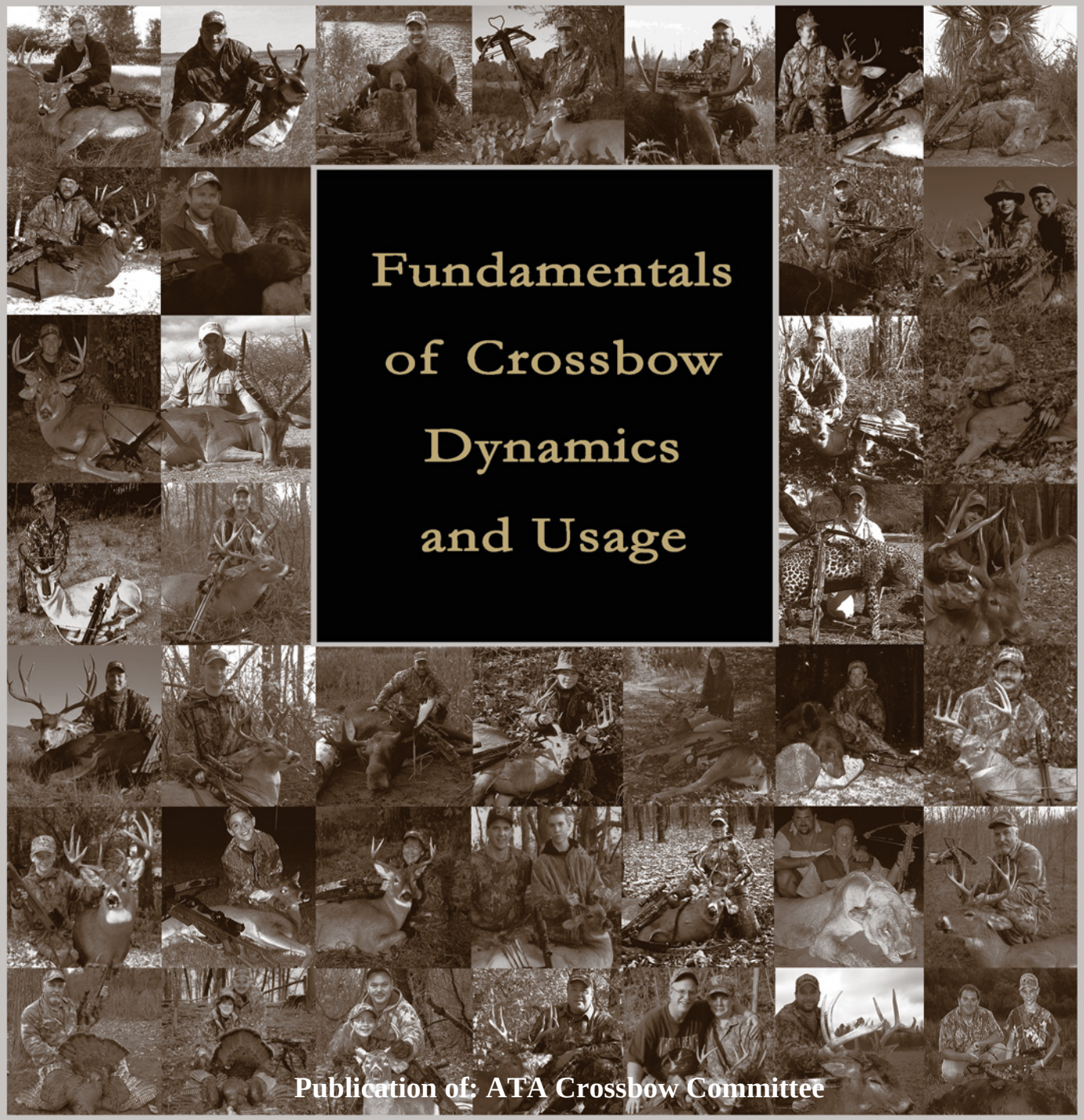

Fundamentals of Crossbow Dynamics and Usage

Publication of: ATA Crossbow Committee

Introduction

This overview contains information that:

- Explains the basic functions, dynamics and ballistics of the crossbow;
- Review the experience of states in which the crossbow has been adopted as an archery game management tool; and
- Compares crossbows to other archery equipment.

