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2018 WATERFOWL HARVEST SURVEY

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ABSTRACT

A sample of waterfowl hunters was contacted after the 2018 hunting seasons to estimate hunting activity and determine their opinions and satisfaction with hunting regulations. An estimated 43,936 people went afield to hunt waterfowl (ducks and geese combined) in 2018, which was not significantly different from the estimated number of hunters in 2016. The number of duck hunters and number of goose hunters in 2018 also did not change significantly from 2016. In 2018, about 37,798 duck hunters spent 296,094 days afield hunting ducks; while an estimated 29,859 goose hunters spent 235,224 days hunting geese. Duck and goose harvest and hunting effort for all seasons combined in 2018 were not significantly different than in 2016. An estimated 57% of the duck hunters were satisfied (i.e., very satisfied or somewhat satisfied) with their duck hunting experience in 2018, 22% had a neutral opinion about their experience, while 18% of duck hunters were dissatisfied. Hunter satisfaction with goose hunting was not significantly different than hunter satisfaction with duck hunting; 53% of goose hunters were satisfied, 23% had a neutral opinion, and 20% of goose hunters were dissatisfied. Overall satisfaction among duck hunters and among goose hunter in 2018 was not significantly different from 2016. Duck hunters were asked to indicate how much they supported eight options for the duck hunting season structure (timing, zones, and splits). Most duck hunters in all three years supported maintaining the current season structure (i.e., preferred three hunting zones and each zone could have a single split, but the season dates could be different in each zone). In 2018, most duck hunters, especially hunters in the South Zone, also preferred that the duck hunting season ended later.



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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 2018 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 the 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 (e.g., season structure and timing).

METHODS

Following the 2018 hunting seasons, a questionnaire (Appendix A) was sent to 7,000 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, 2018, and

February 11, 2019, that had registered with the HIP by February 11, 2019. The overall sample consisted of 5,208 people from the first stratum (N=53,776), and 1,792 people from the second stratum (N=18,265).

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 the duck hunting seasons in 2018. Possible responses included “strongly agree,” “somewhat agree,” “not sure,” “somewhat disagree,” and “strongly disagree.” Hunters were asked to indicate their preferred duck species (i.e., diving ducks, mallards, other dabbling ducks, or no preference) to harvest in Michigan.

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 characteristics). 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 the formal hunting zones used in 2018. Estimates were also calculated separately for waterfowl hunting zones. Hunting effort and birds harvested from unknown locations were allocated among areas in proportion to the known effort and harvest. Opinions of hunters regarding satisfaction with the 2018 seasons, the timing of the seasons, and locations of hunting zones were calculated separately for hunters based on their preferred hunting zone (i.e., North, Middle, or South zones) and preferred duck species to harvest (i.e., diving ducks, mallards, and other dabbling ducks except mallards). Furthermore, opinion estimates were calculated separately among hunters that hunted in the Saginaw Bay area (Arenac, Bay, Huron, Midland, Saginaw, Sanilac, Tuscola counties), southwest LP (Allegan, Barry, Berrien, Cass, Kalamazoo, St. Joseph, and Van Buren counties), northwest LP (Antrim, Benzie, Charlevoix, Emmet, Grand Traverse, Leelanau, Mason, and Manistee counties), and east UP (Chippewa and Mackinac counties).

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 the 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 were equivalent to stating the difference between the means was larger than would be expected 95 out of 100 times ($P < 0.05$), if the study had been repeated (Payton et al. 2003). Because a waterfowl harvest survey was not conducted in 2017, the 2018 estimates were compared to the most recently completed survey which was done for the 2016 hunting seasons.

RESULTS

Survey Response Rate

Questionnaires were mailed initially in early March 2019. Up to two follow-up questionnaires were sent to non-respondents. Questionnaires were undeliverable to 187 people, primarily because of changes in residence. Questionnaires were returned by 2,620 of 6,813 people receiving the questionnaire (38% response rate).

License Sales and Hunter Participation

In 2018, 53,828 people purchased a Michigan waterfowl hunting license. This was nearly a 6% decrease compared to the number of license buyers in 2016 and a 3% decrease compared to 2017 (Table 2). The average age of waterfowl hunting license buyers was 42 years (Figure 2). About 1% (746) 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 2018. Although the estimated number of active hunters declined by 4% from 2016, this decline was not significantly different (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 (4,465 youth hunters). About $61 \pm 2\%$ 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, $22 \pm 4\%$ of the people less than 16 years old that had registered with the HIP (stratum 2) hunted waterfowl. An estimated 37,798 duck hunters spent 296,094 days afield hunting ducks; while an estimated 29,859 goose hunters spent

235,224 days afield hunting geese (Tables 4 and 5). About $33 \pm 2\%$ ($23,721 \pm 1,202$) of those eligible to hunt waterfowl attempted hunting both ducks and geese.

Most ($63 \pm 2\%$) duck hunters preferred to hunt in the South Zone, while $25 \pm 2\%$ of duck hunters preferred to hunt in the Middle Zone, and $10 \pm 2\%$ preferred to hunt in the North Zone. About $2 \pm 1\%$ of the duck hunters did not indicate a preferred hunt zone.

Ducks were classified into two types: dabblers or divers. Dabbler ducks (e.g., mallards, teal, and pintail) sit high on the water and generally feed on food near the surface. In contrast, diver ducks (e.g., scaup and canvasback) sit lower in the water and dive underwater to find their food. Most ($44 \pm 2\%$) duck hunters preferred to hunt mallards, but $12 \pm 2\%$ of hunters preferred to harvest some other type of dabbler duck. In addition, $32 \pm 2\%$ of duck hunters did not have a preference for a species to harvest, and $8 \pm 1\%$ of hunters preferred to harvest diver ducks. About $5 \pm 1\%$ of the duck hunters did not indicate a preferred species to harvest.

An estimated $2,565 \pm 485$ people hunted sea ducks (long-tailed ducks and scoters) in Michigan during 2018. Most of these hunters ($78 \pm 8\%$) hunted 1-4 days; $17 \pm 7\%$ of the hunters hunted 5-10 days, and $4 \pm 4\%$ of the hunters hunted more than 10 days. These sea duck hunters took an estimated $17,031 \pm 5,197$ sea ducks (6.6 ± 1.6 sea ducks per hunter).

Harvest and Hunting Trends

The 2016 and 2018 duck and goose seasons were split into multiple segments in each of the three hunting zones (e.g., Table 1). The number of days in the segments was generally the same in each year; however, the first segment of the 2018 season generally occurred about five days later than the 2016 season. Thus, the estimates for most season segments were comparing seasons of similar length between 2016 and 2018, except for the late goose season in 2018 which was 5 days shorter than in 2016.

The numbers of duck and goose hunters statewide (all seasons combined) did not change between 2016 and 2018 (Tables 4-8). Statewide hunting effort and harvest for all seasons combined also did not change significantly among duck and goose hunters.

The length of the late goose season decreased by 23% (from 22 to 17 days) between 2016 and 2018, and the number of people hunting during this late-season declined significantly by 31% (5,296 hunters in 2016 versus 3,635 in 2018, Table 4). In addition, estimates of hunting effort and harvest in the late-season declined significantly by 35% and 48%, respectively.

The length of the teal season increased from 7 to 16 days between 2016 and 2018; however, the number of people hunting during the teal season did not change significantly (5,906 hunters in 2016 versus 5,839 in 2018, Table 4). In addition, estimates of hunting effort and harvest in the teal season did not change significantly between 2016 and 2018 (Tables 5-6).

Hunter Satisfaction

Hunters were asked to rate their level of satisfaction with twelve aspects of the waterfowl hunting seasons and waterfowl populations in 2018 (Table 9). An estimated 57% of the

Michigan duck hunters were satisfied (i.e., very satisfied or somewhat satisfied) with their duck hunting experience in 2018, 22% had a neutral opinion about their experience, while 18% of hunters were dissatisfied. Hunter satisfaction with goose hunting was not significantly different than hunter satisfaction with duck hunting; 53% of goose hunters were satisfied, 23% had a neutral opinion, and 20% of goose hunters were dissatisfied. Overall satisfaction among duck and goose hunters in 2018 was not significantly different from 2016 (Table 9, Figure 3). Satisfaction with the number of ducks seen and the number of ducks harvested by duck hunters was significantly greater in 2018 than in 2016. In contrast, goose hunters were less satisfied with the number of geese harvested in 2018 than in 2016.

Opinions about the Preferred Hunting Zones and Timing of the Duck Hunting Seasons

Duck hunters were presented eight statements about the timing and structure of the duck hunting season (i.e., hunting zones and splits) and were asked whether they agreed or disagreed (or supported or opposed) with these statements (Tables 10-17). Generally, less than 50% of duck hunters indicated they agreed with most statements. There were only two statements for which more than 50% of duck hunters agreed (or supported): (1) they liked the duck hunting season dates used in 2011 [55% agreed], (2) they liked having three zones with different seasons and splits [63% supported], and (3) they preferred that the seasons stay open later [54% agreed]. In addition, hunters that preferred to harvest diver ducks were more likely to desire seasons that stayed open later than hunters that preferred to harvest mallards or other dabbling ducks.

