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2016 WATERFOWL HARVEST SURVEY

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ABSTRACT

A sample of waterfowl hunters was contacted after the 2016 hunting seasons to estimate hunting activity and determine opinions and satisfaction with hunting regulations. An estimated 45,551 people went afield to hunt waterfowl in 2016, which was significantly fewer (-9%) hunters than in 2014. The number of duck hunters declined 10%, and the number of goose hunters declined 7%. In 2016, about 38,705 waterfowl hunters spent 318,700 days afield hunting ducks; while an estimated 32,340 waterfowl hunters spent 269,833 days afield hunting geese. Duck and goose harvest and hunting effort for all seasons combined in 2016 were not significantly different than in 2014. An estimated 54% of the Michigan duck hunters were satisfied (i.e., very satisfied or somewhat satisfied) with their duck hunting experience in 2016, 21% had a neutral opinion about their experience, while 21% of duck hunters were dissatisfied. Hunter satisfaction with goose hunting was not significantly different than hunter satisfaction with duck hunting; 57% of goose hunters were satisfied, 22% had a neutral opinion, and 17% of goose hunters were dissatisfied. Overall satisfaction among duck hunters in 2016 was significantly lower by 9 percentage points from 2014; however, goose hunter satisfaction in 2016 was not significantly different from 2014. Duck hunters were asked to indicate how much they supported six options for the length and timing of the teal hunting season and youth hunting weekend (Tables 10-11). The options that received the highest levels of support were options having a 16-day teal season (September 1-16) and a youth waterfowl hunting weekend occurring during either September 8-9 or September 15-16.



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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.

The licenses required to hunt waterfowl during the 2016 hunting seasons (Table 1) in Michigan varied by the hunter's age. Hunters greater than 15 years of age had to obtain both a base license and a waterfowl hunting license. Hunters that were 10-15 years old were only required to obtain a base hunting license, and hunters younger than 10 years old were only required to obtain a mentored youth license. All waterfowl hunters also had to register with the National Migratory Bird Harvest Information Program (HIP), and all hunters greater than 15 years old had to obtain a federal waterfowl stamp.

The HIP is a cooperative effort between state wildlife agencies and the USFWS. It was implemented to improve knowledge about the 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 potential migratory bird hunters from which they could 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.

METHODS

Following the 2016 hunting seasons, a questionnaire (Appendix A) was sent to 6,500 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, 2016, and February 11, 2017, that had registered with the HIP by February 11, 2017. The overall sample consisted of

5,106 people from the first stratum (N=56,971), and 1,394 people from the second stratum (N=15,131).

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. In addition, hunters were asked to rate their overall hunting experience and indicate satisfaction with hunting regulations (e.g., season dates and bag limits). Possible responses included “very satisfied,” “somewhat satisfied,” “neutral,” “somewhat dissatisfied,” and “strongly dissatisfied.” Duck hunters were asked whether they agreed with various statements about the timing of teal and youth hunting seasons in 2018. Possible responses included “strongly support,” “somewhat support,” “not sure,” “somewhat oppose,” and “strongly oppose.” Hunters were asked to indicate how important waterfowl hunting was to them compared to their other recreational activities.

Michigan currently sells hunting licenses using a statewide electronic license sales system (i.e., Retail Sales System). This system allowed the DNR to maintain a central database containing license sales information (e.g., sales transactions and customer profiles). From this database, the sex, birth date, state and county of residence, and license purchasing history of each license buyer were determined.

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 were 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). Because a waterfowl harvest survey was not conducted in 2015, the 2016 estimates were compared to the most recently completed survey which was done for the 2014 hunting seasons.

RESULTS

Survey Response Rate

Questionnaires were mailed initially in mid-March 2017. Up to two follow-up questionnaires were sent to non-respondents. Questionnaires were undeliverable to 192 people, primarily because of changes in residence. Questionnaires were returned by 2,747 of 6,308 people receiving the questionnaire (44% response rate).

License Sales and Hunter Participation

In 2016, 57,037 people purchased a Michigan waterfowl hunting license. This was nearly a 1% decrease compared to numbers of license purchasers in 2015 seasons and nearly 5% decrease compared to the 2014 seasons (Table 2). The average age of people that purchased a waterfowl hunting license was 42 years (Figure 2). About 2% (947) 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 96% of the waterfowl hunting license buyers were males.

An estimated 45,551 people went afield to hunt waterfowl in 2016, which was significantly fewer (-9%) hunters than in 2014 (Table 3). The mean age of the active waterfowl hunter was 43 years, and about 10% of the active hunters were less than 17 years old (4,603 youth hunters). About $63 \pm 2\%$ of the people eligible to hunt waterfowl (strata 1 and 2 combined) spent time hunting ducks or geese. About $73 \pm 2\%$ of the people that had purchased a waterfowl hunting license (stratum 1) hunted waterfowl. In contrast, $27 \pm 4\%$ of the people less than 16 years old that had registered with the HIP (stratum 2) hunted waterfowl. An estimated 38,705 waterfowl hunters spent 318,700 days afield hunting ducks; while an estimated 32,340 waterfowl hunters spent 269,833 days afield hunting geese (Tables 4 and 5). About $35 \pm 2\%$ ($25,494 \pm 1,222$) of those eligible to hunt waterfowl attempted hunting both ducks and geese.

Most ($60 \pm 2\%$) duck hunters preferred to hunt in the South Zone, while $24 \pm 2\%$ of duck hunters preferred to hunt in the Middle Zone and $12 \pm 2\%$ preferred to hunt in the North Zone. About $4 \pm 1\%$ of the duck hunters did not indicate a preferred hunt zone.

Prior to 2016, only hunters 10-15 years old could participate in the youth hunt. Starting in 2016, hunters 16 years of age also could participate in the youth waterfowl hunting weekend. An estimated $2,291 \pm 498$ youth hunters (less than 17 years old) participated during the 2-day

youth waterfowl hunting season (Figure 3). About $15 \pm 3\%$ of the youth hunters eligible to hunt during the youth season actually participated.

An estimated $2,174 \pm 445$ people hunted sea ducks (long-tailed ducks and scoters) in Michigan during 2016. Most of these hunters ($79 \pm 8\%$) hunted 1-4 days; $15 \pm 8\%$ of the hunters hunted 5-10 days, and $6 \pm 5\%$ of the hunters hunted more than 10 days. These sea duck hunters took an estimated $16,280 \pm 6,305$ sea ducks (7.5 ± 3 sea ducks per hunter).

Harvest and Hunting Trends

The numbers of duck and goose hunters statewide (all seasons combined) declined significantly by 9% between 2014 and 2016 (Tables 4-8). The number of duck hunters declined 10%, and the number of goose hunters declined 7%. Hunting effort and harvest also declined among duck and goose hunters; however, the declines for all seasons combined were not significantly different.

Beginning in 2016, the goose season segments were restructured statewide. For example, geese were hunted 10-15 days during the early season segment (i.e., early season) in 2014, but the early segment was increased to 25-30 days in length during 2016. In addition, the 2016 regular and late season segments had fewer days than segments in 2014. Thus, the estimates for season segments were not directly comparable between 2014 and 2016.

The number of hunters hunting during the teal season (5,906) declined significantly by 33% statewide between 2014 and 2016 (Table 4). In addition, the number of duck hunters in the early segment of the duck season declined significantly by 9% statewide.

Hunter Types

Among active waterfowl hunters in 2016 (45,551), $17 \pm 2\%$ reported waterfowl hunting was their most important recreational activity, and $53 \pm 2\%$ reported waterfowl hunting was among their most important recreational activities. In contrast, $20 \pm 2\%$ of hunters indicated waterfowl hunting was no more important than their other activities. In addition, $8 \pm 1\%$ of hunters indicated waterfowl hunting was less important than their other activities, and less than 1% of hunters indicated waterfowl hunting was not an important activity (Uncommitted Group). Less than 1% of hunters did not indicate the importance of waterfowl hunting.