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Crossbow Committee

National Percentage of Bowhunter Participation

Table 33. **Hunters Using Bows and Arrows, Muzzleloaders, and Other Primitive Firearms for Hunting: 2001**

(Population 16 years old and older. Numbers in thousands)

Hunters	2001 Number	2005*	Percent
Total hunters	**13,034**	**14,570**	**100**
Hunters using bow and arrow	3,070	3,250	24
Hunters using muzzleloader or other primitive firearm	2,050		16
Total days of hunting	**228,368**		**100**
With bow and arrow	38,705		17
With muzzleloader or other primitive firearm	12,841		6

Note: Detail does not add to total because of multiple responses.

Total hunters	**2001**	**2005**	**2006**
Total hunters	**13,034**	**14,570**	**12,510**
Bow & Arrow	**3,070**	**3,250**	**3,501**

Percentage of Bow hunters of Total Hunters:

➢	23.5%	22.0%	28%

Sources: US Fish and Wildlife 2001 National Survey of Fishing, Hunting & Wildlife associated recreation – page 83 of 116

* 2005 US Fish and Wildlife: Unpublished

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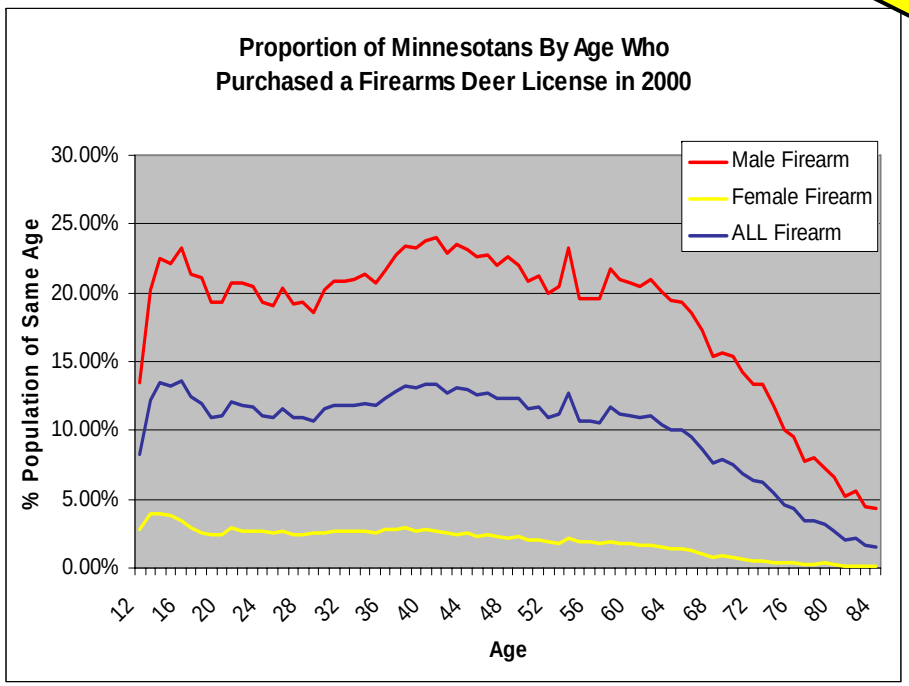
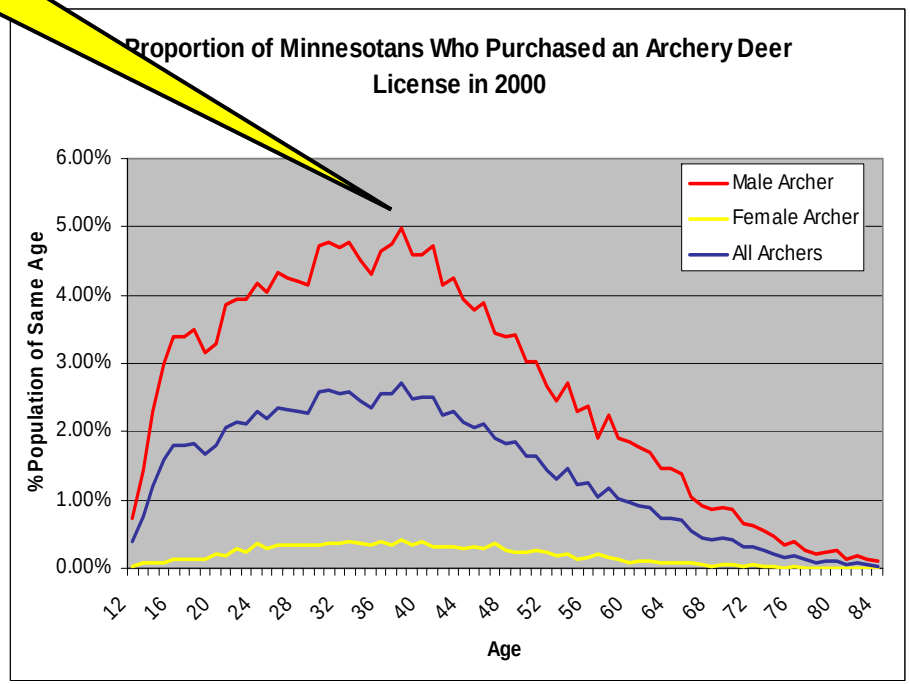
Minnesota Hunter Retention:
Firearms/Archery