DISCUSSION

Participation Trends

The number of people buying a Michigan waterfowl hunting license in 2018 declined by about 7% compared to the number of license buyers in 2008 (53,828 people purchased a license in 2018 versus 58,036 in 2008). There were fewer license buyers for the age classes between 33 and 57 years of age in 2018, compared to 2008 (Figure 4). However, there were increased hunter numbers among the youngest and oldest age classes in 2018. 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 has aged. 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 5). From this peak, the current number of people hunting ducks has declined 73% (average annual decline = 2.7%), while the number of people hunting geese has declined 54% (average annual decline = 1.6%). 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 6). Goose harvest and the mean number of geese taken per day of hunting effort also have increased gradually since the 1970s (Figure 6).

Harvest estimation

Raftovich and Wilkins (2019) reported estimates of harvest, hunter numbers, and hunting effort of Michigan waterfowl hunters in 2018 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 the number of goose hunters (Table 18). These differences may reflect variations in the way the surveys were implemented.

Season structure and hunting zones

The duck hunting season dates and structure (i.e., three hunting zones with different hunting dates and splits in each zone) has been similar in Michigan during recent years, varying only by a few days. Duck hunters have been asked whether they generally supported the season dates and structure in 2011 (Frawley 2015), 2014 (Frawley 2017), and 2018. Overall, most duck hunters in all three years supported maintaining the current season dates and structure (Figures 7 and 8). In 2018, most ducks hunters, especially hunters in the South Zone (Figure 7 and Table 12), also preferred that the duck hunting season ended later.

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Table 1. Waterfowl hunting seasons in Michigan, 2018-2019.

Species, season, and area ^a	Season dates
Teal	
Statewide	Sept. 1 – 16
Ducks ^b	
North Zone (UP)	Sept. 29 – Nov. 25 and Dec. 1 – 2
Middle Zone	Oct. 6 – Dec. 2 and Dec. 15 – 16
South Zone	Oct. 13 – Dec. 9 and Dec. 29 – 30
Canada geese ^{b,c}	
North Zone (UP)	Sept. 1 – 30 and Oct. 1 – Dec. 16
Middle Zone	Sept. 1 – 30, Oct. 6 – Dec. 21
South Zone	Sept. 1 – 30, Oct. 13 – Dec. 9, Dec. 29 – 30, and Jan. 26 – 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 15-16).

^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, 2014-2018.

Item	Year					2017-2018 % Change
	2014	2015	2016	2017	2018	
Number of licenses sold ^a	59,958	57,821	57,051	55,478	53,843	-2.9
Number of people buying a hunting license ^{a,b,c}	59,946	57,810	57,037	55,461	53,828	-2.9

^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=11,274) 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, 2011-2018.^a

Hunters	2011	2012	2014	2016	2018	
					Estimate	95% CL
Waterfowl ^b	45,786	48,644	49,873	45,551	43,936	1,186
Males (%)	96.4	96.5	95.1	95.8	95.8	1.0
Females (%)	3.6	3.5	4.9	4.2	4.2	1.0
Mean age (Years)	41.5	40.8	43.2	42.8	43.5	0.9
Youth (%) ^c	11.5	13.7	10.4	10.1	10.2	1.5
Youth (No.) ^c	5,245	6,650	5,172	4,603	4,465	698

^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 2016 and 2018 (P<0.05).

Table 4. Estimated waterfowl hunter numbers by season and region in Michigan, 2012-2018.^a

Species and area (stratum)	2012	2014	2016	2018		2016-18 % Change
				No.	95% CL	
Teal						
UP	NA	1,036	786	574	240	-27
NLP	NA	3,567	2,310	2,448	492	6
SLP	NA	4,390	2,959	2,969	526	0
Statewide	NA	8,784	5,906	5,839	737	-1
Ducks (First split)						
UP	5,422	5,320	5,664	5,214	659	-8
NLP	17,831	17,830	15,873	15,348	1,043	-3
SLP	22,901	23,347	20,567	20,669	1,145	0
Statewide	41,156	41,520	37,581	36,515	1,250	-3
Ducks (Second split)						
UP	501	357	475	269	152	-43
NLP	2,862	2,468	1,841	1,657	381	-10
SLP	8,657	7,851	7,250	6,247	698	-14
Statewide	11,788	10,415	9,368	8,022	810	-14
Ducks (Seasons combined)						
UP	5,432	5,529	5,758	5,302	663	-8
NLP	18,226	18,687	16,462	16,162	1,063	-2
SLP	24,560	24,465	21,941	22,094	1,168	1
Statewide	42,427	42,870	38,705	37,798	1,249	-2
Geese (Early segment)^b						
UP	1,405	1,695	2,390	1,736	401	-27
NLP	7,190	7,227	7,414	6,423	740	-13
SLP	13,481	11,970	12,144	11,526	945	-5
Statewide	21,523	20,293	21,276	19,056	1,145	-10
Geese (Regular season)^b						
UP	2,515	2,832	2,294	2,110	426	-8
NLP	10,763	10,376	8,418	7,694	790	-9
SLP	16,788	16,914	13,278	13,036	980	-2
Statewide	28,523	28,351	23,032	21,557	1,174	-6
Geese (Late segment)^b						
UP	0	0	0	0	0	
NLP	521	356	486	93	100	-81*
SLP	5,421	3,474	4,860	3,542	555	-27*
Statewide	5,920	3,803	5,296	3,635	578	-31*
Geese (Seasons combined)						
UP	2,998	3,266	3,539	3,065	517	-13
NLP	13,195	12,797	12,176	10,689	911	-12
SLP	22,288	21,708	19,093	18,431	1,105	-3
Statewide	35,751	34,933	32,340	29,859	1,244	-8

^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 2016 and 2018.

*Non-overlapping 95% confidence intervals indicated estimates differed significantly in 2016 and 2018 ($P < 0.05$).

Table 5. Estimated waterfowl hunter effort (days afield) by season and region, 2012-2018.^a

Species and area (stratum)	2012	2014	2016	2018		2016-18 % Change
				No.	95% CL	
Teal						
UP	NA	2,596	1,877	2,181	1,245	16
NLP	NA	7,900	5,238	7,486	1,884	43
SLP	NA	10,024	7,039	9,042	2,036	28
Statewide	NA	20,519	14,154	18,709	3,050	32
Ducks (First split)						
UP	34,916	31,707	39,616	33,416	6,435	-16
NLP	121,253	117,597	104,496	94,697	10,568	-9
SLP	159,732	166,104	146,444	136,560	12,318	-7
Statewide	315,900	315,408	290,556	264,674	16,683	-9
Ducks (Second split)						
UP	1,061	541	603	482	281	-20
NLP	5,150	3,421	2,702	2,439	643	-10
SLP	17,359	12,040	10,686	9,791	1,829	-8
Statewide	23,570	16,002	13,991	12,712	1,986	-9
Ducks (Seasons combined)						
UP	35,980	34,833	42,113	36,097	7,209	-14
NLP	126,412	128,889	112,475	104,696	11,657	-7
SLP	177,079	188,208	164,113	155,301	13,930	-5
Statewide	339,470	351,930	318,700	296,094	18,740	-7
Geese (Early segment)^b						
UP	5,033	5,424	11,150	11,998	3,827	8
NLP	28,967	24,933	36,918	28,244	4,676	-23
SLP	50,862	42,824	55,969	52,696	6,506	-6
Statewide	84,862	73,180	104,038	92,938	8,700	-11
Geese (Regular season)^b						
UP	15,661	16,506	13,372	11,116	3,368	-17
NLP	75,608	56,506	52,377	45,055	7,771	-14
SLP	98,981	103,004	83,849	75,649	9,242	-10
Statewide	190,250	176,015	149,597	131,821	12,366	-12
Geese (Late segment)^b						
UP	0	0	0	0	0	
NLP	1,417	1,329	768	332	384	-57
SLP	17,871	11,052	15,430	10,133	2,253	-34*
Statewide	19,288	12,381	16,198	10,465	2,386	-35*
Geese (Seasons combined)						
UP	20,677	21,866	24,496	23,162	6,433	-5
NLP	105,932	82,660	90,051	73,673	10,878	-18
SLP	167,791	157,051	155,286	138,389	14,612	-11
Statewide	294,400	261,576	269,833	235,224	18,976	-13

^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 2016 and 2018.

*Non-overlapping 95% confidence intervals indicated estimates differed significantly in 2016 and 2018 ($P < 0.05$).