Hunter Satisfaction

Hunters were asked to rate their level of satisfaction with eleven aspects of the hunting season and waterfowl population in 2016 (Table 9). An estimated 54% of the Michigan duck hunters were satisfied (i.e., very satisfied or somewhat satisfied) with their duck hunting experience in 2016, 21% had a neutral opinion about their experience, while 21% of duck hunters were dissatisfied. Hunter satisfaction with goose hunting was not significantly different than hunter satisfaction with duck hunting; 57% of goose hunters were satisfied, 22% had a neutral opinion, and 17% of goose hunters were dissatisfied. Overall satisfaction among duck hunters in 2016 was significantly lower by 9 percentage points from 2014; however, goose hunter satisfaction in 2016 was not significantly different from 2014 (Table 9, Figure 4). Satisfaction with the number of geese seen and the number of geese harvested

among goose hunters was similar to estimates reported since 2005 (Figure 4). In contrast, satisfaction with the number of ducks seen and the number of ducks harvested among duck hunters was among the lowest levels seen since 2005.

Opinions about the Timing of Teal Hunting Season and Youth Hunting Weekend

Although fewer duck hunters had hunted teal in 2016, about $19 \pm 2\%$ of duck hunters (7,171 \pm 780) indicated that they were very likely to hunt teal in 2018, while $31 \pm 2\%$ were somewhat likely to hunt teal (12,131 \pm 971) in 2018. Duck hunters were asked to indicate how much they supported six options for the length and timing of the teal hunting season and youth hunting weekend (Tables 10-11). The options that received the highest levels of support were options having a 16-day teal season (September 1-16) and a youth waterfowl hunting weekend occurring during either September 8-9 or September 15-16.

DISCUSSION

Participation Trends

The number of people buying a Michigan waterfowl hunting license in 2016 declined by about 6% compared to the number of license buyers in 2006 (57,037 people purchased a license in 2016 versus 60,401 in 2006). There were fewer license buyers for the age classes between 32 and 53 years of age in 2016, compared to 2006 (Figure 7). However, there were increased hunter numbers among the youngest and oldest age classes in 2016. 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. The increased number of hunters in the youngest age classes may partially be explained by the significant increase in human birth rates during the 1980s and into the 1990s (i.e., the millennial generation, Colby 2015).

Since 1954, the highest numbers of duck and goose hunters recorded in Michigan occurred in 1970 (Figure 8). From this peak, the current number of people hunting ducks has declined 72% (average annual decline = 2.7%), while the number of people hunting geese has declined 50% (average annual decline = 1.5%). 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 9). Goose harvest and the mean number of geese taken per day of hunting effort also have increased gradually since the 1970s (Figure 8).

Hunter types

Michigan waterfowl hunters were asked to indicate how important waterfowl hunting was to them compared to their other recreational activities. The relative importance of waterfowl

hunting in among Michigan hunters was comparable to estimates from several other states (Figure 10).

Harvest estimation

Raftovich and Wilkins (2017) reported estimates of harvest, hunter numbers, and hunting effort of Michigan waterfowl hunters in 2016 from a USFWS survey. These estimates were based on responses received from a random sample of HIP registrants. Most estimates from the current survey and the USFWS survey were not significantly different, except for estimates of hunting effort by duck hunters and number of goose hunters (Table 12). These differences may reflect variations in the way the surveys were implemented.

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Table 1. Waterfowl hunting seasons in Michigan, 2016-2017.

Species, season, and area ^a	Season dates
Teal	
Statewide	Sept. 1 – 7
Ducks ^b	
North Zone (UP)	Sept. 24 – Nov. 20 and Nov. 26 – 27
Middle Zone	Oct. 1 – Nov. 27 and Dec. 17 – 18
South Zone	Oct. 8 – Dec. 4 and Dec. 31 – Jan. 1
Canada geese ^{b,c}	
North Zone (UP)	Sept. 1 – 30 and Oct. 1 – Dec. 16
Middle Zone	Sept. 1 – 30, Oct. 1 – Dec. 14, and Dec. 17 – 18
South Zone	Sept. 1 – 25, Oct. 8 – Dec. 4, Dec. 31 – Jan.1, and Jan. 21 – Feb. 11

^aSee Figure 1 for boundaries of hunt areas.

^bDucks and geese could also be taken statewide during a special 2-day Youth Season (September 10-11).

^cSpecial 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, 2012-2016.

Item	Year					2015-2016 % Change
	2012	2013	2014	2015	2016	
Number of licenses sold ^a	58,370	62,051	59,958	57,821	57,051	-1.3
Number of people buying a hunting license ^{a,b,c}	57,805	61,951	59,946	57,810	57,037	-1.3

^aThe 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=11,335) were eligible to hunt waterfowl, they were not included in license sales total.

^bA person was counted only once, regardless of how many licenses they purchased.

^cHunters 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, 2009-2016.^a

Hunters	2010	2011	2012	2014	2016	
					Estimate	95% CL
Waterfowl ^b	47,788	45,786	48,644	49,873	45,551*	1,189
Males (%)	97.2	96.4	96.5	95.1	95.8	0.9
Females (%)	2.8	3.6	3.5	4.9	4.2	0.9
Mean age (Years)	41.7	41.5	40.8	43.2	42.8	0.8
Youth (%) ^c	10.9	11.5	13.7	10.4	10.1	1.3
Youth (No.) ^c	5,191	5,245	6,650	5,172	4,603	653

^aAnalyses included only those people that hunted. Estimates were not available for 2013.

^bPeople that hunted ducks or geese (active hunters).

^cHunters less than 17 years of age. Prior to 2012, hunters had to be at least 10 years old to hunt waterfowl. Starting in 2012, the minimum age requirement was eliminated.

*Non-overlapping 95% confidence intervals indicated estimates differed significantly between 2014 and 2016 ($P < 0.005$).

Table 4. Estimated waterfowl hunter numbers by season and region in Michigan, 2011-2016.^a

Species and area (stratum)	2011	2012	2014	2016		2014-16 % Change
				No.	95% CL	
Teal						
UP	NA	NA	1,036	786	267	-24
NLP	NA	NA	3,567	2,310	456	-35*
SLP	NA	NA	4,390	2,959	518	-33*
Statewide	NA	NA	8,784	5,906	716	-33*
Ducks (First split)						
UP	5,349	5,422	5,320	5,664	679	6
NLP	15,480	17,831	17,830	15,873	1,047	-11
SLP	20,986	22,901	23,347	20,567	1,136	-12*
Statewide	38,146	41,156	41,520	37,581	1,251	-9*
Ducks (Second split)						
UP	636	501	357	475	201	33
NLP	3,140	2,862	2,468	1,841	394	-25
SLP	6,726	8,657	7,851	7,250	757	-8
Statewide	10,258	11,788	10,415	9,368	867	-10
Ducks (Seasons combined)						
UP	5,442	5,432	5,529	5,758	683	4
NLP	15,900	18,226	18,687	16,462	1,060	-12*
SLP	21,602	24,560	24,465	21,941	1,162	-10*
Statewide	38,783	42,427	42,870	38,705	1,254	-10*
Geese (Early segment)^b						
UP	1,775	1,405	1,695	2,390	454	41
NLP	6,488	7,190	7,227	7,414	771	3
SLP	11,831	13,481	11,970	12,144	945	1
Statewide	19,603	21,523	20,293	21,276	1,169	5
Geese (Regular season)^b						
UP	2,919	2,515	2,832	2,294	449	-19
NLP	9,394	10,763	10,376	8,418	807	-19*
SLP	13,820	16,788	16,914	13,278	968	-21*
Statewide	25,094	28,523	28,351	23,032	1,189	-19*
Geese (Late segment)^b						
UP	0	0	0	0	0	
NLP	663	521	356	486	206	37
SLP	6,491	5,421	3,474	4,860	631	40*
Statewide	7,113	5,920	3,803	5,296	676	39*
Geese (Seasons combined)						
UP	3,545	2,998	3,266	3,539	551	8
NLP	11,609	13,195	12,797	12,176	947	-5
SLP	19,395	22,288	21,708	19,093	1,109	-12*
Statewide	32,685	35,751	34,933	32,340	1,259	-7*

^aThe 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.

^bEstimates for the goose season segments were not directly comparable between 2014 and 2016.

*Non-overlapping 95% confidence intervals indicated estimates differed significantly in 2014 and 2016 ($P < 0.005$).

