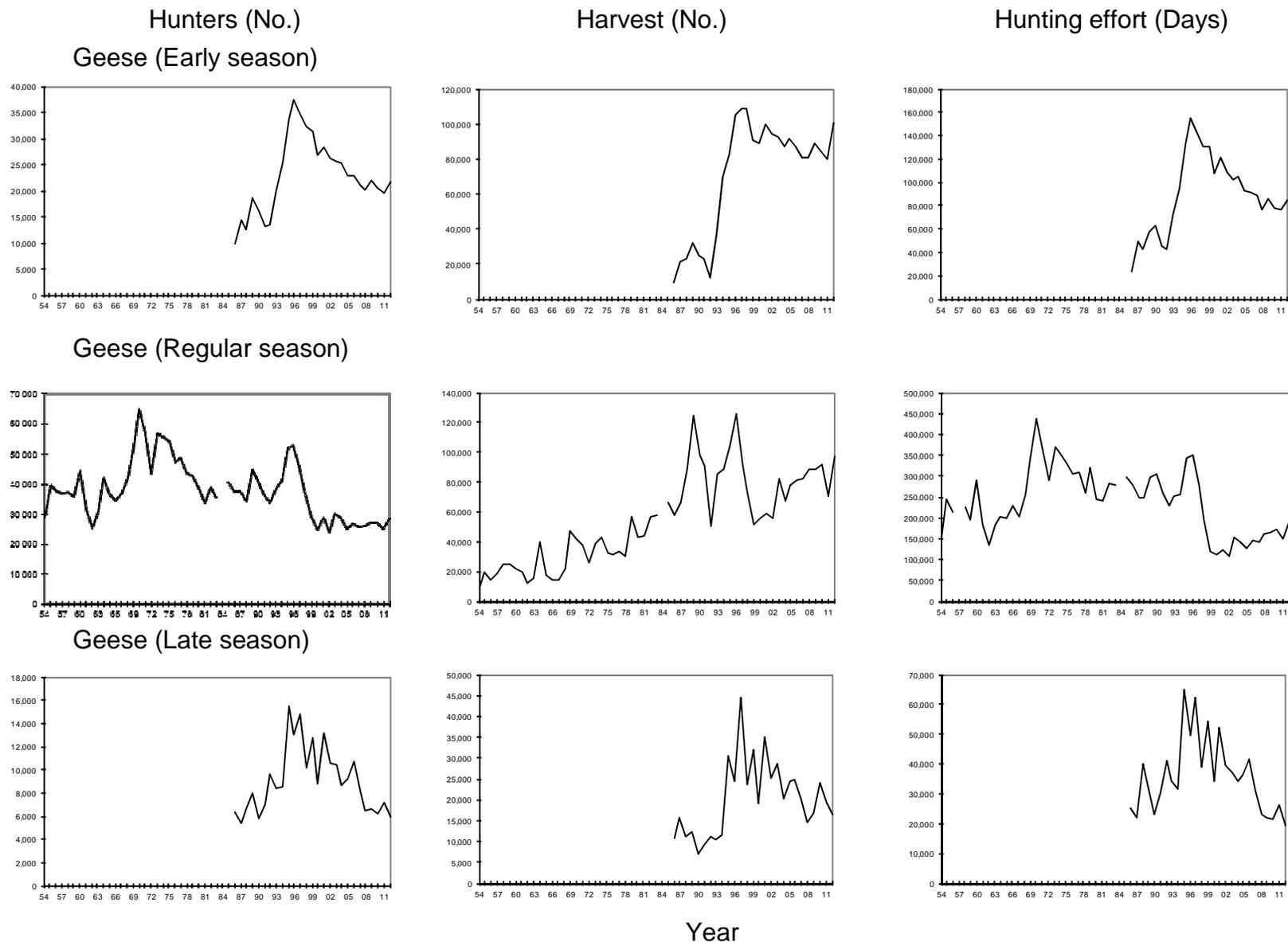
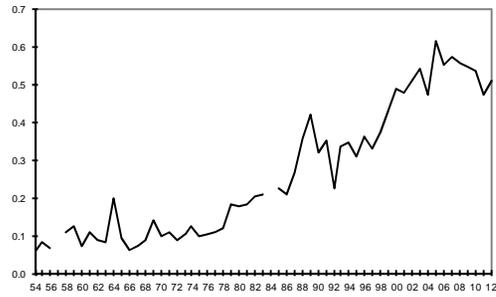
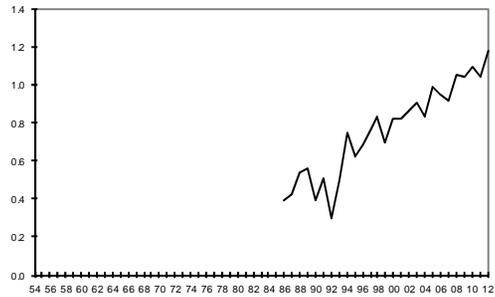