Table 6. Estimated waterfowl harvest by season and region in Michigan, 2011-2018.^a

Species and area (stratum)	2012	2014	2016	2018		2016-18 % Change
				No.	95% CL	
Teal						
UP	NA	1,795	470	2,121	2,466	352
NLP	NA	8,482	4,743	6,128	2,793	29
SLP	NA	4,588	4,850	4,778	1,869	-1
Statewide	NA	14,865	10,063	13,027	4,178	29
Ducks (First split)						
UP	46,193	33,599	39,758	42,767	9,949	8
NLP	155,333	180,764	148,884	128,427	19,194	-14
SLP	211,574	207,886	183,537	171,188	21,209	-7
Statewide	413,100	422,248	372,178	342,382	29,828	-8
Ducks (Second split)						
UP	3,131	809	748	1,103	827	47
NLP	8,505	6,982	4,504	4,205	1,505	-7
SLP	33,458	19,842	19,771	14,763	2,627	-25
Statewide	45,093	27,633	25,023	20,071	3,468	-20
Ducks (Seasons combined)						
UP	49,330	36,196	40,939	46,079	11,613	13
NLP	163,863	196,200	158,142	138,972	20,583	-12
SLP	245,001	232,350	208,183	190,429	23,028	-9
Statewide	458,193	464,747	407,264	375,480	32,657	-8
Geese (Early segment)^b						
UP	6,043	4,249	11,683	13,308	5,075	14
NLP	32,208	33,484	42,288	33,409	7,866	-21
SLP	61,926	50,496	62,936	67,513	14,129	7
Statewide	100,178	88,229	116,908	114,231	16,901	-2
Geese (Regular season)^b						
UP	6,644	6,134	5,164	6,068	2,932	18
NLP	37,398	30,341	25,938	23,420	5,215	-10
SLP	52,975	50,868	50,108	44,141	8,286	-12
Statewide	97,017	87,343	81,210	73,629	10,104	-9
Geese (Late segment)^b						
UP	0	0	0	0	0	
NLP	1,272	1,736	761	317	492	-58
SLP	15,208	9,073	16,506	8,700	2,573	-47*
Statewide	16,480	10,809	17,267	9,017	2,671	-48*
Geese (Seasons combined)						
UP	12,663	10,363	16,884	19,393	7,351	15
NLP	70,779	65,541	69,053	57,205	12,080	-17
SLP	130,233	110,477	129,448	120,279	20,654	-7
Statewide	213,675	186,381	215,385	196,877	24,872	-9

^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 2016 and 2018.

*Non-overlapping 95% confidence intervals indicated estimates differed significantly in 2016 and 2018 ($P < 0.05$).

Table 7. Estimated number of duck hunters, hunting effort, and ducks harvested, summarized by season and management zone in Michigan, 2018.

Season and waterfowl zone ^a	Hunters		Effort		Harvest	
	No.	95% CL	No.	95% CL	No.	95% CL
Teal						
North	571	240	2,178	1,245	2,121	2,466
Middle	1,016	321	3,112	1,108	1,095	789
South	4,378	639	13,418	2,546	9,811	3,267
Statewide	5,839	737	18,709	3,050	13,027	4,178
First split						
North	5,259	679	33,548	6,485	43,066	10,124
Middle	9,640	879	48,892	6,772	59,239	11,166
South	25,903	1,236	182,233	14,686	240,077	25,724
Statewide	36,515	1,250	264,674	16,683	342,382	29,828
Second split						
North	278	160	505	297	1,137	861
Middle	1,367	362	2,097	627	3,656	1,602
South	6,566	738	10,111	1,863	15,278	2,832
Statewide	8,022	810	12,712	1,986	20,071	3,468
Seasons combined						
North	5,342	683	36,229	7,254	46,327	11,765
Middle	10,035	895	54,101	7,535	63,984	11,857
South	27,389	1,250	205,764	16,506	265,169	28,028
Statewide	37,798	1,249	296,094	18,740	375,480	32,657

^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 2016 and 2018 ($P < 0.05$).

Table 8. Estimated number of goose hunters, hunting effort, and geese harvested, summarized by season and management zone in Michigan, 2018.

Season and waterfowl zone ^a	Hunters		Effort		Harvest	
	No.	95% CL	No.	95% CL	No.	95% CL
Early segment						
North	1,907	401	13,049	3,827	14,140	5,075
Middle	3,182	504	12,703	2,826	12,604	4,054
South	14,582	1,001	67,186	7,038	87,486	15,339
Statewide	19,056	1,145	92,938	8,700	114,231	16,901
Regular						
North	2,319	426	12,156	3,368	6,528	2,932
Middle	3,876	550	18,850	4,120	10,411	3,007
South	16,594	1,037	100,815	10,723	56,691	9,018
Statewide	21,557	1,174	131,821	12,366	73,629	10,104
Late segment						
North	0	0	0	0	0	0
Middle	0	0	0	0	0	0
South	3,635*	563	10,465*	2,284	9,017*	2,619
Statewide	3,635*	578	10,465*	2,386	9,017*	2,671

^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 2016 and 2018 (P<0.05).

Table 9. Level of satisfaction among waterfowl hunters with the 2016 and 2018 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		
	2016	2018		2016	2018		2016	2018		2016	2018	
	%	%	95% CL	%	%	95% CL	%	%	95% CL	%	%	95% CL
Ducks seen	37	45*	3	20	20	2	41	34*	2	2	2	1
Ducks harvested	26	31*	2	22	22	2	46	41	3	6	6	1
Duck hunting experience	54	57	3	21	22	2	21	18	2	3	2	1
Days in duck season	49	50	3	29	28	2	18	18	2	4	4	1
Daily duck limit	59	64*	2	28	26	2	9	7	1	4	4	1
Geese seen	58	56	3	17	17	2	20	24	2	5	3	1
Geese harvested	37	30*	3	23	24	2	33	39*	3	8	7	1
Goose hunting experience	57	53	3	22	23	2	17	20	2	4	3	1
Days in goose season	59	57	3	23	25	2	14	13	2	4	5	1
Goose season dates	55	56	3	23	27	3	16	14	2	5	3	1
Daily goose limit	52	56	3	26	24	2	18	17	2	4	3	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 2016 and 2018 (P<0.05).

Table 10. The proportion of active duck hunters that agreed or disagreed that that they liked the dates of the duck hunting seasons in 2018, summarized by area.

Hunt area or preferred duck to harvest ^a	Strongly agree		Somewhat agree		Not sure		Somewhat disagree		Strongly disagree		Unknown	
	%	95% CL	%	95% CL	%	95% CL	%	95% CL	%	95% CL	%	95% CL
North Zone	32	7	40	8	9	5	13	5	3	3	3	2
Eastern Upper Peninsula ^b	28	9	41	10	14	7	12	7	3	3	2	3
Middle Zone	22	4	47	5	16	4	11	3	3	2	1	1
Northwest Lower Peninsula ^c	22	8	53	10	7	5	15	7	3	4	0	0
South Zone	20	3	40	3	14	2	16	2	8	2	2	1
Saginaw Bay ^d	19	4	37	5	20	4	16	4	6	3	1	1
Southwest Lower Peninsula ^e	19	6	38	7	17	6	17	6	7	4	2	2
Diver ducks	22	7	30	8	13	6	22	7	8	5	3	3
Mallards	22	3	41	4	14	3	15	3	6	2	2	1
Other dabbling ducks	23	6	47	7	11	5	14	5	5	3	1	1
Statewide	22	2	41	3	14	2	14	2	6	1	2	1

^aEstimates were summarized by the hunter's preferred hunting zone (North, Middle, or South) and for hunters that had hunted in selected areas (EUP, NWLP, Saginaw Bay, and SWLP) in 2018, and among hunters statewide that preferred to harvest diver ducks, mallards, or other types of dabbling ducks.

^bHunted in Chippewa or Mackinac counties.

^cHunted in Antrim, Benzie, Charlevoix, Emmet, Grand Traverse, Leelanau, Mason, or Manistee counties.

^dHunted in Arenac, Bay, Huron, Midland, Saginaw, Sanilac, or Tuscola counties.

^eHunted in Allegan, Barry, Berrien, Cass, Kalamazoo, St. Joseph, or Van Buren counties.

Table 11. The proportion of active duck hunters that agreed or disagreed that the duck season should begin earlier than the 2018 seasons, summarized by area.

Hunt area or preferred duck to harvest ^a	Strongly agree		Somewhat agree		Not sure		Somewhat disagree		Strongly disagree		Unknown	
	%	95%	%	95%	%	95%	%	95%	%	95%	%	95%
		CL		CL		CL		CL		CL		CL
North Zone	18	6	23	7	26	7	15	6	17	6	2	2
Eastern Upper Peninsula ^b	13	7	16	8	26	9	19	8	24	9	2	3
Middle Zone	19	4	19	4	33	5	14	4	11	3	3	2
Northwest Lower Peninsula ^c	13	7	21	8	25	9	19	8	22	8	1	2
South Zone	19	3	19	3	25	3	18	2	18	2	2	1
Saginaw Bay ^d	21	5	17	4	28	5	18	4	14	4	3	2
Southwest Lower Peninsula ^e	11	5	21	6	21	6	24	7	22	6	1	2
Diver ducks	13	6	9	5	23	8	29	8	22	7	4	4
Mallards	20	3	21	3	25	3	18	3	16	3	2	1
Other dabbling ducks	21	6	28	7	20	6	14	5	15	6	2	2
Statewide	18	2	19	2	27	2	17	2	16	2	2	1

^aEstimates were summarized by the hunter's preferred hunting zone (North, Middle, or South) and for hunters that had hunted in selected areas (EUP, NWLP, Saginaw Bay, and SWLP) in 2018, and among hunters statewide that preferred to harvest diver ducks, mallards, or other types of dabbling ducks.

^bHunted in Chippewa or Mackinac counties.

^cHunted in Antrim, Benzie, Charlevoix, Emmet, Grand Traverse, Leelanau, Mason, or Manistee counties.

^dHunted in Arenac, Bay, Huron, Midland, Saginaw, Sanilac, or Tuscola counties.

^eHunted in Allegan, Barry, Berrien, Cass, Kalamazoo, St. Joseph, or Van Buren counties.

Table 12. The proportion of active duck hunters that agreed or disagreed that the duck season should end later than the 2018 seasons, summarized by area.

