

Iowa Crossbow Analysis

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This document provides a summary of an analysis to estimate changes in the number of White-tailed Deer hunters and harvest in Iowa if crossbows were added as an allowable method of take during the archery deer season. All estimates provided below are based on reported archery harvest and number of hunters who purchased any-deer licenses in Iowa in 2018. The analysis does not estimate changes in the number of hunters or harvest for antlerless licenses. Percent changes in the number of hunters based on license type (archery only, firearm only, etc.) and success rates are based primarily on expert opinion and on estimates from a similar analysis conducted in Wisconsin in 2019 (see: <https://dnr.wi.gov/About/NRB/2019/October/00%20Tuesday%202019-10-3A%20Wisconsin%20Crossbow%20Report%20Final.pdf> (<https://dnr.wi.gov/About/NRB/2019/October/00%20Tuesday%202019-10-3A%20Wisconsin%20Crossbow%20Report%20Final.pdf>))

2018 deer hunter and harvest statistics

Total harvest = 107,857

Total archery harvest = 21,271

Total number of any-deer archery-only hunters = 59,470

Total number of any-deer firearm-only (shotgun or muzzleloader) hunters = 149,008

Total number of any-deer firearm and archery hunters = 44,873

Archery success rate = 22%

Archery hunters who switch to crossbow

I first estimated the number of archery hunters that would switch from using a vertical bow to using a crossbow and the resulting increase in harvest (antlered and antlerless deer combined) based on a range of increases in success rates. The percent of archery hunters currently using a vertical bow that might switch to using a crossbow ranged from 1-3% based on the recent Wisconsin study and range of increases in success rates when switching from a vertical bow to crossbow (0-10%) was based on the increase in success rates published in the Wisconsin study, with additional increases analyzed based on expert opinion. *No additional harvest would result if success rate was 22% because hunters would be experiencing the same success rate with a crossbow as with a vertical bow.*

% who switch	Hunters who switch	Additional harvest based on success rate					
		22%	23%	25%	27%	29%	32%
1	595	0	137	149	161	173	190
2	1189	0	273	297	321	345	380
3	1784	0	410	446	482	517	571

Firearm hunters who add archery license for crossbow

Next, I estimated the number of hunters who currently hunt only during a firearm season (shotgun or muzzleloader) that would add an archery license for the opportunity to hunt with a crossbow. I also estimated the resulting increase in harvest (antlered and antlerless deer combined) based on the number of new archery hunters and the varying increases in success rate used above (0-10%). The percent of firearm-only hunters who would add an archery license to hunt with a crossbow (0-10%) was based in part on what was published in the Wisconsin study (0-3%). However, I also expanded the range up to 10% assuming firearm-only hunters would be more motivated to add an archery license if crossbows were allowed because it would provide them the opportunity to hunt during the rut (early November) with a triggered weapon.

% change in hunters	Additional hunters	Additional harvest based on success rate					
		22%	23%	25%	27%	29%	32%

Additional harvest based on success rate

% change in hunters	Additional hunters	Additional harvest based on success rate					
		22%	23%	25%	27%	29%	32%
1	1041	229	239	260	281	302	333
2	2083	458	479	521	562	604	667
3	3124	687	719	781	843	906	1000
5	5207	1146	1198	1302	1406	1510	1666
10	10414	2291	2395	2604	2812	3020	3332

Firearm and archery hunters who switch to using crossbow

The Wisconsin study demonstrated that the rate at which archery-only hunters switched to using a crossbow was different than the rate at which hunters who hunted both firearm and archery seasons switched to using a crossbow. Therefore, I recognized them as different groups for this analysis. Of those hunters who currently hunt both firearm and archery seasons, I estimated the number that would switch from using a vertical bow to using a crossbow. Assuming these hunters are similar to firearm-only hunters in that they prefer to hunt with a triggered weapon, I estimated the number of hunters from this group that would change to using a crossbow during the archery season using the same percent range as used for estimating the number of firearm-only hunters that would add an archery license to use a crossbow (0-10%). I also estimated the additional harvest (antlered and antlerless deer combined) using the estimated hunter numbers and varying increases in success rate used above (0-10%). *No additional harvest would result if success rate was 22% because hunters would be experiencing the same success rate with a crossbow as with a vertical bow.*

Additional harvest based on success rate

% who switch	Hunters who switch	Additional harvest based on success rate					
		22%	23%	25%	27%	29%	32%
1	449	0	103	112	121	130	144
2	897	0	206	224	242	260	287
3	1346	0	310	336	363	390	431
5	2244	0	516	561	606	651	718
10	4487	0	1032	1122	1211	1301	1436

New deer hunters using a crossbow

Lastly, I estimated the total number of new deer hunters that would be recruited into the population if crossbow was added as an allowable method of take during the archery season. It is largely unknown how many, if any, new hunters would be recruited and this was not analyzed in the Wisconsin study. Therefore, I conservatively estimated the number of new hunters based on the total number of deer hunters (148,333) and the percent range as used for the number of firearm-only hunters that would add an archery license to hunt with a crossbow (0-10%). Additional harvest (antlered and antlerless deer combined) from these hunters was estimated using the range of increases in success rate used above (0-10%).