Usage Peak at age 39-44





Source: U.S. Census Bureau, DNR ELS Database, 2000.

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Crossbow Committee

Physics/Archery

A law of Physics that affects us all everyday is:

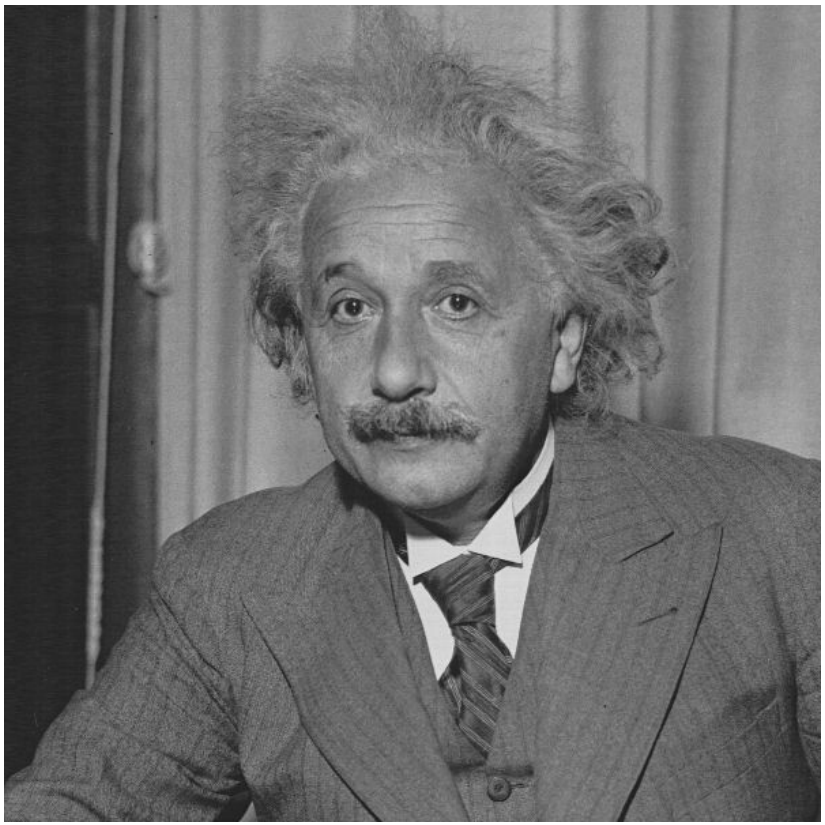
Kinetic Energy Formula

$$E_{kinetic} = \frac{\text{MASS x VELOCITY}^2}{450{,}240^*}$$

*** Conversion is a constant.**

Example: Light & Fast Arrow
350 grns @ 300 fps = 69.96 Ft/lbs

Example: Slow Heavy Arrow
540 grns @ 240 fps = 69.08 Ft/lbs



Albert Einstein

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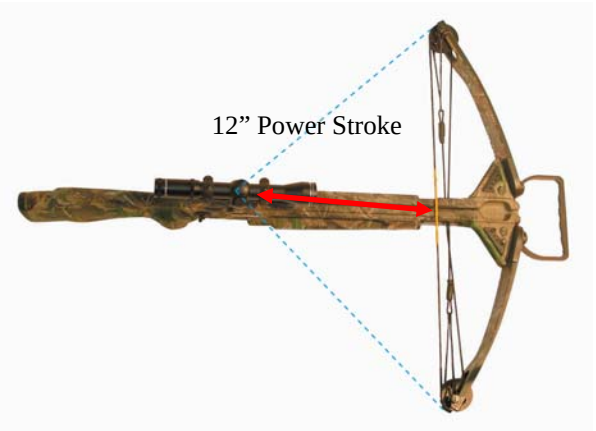
Crossbow Committee

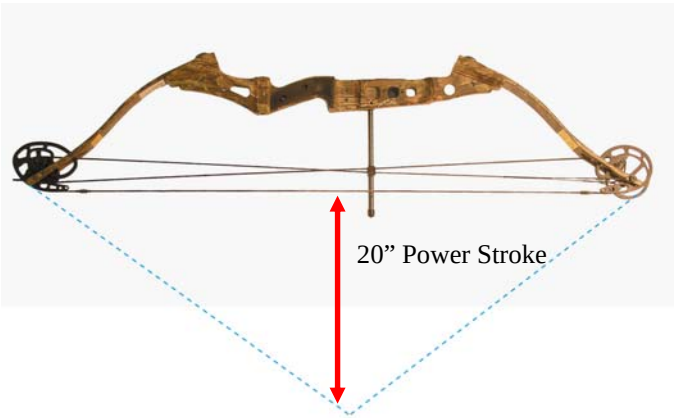
Power Stroke

The distance the string travels:

- Crossbows - approx 12”
- Vertical Bows - approx 20” to 22”

Crossbows require a heavier draw weight to generate the same energy that propels the arrow downrange.





