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CROSSBOW DEER HUNTER SURVEY

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ABSTRACT

Beginning in 2009, crossbows were allowed for use in Michigan's archery deer hunting season in an attempt to expand hunting opportunities, retain existing hunters, and recruit new hunters. An evaluation was done to assess whether these objectives had been met and to determine crossbow hunters' opinions about the use of crossbows. The number of people hunting in the archery season increased 13% statewide since crossbow hunting opportunities was expanded (between 2008 and 2011). In contrast, participation in all deer hunting seasons declined 7% during this same period. The proportion of archers using a crossbow statewide increased from 19% in 2009 to 37% in 2011. The number of crossbow archers in Michigan more than doubled between 2009 and 2011. The number of deer harvested with crossbows also more than doubled during 2009-2011, although hunter success among archers using crossbows was similar each year. Harvest by crossbow hunters increased in each successive year during 2009-2011; yet, harvest of deer during all deer hunting seasons combined did not increase each year. An estimated 118,573 archers used a crossbow during the Michigan archery season in 2011. About 74% of the hunters (71,305) using a crossbow in 2011 had hunted in the archery season during one of the three years prior to authorization of crossbows. About 25% (24,438) of the crossbow hunters in 2011 had not hunted during the archery season during the three years prior to expanded use of crossbows (i.e., newly recruited archers). In addition, about 19% (18,731) of the hunters using a crossbow in 2011 had never hunted with anything other than a firearm prior to the expanded use of crossbows. About 88% of the crossbow hunters indicated their experience hunting with a crossbow had met all or most of their expectations. About 65% of the crossbow hunters indicated crossbows had either greatly improved or

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improved the quality of their hunt. At least 77% of the crossbow hunters agreed that in comparison to other types of bows (1) crossbows were easier to use, (2) it took less time to become proficient with crossbows, (3) they were more accurate with crossbows, and (4) they were more confident they could harvest a deer using a crossbow. About 50% of crossbow hunters agreed that (1) using crossbows allowed them to hunt more often, (2) they would not hunt during the archery season if crossbows could not be used, and (3) they would not want to hunt in the archery season if crossbows could not be used. About 52% of crossbow hunters reported using crossbows increased how often they hunted in the archery season, and 27% indicated using a crossbow had increased the number of deer they took in the archery season. About 96% of the crossbow hunters planned to use a crossbow to hunt in future archery seasons in Michigan. In addition, 57% of crossbow hunters planned to increase the amount of time they hunt in future seasons.

INTRODUCTION

Prior to 2009, only hunters with disabilities had an option to use a crossbow to hunt deer during the archery season in Michigan. Interest in allowing expanded use of crossbows has grown as the average age of hunters has increased because older hunters often have physical limitations that make it difficult to use other types of bows. As hunting participation in Michigan has declined in recent years (Frawley 2006), expanded use of crossbows has been viewed as an option to expand hunting opportunities, retain existing hunters, and recruit new hunters.

The archery season in Michigan occurred statewide on public and private lands. This season was divided into early and late season segments (October 1 through November 14 and December 1 through January 1 of the following year). Crossbows were authorized for use to hunt deer during Michigan's archery season in 2009, except in the Upper Peninsula where crossbow use was prohibited during the late archery season segment (unless the hunter had disabilities). Outside of Zone 3 (southern Lower Peninsula), only hunters 50 years of age or older could take advantage of this expanded opportunity in 2009. Limits on the velocity of the crossbow were also in place in 2009, restricting hunters to use of crossbows that fired bolts at no more than 350 feet per second. Starting in 2010, the age and velocity restrictions on crossbow use were eliminated.

The Natural Resources Commission and Wildlife Division have the authority and responsibility to protect and manage the wildlife resources of the state of Michigan. Opinion surveys are a management tool used by the Wildlife Division to accomplish its statutory responsibility. The main objectives of this opinion survey were to determine why hunters used crossbows, whether using crossbows had met hunters' expectations, and whether hunters planned to continue to use crossbows in the future. This information will aid in determining whether the changes in crossbow regulations met the intent of expanding hunting opportunities, retaining existing hunters, and recruiting new hunters.

METHODS

Hunters using a crossbow were required to obtain either a free DNR-issued crossbow stamp each year they hunted or obtain a free DNR-issued crossbow permit. The crossbow stamp was available annually beginning in 2009 to all hunters wanting to hunt with a crossbow during the archery season, except in the Upper Peninsula (UP) where crossbow use was prohibited during the late archery season segment. Alternatively, a crossbow permit was available to hunters certified as being disabled by a licensed or registered physician, physical or occupational therapist. These crossbow permits allowed a hunter to use a crossbow for the taking of deer during any open season, including the late archery season segment in the UP. The crossbow permits for hunters with disabilities were available prior to 2009 when the crossbow stamp was created. Most of these permits were issued to individuals with permanent disabilities; thus, most permits did not expire.

Three years after the crossbow was authorized for use in Michigan's archery season, a questionnaire (Appendix A) was sent to a random sample of 2,000 hunters that had reported they had used a crossbow in the archery season during 2011. This sample represented randomly selected hunters included in the annual deer harvest survey conducted by the Wildlife Division (Frawley 2012). Hunters receiving the crossbow survey were asked to indicate their opinion about the use of crossbows.

Estimates were calculated using a random sampling design (Cochran 1977). Estimates were calculated along with their 95% confidence limit (CL). This CL could be added and subtracted from the estimate to calculate the 95% confidence interval. The confidence interval was a measure of the precision associated with the estimate and implied the true value would be within this interval 95 times out of 100. Estimates were not adjusted for possible response or nonresponse bias.