Table 5. Estimated waterfowl hunter effort (days afield) by season and region, 2011-2016.^a

Species and area (stratum)	2011	2012	2014	2016		2014-16 % Change
				No.	95% CL	
Teal						
UP	NA	NA	2,596	1,877	732	-28
NLP	NA	NA	7,900	5,238	1,284	-34
SLP	NA	NA	10,024	7,039	1,474	-30
Statewide	NA	NA	20,519	14,154	2,081	-31*
Ducks (First split)						
UP	30,676	34,916	31,707	39,616	7,600	25
NLP	98,528	121,253	117,597	104,496	11,270	-11
SLP	145,025	159,732	166,104	146,444	13,188	-12
Statewide	274,230	315,900	315,408	290,556	18,345	-8
Ducks (Second split)						
UP	1,184	1,061	541	603	296	11
NLP	5,548	5,150	3,421	2,702	652	-21
SLP	10,512	17,359	12,040	10,686	1,281	-11
Statewide	17,244	23,570	16,002	13,991	1,502	-13
Ducks (Seasons combined)						
UP	31,862	35,980	34,833	42,113	8,021	21
NLP	104,078	126,412	128,889	112,475	12,096	-13
SLP	155,533	177,079	188,208	164,113	14,400	-13
Statewide	291,474	339,470	351,930	318,700	19,786	-9
Geese (Early segment)^b						
UP	6,029	5,033	5,424	11,150	2,912	106*
NLP	24,992	28,967	24,933	36,918	5,611	48*
SLP	45,411	50,862	42,824	55,969	6,531	31*
Statewide	76,432	84,862	73,180	104,038	9,164	42*
Geese (Regular season)^b						
UP	18,354	15,661	16,506	13,372	4,620	-19
NLP	53,729	75,608	56,506	52,377	7,784	-7
SLP	76,409	98,981	103,004	83,849	9,975	-19
Statewide	148,493	190,250	176,015	149,597	13,291	-15
Geese (Late segment)^b						
UP	0	0	0	0	0	
NLP	1,863	1,417	1,329	768	390	-42
SLP	24,521	17,871	11,052	15,430	2,901	40
Statewide	26,384	19,288	12,381	16,198	2,974	31
Geese (Seasons combined)						
UP	24,439	20,677	21,866	24,496	6,603	12
NLP	80,653	105,932	82,660	90,051	11,346	9
SLP	146,217	167,791	157,051	155,286	16,095	-1
Statewide	251,309	294,400	261,576	269,833	20,336	3

^aThe 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.

^bEstimates for the goose season segments were not directly comparable between 2014 and 2016.

*Non-overlapping 95% confidence intervals indicated estimates differed significantly in 2014 and 2016 ($P < 0.005$).

Table 6. Estimated waterfowl harvest by season and region in Michigan, 2011-2016.^a

Species and area (stratum)	2011	2012	2014	2016		2014-16 % Change
				No.	95% CL	
Teal						
UP	NA	NA	1,795	470	370	-74*
NLP	NA	NA	8,482	4,743	1,782	-44
SLP	NA	NA	4,588	4,850	1,599	6
Statewide	NA	NA	14,865	10,063	2,426	-32
Ducks (First split)						
UP	32,720	46,193	33,599	39,758	8,125	18
NLP	120,127	155,333	180,764	148,884	22,694	-18
SLP	171,984	211,574	207,886	183,537	26,117	-12
Statewide	324,831	413,100	422,248	372,178	37,173	-12
Ducks (Second split)						
UP	1,391	3,131	809	748	624	-8
NLP	7,721	8,505	6,982	4,504	1,390	-35
SLP	16,462	33,458	19,842	19,771	3,216	0
Statewide	25,575	45,093	27,633	25,023	3,662	-9
Ducks (Seasons combined)						
UP	34,117	49,330	36,196	40,939	8,420	13
NLP	127,858	163,863	196,200	158,142	23,917	-19
SLP	188,431	245,001	232,350	208,183	28,246	-10
Statewide	350,406	458,193	464,747	407,264	39,650	-12
Geese (Early segment)^b						
UP	4,841	6,043	4,249	11,683	5,068	175*
NLP	24,219	32,208	33,484	42,288	8,128	26
SLP	50,700	61,926	50,496	62,936	9,767	25
Statewide	79,760	100,178	88,229	116,908	14,027	33*
Geese (Regular season)^b						
UP	6,968	6,644	6,134	5,164	2,094	-16
NLP	23,291	37,398	30,341	25,938	4,473	-15
SLP	40,001	52,975	50,868	50,108	8,255	-1
Statewide	70,261	97,017	87,343	81,210	10,300	-7
Geese (Late segment)^b						
UP	0	0	0	0	0	
NLP	1,482	1,272	1,736	761	467	-56
SLP	18,174	15,208	9,073	16,506	4,185	82
Statewide	19,655	16,480	10,809	17,267	4,354	60
Geese (Seasons combined)						
UP	11,810	12,663	10,363	16,884	6,033	63
NLP	48,928	70,779	65,541	69,053	11,016	5
SLP	108,938	130,233	110,477	129,448	18,711	17
Statewide	169,676	213,675	186,381	215,385	23,584	16

^aThe 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.

^bEstimates for the goose season segments were not directly comparable between 2014 and 2016.

*Non-overlapping 95% confidence intervals indicated estimates differed significantly in 2014 and 2016 ($P < 0.005$).

Table 7. Estimated number of duck hunters, hunting effort, and ducks harvested, summarized by season and management zone in Michigan, 2016.

Season and waterfowl zone ^a	Hunters		Effort		Harvest	
	No.	95% CL	No.	95% CL	No.	95% CL
Teal						
North	782	703	1,890	732	471*	370
Middle	932	909	1,925	713	1,140	656
South	4,365*	1,220	10,338*	1,788	8,452	2,245
Statewide	5,906*	1,136	14,154*	2,081	10,063	2,426
First split						
North	5,855	703	40,231	7,657	41,293	8,333
Middle	10,698	909	55,445	7,291	69,591	13,149
South	25,804*	1,220	194,880	15,648	261,294	31,622
Statewide	37,581*	1,251	290,556	18,345	372,178	37,173
Second split						
North	538	221	675	327	1,002	752
Middle	1,379	351	1,895	534	3,184	1,195
South	7,723	792	11,421	1,336	20,837	3,338
Statewide	9,368	867	13,991	1,502	25,023	3,662
Seasons combined						
North	5,955	708	42,801	8,108	42,753	8,667
Middle	11,093	923	59,267	7,707	73,903	13,977
South	27,025*	1,234	216,633	17,003	290,609	33,938
Statewide	38,705*	1,254	318,700	19,786	407,264	39,650

^aEstimates 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 2014 and 2016 (P<0.005).

Table 8. Estimated number of goose hunters, hunting effort, and geese harvested, summarized by season and management zone in Michigan, 2016.

Season and waterfowl zone ^a	Hunters		Effort		Harvest	
	No.	95% CL	No.	95% CL	No.	95% CL
Early segment						
North	2,666	454	12,493	2,912	12,989	5,068
Middle	3,768	535	18,246	3,813	19,959	5,676
South	15,653	998	73,299	7,039	83,960	10,727
Statewide	21,276	1,169	104,038	9,164	116,908	14,027
Regular						
North	2,553	449	14,406	4,620	5,600	2,094
Middle	4,490	577	24,996	5,014	12,989	3,210
South	17,104	1,021	110,195	11,112	62,621	8,578
Statewide	23,032	1,189	149,597	13,291	81,210	10,300
Late segment						
North	0	0	0	0	0	0
Middle	0	0	0	0	0	0
South	5,321	676	16,198	2,974	17,267	4,354
Statewide	5,296	676	16,198	2,974	17,267	4,354

^aEstimates 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 2014 and 2016 ($P < 0.005$).