Additional harvest based on success rate

% change in hunters	Additional hunters	Additional harvest based on success rate					
		22%	23%	25%	27%	29%	32%
1	1483	326	341	371	400	430	475
2	2967	653	682	742	801	860	949
3	4450	979	1024	1112	1202	1291	1424
5	7417	1632	1706	1854	2003	2151	2373
10	14833	3263	3412	3708	4005	4302	4747

Total hunters using crossbows and additional harvest

The below table sums all the above tables to show the estimated total number of additional hunters based on various rates of increase and additional harvest based on a range of success rates.

		<u>Additional harvest and percent change</u>											
		<u>22% success</u>		<u>23% success</u>		<u>25% success</u>		<u>27% success</u>		<u>29% success</u>		<u>32% success</u>	
% change in hunters	Hunters using crossbows	Harvest	% change	Harvest	% change	Harvest	% change	Harvest	% change	Harvest	% change	Harvest	% change
1	3568	555	3	820	4	892	4	963	5	1035	5	1142	5
2	7136	1111	5	1640	8	1784	8	1926	9	2069	10	2283	11
3	10704	1666	8	2463	12	2675	13	2890	14	3104	15	3426	16
5	14868	2778	13	3420	16	3717	17	4015	19	4312	20	4757	22
10	29734	5554	26	6839	32	7434	35	8028	38	8623	41	9515	45

Total additional hunters during archery season

The below table shows the additional number of hunters during the archery season based on various rates of change and the percentage increase in archery hunters relative to the total number of archery hunters during the 2018 season (59,470). *The change rate represents the rate at which firearm-only hunters add an archery license to hunt with a crossbow and the percentage of new hunters that purchase a license to use a crossbow.*

% change in hunters	Additional hunters	% increase in hunters
1	2524	4
2	5050	8
3	7574	13
5	12624	21
10	25247	42

Change in antlered deer (i.e., buck) harvest

On average, archery hunters target antlered deer (i.e., bucks) at a higher rate than firearm hunters. In 2018, bucks comprised 60% of the total archery harvest whereas bucks comprised an average of 51% of the total harvest among the various firearm seasons. Therefore, one would expect an increase in total harvest resulting from the allowance of crossbows as a legal method of take during the archery season to be skewed towards bucks. The table below, therefore, shows the increase in bucks harvested based on various rates of increase in the number of hunters using crossbows and on a range of success rates, along with the percent increase in bucks harvested relative to the total archery antlered harvest in 2018 (12,859).

		<u>Additional buck harvest and percent change</u>											
		<u>22% success</u>		<u>23% success</u>		<u>25% success</u>		<u>27% success</u>		<u>29% success</u>		<u>32% success</u>	
% change in hunters	Hunters using crossbow	Harvest	% change	Harvest	% change	Harvest	% change	Harvest	% change	Harvest	% change	Harvest	% change
1	3568	333	3	492	4	535	4	578	4	621	5	685	5
2	7136	667	5	984	8	1070	8	1156	9	1241	10	1370	11

Additional buck harvest and percent change

		<u>22% success</u>		<u>23% success</u>		<u>25% success</u>		<u>27% success</u>		<u>29% success</u>		<u>32% success</u>	
		Harvest	% change										
% change in hunters	Hunters using crossbow	1000	8	1478	11	1605	12	1734	13	1862	14	2056	16
3	10704	1667	13	2052	16	2230	17	2409	19	2587	20	2854	22
5	14868	3332	26	4103	32	4460	35	4817	37	5174	40	5709	44
10	29734												

Summary

Based on published results from a similar analysis and expert opinion, I predict that total harvest (both antlered and antlerless deer) could increase from 3-45% depending on the number of hunters who switch to or add crossbow for hunting deer in Iowa and their respective success rates. I also predict that total antlered deer harvest will increase from 3-44% depending on the number of hunters who switch to or add crossbow for hunting deer in Iowa. The number of hunters afield during the archery season could increase as much as 42% depending on the number of hunters who add an archery license to hunt with a crossbow, which would then make the archery season the most popular single season with as many as 84,717 hunters afield.

These estimates are based on the number of hunters and total reported harvest during the 2018 season and assume that both harvest and the number of hunters will remain constant in years following 2018. This is not an unreasonable assumption given that both harvest and number of hunters during the archery season has remained relatively stable since 2013. While the rates of change in hunter numbers and success rate were based on a previous study, it is unknown if similar rates will be experienced in Iowa. Therefore, this analysis is intended to demonstrate a range of possibilities in regards to the number of hunters who switch to using a crossbow and the resulting change in both total and antlered harvest.

End of report