Hunt area or preferred duck to harvest ^a	Strongly agree		Somewhat agree		Not sure		Somewhat disagree		Strongly disagree		Unknown	
	%	95% CL	%	95% CL	%	95% CL	%	95% CL	%	95% CL	%	95% CL
North Zone	20	6	20	6	34	7	12	5	12	5	2	2
Eastern Upper Peninsula ^b	27	9	20	8	27	9	13	7	9	6	3	3
Middle Zone	23	4	24	4	34	5	11	3	5	2	3	2
Northwest Lower Peninsula ^c	24	9	30	10	26	9	10	6	8	6	1	2
South Zone	34	3	25	3	23	3	11	2	6	1	1	1
Saginaw Bay ^d	24	5	25	5	31	5	11	3	7	3	2	1
Southwest Lower Peninsula ^e	43	8	22	6	21	6	9	5	4	3	0	0
Diver ducks	38	9	28	8	16	7	10	5	7	4	2	2
Mallards	28	3	26	3	25	3	11	2	7	2	2	1
Other dabbling ducks	30	7	23	6	26	6	13	5	7	4	1	2
Statewide	29	2	24	2	27	2	11	2	6	1	2	1

^aEstimates were summarized by the hunter's preferred hunting zone (North, Middle, or South) and for hunters that had hunted in selected areas (EUP, NWLP, Saginaw Bay, and SWLP) in 2018, and among hunters statewide that preferred to harvest diver ducks, mallards, or other types of dabbling ducks.

^bHunted in Chippewa or Mackinac counties.

^cHunted in Antrim, Benzie, Charlevoix, Emmet, Grand Traverse, Leelanau, Mason, or Manistee counties.

^dHunted in Arenac, Bay, Huron, Midland, Saginaw, Sanilac, or Tuscola counties.

^eHunted in Allegan, Barry, Berrien, Cass, Kalamazoo, St. Joseph, or Van Buren counties.

Table 13. The proportion of active duck hunters that agreed or disagreed that having different opening dates among the zones created crowding in the area where they hunted in 2018, summarized by area.

Hunt area or preferred duck to harvest ^a	Strongly agree		Somewhat agree		Not sure		Somewhat disagree		Strongly disagree		Unknown	
	95%		95%		95%		95%		95%		95%	
	%	CL	%	CL	%	CL	%	CL	%	CL	%	CL
North Zone	8	4	12	5	39	8	23	7	16	6	2	2
Eastern Upper Peninsula ^b	16	7	15	7	29	9	22	8	16	7	2	3
Middle Zone	9	3	17	4	43	5	17	4	11	3	3	2
Northwest Lower Peninsula ^c	11	7	18	8	38	10	18	8	10	6	3	4
South Zone	10	2	13	2	44	3	16	2	14	2	2	1
Saginaw Bay ^d	11	3	17	4	42	6	16	4	11	4	2	2
Southwest Lower Peninsula ^e	4	3	9	4	50	8	20	6	14	6	2	2
Diver ducks	12	6	16	6	40	9	13	6	14	6	4	4
Mallards	9	2	15	3	45	4	17	3	12	3	2	1
Other dabbling ducks	13	5	16	5	36	7	18	6	17	6	1	2
Statewide	10	2	14	2	43	3	17	2	13	2	3	1

^aEstimates were summarized by the hunter's preferred hunting zone (North, Middle, or South) and for hunters that had hunted in selected areas (EUP, NWLP, Saginaw Bay, and SWLP) in 2018, and among hunters statewide that preferred to harvest diver ducks, mallards, or other types of dabbling ducks.

^bHunted in Chippewa or Mackinac counties.

^cHunted in Antrim, Benzie, Charlevoix, Emmet, Grand Traverse, Leelanau, Mason, or Manistee counties.

^dHunted in Arenac, Bay, Huron, Midland, Saginaw, Sanilac, or Tuscola counties.

^eHunted in Allegan, Barry, Berrien, Cass, Kalamazoo, St. Joseph, or Van Buren counties.

Table 14. The proportion of active duck hunters that supported or opposed having three duck hunting zones in future years. Each zone could have different season dates with a split seasons within each zone (i.e., early and late segments with a break between segments). This is the option that was used in Michigan for 2018 duck seasons.

Hunt area or preferred duck to harvest ^a	Strongly support		Somewhat support		Not sure		Somewhat oppose		Strongly oppose		Unknown	
	95%		95%		95%		95%		95%		95%	
	%	CL	%	CL	%	CL	%	CL	%	CL	%	CL
North Zone	24	7	33	7	20	6	11	5	9	5	3	3
Eastern Upper Peninsula ^b	27	9	35	10	15	7	11	7	7	5	4	4
Middle Zone	21	4	30	5	27	5	9	3	7	3	6	2
Northwest Lower Peninsula ^c	27	9	41	10	17	8	7	5	2	3	6	5
South Zone	26	3	31	3	23	3	8	2	6	2	5	1
Saginaw Bay ^d	22	5	29	5	29	5	9	3	8	3	3	2
Southwest Lower Peninsula ^e	24	7	35	7	22	6	8	4	7	4	5	3
Diver ducks	26	8	30	8	18	7	9	5	13	6	3	3
Mallards	22	3	33	4	26	3	8	2	7	2	4	2
Other dabbling ducks	27	7	32	7	19	6	8	4	6	4	8	4
Statewide	24	2	31	2	24	2	9	1	7	1	5	1

^aEstimates were summarized by the hunter's preferred hunting zone (North, Middle, or South) and for hunters that had hunted in selected areas (EUP, NWLP, Saginaw Bay, and SWLP) in 2018, and among hunters statewide that preferred to harvest diver ducks, mallards, or other types of dabbling ducks.

^bHunted in Chippewa or Mackinac counties.

^cHunted in Antrim, Benzie, Charlevoix, Emmet, Grand Traverse, Leelanau, Mason, or Manistee counties.

^dHunted in Arenac, Bay, Huron, Midland, Saginaw, Sanilac, or Tuscola counties.

^eHunted in Allegan, Barry, Berrien, Cass, Kalamazoo, St. Joseph, or Van Buren counties.

Table 15. The proportion of active duck hunters that supported or opposed having four hunting zones in future years, with the opportunity to have different duck season dates in each zone but no opportunity to split seasons into early and late segments with a break between segments (i.e., continuous duck season dates).

Hunt area or preferred duck to harvest ^a	Strongly support		Somewhat support		Not sure		Somewhat oppose		Strongly oppose		Unknown	
	95%		95%		95%		95%		95%		95%	
	%	CL	%	CL	%	CL	%	CL	%	CL	%	CL
North Zone	8	4	14	5	40	8	13	5	17	6	8	4
Eastern Upper Peninsula ^b	6	5	11	6	39	10	13	7	24	9	7	5
Middle Zone	7	3	13	3	37	5	17	4	15	4	10	3
Northwest Lower Peninsula ^c	8	6	25	9	26	9	16	8	15	7	10	6
South Zone	7	2	15	2	32	3	18	2	21	3	8	2
Saginaw Bay ^d	8	3	14	4	32	5	19	4	22	5	6	3
Southwest Lower Peninsula ^e	6	4	13	5	33	7	21	6	17	6	9	4
Diver ducks	7	5	12	6	30	8	22	7	25	8	4	4
Mallards	8	2	15	3	34	4	16	3	18	3	8	2
Other dabbling ducks	9	4	14	5	30	7	19	6	17	6	11	5
Statewide	7	1	14	2	34	2	17	2	19	2	9	1

^aEstimates were summarized by the hunter's preferred hunting zone (North, Middle, or South) and for hunters that had hunted in selected areas (EUP, NWLP, Saginaw Bay, and SWLP) in 2018, and among hunters statewide that preferred to harvest diver ducks, mallards, or other types of dabbling ducks.

^bHunted in Chippewa or Mackinac counties.

^cHunted in Antrim, Benzie, Charlevoix, Emmet, Grand Traverse, Leelanau, Mason, or Manistee counties.

^dHunted in Arenac, Bay, Huron, Midland, Saginaw, Sanilac, or Tuscola counties.

^eHunted in Allegan, Barry, Berrien, Cass, Kalamazoo, St. Joseph, or Van Buren counties.

Table 16. The proportion of active duck hunters that supported or opposed having a single statewide zone in future years, with the same duck season dates statewide and the opportunity to split the duck season into one early and late segment with a break between segments.

Hunt area or preferred duck to harvest ^a	Strongly support		Somewhat support		Not sure		Somewhat oppose		Strongly oppose		Unknown	
	95%		95%		95%		95%		95%		95%	
	%	CL	%	CL	%	CL	%	CL	%	CL	%	CL
North Zone	9	5	15	6	17	6	16	6	35	8	8	4
Eastern Upper Peninsula ^b	14	7	18	8	16	7	17	7	29	9	6	5
Middle Zone	12	3	16	4	27	5	14	3	21	4	10	3
Northwest Lower Peninsula ^c	9	6	14	7	23	9	14	7	32	10	8	6
South Zone	12	2	18	2	22	3	13	2	28	3	7	2
Saginaw Bay ^d	11	4	21	5	22	5	15	4	25	5	6	3
Southwest Lower Peninsula ^e	13	5	14	5	21	6	18	6	25	7	7	4
Diver ducks	10	5	18	7	18	7	13	6	37	9	3	3
Mallards	11	2	18	3	23	3	14	3	25	3	8	2
Other dabbling ducks	16	5	14	5	18	6	12	5	31	7	8	4
Statewide	12	2	17	2	23	2	14	2	27	2	8	1

^aEstimates were summarized by the hunter's preferred hunting zone (North, Middle, or South) and for hunters that had hunted in selected areas (EUP, NWLP, Saginaw Bay, and SWLP) in 2018, and among hunters statewide that preferred to harvest diver ducks, mallards, or other types of dabbling ducks.