The primary target of this survey was archers that used a crossbow under the expanded opportunities created during the archery season beginning in 2009. However, the sample of crossbow hunters was drawn from an annual harvest survey that included crossbow hunters with either a crossbow stamp or a crossbow permit. Additionally, the sample included some archers using a crossbow without either a crossbow stamp or permit. Thus, the sample was broader than the target population because it included some archers using a crossbow under the authority of a crossbow permit for hunters with disabilities. Because archers having a crossbow permit for hunters with disabilities were not the target of this survey, they were excluded when deriving most estimates from the survey (i.e., see estimation of subpopulations, Cochran 1977).

The random sample of people receiving the questionnaire included 2,000 hunters. Questionnaires were initially mailed during early October 2012. One follow-up questionnaire was mailed to nonrespondents in early November. To increase the number of questionnaires returned, respondents that returned their questionnaire promptly were eligible to win a prize of a crossbow. Although 2,000 people were sent the questionnaire, 15 surveys were undeliverable resulting in an adjusted sample size of 1,985 (i.e., minus undeliverable questionnaires). Questionnaires were returned by 1,475 people, yielding a 74% adjusted response rate.

RESULTS AND DISCUSSION

Crossbows were authorized for hunting deer during Michigan's archery season in 2009, except in the UP where crossbow use was prohibited during the late archery season segment. In 2009, only hunters 50 years of age or older outside of the southern Lower Peninsula could use crossbows with a crossbow stamp. Starting in 2010, this age restriction was eliminated. The number of people obtaining a crossbow stamp was 45,692 in 2009; 64,340 in 2010; and 74,120 in 2011 (Figure 1).

The average age of crossbow stamp holders was greater than among all deer hunting license buyers during 2009-2011 (Figure 2). The mean age of deer hunting license buyers increased each year during 2009-2011; however, the mean age of people obtaining a crossbow stamp declined each year (Figure 3). The declining age of crossbow stamp holders was indicative of younger hunters choosing to use crossbows in each successive year throughout 2009-2011. Crossbow use was initially greatest among older hunters because in 2009 archers using crossbows outside of the southern Lower Peninsula had to 50 years of age or older. The average age of those using crossbows probably remained higher after 2009 because older hunters were more likely to have some limitations that prevented them from using other types of bows.

Based on estimates from annual deer harvest surveys (e.g., Frawley 2012), the number of people hunting deer during all deer hunting seasons in Michigan declined 7% and deer harvested declined 13% between 2008 and 2011 (i.e., after crossbows were allowed in the archery season). Furthermore, the number of hunters participating in the regular firearm season (November 15-30) declined 10% and deer taken declined 27% during this same period. In contrast, the number of people hunting in the archery season increased 13% and deer taken increased 24% between 2008 and 2011 (Tables 1-2). Thus, authorization of crossbow use during the archery season appeared to help increase hunter participation and deer harvest in the archery season since 2008.

Although the number of hunters and deer harvested in the regular firearm season decreased at the same time participation and harvest increased in the archery season, it was not possible to ascribe these changes solely to the authorization of crossbows. The opening date for the regular firearm season was known to affect the annual changes in deer harvest and hunter participation in the regular firearm season. Generally, participation and harvest in the regular firearm season have been greatest for seasons starting Thursday through Sunday. The regular firearm season started on Saturday in 2008, Sunday in 2009, Monday in 2010, and Tuesday in 2011. Thus, annual changes in harvest and participation in the regular firearm season were confounded by the changes in crossbow usage in the archery season.

The opportunity for archers to harvest deer with a crossbow did not lead directly to a higher harvest of deer overall (Table 1). The total harvest of deer during the archery season increased in 2009 and 2011 compared to the prior years, but was nearly unchanged from 2009-2010 (Table 2). The total harvest of deer during all seasons combined declined or was similar to prior years in each year during which archers could use crossbows. This occurred

despite a more than doubling of the number of deer harvested with crossbows 2009-2011 (Table 5).

Hunters were presented six statements about how using crossbows for deer hunting in Michigan had affected their hunting effort and harvest during archery and regular firearm deer hunting seasons, as well as how crossbows may affect future hunting effort (Tables 3-4). About 52% of crossbow hunters reported using crossbows increased how often they hunted in the archery season, and 27% indicated using a crossbow had increased the number of deer they took in the archery season. About 87% of crossbow hunters reported using crossbows in the archery season had not changed how often they hunted in the regular firearm season. Furthermore, 86% of crossbow hunters reported their harvest was unchanged in the regular firearm season.

The proportion of all archers using a crossbow increased from 19% in 2009 to 37% in 2011 (Table 5). For comparison, 26% of Georgia archers used a crossbow in the first year after crossbows were authorized in 2004 (Responsive Management 2005), and 25% of New Jersey archers used a crossbow in the first year after crossbows were allowed in 2009 (Kandoth and Roberts 2010). The number of crossbow archers in Michigan more than doubled between 2009 and 2011. The number of archers using a crossbow increased from 56,915 to 90,615 (59%) between 2009 and 2010, likely due to elimination of the age restriction. Crossbow archers increased another 31% between 2010 and 2011. The number of deer harvested with crossbows also more than doubled during 2009-2011, although the proportion of crossbow hunters who took at least one deer (hunter success) was similar each year (36-39%, Table 5).

Archers using a crossbow had higher hunting success than all archers combined (Figure 4). The addition of crossbow hunters in the archery season starting in 2009 likely increased overall hunting success among archers by 2-4 percentage points. (Hunter success without crossbows was predicted from a linear model that used the relationship between hunter success in the regular firearm season and archery season during 2000-2008.) For comparison, Ditchkoff et al. (2001) reported archers using crossbows in southeast Oklahoma were more successful than archers using other types of bows.