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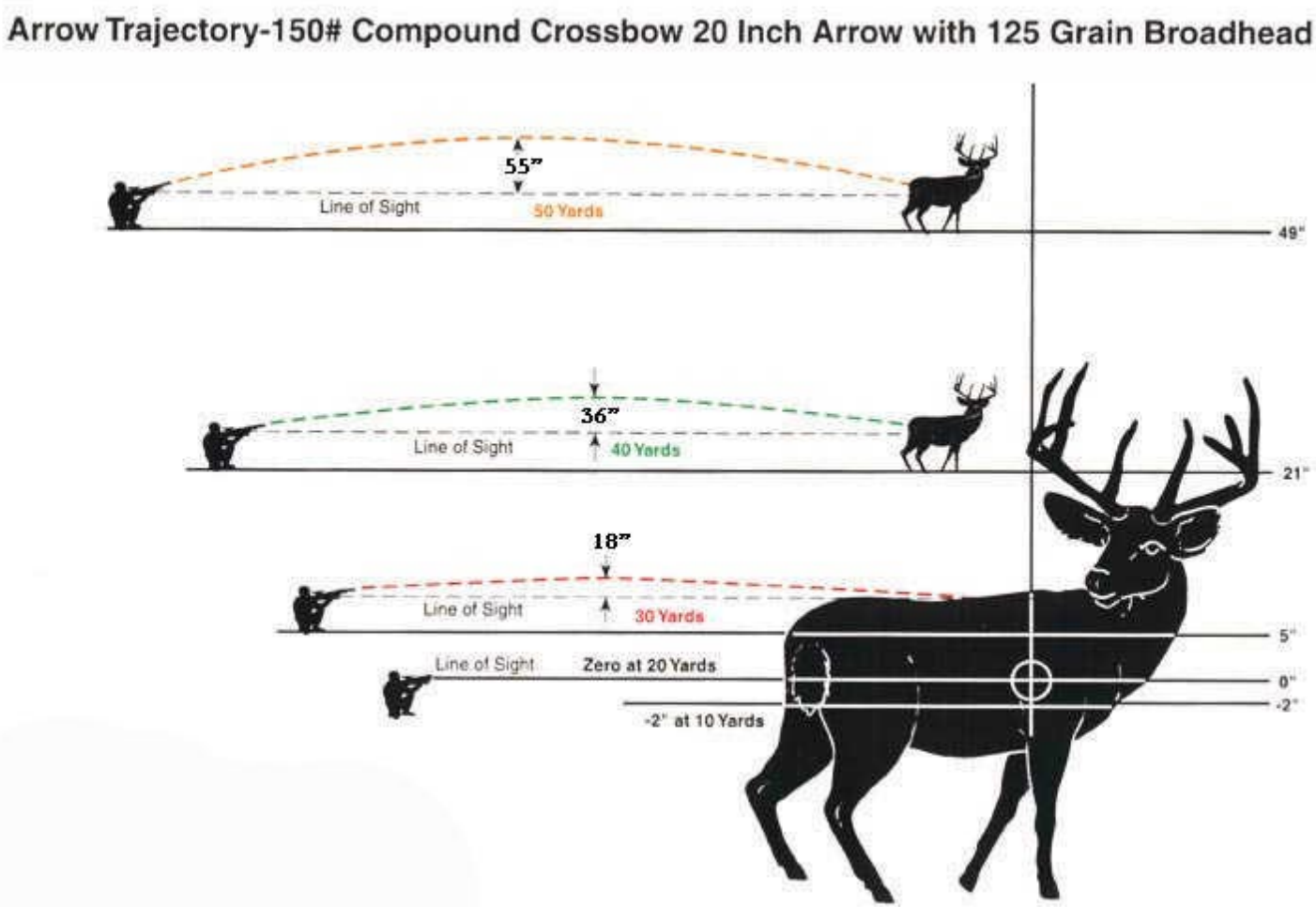
Arrow Trajectory

(@ 300 ft/second)



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High Performance Crossbow vs. Compound Bow - FPS & Energy

Manufacturer	Model	FPS	Arrow/Grains	Foot/Lbs.
Compound Bows:				
Bear	Truth	314	350	77
PSE	Mach X-X1	312	350	76
* APA	Black Mamba	345	350	92
Mathews	Drenalin	320	350	79
Hoyt	Vectrix	316	350	78
Crossbows:				
Horton	Hunter HD 175	320	406	92
Ten Point	Phantom 185	343	420	110
Excalibur	Equinox 225	350	350	95
Parker	Saf. Mag. HP 175	340	420	108
** Bowtech	Stryker 175	405	425	155

* Fastest Compound Bow ** Fastest Crossbow (Difference at 50 yards: 12”)

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High Performance Crossbow vs. Compound Bow Arrow Trajectory (Total inches of drop.)