Table 9. Level of satisfaction among waterfowl hunters with the 2014 and 2016 waterfowl hunting seasons and hunting regulations in Michigan (summarized as the proportion of active waterfowl hunters reporting various levels of satisfaction).^a

Hunting experience or regulation	Level of satisfaction and year											
	Very satisfied or somewhat satisfied			Neutral			Somewhat dissatisfied or strongly dissatisfied			No answer		
	2014	2016		2014	2016		2014	2016		2014	2016	
	%	%	95% CL	%	%	95% CL	%	%	95% CL	%	%	95% CL
Ducks seen	50	37*	2	20	20	2	29	41*	2	1	2	1
Ducks harvested	32	26*	2	25	22	2	36	46*	2	6	6	1
Duck hunting experience	63	54*	2	19	21	2	15	21*	2	2	3	1
Length of duck season	57	49*	2	25	29	2	15	18	2	3	4	1
Daily duck limit	65	59*	2	25	28	2	8	9	1	3	4	1
Geese seen	59	58	3	16	17	2	23	20	2	2	5*	1
Geese harvested	34	37	3	23	23	2	36	33	3	7	8	1
Goose hunting experience	56	57	3	23	22	2	19	17	2	2	4	1
Days in goose season	57	59	3	25	23	2	16	14	2	3	4	1
Goose season dates	54	55	3	26	23	2	16	16	2	3	5	1
Daily goose limit	48	52	3	26	26	2	23	18*	2	3	4	1

^aEstimates 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 2014 and 2016 (P<0.005).

Table 10. The proportion of duck hunters active in 2016 that supported or opposed various options for the timing of the teal and youth hunting seasons in 2018.

Option	Strongly support		Somewhat support		Not sure		Strongly oppose		Somewhat oppose		Unknown	
	%	95% CL	%	95% CL	%	95% CL	%	95% CL	%	95% CL	%	95% CL
Teal season: Sept 1-7 and Youth season: Sept 8-9	15	2	16	2	37	2	7	2	10	1	15	0
Teal season: Sept 1-7 and Youth season: Sept 15-16	12	2	15	2	37	2	8	1	11	1	18	2
Teal season: Sept 1-9 and Youth season: Sept 8-9	13	2	15	2	36	2	7	1	11	2	18	2
Teal season: Sept 1-9 and Youth season: Sept 15-16	13	2	15	2	36	2	8	1	10	2	18	2
Teal season: Sept 1-16 and Youth season: Sept 8-9	23	2	12	2	32	2	7	1	10	2	15	2
Teal season: Sept 1-16 and Youth season: Sept 15-16	25	2	12	2	32	2	7	1	11	1	13	2

^aEstimates among people that had hunted waterfowl (either ducks or geese).

Table 11. The number of duck hunters active in 2016 that supported or opposed various options for the timing of the teal and youth hunting seasons in 2018.

Option	Strongly support		Somewhat support		Not sure		Strongly oppose		Somewhat oppose		Unknown	
	No.	95% CL	No.	95% CL	No.	95% CL	No.	95% CL	No.	95% CL	No.	95% CL
Teal season: Sept 1-7 and Youth season: Sept 8-9	5,822	780	6,021	971	14,449	871	2,659	759	3,992	524	5,763	134
Teal season: Sept 1-7 and Youth season: Sept 15-16	4,477	723	5,621	721	14,381	1,033	3,052	487	4,235	594	6,938	698
Teal season: Sept 1-9 and Youth season: Sept 8-9	5,017	645	5,819	697	14,084	1,030	2,835	526	4,150	606	6,799	760
Teal season: Sept 1-9 and Youth season: Sept 15-16	4,884	675	5,969	707	13,907	1,023	2,984	506	4,062	606	6,898	755
Teal season: Sept 1-16 and Youth season: Sept 8-9	8,953	667	4,765	723	12,418	1,015	2,573	518	4,013	595	5,983	760
Teal season: Sept 1-16 and Youth season: Sept 15-16	9,584	862	4,496	650	12,359	978	2,864	485	4,211	591	5,192	715

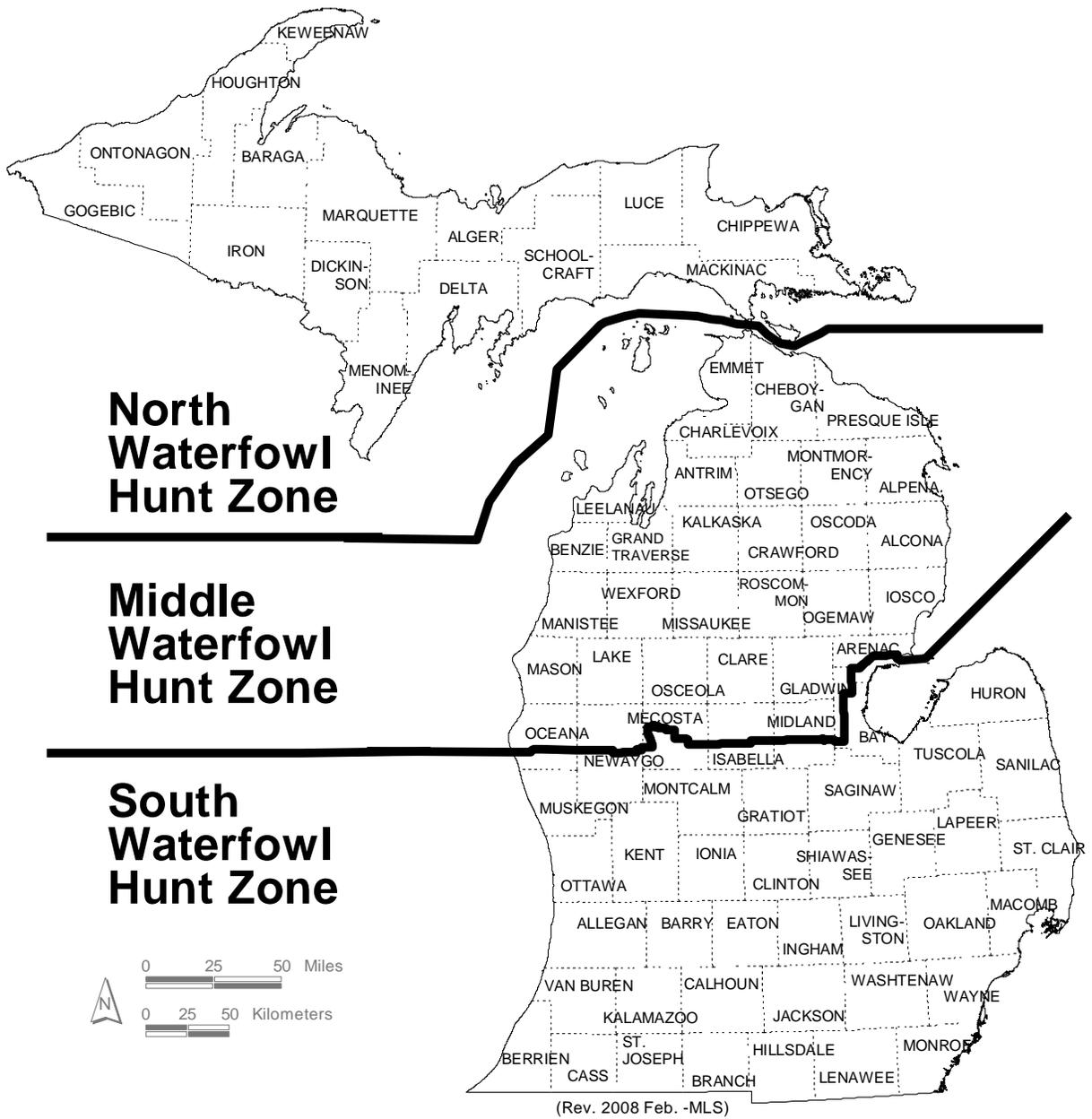
^aEstimates among people that had hunted waterfowl (either ducks or geese).

Table 12. Comparison of estimates of waterfowl hunter numbers, hunting effort, and harvest in Michigan during 2016 from the USFWS harvest survey and the Michigan waterfowl harvest survey.