Figure 6 (continued). Estimated number of hunters, harvest, and hunting effort in Michigan during the waterfowl hunting seasons, 1954-2012. No estimates were available or no seasons existed during years when no data are plotted.

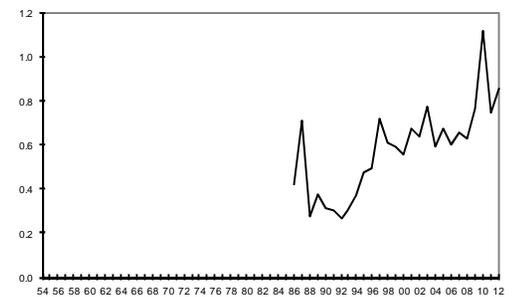
Geese (Regular season)



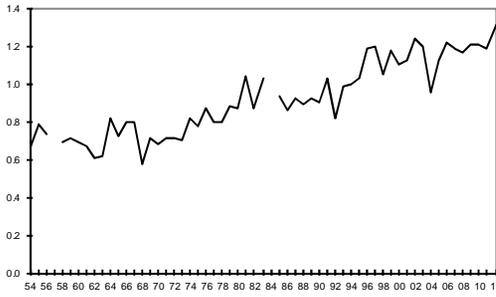
Geese (Early season)



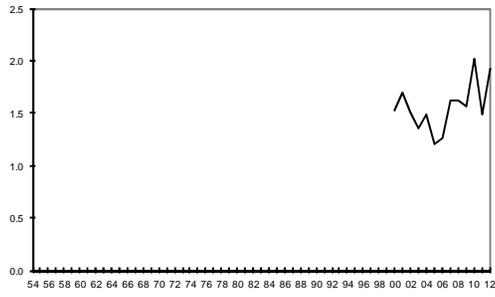
Geese (Late season)



Ducks (First split)



Ducks (Second split)



Year

Figure 7. Estimated harvest per effort in Michigan during the waterfowl hunting seasons, 1954-2012. No estimates were available or no seasons existed during years when no data are plotted.

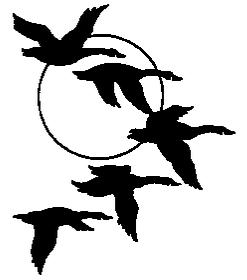
## Appendix A

### 2012-2013 Waterfowl Harvest Questionnaire



**2012-2013 WATERFOWL HARVEST REPORT**

This information is requested under authority of Part 435, 1994 PA 451, M.C.L. 324.43539.



*It is important that you complete this questionnaire even if you did not hunt any waterfowl. Please report only your hunting activities and the birds that you harvested.*

**1. Did you hunt ducks or geese in Michigan from September 1, 2012, through February 10, 2013 (2012-2013 hunting season)?**

- <sup>1</sup>  Yes. Please complete the table below and answer questions on next page.  
<sup>2</sup>  No. Skip to Question #3.