^bHunted in Chippewa or Mackinac counties.

^cHunted in Antrim, Benzie, Charlevoix, Emmet, Grand Traverse, Leelanau, Mason, or Manistee counties.

^dHunted in Arenac, Bay, Huron, Midland, Saginaw, Sanilac, or Tuscola counties.

^eHunted in Allegan, Barry, Berrien, Cass, Kalamazoo, St. Joseph, or Van Buren counties.

Table 17. The proportion of active duck hunters that supported or opposed having a single statewide hunting zone with a continuous duck season (i.e., no split season) in future years.

Hunt area or preferred duck to harvest ^a	Strongly support		Somewhat support		Not sure		Somewhat oppose		Strongly oppose		Unknown	
	%	95% CL	%	95% CL	%	95% CL	%	95% CL	%	95% CL	%	95% CL
North Zone	16	6	9	4	21	7	13	5	34	7	6	4
Eastern Upper Peninsula ^b	17	8	13	7	19	8	15	7	30	9	5	4
Middle Zone	14	4	12	3	28	5	13	3	25	4	9	3
Northwest Lower Peninsula ^c	7	5	11	7	22	8	14	7	36	10	10	6
South Zone	13	2	10	2	22	3	13	2	35	3	7	2
Saginaw Bay ^d	14	4	12	4	22	5	16	4	31	5	6	3
Southwest Lower Peninsula ^e	11	5	9	4	22	6	15	6	35	7	7	4
Diver ducks	19	7	5	4	16	7	13	6	41	9	6	4
Mallards	13	3	11	2	24	3	14	3	30	4	7	2
Other dabbling ducks	17	6	8	4	18	6	11	5	35	7	10	4
Statewide	14	2	10	2	23	2	13	2	32	2	8	1

^aEstimates were summarized by the hunter's preferred hunting zone (North, Middle, or South) and for hunters that had hunted in selected areas (EUP, NWLP, Saginaw Bay, and SWLP) in 2018, and among hunters statewide that preferred to harvest diver ducks, mallards, or other types of dabbling ducks.

^bHunted in Chippewa or Mackinac counties.

^cHunted in Antrim, Benzie, Charlevoix, Emmet, Grand Traverse, Leelanau, Mason, or Manistee counties.

^dHunted in Arenac, Bay, Huron, Midland, Saginaw, Sanilac, or Tuscola counties.

^eHunted in Allegan, Barry, Berrien, Cass, Kalamazoo, St. Joseph, or Van Buren counties.

Table 18. Comparison of estimates of waterfowl hunter numbers, hunting effort, and harvest in Michigan during 2018 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			37,798	1,249	
Hunting effort			296,094	18,740	
Harvest			375,480	32,657	
Geese					
Hunters			29,859	1,244	
Hunting effort			235,224	18,976	
Harvest			196,877	24,872	
Ducks and geese combined					
Hunters			43,936	1,186	

^aRaftovich et al (2019).

*Non-overlapping 95% confidence intervals indicated estimates from the surveys were significantly different (P<0.05).

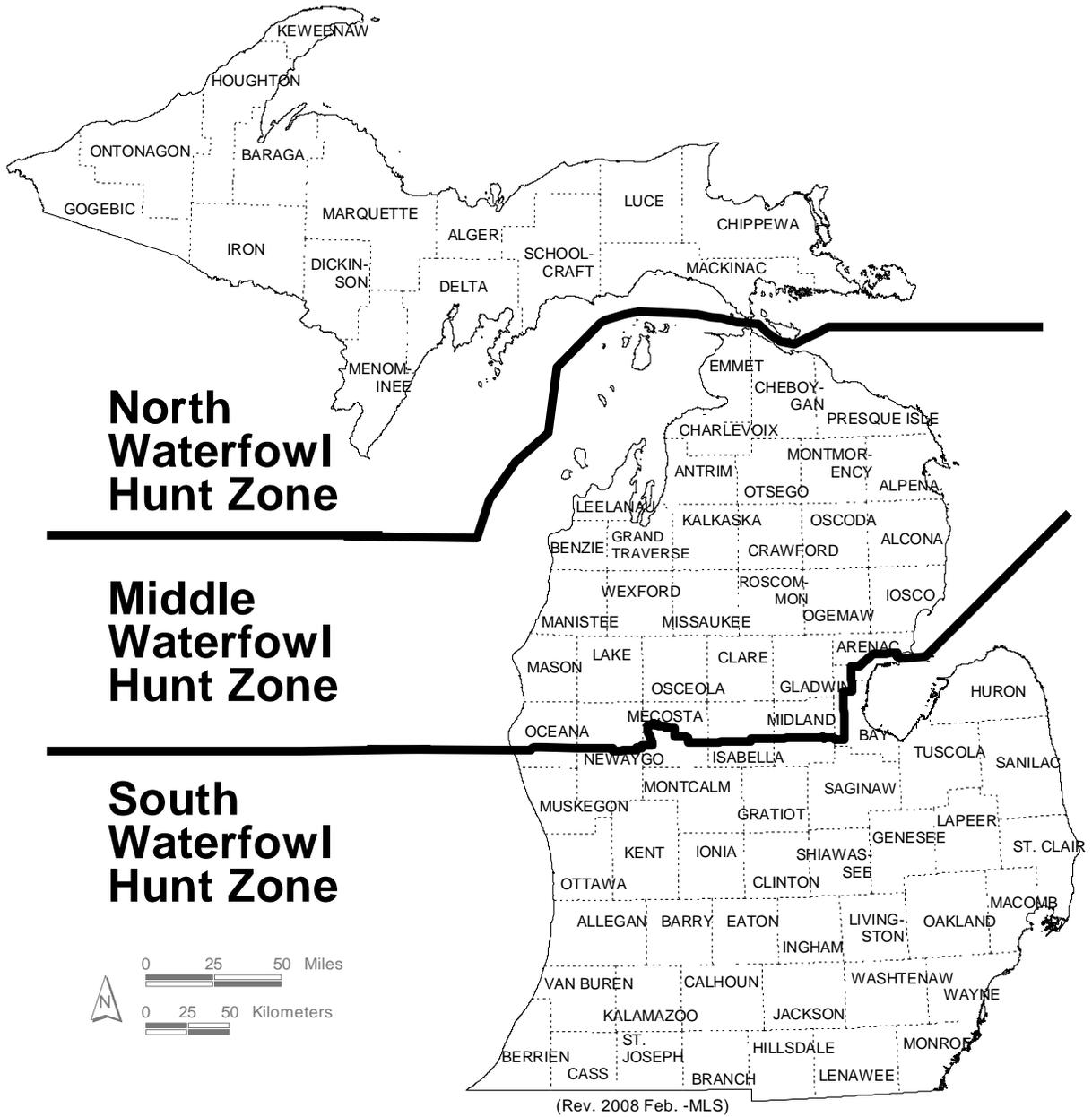


Figure 1. Areas used to summarize the waterfowl survey data for the 2018 waterfowl hunting seasons in Michigan. Regional boundaries did not match the waterfowl management hunting zones.

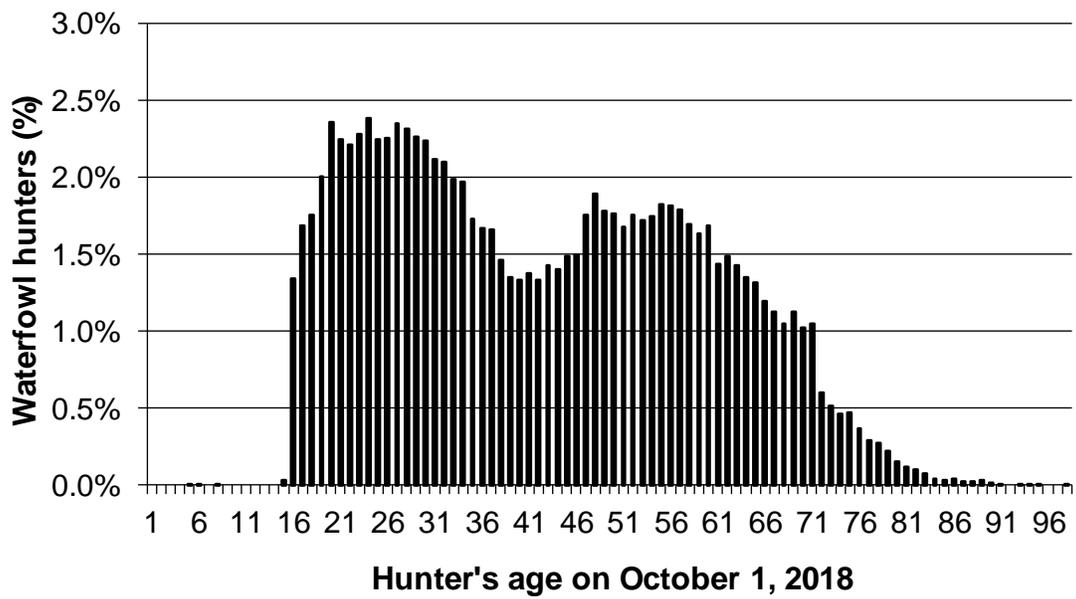


Figure 2. Age of people that purchased a waterfowl hunting license in Michigan for the 2018 hunting seasons ($\bar{x} = 42$ years). Hunters less than 16 years of age could legally hunt waterfowl without a waterfowl hunting license.