Estimate	USFWS survey ^a		Michigan survey		Difference (%)
	No.	95% CL	No.	95% CL	
Ducks					
Hunters	38,200	5,730	38,705	1,254	1
Hunting effort	248,800	39,808	318,700	19,786	28*
Harvest	361,300	83,099	407,264	39,650	13
Geese					
Hunters	39,700	5,558	32,340	1,259	-19*
Hunting effort	263,400	52,680	269,833	20,336	2
Harvest	167,800	31,882	215,385	23,584	28
Ducks and geese combined					
Hunters	43,600	6,104	45,551	1,189	4

^aRaftovich et al (2017).

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



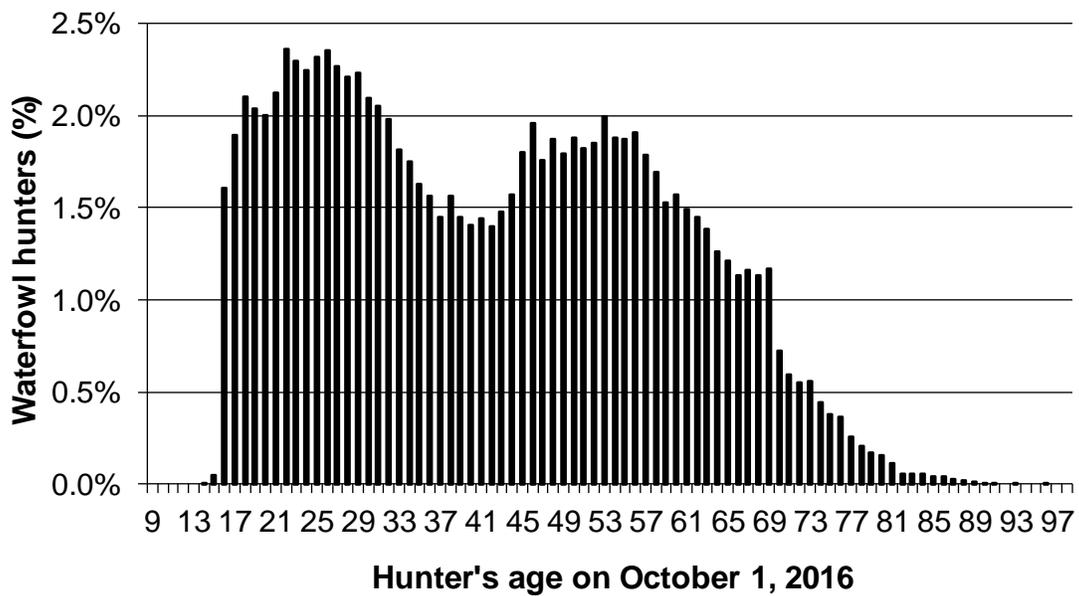


Figure 2. Age of people that purchased a waterfowl hunting license in Michigan for the 2016 hunting seasons (\bar{x} = 42 years). Hunters less than 16 years of age could legally hunt waterfowl without a waterfowl hunting license.

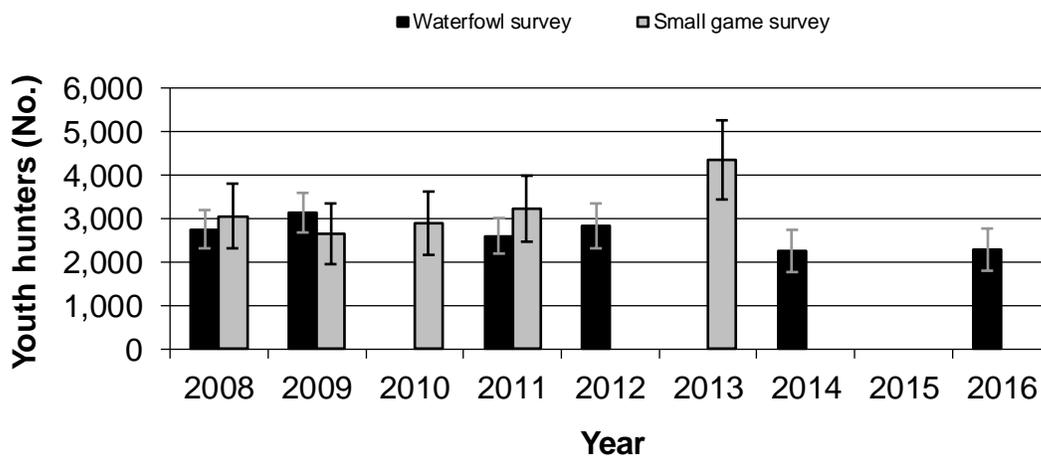


Figure 3. Estimated number of youths (10-16 years old) hunting during the youth waterfowl hunting weekend in Michigan during 2008-2016. Estimates plotted separately by the source of the estimate (waterfowl harvest survey or small game harvest survey). Prior to 2016, only hunters 10-15 years old could participate in the youth hunt. Starting in 2016, hunters 16 years of age also could participate in the youth waterfowl hunting weekend.

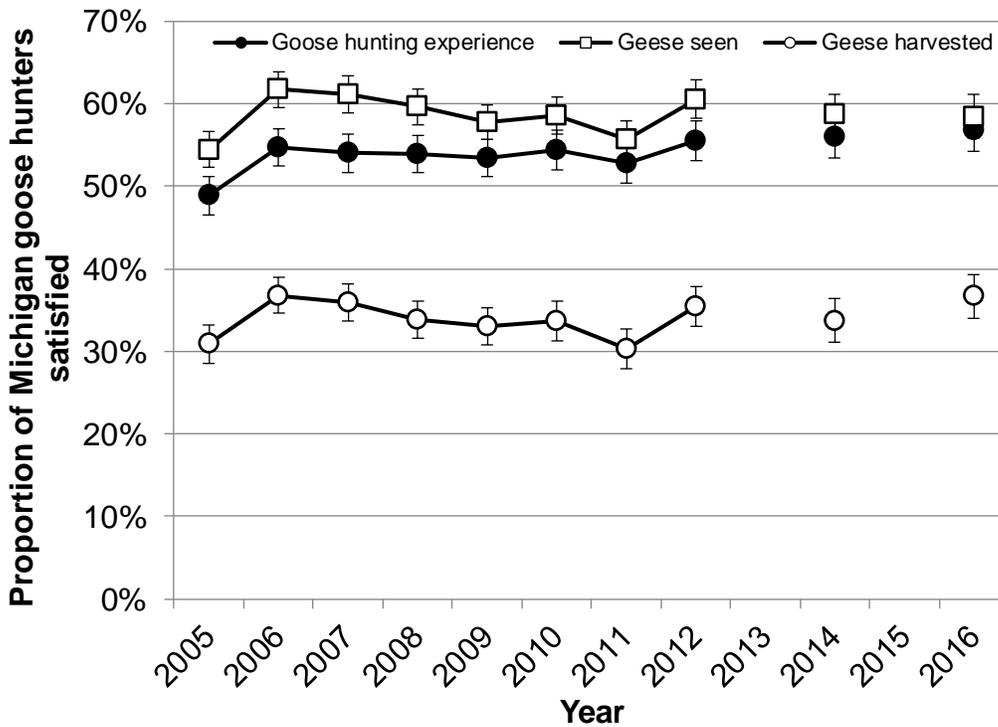
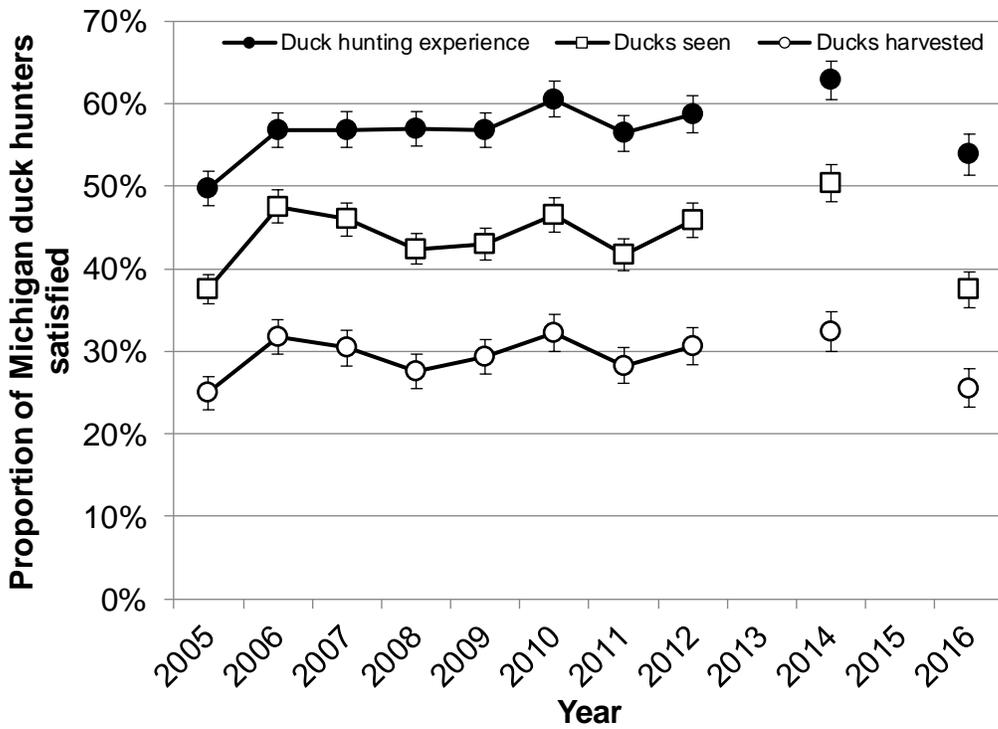