SEASON SEGMENT <i>(Check box if you hunted during the season. Note the duck season is divided into two segments and goose season divided into three segments. Dates and areas of each segment listed below.)</i>	COUNTY HUNTED <i>(For each season you hunted, list the counties hunted on separate lines.)</i>	MANAGEMENT ZONE <i>(See figure on last page for zone boundaries.)</i>			DAYS HUNTED	NUMBER OF BIRDS TAKEN	LAND TYPE		
		North (UP)	Middle (NLP)	South (SLP)			Private	Public	Both
<sup>0</sup> <input checked="" type="checkbox"/> <b>Example</b>	1 Jackson	1 <input type="checkbox"/>	2 <input type="checkbox"/>	3 <input checked="" type="checkbox"/>	5	12	1 <input type="checkbox"/>	2 <input type="checkbox"/>	3 <input checked="" type="checkbox"/>
<sup>1</sup> <input type="checkbox"/> <b>Duck</b> First Portion of Regular Season Sept 22 – Nov 16 (North Zone) Sept 29 – Nov 25 (Middle Zone) Oct 6 – Nov 30 (South Zone)	1	1 <input type="checkbox"/>	2 <input type="checkbox"/>	3 <input type="checkbox"/>			1 <input type="checkbox"/>	2 <input type="checkbox"/>	3 <input type="checkbox"/>
	2	1 <input type="checkbox"/>	2 <input type="checkbox"/>	3 <input type="checkbox"/>			1 <input type="checkbox"/>	2 <input type="checkbox"/>	3 <input type="checkbox"/>
	3	1 <input type="checkbox"/>	2 <input type="checkbox"/>	3 <input type="checkbox"/>			1 <input type="checkbox"/>	2 <input type="checkbox"/>	3 <input type="checkbox"/>
	4	1 <input type="checkbox"/>	2 <input type="checkbox"/>	3 <input type="checkbox"/>			1 <input type="checkbox"/>	2 <input type="checkbox"/>	3 <input type="checkbox"/>
<sup>2</sup> <input type="checkbox"/> <b>Duck</b> Late Portion of Regular Season (2-4 days only) Nov 22-25 (North Zone) Dec 15-16 (Middle Zone) Dec 29 – Jan 1 (South Zone)	1	1 <input type="checkbox"/>	2 <input type="checkbox"/>	3 <input type="checkbox"/>			1 <input type="checkbox"/>	2 <input type="checkbox"/>	3 <input type="checkbox"/>
	2	1 <input type="checkbox"/>	2 <input type="checkbox"/>	3 <input type="checkbox"/>			1 <input type="checkbox"/>	2 <input type="checkbox"/>	3 <input type="checkbox"/>
	3	1 <input type="checkbox"/>	2 <input type="checkbox"/>	3 <input type="checkbox"/>			1 <input type="checkbox"/>	2 <input type="checkbox"/>	3 <input type="checkbox"/>
	4	1 <input type="checkbox"/>	2 <input type="checkbox"/>	3 <input type="checkbox"/>			1 <input type="checkbox"/>	2 <input type="checkbox"/>	3 <input type="checkbox"/>
<sup>3</sup> <input type="checkbox"/> <b>Goose</b> Early Season Sept 1-10 (North Zone) Sept 1-15 (Middle Zone) Sept 1-15 (South Zone)	1	1 <input type="checkbox"/>	2 <input type="checkbox"/>	3 <input type="checkbox"/>			1 <input type="checkbox"/>	2 <input type="checkbox"/>	3 <input type="checkbox"/>
	2	1 <input type="checkbox"/>	2 <input type="checkbox"/>	3 <input type="checkbox"/>			1 <input type="checkbox"/>	2 <input type="checkbox"/>	3 <input type="checkbox"/>
	3	1 <input type="checkbox"/>	2 <input type="checkbox"/>	3 <input type="checkbox"/>			1 <input type="checkbox"/>	2 <input type="checkbox"/>	3 <input type="checkbox"/>
	4	1 <input type="checkbox"/>	2 <input type="checkbox"/>	3 <input type="checkbox"/>			1 <input type="checkbox"/>	2 <input type="checkbox"/>	3 <input type="checkbox"/>
<sup>4</sup> <input type="checkbox"/> <b>Goose</b> Regular Season Sept 22-Dec 22 (North Zone) Sept 29- Dec 29 (Middle) Sept 22-23, Oct 6-Nov 30, & Dec 29-Jan 1 (South)	1	1 <input type="checkbox"/>	2 <input type="checkbox"/>	3 <input type="checkbox"/>			1 <input type="checkbox"/>	2 <input type="checkbox"/>	3 <input type="checkbox"/>
	2	1 <input type="checkbox"/>	2 <input type="checkbox"/>	3 <input type="checkbox"/>			1 <input type="checkbox"/>	2 <input type="checkbox"/>	3 <input type="checkbox"/>
	3	1 <input type="checkbox"/>	2 <input type="checkbox"/>	3 <input type="checkbox"/>			1 <input type="checkbox"/>	2 <input type="checkbox"/>	3 <input type="checkbox"/>
	4	1 <input type="checkbox"/>	2 <input type="checkbox"/>	3 <input type="checkbox"/>			1 <input type="checkbox"/>	2 <input type="checkbox"/>	3 <input type="checkbox"/>
<sup>5</sup> <input type="checkbox"/> <b>Goose</b> Late Season Jan 12 – Feb 10 (South Zone)	1			3 <input type="checkbox"/>			1 <input type="checkbox"/>	2 <input type="checkbox"/>	3 <input type="checkbox"/>
	2			3 <input type="checkbox"/>			1 <input type="checkbox"/>	2 <input type="checkbox"/>	3 <input type="checkbox"/>
	3			3 <input type="checkbox"/>			1 <input type="checkbox"/>	2 <input type="checkbox"/>	3 <input type="checkbox"/>
	4			3 <input type="checkbox"/>			1 <input type="checkbox"/>	2 <input type="checkbox"/>	3 <input type="checkbox"/>