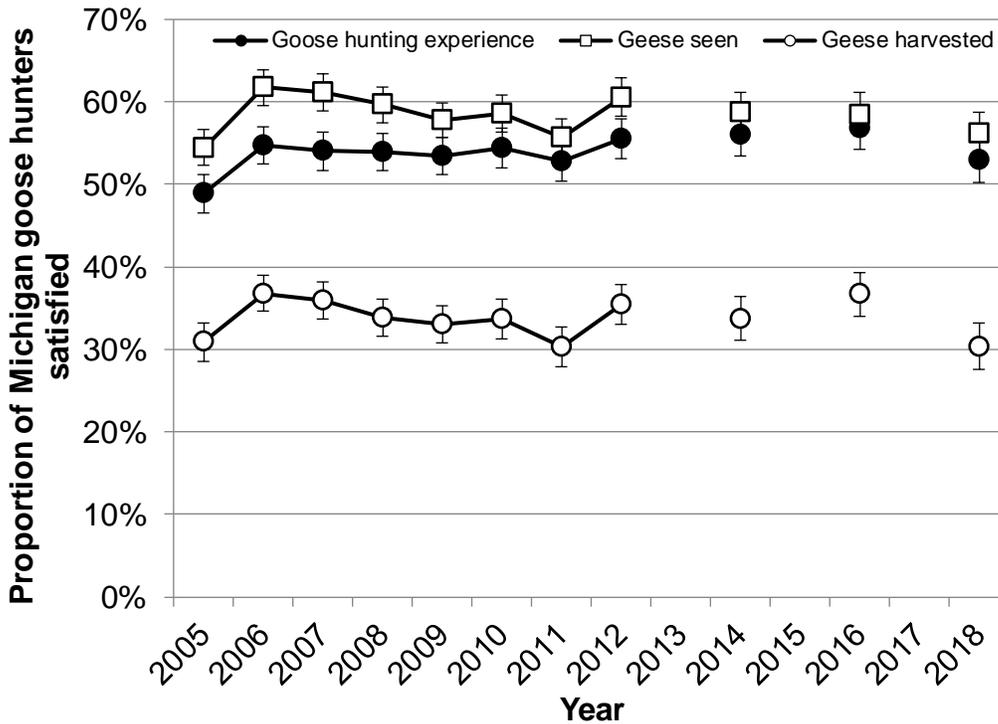
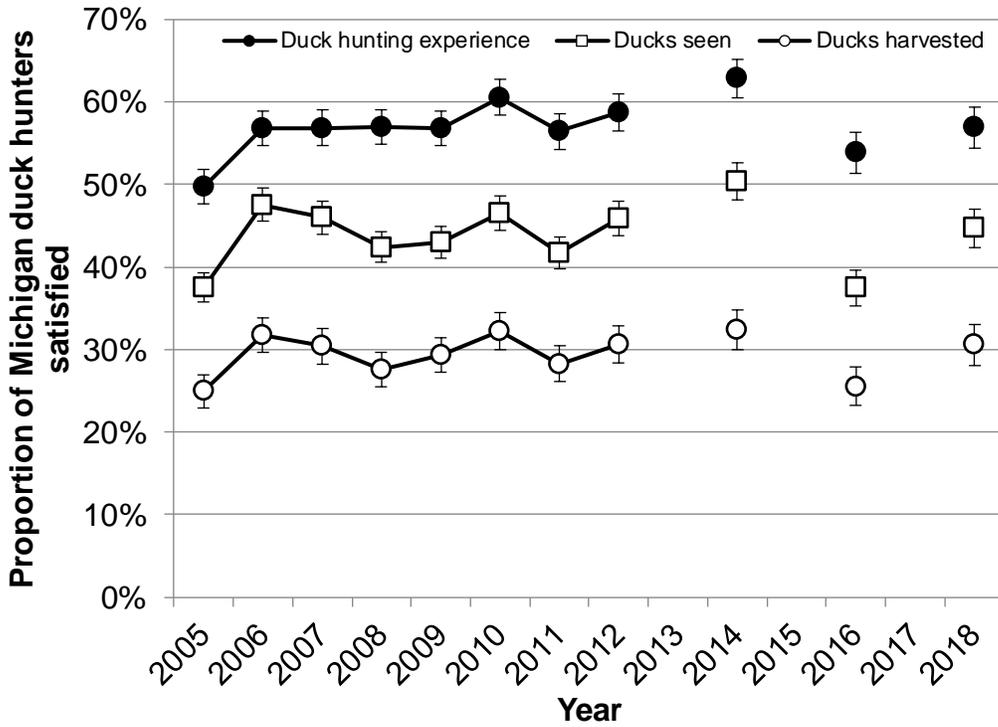


Figure 3. Proportion of Michigan goose and duck hunters satisfied with their overall hunting experience and the amount of waterfowl seen and harvested. Satisfaction measures the proportion of hunters that were very satisfied or somewhat satisfied. Error bars represent the 95% confidence limit.

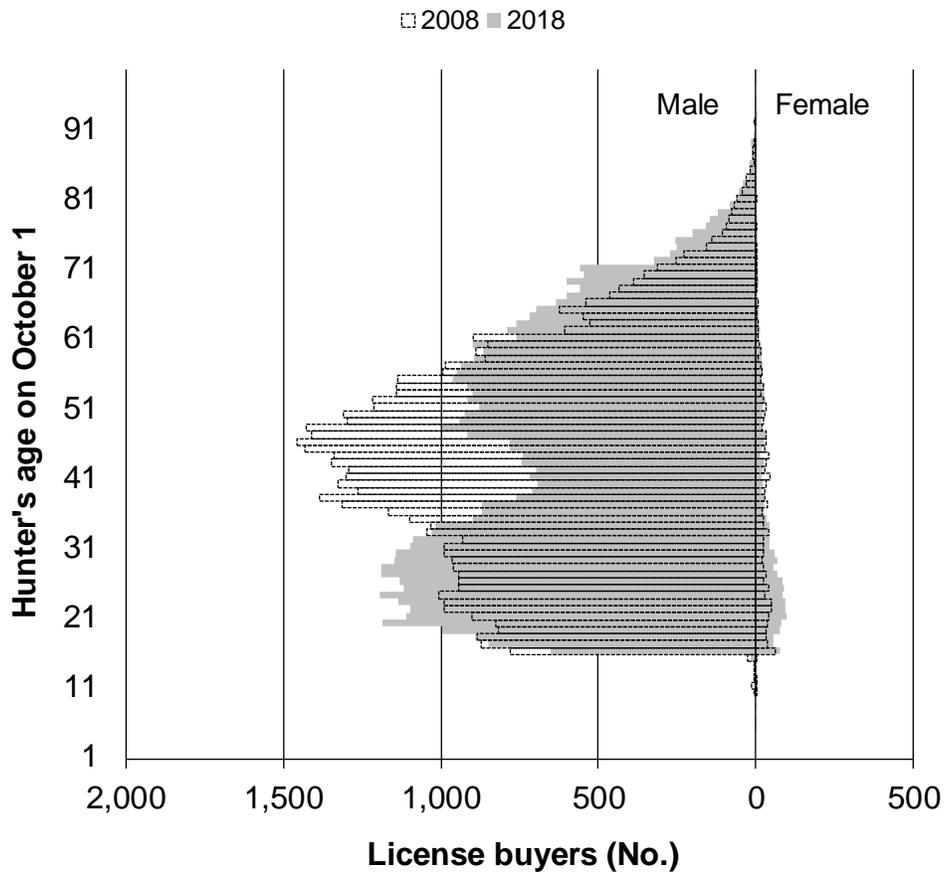


Figure 4. Number of waterfowl hunting license buyers in Michigan by age and sex during 2008 and 2018 hunting seasons. Waterfowl hunting licenses were purchased by 53,828 people in 2008 and 58,036 people in 2018. Hunters less than 16 years of age could legally hunt waterfowl without a waterfowl hunting license.