An estimated 118,573 hunters used a crossbow during the Michigan archery season in 2011 (Frawley 2012, Table 5). About 74 ± 2% of the archers using a crossbow in 2011 had obtained at least one crossbow stamp during 2009-2011; 15 ± 2% of these archers had obtained a crossbow permit (i.e., hunters with disabilities); and 80 ± 2% of these archers had either a crossbow stamp or permit.

About 74 ± 2% of the hunters (71,305 ± 2,945) using a crossbow in 2011 (excluding hunters having a crossbow permit) had hunted in the archery season during one of the three years prior to authorization of crossbows (i.e., 2006-2008). For comparison, 68% of Georgia hunters using crossbows in 2004 after they had been allowed in the archery season had previously hunted in the archery season (Responsive Management 2005). The compound bow was the most commonly used hunting device (96 ± 1%) among previously active hunters in Michigan. A recurve bow was used by 6 ± 2% and a longbow was used by 2 ± 1%. (Proportions were greater than 100% because a few hunters reported using more than one device.)

About 25 ± 2% (24,438 ± 2,433) of the crossbow hunters in 2011 had not hunted during the archery season during the three years prior to authorization of crossbows (i.e., newly recruited archers, excluding hunters having a crossbow permit). In addition, about 19 ± 2% (18,731 ± 2,194) of the hunters using a crossbow in 2011 had hunted with firearms only prior to the authorization of crossbows.

About 96 ± 1% of the hunters using a crossbow in 2011 (96,225 ± 2,353; excluding hunters having a crossbow permit) reported they had hunted in the archery season during 2009-2011. (About 4% of hunters did not report hunting during 2009-2011, although these same hunters had previously reported hunting for the annual harvest survey.) The crossbow was the most commonly used hunting device (98 ± 1%) among active crossbow hunters. A compound bow was used by 36 ± 3%, a recurve bow was used by 2 ± 1%, and a longbow was used by 1 ± 1% of active hunters.

About 88 ± 2% of the hunters using a crossbow in 2011 (excluding hunters having a crossbow permit) indicated their experience hunting with a crossbow met all or most of their expectations (43 ± 3% reported all of their expectations were met and 45 ± 3% reported most of their expectations were met). In contrast, 6 ± 1% of crossbow hunters indicated that some or all of their expectations were not met.

About 65 ± 3% of the hunters using a crossbow in 2011 (excluding hunters having a crossbow permit) indicated crossbows had either greatly improved or improved the quality of their hunt (26 ± 2% reported greatly improved conditions while 39 ± 3% reported improved conditions). In contrast, 2 ± 1% of crossbow hunters indicated crossbows had either greatly decreased or decreased the quality of their hunt.

Crossbow hunters were presented nine statements about the use of crossbows for deer hunting in Michigan and were asked to indicate how much they agreed or disagreed with these statements (Tables 6-7). The nine statements were designed to evaluate some reasons why these hunters may have decided to use crossbows over other types of bows.

At least 77% of the crossbow hunters agreed (1) crossbows were easier to use, (2) it took less time to become proficient with crossbows, (3) they were more accurate with crossbows, and (4) they were more confident they could harvest a deer using a crossbow than with other types of bows (Tables 6-7). About 50% of crossbow hunters agreed that (1) using crossbows allowed them to hunt more often, (2) they would not hunt during the archery season if crossbows could not be used, and (3) they would not want to hunt in the archery season if crossbows could not be used. Less than 30% of crossbow hunters stated they used crossbows because it was either (1) more satisfying or (2) more challenging to hunt with crossbows than other types of bows.

About 96 ± 1% of the crossbow hunters planned to use a crossbow to hunt in future archery seasons in Michigan. In contrast, 26 ± 2% of the crossbow hunters planned to use a compound bow in the future. In addition, 57% of crossbow hunters planned to increase the amount of time they hunt in future seasons (Tables 3-4).

Among newly recruited archers using a crossbow in 2011 (24,438 ± 2,433), at least 70% agreed that (1) using crossbows allowed them to hunt more often, (2) they would not hunt during the archery season if crossbows could not be used, and (3) they would not want to hunt in the archery season if crossbows could not be used (Table 8). A higher proportion of the newly recruited crossbow hunters agreed with these statements than among all crossbows hunters (compare Tables 6 and 8). In addition, 83% of the newly recruited archers reported using crossbows increased how often they hunted in the archery season (Table 9). This was higher than among all crossbows hunters (compare Tables 3 and 9).

Authorization of crossbows during Michigan's archery deer season appeared to be an important factor for recruiting and retaining a number of new archers, increasing the recreational opportunity for those that had previously hunted in the archery season, and improving the quality of hunts for archers using a crossbow. Most archers that used a crossbow indicated their experience using crossbows met most or all of their expectations, and nearly all crossbow hunters planned to use crossbows again in future seasons. Crossbow hunters had higher hunting success than archers using other types of bows, although the expanded opportunity did not produce a consistently higher archery harvest or increase the number of deer harvested during all seasons combined. These expanded opportunities appear to have increased archer numbers in Michigan, although crossbow use did not reverse the longer-term decline in deer hunter numbers in Michigan.

ACKNOWLEDGEMENTS

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LITERATURE CITED

Cochran, W. G. 1977. Sampling techniques. John Wiley & Sons, New York. USA.

Frawley, B. J. 2006. Demographics, recruitment, and retention of Michigan hunters: 2005 update. Wildlife Division Report 3462. Michigan Department of Natural Resources, Lansing, USA.