**2. Please indicate how satisfied or dissatisfied you were with the following for the 2012-2013 waterfowl hunting season and hunting regulations:**  
*(Select one choice per item.)*

	Very Satisfied	Somewhat Satisfied	Neutral	Somewhat Dissatisfied	Strongly Dissatisfied	Not Applicable
a. Number of <u>ducks</u> you saw.	1 <input type="checkbox"/>	2 <input type="checkbox"/>	3 <input type="checkbox"/>	4 <input type="checkbox"/>	5 <input type="checkbox"/>	6 <input type="checkbox"/>
b. Number of <u>ducks</u> you harvested.	1 <input type="checkbox"/>	2 <input type="checkbox"/>	3 <input type="checkbox"/>	4 <input type="checkbox"/>	5 <input type="checkbox"/>	6 <input type="checkbox"/>
c. Your overall <u>duck</u> hunting experience.	1 <input type="checkbox"/>	2 <input type="checkbox"/>	3 <input type="checkbox"/>	4 <input type="checkbox"/>	5 <input type="checkbox"/>	6 <input type="checkbox"/>
d. <u>Duck</u> season dates.	1 <input type="checkbox"/>	2 <input type="checkbox"/>	3 <input type="checkbox"/>	4 <input type="checkbox"/>	5 <input type="checkbox"/>	6 <input type="checkbox"/>
e. The number of days in the <u>duck</u> season.	1 <input type="checkbox"/>	2 <input type="checkbox"/>	3 <input type="checkbox"/>	4 <input type="checkbox"/>	5 <input type="checkbox"/>	6 <input type="checkbox"/>
f. The size of the daily <u>duck</u> limit.	1 <input type="checkbox"/>	2 <input type="checkbox"/>	3 <input type="checkbox"/>	4 <input type="checkbox"/>	5 <input type="checkbox"/>	6 <input type="checkbox"/>
g. Number of <u>geese</u> you saw.	1 <input type="checkbox"/>	2 <input type="checkbox"/>	3 <input type="checkbox"/>	4 <input type="checkbox"/>	5 <input type="checkbox"/>	6 <input type="checkbox"/>
h. Number of <u>geese</u> you harvested.	1 <input type="checkbox"/>	2 <input type="checkbox"/>	3 <input type="checkbox"/>	4 <input type="checkbox"/>	5 <input type="checkbox"/>	6 <input type="checkbox"/>
i. Your overall <u>goose</u> hunting experience.	1 <input type="checkbox"/>	2 <input type="checkbox"/>	3 <input type="checkbox"/>	4 <input type="checkbox"/>	5 <input type="checkbox"/>	6 <input type="checkbox"/>

Questions continue on next page.

2. Please indicate how satisfied or dissatisfied you were with the following for the 2012-2013 waterfowl hunting season and hunting regulations:

(Select one choice per item.)