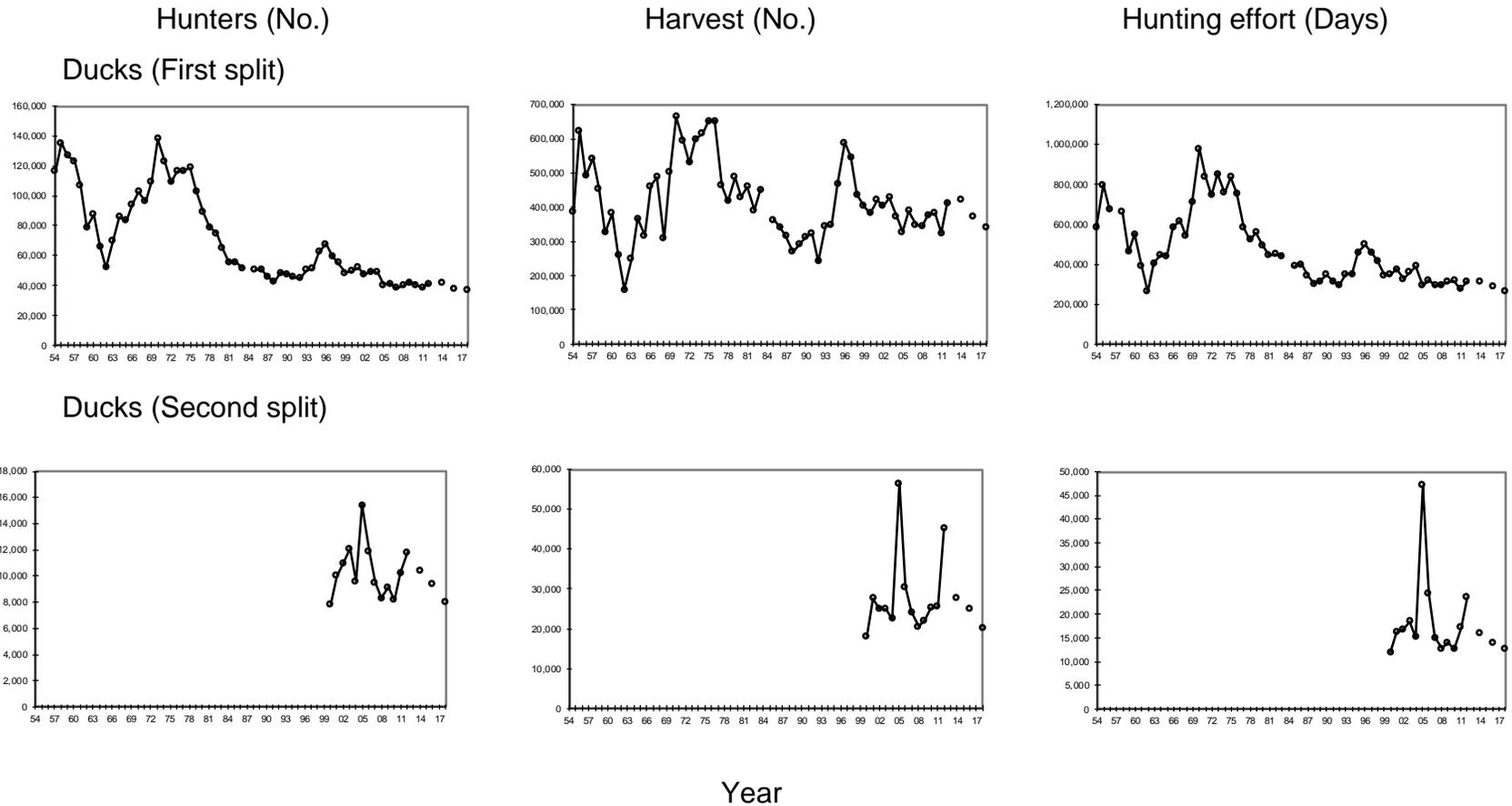


Figure 5. Estimated number of hunters, harvest, and hunting effort in Michigan during the waterfowl hunting seasons, 1954-2018. No estimates were available or no seasons existed during years when no data are plotted.

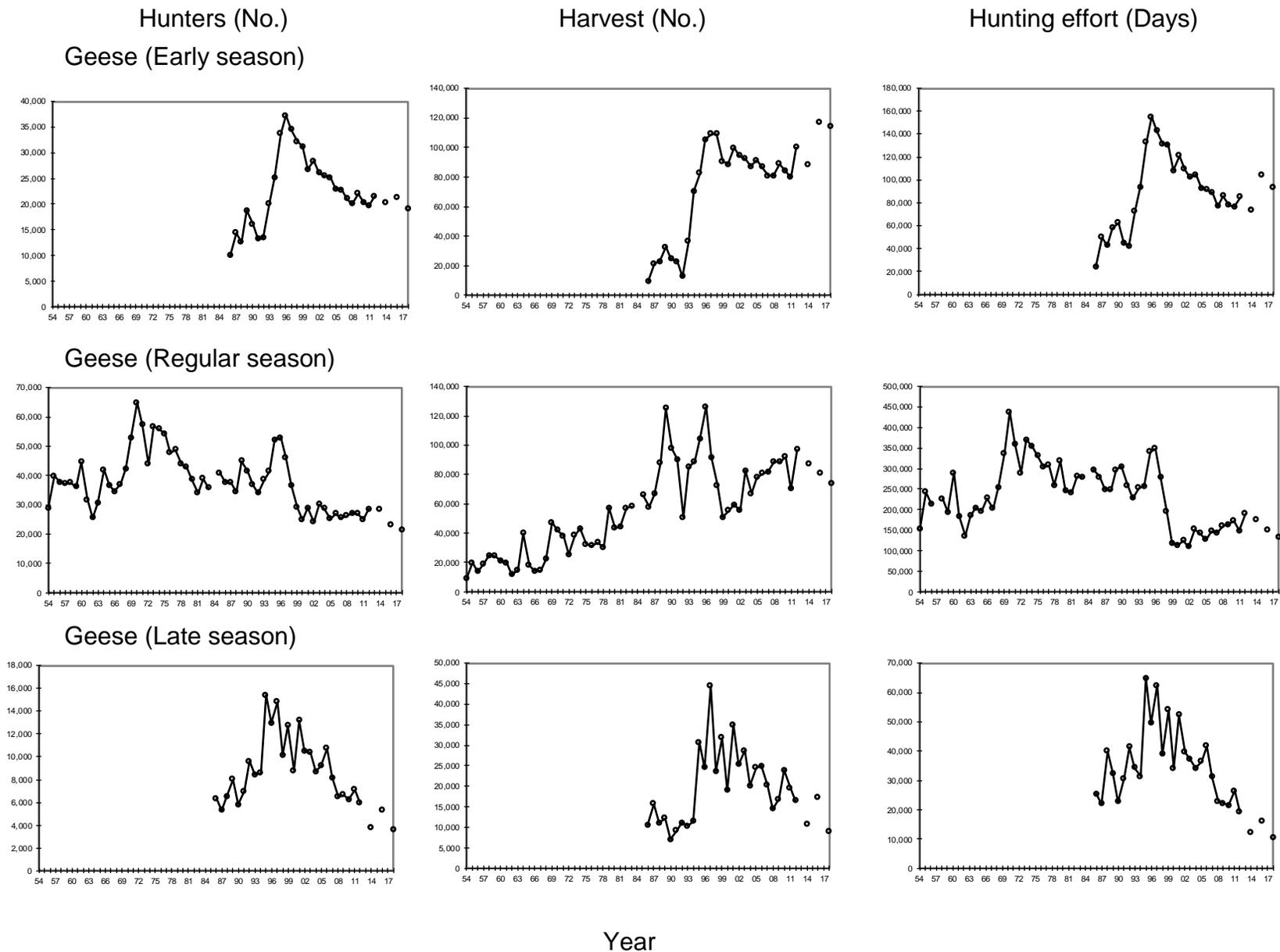
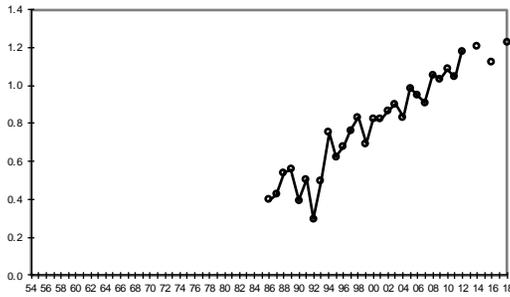


Figure 5 (continued). Estimated number of hunters, harvest, and hunting effort in Michigan during the waterfowl hunting seasons, 1954-2018. No estimates were available or no seasons existed during years when no data are plotted.

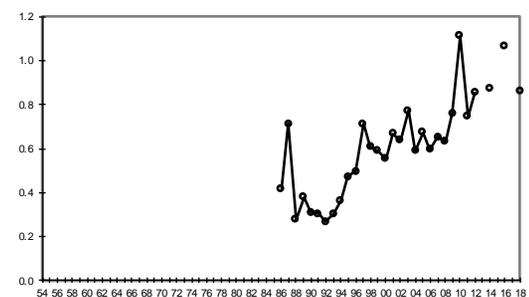
Geese (Regular season)



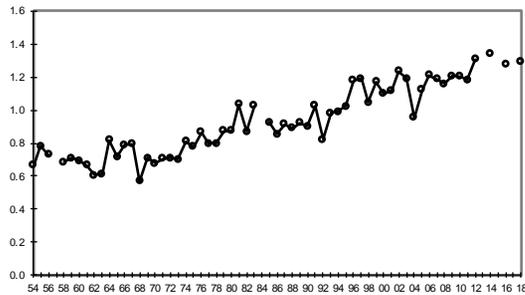
Geese (Early season)



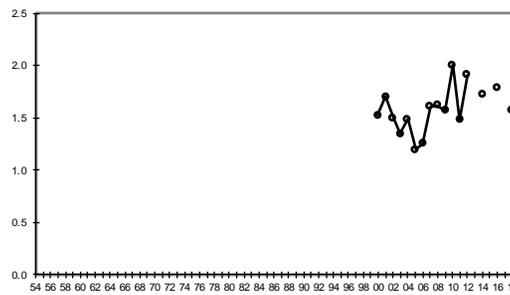
Geese (Late season)



Ducks (First split)



Ducks (Second split)



Year

Figure 6. Estimated harvest per effort in Michigan during the waterfowl hunting seasons, 1954-2018. No estimates were available or no seasons existed during years when no data are plotted.