Figure 4. Proportion of Michigan goose and duck hunters satisfied with their overall hunting experience and the amount of waterfowl seen and harvested. Satisfaction measures the proportion of hunters that were very satisfied or somewhat satisfied. Error bars represent the 95% confidence limit.

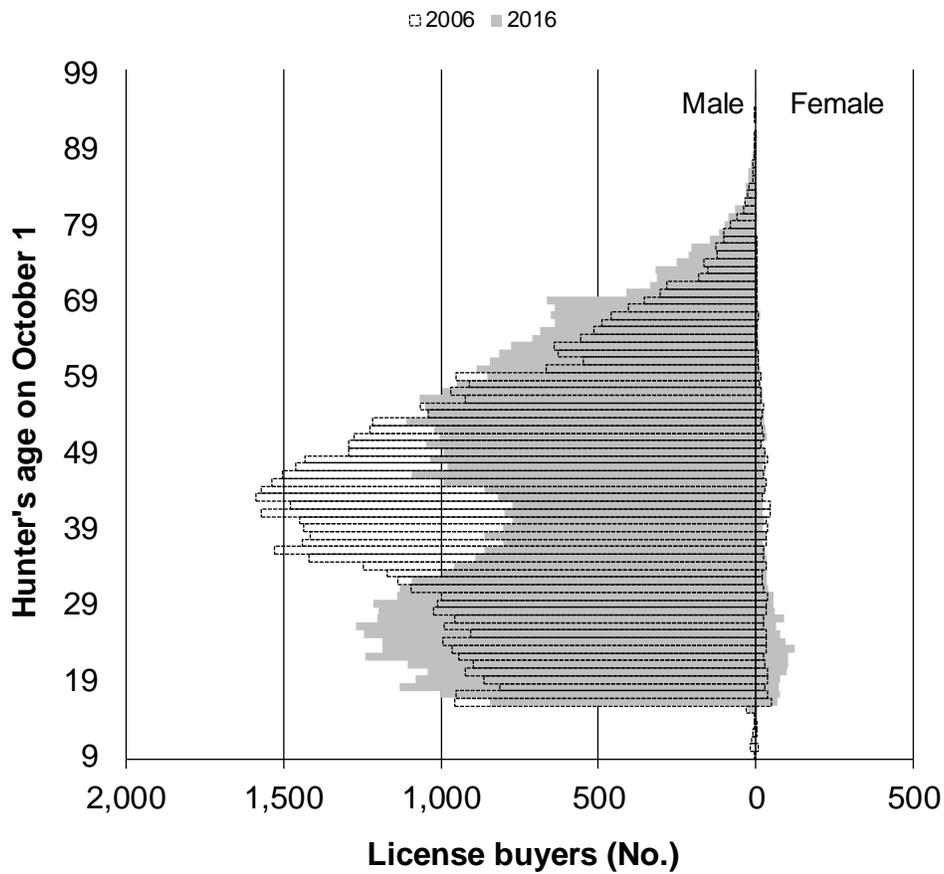


Figure 5. Number of waterfowl hunting license buyers in Michigan by age and sex during 2006 and 2016 hunting seasons. Waterfowl hunting licenses were purchased by 60,401 people in 2006 and 57,037 people in 2016. Hunters less than 16 years of age could legally hunt waterfowl without a waterfowl hunting license.

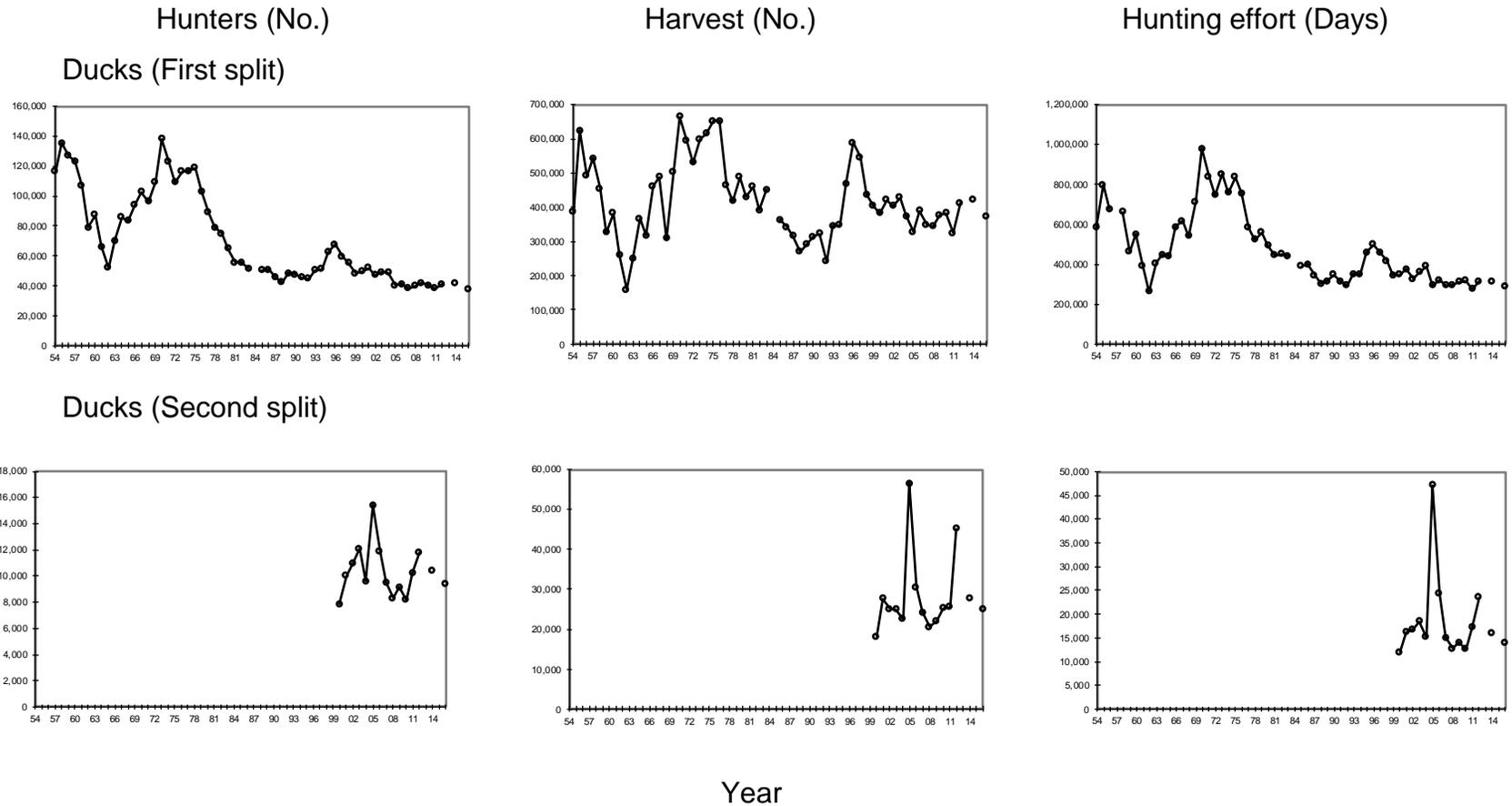


Figure 8. Estimated number of hunters, harvest, and hunting effort in Michigan during the waterfowl hunting seasons, 1954-2016. No estimates were available or no seasons existed during years when no data are plotted.