Frawley, B. J. 2012. Michigan deer harvest survey report: 2011 seasons. Wildlife Division Report 3548. Michigan Department of Natural Resources, Lansing, USA.

Kandoth, C., and D. Roberts. 2010. An assessment of New Jersey resident bow hunter participation. New Jersey Division of Fish and Wildlife. Trenton, USA.

Responsive Management. 2005. Georgia wildlife harvest survey 2004-2005. Responsive Management, Harrisonburg, Virginia. USA.

Ditchkoff, S. S., W. R. Starry, R. E. Masters, and C. W. Deurmyer. 2001. Hunter success and selectivity using crossbows. Proceedings of the Annual Conference of the Southeast Association of Fish and Wildlife Agencies. 55:560–566.

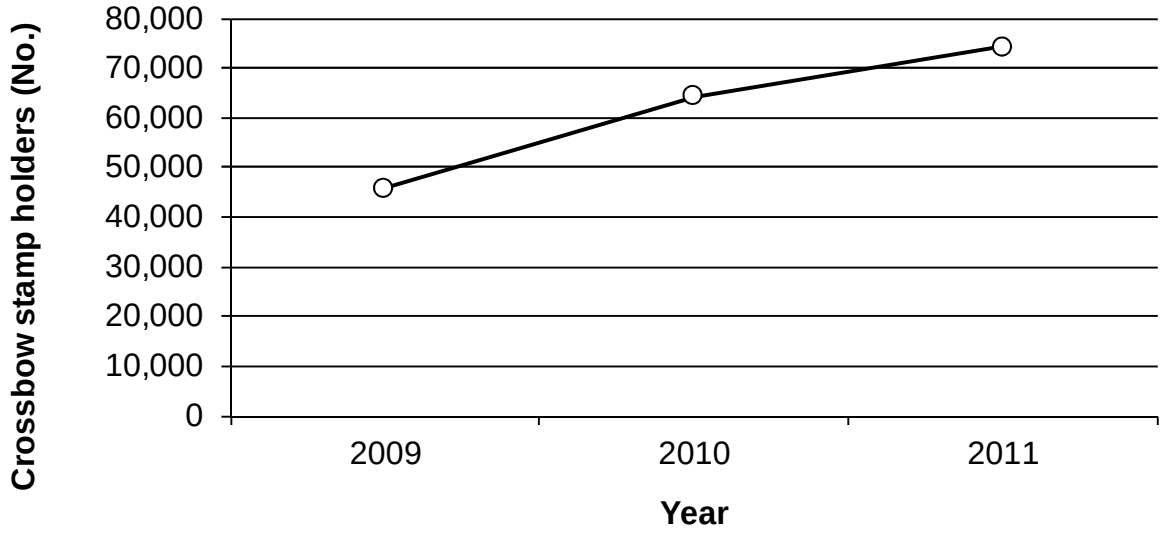

Figure 1. Number of people obtaining a crossbow stamp in Michigan, 2009-2011. Crossbow was authorized for use in the archery season in 2009.

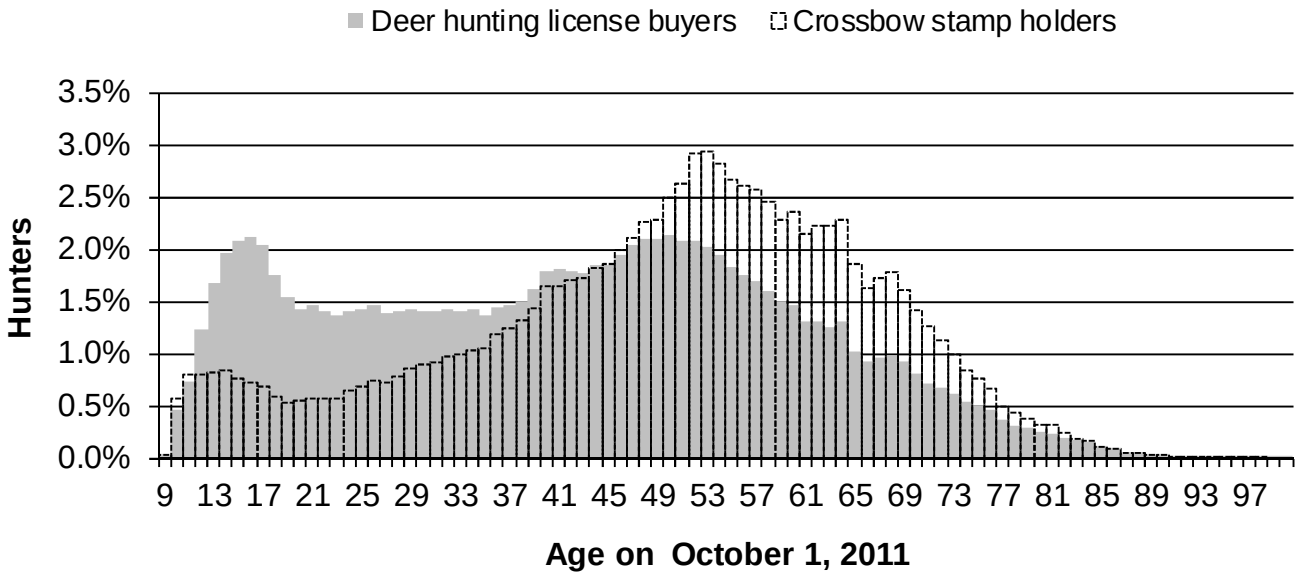

Figure 2. Proportion of deer hunting license buyers (all types) and crossbow stamp holders within each age class in Michigan during 2009-2011. The mean age of deer hunting license buyers was 42, while the mean age of crossbow stamp holders was 50.