	Very Satisfied	Somewhat Satisfied	Neutral	Somewhat Dissatisfied	Strongly Dissatisfied	Not Applicable
j. The number of days in the <u>goose</u> season.	1 <input type="checkbox"/>	2 <input type="checkbox"/>	3 <input type="checkbox"/>	4 <input type="checkbox"/>	5 <input type="checkbox"/>	6 <input type="checkbox"/>
k. <u>Goose</u> season dates.	1 <input type="checkbox"/>	2 <input type="checkbox"/>	3 <input type="checkbox"/>	4 <input type="checkbox"/>	5 <input type="checkbox"/>	6 <input type="checkbox"/>
l. The size of the daily <u>goose</u> limit.	1 <input type="checkbox"/>	2 <input type="checkbox"/>	3 <input type="checkbox"/>	4 <input type="checkbox"/>	5 <input type="checkbox"/>	6 <input type="checkbox"/>

3. If you are a youth (*adults skip to question 4*), did you hunt during Michigan's Youth Waterfowl Hunting weekend (September 15-16, 2012)? Eligible youth were 15 years old or younger during the youth season.

1  Yes                      2  No

4. What is your preferred zone to hunt waterfowl in Michigan? (Check one.)

1  North Zone (Upper Peninsula)                      2  Middle Zone (Northern Lower Peninsula)                      3  South Zone (Southern Lower Peninsula)

5. For your preferred zone to hunt waterfowl, as in the previous question, please indicate the opening date you would prefer for duck season in that zone for the 2013-2014 duck season. (Check one.)

1  Sept. 21    2  Sept. 28    3  October 5    4  October 12    5  Undecided    6  Other: \_\_\_\_\_

6. For your preferred zone to hunt waterfowl, please indicate the regular goose season option that you would most prefer (note early goose season starts Sept. 1 statewide). (Check one.)

- 1  Open regular goose season as early as possible within federal frameworks (For example, Sept. 11 or 16)
- 2  Open the same date duck season opens in my preferred zone.
- 3  Undecided
- 4  Other (list): \_\_\_\_\_

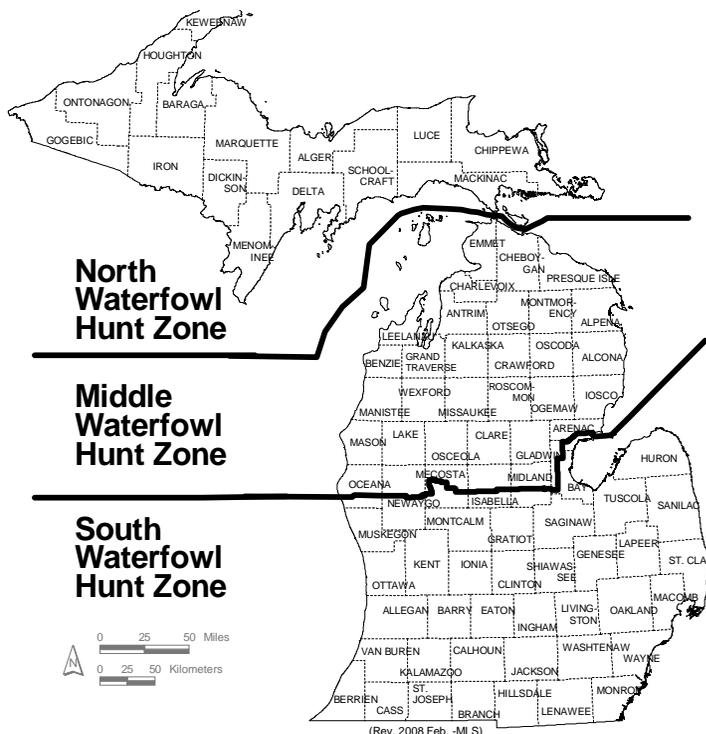
In the next two questions, you will be asked about all your hunting trips taken during the 2012-2013 hunting season primarily to hunt waterfowl in Michigan. A hunting trip includes trips that take place during a single day, as well as, trips that require an overnight stay away from home. Consequently, the cost of these hunting trips can vary greatly. On a long trip you may spend money for food, travel, and lodging, while on a short trip you may only spend money for gas.

7. How many trips did you take primarily to hunt waterfowl during the 2012-2013 season in Michigan?

\_\_\_\_\_ Trips

8. How much did an average trip cost you during 2012-2013 season when you went primarily to hunt waterfowl in Michigan?

\$\_\_\_\_\_ per trip



Please return questionnaire in the enclosed postage-paid envelope.

Thanks.