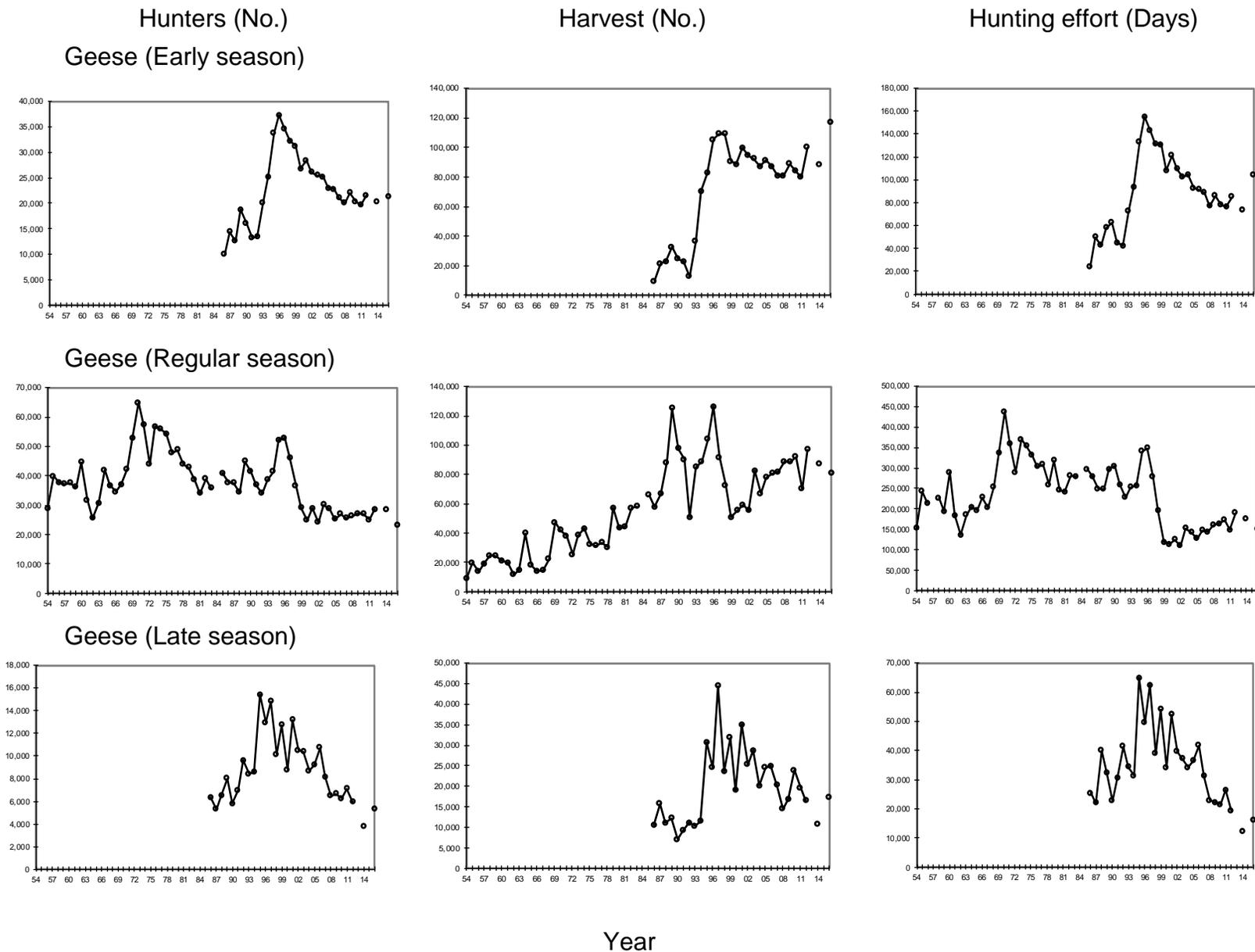


Figure 8 (continued). Estimated number of hunters, harvest, and hunting effort in Michigan during the waterfowl hunting seasons, 1954-2016. No estimates were available or no seasons existed during years when no data are plotted.

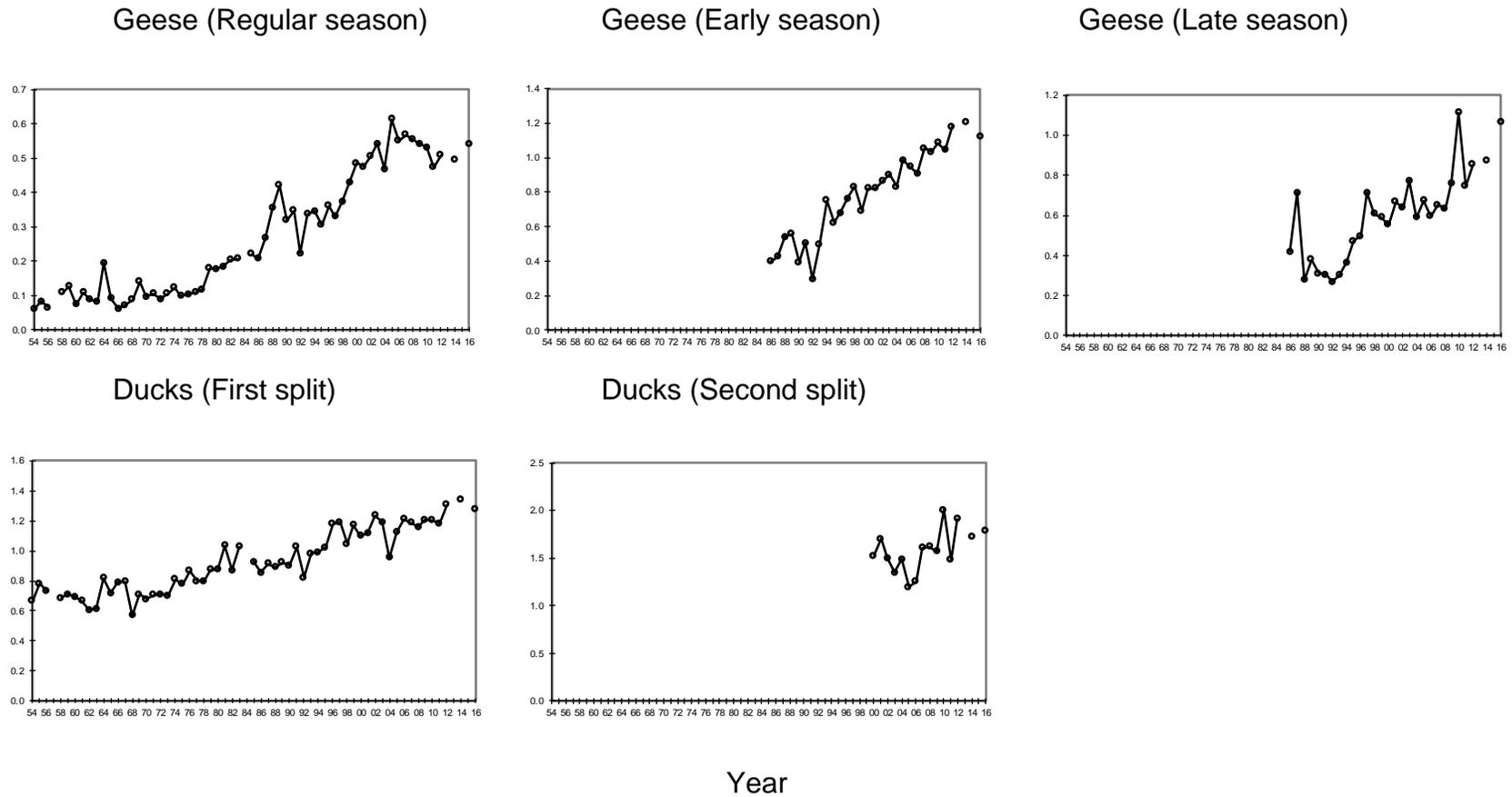


Figure 9. Estimated harvest per effort in Michigan during the waterfowl hunting seasons, 1954-2016. No estimates were available or no seasons existed during years when no data are plotted.