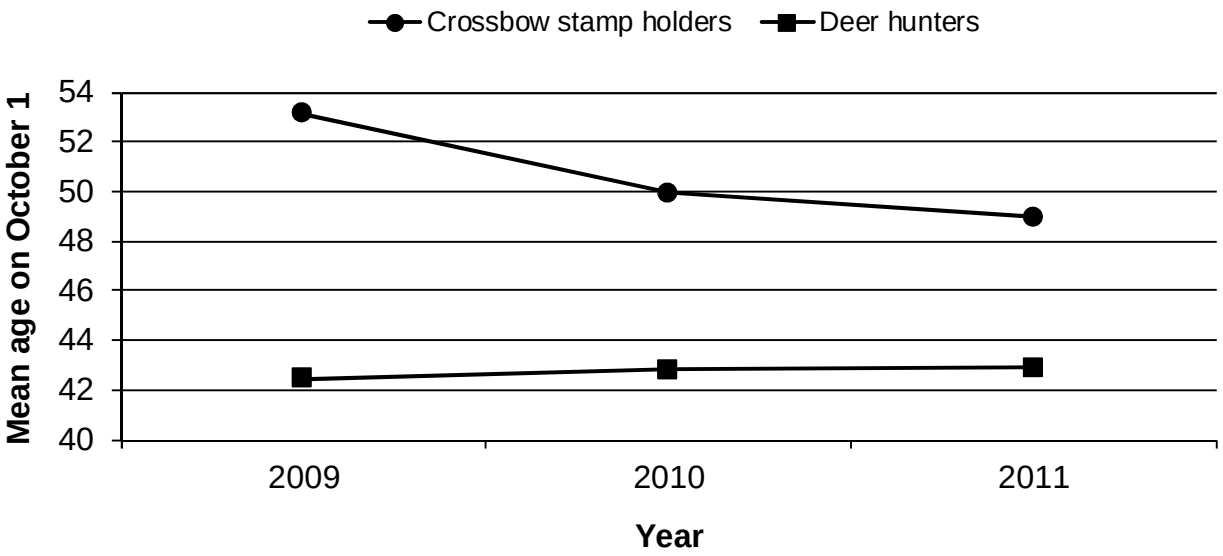

Figure 3. The mean age of people obtaining a deer hunting license (all types) and a crossbow stamp in Michigan, 2009-2011.

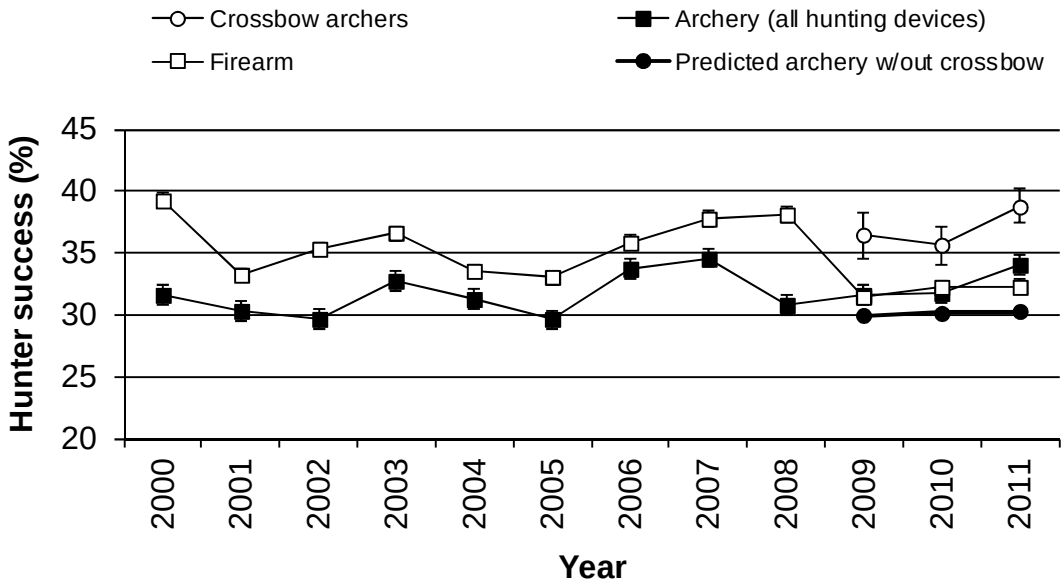

Figure 4. Hunter success in Michigan's archery and regular firearm seasons, 2000-2011. Hunter success in the archery season was estimated for all archers, archers using a crossbow (started in 2009), and predicted among all archers since 2009 if crossbows had not been authorized. Hunter success without crossbows was predicted using the historic relationship between hunter success in the regular firearm season and archery season during 2000-2008.

Table 1. Number of deer hunters in Michigan by hunting season, 2006-2011. [a]

	Deer hunting season					
	All seasons[b]		Regular firearm		Archery	
Year	No.	95% CL[c]	No.	95% CL	No.	95% CL
2006	691,073	1,765	630,379	2,684	309,140	3,951
2007	682,962	1,700	620,192	2,632	300,254	3,846
2008	693,817	1,700	642,317	2,581	285,508	4,022
2009	686,392	1,653	628,675	2,593	305,332	3,902
2010	656,501	1,679	593,074	2,724	306,686	3,990
2011	648,127	1,731	578,855	2,846	321,869	4,037

[a]Estimates obtained from annual deer harvest surveys done by the Wildlife Division (e.g., Frawley 2012).
[b]Included archery, regular firearm, muzzleloader, youth, disabled hunters, and special antlerless deer hunting seasons.
[c]95% confidence limits.