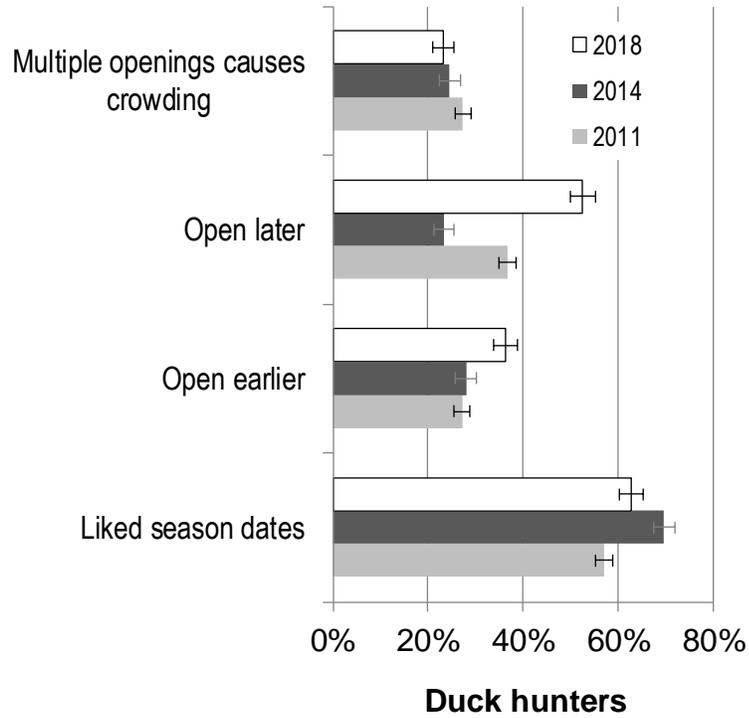


Figure 7. The proportion of duck hunters that agreed (i.e., strongly agreed or somewhat agreed) with various statements about the waterfowl hunting seasons and hunting regulations in Michigan in 2011, 2014, and 2018.

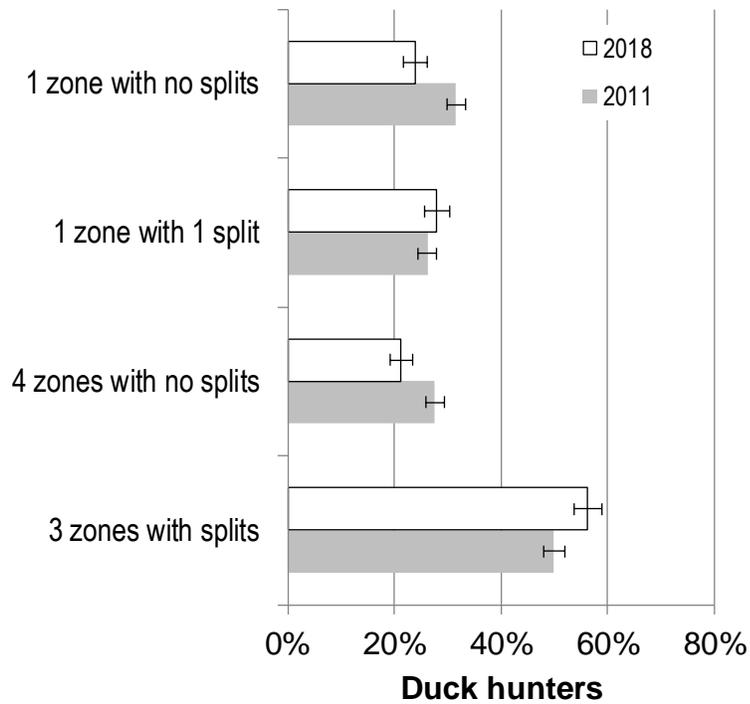


Figure 8. The proportion of duck hunters that supported (i.e., strongly supported or somewhat supported) various options for the waterfowl hunting zones and season splits in Michigan during 2011 and 2018.

APPENDIX A

2018-2019 Waterfowl Harvest Questionnaire



2018-2019 WATERFOWL HARVEST REPORT

This information is requested under the 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 or harvest any waterfowl. Please report only your hunting activities and the birds that you harvested.

1. Did you hunt ducks or geese in Michigan during September 1, 2018, through February 11, 2019 (2018-19 hunting season)?

- 1 Yes. Please complete the table below and answer questions on the next page.
2 No. Skip to Question #6.

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 are listed below.)</i>	COUNTY HUNTED <i>(For each season you hunted, list the counties hunted on separate lines.)</i>	MANAGEMENT ZONE			DAYS HUNTED	NUMBER OF BIRDS TAKEN	LAND TYPE		
		North (UP)	Middle (NLP)	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 – 16 (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 29 – Nov 25 (North Zone) Oct 6 – Dec 2 (Middle Zone) Oct 13 – Dec 9 (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) Dec 1-2 (North Zone) Dec 15-16 (Middle Zone) Dec 29 – 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 <input type="checkbox"/> Goose Early Segment Sept 1-30 (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"/>
5 <input type="checkbox"/> Goose Oct 1-Dec 16 (North Zone) Oct 6-Dec 21 (Middle Zone) Oct 13 – Dec 9 & Dec 29- 30 (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 26 – 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 2018-19 hunting season?

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

3. How many days did you specifically hunt for sea ducks during the 2018-19 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 2018-19 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 2018-2019 waterfowl hunting season and hunting regulations:

(Select one choice per item.)

	Very Satisfied	Somewhat Satisfied	Neutral	Somewhat Dissatisfied	Very 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. <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"/>
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"/>
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"/>

6. 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)

7. What is your preferred duck species to harvest in Michigan? (Check one.)

- 1 Diving ducks and sea ducks 2 Mallards 3 Other dabbling ducks (e.g., wood ducks, teal, pintail) 4 I don't have a preferred duck species

For the following question, you will be asked about the timing of the duck hunting season in the zone where you prefer to hunt. The 2018 dates of the duck hunting seasons are listed below to assist you in answering these questions.

Zone	2018 duck hunting season dates
North Zone	September 29 – November 25 and December 1 – 2
Middle Zone	October 6 – December 2 and December 15 – 16
South Zone	October 13 – December 9 and December 29 – 30

8. For the zone where you prefer to hunt, how much do you agree or disagree with the following statements about the dates of the duck season:

(Select one choice per item.)

	Strongly Agree	Somewhat Agree	Not Sure	Somewhat Disagree	Strongly Disagree
a. Overall, I liked the duck hunting season dates used in 2018.	1 <input type="checkbox"/>	2 <input type="checkbox"/>	3 <input type="checkbox"/>	4 <input type="checkbox"/>	5 <input type="checkbox"/>
b. I would prefer the duck season begin <u>earlier</u> .	1 <input type="checkbox"/>	2 <input type="checkbox"/>	3 <input type="checkbox"/>	4 <input type="checkbox"/>	5 <input type="checkbox"/>
c. I would prefer the duck season stay open <u>later</u> .	1 <input type="checkbox"/>	2 <input type="checkbox"/>	3 <input type="checkbox"/>	4 <input type="checkbox"/>	5 <input type="checkbox"/>
d. The different opening dates among the zones created crowding in the area where I hunt.	1 <input type="checkbox"/>	2 <input type="checkbox"/>	3 <input type="checkbox"/>	4 <input type="checkbox"/>	5 <input type="checkbox"/>

9. The state of Michigan has the opportunity to adopt one of four duck hunting zone and split season options for the next 5 years. Please indicate whether you would support or oppose the following options.

(Select one choice per option.)

	Strongly Support	Somewhat Support	Not Sure	Somewhat Oppose	Strongly Oppose
a. Have <u>3 zones</u> , with the opportunity to have different duck season dates in each zone and to <u>split seasons within each zone into early and late segments</u> with a break between segments. This is the option currently used in Michigan for duck seasons.	1 <input type="checkbox"/>	2 <input type="checkbox"/>	3 <input type="checkbox"/>	4 <input type="checkbox"/>	5 <input type="checkbox"/>
b. Have <u>4 zones</u> , with the opportunity to have different duck season dates in each zone but <u>no opportunity to split seasons into early and late segments</u> with a break between segments (i.e., continuous duck season dates).	1 <input type="checkbox"/>	2 <input type="checkbox"/>	3 <input type="checkbox"/>	4 <input type="checkbox"/>	5 <input type="checkbox"/>
c. Make the entire state <u>one zone</u> , with the same duck season dates statewide and the opportunity to <u>split the duck season into one early and late segment</u> with a break between segments.	1 <input type="checkbox"/>	2 <input type="checkbox"/>	3 <input type="checkbox"/>	4 <input type="checkbox"/>	5 <input type="checkbox"/>
d. Make the entire state <u>one zone</u> with the <u>same continuous duck season dates statewide</u> .	1 <input type="checkbox"/>	2 <input type="checkbox"/>	3 <input type="checkbox"/>	4 <input type="checkbox"/>	5 <input type="checkbox"/>