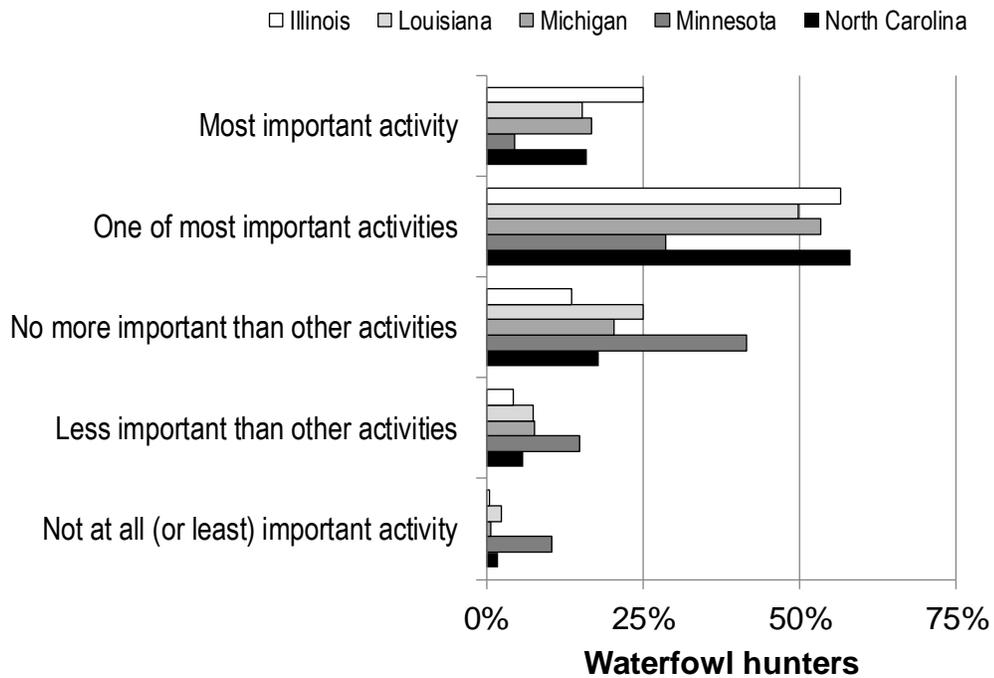


Figure 10. The importance of waterfowl hunting as a recreational activity compared to the hunter's other recreational activities. Estimates were summarized separately for Illinois (Lischka et al. 2011), Louisiana (Laborde and Rohwer 2010), Michigan (current study), Minnesota (Schroeder et al. 2012), and North Carolina (Fuller et al. 2011).

APPENDIX A

2016-2017 Waterfowl Harvest Questionnaire



MICHIGAN DEPARTMENT OF NATURAL RESOURCES, WILDLIFE DIVISION
 PO BOX 30030 LANSING MI 48909-7530
2016-2017 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, 2016, through February 11, 2017 (2016-2017 hunting season)?

- 1 Yes. Please complete the table below and answer questions on next page.
 2 No. Skip to Question #7.

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 in cover letter for zone boundaries.)</i>			DAYS HUNTED	NUMBER OF BIRDS TAKEN	LAND TYPE		
		North (UP)	Middle (MLP)	South (SLP)			Private	Public	Both
<input checked="" type="checkbox"/> Example	1 Jackson	1 <input type="checkbox"/>	2 <input type="checkbox"/>	3 <input checked="" type="checkbox"/>	5	8	1 <input type="checkbox"/>	2 <input type="checkbox"/>	3 <input checked="" type="checkbox"/>
1 <input type="checkbox"/> Early Teal Sept 1 – 7 (Statewide)	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"/>
2 <input type="checkbox"/> Duck First Portion of Regular Season Sept 24 – Nov 20 (North Zone) Oct 1 – Nov 27 (Middle Zone) Oct 8 – Dec 4 (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"/>
3 <input type="checkbox"/> Duck Late Portion of Regular Season (2 days only) Nov 26-27 (North Zone) Dec 17-18 (Middle Zone) Dec 31 – 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 <input type="checkbox"/> Goose Early Segment Sept 1-30 (North Zone) Sept 1-30 (Middle Zone) Sept 1-25 (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"/>
5 <input type="checkbox"/> Goose Oct 1-Dec 16 (North Zone) Oct 1- Dec 14 & Dec 17 - 18 (Middle) Oct 8 – Dec 4 & Dec 31- 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"/>
6 <input type="checkbox"/> Goose Late Segment Jan 21 – Feb 11 (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"/>

2. Did you specifically hunt for sea ducks (i.e., long-tailed ducks [also called old squaw] and scoters) in Michigan during the 2016-17 hunting season?

- 1 Yes 2 No (skip to question #5)

3. How many days did you specifically hunt for sea ducks during the 2016-17 hunting season in Michigan?

- 1 None 2 1-4 days 3 5-10 days 4 More than 10 days

4. How many sea ducks did you harvest during the 2016-17 hunting season in Michigan?

Record the number of sea ducks taken

Questions continue on next page.

5. Please indicate how satisfied or dissatisfied you were with the following for the 2016-2017 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. 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"/>
e. 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"/>
f. 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"/>
g. 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"/>
h. 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"/>
i. 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"/>
j. <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"/>
k. 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"/>

6. If you are a youth (*adults skip to question 7*), did you hunt during Michigan's Youth Waterfowl Hunting weekend (September 10-11, 2016)? Eligible youth were 16 years old or younger during the youth season.

1 Yes 2 No

7. 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)

8. As a recreational activity, how important is waterfowl hunting for you compared to your other recreational activities? (*Check only one choice.*)

- 1 My most important recreational activity.
- 2 One of my more important recreational activities.
- 3 No more important than any other recreational activity.
- 4 Less important than most of my other recreational activities.
- 5 Not at all important to me as a recreational activity.

9. Michigan had an early teal season for the last three years. If Michigan has an early teal season in September 2018, how likely is it that you would hunt teal in this season?

1 Very likely 2 Somewhat likely 3 Not very likely 4 Not at all likely 5 Not Sure

10. Please indicate how much you would support or oppose the following dates for the early teal season and Youth Waterfowl Hunting Weekend in 2018.

(Select one choice per option.)

	Strongly Support	Somewhat Support	Not Sure	Somewhat Oppose	Strongly Oppose
a. Teal season: Sept 1-7 and Youth season: Sept 8-9	1 <input type="checkbox"/>	2 <input type="checkbox"/>	3 <input type="checkbox"/>	4 <input type="checkbox"/>	5 <input type="checkbox"/>
b. Teal season: Sept 1-7 and Youth season: Sept 15-16	1 <input type="checkbox"/>	2 <input type="checkbox"/>	3 <input type="checkbox"/>	4 <input type="checkbox"/>	5 <input type="checkbox"/>
c. Teal season: Sept 1-9 and Youth season: Sept 8-9	1 <input type="checkbox"/>	2 <input type="checkbox"/>	3 <input type="checkbox"/>	4 <input type="checkbox"/>	5 <input type="checkbox"/>
d. Teal season: Sept 1-9 and Youth season: Sept 15-16	1 <input type="checkbox"/>	2 <input type="checkbox"/>	3 <input type="checkbox"/>	4 <input type="checkbox"/>	5 <input type="checkbox"/>
e. Teal season: Sept 1-16 and Youth season: Sept 8-9	1 <input type="checkbox"/>	2 <input type="checkbox"/>	3 <input type="checkbox"/>	4 <input type="checkbox"/>	5 <input type="checkbox"/>
f. Teal season: Sept 1-16 and Youth season: Sept 15-16	1 <input type="checkbox"/>	2 <input type="checkbox"/>	3 <input type="checkbox"/>	4 <input type="checkbox"/>	5 <input type="checkbox"/>