Table 2. Number of deer harvested in Michigan by hunting season, 2006-2011. [a]

	Deer hunting season					
	All seasons[b]		Regular firearm		Archery	
Year	No.	95% CL[c]	No.	95% CL	No.	95% CL
2006	450,674	7,984	261,532	5,421	125,035	3,835
2007	476,595	8,267	272,823	5,492	126,197	3,841
2008	480,638	8,903	291,825	6,110	106,439	3,729
2009	436,036	8,272	234,056	5,246	117,633	3,806
2010	412,299	8,276	220,303	5,229	117,180	3,886
2011	416,721	8,387	214,070	5,183	131,615	4,169

[a]Estimates obtained from annual deer harvest surveys done by the Wildlife Division (e.g., Frawley 2012).
[b]Included archery, regular firearm, muzzleloader, youth, disabled hunters, and special antlerless deer hunting seasons.
[c]95% confidence limits.

Table 3. Proportion of 2011 crossbow hunters indicating that using crossbows effected hunting effort, harvest, and future expectations of hunting effort during the archery and regular firearm seasons in Michigan.[a]

	Increased		Decreased		No change		Not sure		No answer	
Measure	%	95% CL[b]	%	95% CL	%	95% CL	%	95% CL	%	95% CL
Hunting effort in archery season	52	3	<1	<1	46	3	1	<1	1	1
Hunting effort in regular firearm season	8	2	3	1	87	2	1	<1	1	1
Harvest in archery season	27	2	2	1	70	3	1	1	1	1
Harvest in firearm season	4	1	7	1	86	2	2	1	1	1
Future hunting in archery season	57	3	1	1	40	3	1	1	1	1
Future hunting in firearm season	7	1	3	1	87	2	2	1	1	1

[a]Estimated number of crossbow archers in 2011 = 96,225 ± 2,353; excluded hunters with a crossbow permit.
[b]95% confidence limits.

Table 4. Number of 2011 crossbow hunters indicating that using crossbows effected hunting effort, harvest, and future expectations of hunting effort during the archery and regular firearm seasons in Michigan.[a]

	Increased		Decreased		No change		Not sure		No answer	
Measure	No.	95% CL[b]	No.	95% CL	No.	95% CL	No.	95% CL	No.	95% CL
Hunting effort in archery season	49,600	2,967	402	350	44,696	2,915	563	413	884	518
Hunting effort in regular firearm season	8,039	1,512	2,974	941	83,524	2,745	723	468	884	518
Harvest in archery season	25,564	2,474	1,608	696	67,285	2,980	804	494	884	518
Harvest in firearm season	3,617	1,035	6,833	1,402	82,720	2,763	2,170	806	804	494
Future hunting in archery season	54,503	2,998	965	540	38,506	2,817	1,367	642	804	494
Future hunting in firearm season	6,592	1,378	3,135	965	83,604	2,743	1,849	745	965	540

[a]Estimated number of crossbow archers in 2011 = 96,225 ± 2,353; excluded hunters with a crossbow permit.
[b]95% confidence limits.

Table 5. The proportion and number of archers using a crossbow, their hunting success, and number of deer taken with a crossbow in Michigan's archery season, 2009-2011.[a]

	Archers using a crossbow		Archers using a crossbow		Hunter success		Deer harvested	
Year	%	95% CL[b]	No.	95% CL	%	95% CL	No.	95% CL
2009	18.6	0.7	56,915	2,154	36.4	1.9	24,882	1,734
2010	29.5	0.8	90,615	2,733	35.6	1.6	38,310	2,207
2011	36.8	0.8	118,573	3,078	38.8	1.4	54,902	2,668

[a]Included all archers using a crossbow in the archery season, regardless of whether they had a crossbow stamp or crossbow permit. Estimates obtained from annual deer harvest surveys done by the Wildlife Division (e.g., Frawley 2012).
[b]95% confidence limits.

Table 6. Proportion of 2011 crossbow hunters agreeing or disagreeing with statements about why they used crossbows to hunt deer during the archery season in Michigan.[a]

	Strongly agree		Agree		Not sure		Disagree		Strongly disagree		No answer	
Statement	%	95% CL[b]	%	95% CL	%	95% CL	%	95% CL	%	95% CL	%	95% CL
Crossbows are easier to use than other types of bows.	40	3	41	3	6	1	12	2	1	<1	<1	<1
It takes less time to become proficient at using a crossbow than other types of bows.	41	3	42	3	6	1	10	2	1	<1	1	<1
I am more accurate hitting a target using a crossbow than other types of bows.	45	3	33	3	9	2	11	2	2	1	<1	<1
Using a crossbow allows me to deer hunt more often than with other types of bows.	33	3	23	2	12	2	24	2	8	2	1	<1
I would not be able to hunt deer during the archery season if I could not use a crossbow.	33	3	16	2	11	2	26	2	13	2	1	1
I would not want to hunt deer during the archery season if I could not use a crossbow.	30	3	18	2	9	2	27	2	14	2	2	1
I used a crossbow because I thought it would be more challenging to harvest a deer than with other types of bows.	4	1	8	1	18	2	48	3	20	2	2	1
I used a crossbow because I thought it would be more satisfying to harvest a deer than with other types of bows.	10	2	19	2	17	2	38	3	14	2	2	1
I am more confident that I can harvest a deer using a crossbow than using other types of bows.	43	3	34	3	7	1	11	2	4	1	1	1

[a]Estimated number of crossbow archers in 2011 = 96,225 ± 2,353; excluded hunters with a crossbow permit.
[b]95% confidence limits.

Table 7. Number of 2011 crossbow hunters agreeing or disagreeing with statements about why they used crossbows to hunt deer during the archery season in Michigan.[a]

	Strongly agree		Agree		Not sure		Disagree		Strongly disagree		No answer	
Statement	No.	95% CL[b]	No.	95% CL	No.	95% CL	No.	95% CL	No.	95% CL	No.	95% CL
Crossbows are easier to use than other types of bows.	38,908	2,825	39,471	2,835	5,708	1,288	11,094	1,752	723	468	241	271
It takes less time to become proficient at using a crossbow than other types of bows.	39,792	2,841	40,033	2,845	5,868	1,305	9,486	1,632	482	383	482	383
I am more accurate hitting a target using a crossbow than other types of bows.	43,651	2,901	31,432	2,655	8,843	1,580	10,129	1,681	1,769	729	322	313
Using a crossbow allows me to deer hunt more often than with other types of bows.	31,352	2,653	22,509	2,359	11,094	1,752	23,232	2,388	7,396	1,455	563	413
I would not be able to hunt deer during the archery season if I could not use a crossbow.	31,995	2,670	15,193	2,011	10,370	1,699	25,081	2,457	12,380	1,839	1,125	583
I would not want to hunt deer during the archery season if I could not use a crossbow.	28,859	2,581	17,685	2,143	8,843	1,580	25,483	2,471	13,666	1,921	1,608	696
I used a crossbow because I thought it would be more challenging to harvest a deer than with other types of bows.	3,778	1,057	7,315	1,447	16,962	2,106	46,625	2,938	19,454	2,228	2,010	776
I used a crossbow because I thought it would be more satisfying to harvest a deer than with other types of bows.	9,968	1,669	18,168	2,167	16,399	2,077	36,496	2,777	13,425	1,906	1,688	713
I am more confident that I can harvest a deer using a crossbow than using other types of bows.	41,320	2,866	32,557	2,685	6,592	1,378	10,933	1,740	3,537	1,023	1,206	604

[a]Estimated number of crossbow archers in 2011 = 96,225 ± 2,353; excluded hunters with a crossbow permit.
[b]95% confidence limits.

Table 8. Proportion of newly recruited crossbow hunters in 2011 agreeing or disagreeing with statements about why they used crossbows in Michigan's archery deer season.[a]

	Strongly agree		Agree		Not sure		Disagree		Strongly disagree		No answer	
Statement	%	95% CL[b]	%	95% CL	%	95% CL	%	95% CL	%	95% CL	%	95% CL
Crossbows are easier to use than other types of bows.	44	6	38	5	8	3	10	3	<1	1	<1	<1
It takes less time to become proficient at using a crossbow than other types of bows.	45	6	38	5	9	3	8	3	<1	1	<1	1
I am more accurate hitting a target using a crossbow than other types of bows.	53	6	30	5	11	3	5	2	1	1	<1	1
Using a crossbow allows me to deer hunt more often than with other types of bows.	47	6	27	5	11	3	12	4	3	2	<1	1
I would not be able to hunt deer during the archery season if I could not use a crossbow.	49	6	21	5	9	3	12	4	7	3	2	1
I would not want to hunt deer during the archery season if I could not use a crossbow.	49	6	24	5	6	3	13	4	7	3	2	1
I used a crossbow because I thought it would be more challenging to harvest a deer than with other types of bows.	5	2	10	3	26	5	40	5	17	4	2	2
I used a crossbow because I thought it would be more satisfying to harvest a deer than with other types of bows.	12	4	20	4	25	5	30	5	12	4	2	1
I am more confident that I can harvest a deer using a crossbow than using other types of bows.	51	6	33	5	7	3	5	2	3	2	2	2

[a]Estimated number of newly recruited crossbow hunters = 24,438 ± 2,433; excluded hunters with a crossbow permit.
[b]95% confidence limits.

Table 9. Proportion of newly recruited crossbow hunters in 2011 indicating that using crossbows effected hunting effort, harvest, and future expectations of hunting effort during the archery and regular firearm seasons in Michigan.[a]

	Increased		Decreased		No change		Not sure		No answer	
Measure	%	95% CL[b]	%	95% CL	%	95% CL	%	95% CL	%	95% CL
Hunting effort in archery season	83	4	1	1	13	4	1	1	1	1
Hunting effort in regular firearm season	13	4	5	2	80	5	1	1	2	1
Harvest in archery season	35	5	1	1	61	5	1	1	2	1
Harvest in firearm season	6	3	10	3	81	4	3	2	1	1
Future hunting in archery season	76	5	0	1	21	5	2	1	1	1
Future hunting in firearm season	9	3	6	3	81	4	3	2	1	1

[a]Estimated number of newly recruited crossbow hunters = 24,438 ± 2,433; excluded hunters with a crossbow permit.
[b]95% confidence limits.

Appendix A

Questionnaire used for the Crossbow Deer Hunter Survey.

MICHIGAN DEPARTMENT OF NATURAL RESOURCES, WILDLIFE DIVISION
PO BOX 30030 LANSING MI 48909-7530

CROSSBOW DEER HUNTER SURVEY

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 use a crossbow or harvest any deer during the last few years.

This questionnaire is designed to assist with establishing future crossbow hunting regulations in Michigan. In 2009, crossbows were allowed for hunting deer during Michigan's archery season. Currently, crossbows can be used during all archery seasons statewide, except in the Upper Peninsula where crossbow use was prohibited during the late archery (unless the hunter was disabled).

1. Did you hunt deer in Michigan's archery season during any of the three years before crossbows were allowed (2006-2008)? [1] ☐ Yes [2] ☐ No *(If "No", skip to Question #3.)*

2. What types of hunting devices did you use to hunt deer during Michigan's archery season during any of the three years before crossbows were allowed (2006-2008)? *(Select each type you used.)*

[1] ☐ Compound bow [2] ☐ Recurve bow [3] ☐ Longbow

3. Did you hunt deer in Michigan's archery season during any of the last three years since crossbows were allowed (2009-2011)? [1] ☐ Yes [2] ☐ No *(If "No", skip the remaining questions.)*

4. What types of hunting devices did you use to hunt deer during the Michigan's archery season during any of the last three years since crossbows were allowed (2009-2011)? *(Select each type you used.)*

[1] ☐ Compound bow [2] ☐ Crossbow [3] ☐ Recurve bow [4] ☐ Longbow

If you hunted deer with a crossbow in Michigan's archery season during any of the last three years (2009-2011), please continue to next question. If you did not hunt deer with a crossbow, skip the remaining questions.

5. Did you hunt deer with a <u>firearm</u> <u>only</u> before the crossbow was legalized in Michigan's archery season? [1] ☐ Yes [2] ☐ No

6. What is your preferred county to hunt deer during the archery season in Michigan? _____ county

7. How much do you agree or disagree with the following statements about the use of crossbows for deer hunting in Michigan.

	Strongly Agree	Agree	Not Sure	Disagree	Strongly Disagree
a. Crossbows are easier to use than other types of bows.	[1] ☐	[2] ☐	[3] ☐	[4] ☐	[5] ☐
b. It takes less time to become proficient at using a crossbow than other types of bows.	[1] ☐	[2] ☐	[3] ☐	[4] ☐	[5] ☐
c. I am more accurate hitting a target using a crossbow than other types of bows.	[1] ☐	[2] ☐	[3] ☐	[4] ☐	[5] ☐
d. Using a crossbow allows me to deer hunt more often than with other types of bows.	[1] ☐	[2] ☐	[3] ☐	[4] ☐	[5] ☐

Continued on next page

7. How much do you agree or disagree with the following statements about the use of crossbows for deer hunting in Michigan.

	Strongly Agree	Agree	Not Sure	Disagree	Strongly Disagree
e. I would not be able to hunt deer during the archery season if I could not use a crossbow.	1 ☐	2 ☐	3 ☐	4 ☐	5 ☐
f. I would not want to hunt deer during the archery season if I could not use a crossbow.	1 ☐	2 ☐	3 ☐	4 ☐	5 ☐
g. I used a crossbow because I thought it would be more challenging to harvest a deer than with other types of bows.	1 ☐	2 ☐	3 ☐	4 ☐	5 ☐
h. I used a crossbow because I thought it would more satisfying to harvest a deer than with other types of bows.	1 ☐	2 ☐	3 ☐	4 ☐	5 ☐
i. I am more confident that I can harvest a deer using a crossbow than using other types of bows.	1 ☐	2 ☐	3 ☐	4 ☐	5 ☐

8. Overall, did your experience hunting with a crossbow match your expectations?

1 ☐ All my expectations were met 2 ☐ Most expectations were met 3 ☐ Not Sure 4 ☐ Not all expectations were met 5 ☐ No expectations were met

9. How did allowing archers to use crossbows to hunt deer during the archery season affect the quality of your deer hunting experience in the archery season during the last three years?

1 ☐ Greatly Improved quality of hunt 2 ☐ Improved quality of hunt 3 ☐ Not Sure 4 ☐ Decreased quality of hunt 5 ☐ Greatly decreased quality of hunt

10. Since crossbows were legalized for hunting deer during the archery season in 2009, how has this change affected how often you hunted deer in the Michigan's <u>archery</u> season? *(Select one choice)*

1 ☐ Increased 2 ☐ Decreased 3 ☐ No change 4 ☐ Not sure

11. Since crossbows were legalized for hunting deer during the archery season in 2009, how has this change affected how often you hunted deer in Michigan's <u>regular firearm</u> season (November 15-30)? *(Select one choice)*

1 ☐ Increased 2 ☐ Decreased 3 ☐ No change 4 ☐ Not sure

12. Since crossbows were legalized for hunting deer during the archery season in 2009, how has this change affected how many deer you harvested in Michigan's <u>archery</u> season? *(Select one choice)*

1 ☐ Increased 2 ☐ Decreased 3 ☐ No change 4 ☐ Not sure

13. Since crossbows were legalized for hunting deer during the archery season in 2009, how has this change affected how many deer you harvested in Michigan's <u>regular firearm</u> season (November 15-30)? *(Select one choice)*

1 ☐ Increased 2 ☐ Decreased 3 ☐ No change 4 ☐ Not sure

14. How do you believe the legalization of crossbows to hunt deer in the archery season will affect how often you will hunt deer in the <u>archery</u> season in future years? *(Select one choice)*

1 ☐ Increase 2 ☐ Decrease 3 ☐ No change 4 ☐ Not sure

15. What types of hunting devices do you think you will use to hunt deer during Michigan's archery season during future years? *(Select each type you may use.)*

1 ☐ Compound bow 2 ☐ Crossbow 3 ☐ Recurve bow 4 ☐ Longbow 5 ☐ I do not plan to hunt in Archery season

16. How do you believe the legalization of crossbows to hunt deer in the archery season will affect how often you will hunt deer in Michigan's <u>regular</u> <u>firearm</u> season (November 15-30) in future years? *(Select one choice)*

1 ☐ Increase 2 ☐ Decrease 3 ☐ No change 4 ☐ Not sure

Please return questionnaire in the enclosed postage-paid envelope.
Thank you for your help.