Mfg – Model (FPS/Arrow grain)	10 yds.	20 yds.	30 yds.	40 yds.	50 yds.
Compound Bows:					
Bear – Truth (314/350)	-2	-7	-17	-31	-49
PSE – Mach X-X1 (312/350)	-2	-7	-17	-31	-49
* APA – Black Mamba (345/350)	-1	-6	-14	-25	-41
Mathews – Drenalin (320/350)	-2	-7	-16	-29	-47
Hoyt – Vectrix (316/350)	-2	-7	-17	-31	-49
Crossbows:					
Horton – Hunter HD 175 (320/406)	-2	-7	-16	-29	-47
Ten Point – Phantom 185 (343/420)	-1	-6	-14	-26	-41
Excalibur – Equinox 225 (350/350)	-1	-6	-14	-25	-39
Parker – Saf. Mag. HP 175 (340/420)	-1	-6	-15	-26	-43
** Bowtech – Stryker 175 (405/425)	-1	-5	-10	-18	-29

* Fastest Compound Bow ** Fastest Crossbow (Difference at 50 yards: 12”)

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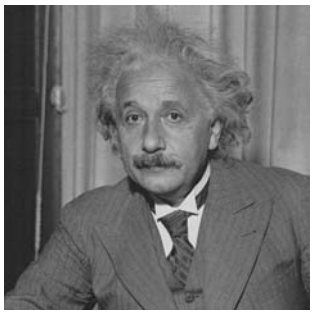
Down Range Ballistics



BASIC FOOT POUNDS OF ENERGY ARROW CALCULATIONS

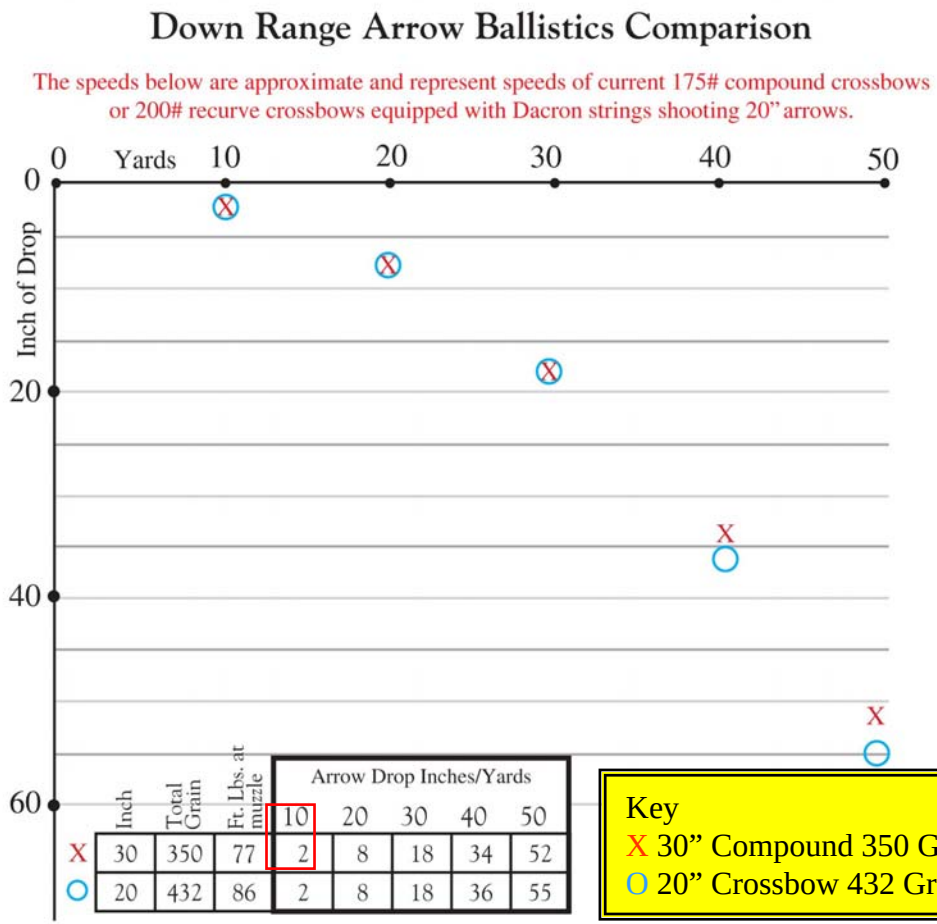
Terms:

M = Mass
W = Weight
Wg = Weight in grains
g = Gravitational constant (32.22)
KE = Kinetic Energy
grains (7000) = pound (1)

Calculations:

m = W(grn) (1-lb/7000grn) /32.22ft/s^2

KE=1/2*m*v^2x2x7000x32.22=451,080grn-ft/s^2



	Inch	Total Grain	Ft. Lbs. at muzzle	Arrow Drop Inches/Yards 10	20	30	40	50
X	30	350	77	2	8	18	34	52
O	20	432	86	2	8	18	36	55

Key
X 30" Compound 350 Grain 300 FPS
O 20" Crossbow 432 Grain 300 FPS

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Safety

Since Ohio first legalized crossbows in 1976 through the 2003-04 season:

- 19 accidents involving crossbows;
  - 15 of these incidents were self-inflicted.
- 12 vertical incidents during the same period; with
  - 7 of these being self-inflicted.
- Rate of accidents for both types of archery is well below 1 occurance per 1 million trips

Source: Ortman, W. M. (2007). Archery incidents in Ohio, 1976-2006. Unpublished data, Ohio Department of Natural Resources, Division of Wildlife, Columbus, Ohio.

Game Violations

Ohio - During a five-year period in the 1990's;

- 633 hunting implements were seized by wildlife officers.
  - Firearms accounted for 95%;
  - Vertical bows accounted for 2.7%; and
  - Crossbows accounted for 2.2%.

Source: Ortman, W. M. (2007). Archery incidents in Ohio, 1976-2006. Unpublished data, Ohio Department of Natural Resources, Division of Wildlife, Columbus, Ohio.

Success Rate

Ohio - 2001 - 02 Hunting Season:

- Crossbow Hunters - 15% Success Rate
- Vertical Bow Hunters - 15% Success Rate

Source: Ortman, W. M. (2007). Archery incidents in Ohio, 1976-2006. Unpublished data, Ohio Department of Natural Resources, Division of Wildlife, Columbus, Ohio.

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Crossbow Committee

Impact on Bow Hunting

"By the 2001-02 season crossbow hunter number had increased nearly 10-fold to an estimated 106,000."

Bow Hunting: An Important Deer Man[illegible]t Tool

by Michael J. Tonkovich, wildlife research biologist, and Patrick Rubl[illegible]ng Preservation Alliance

In 1982, the Division of Wildlife estimated that there were 82,000 vertical bow (long, recurve, and compound), 11,000 crossbow, 48,000 muzzleloader, and nearly 200,000 shotgun deer hunters. Less than 10 percent of each group was successful that year, shotgun hunters being the exception at nearly 20 percent. Clearly, at that time management of Ohio's deer herd depended heavily on shotgun hunters. Over the next two decades, a number of things would change including the role of bowhunting as a deer management tool.

The first major change occurred during the 1982–83 season when the crossbow season was expanded to four months to coincide with the existing archery season. Crossbow hunter numbers and harvests increased dramatically as a result of the expanded season. During that 20-year period, the deer population continued to grow and there was a corresponding increase in harvest by all types of deer hunters. Hunter success rates continued to climb.

By the 2001–02 season, crossbow hunter numbers had increased nearly 10-fold to an estimated 106,000. That year the crossbow season provided an estimated 1.8 million hunter-days of opportunity. Nearly 15 percent of crossbow hunters were successful that year. Vertical bowhunter numbers had increased to 88,000, with 15 percent successfully harvesting a deer that year. Hunter numbers and success rates increased for firearms hunters as well, but not to the extent of archers. The 2004–05 archery harvest was 60,626, which accounted for 28 percent of th[illegible] total harvest.

Another phenomenon occurred during the past 25 year[illegible] which has made bowhunting a very valuable managemen[illegible] tool. Deer have taken up residence in our cities and towns i[illegible] fairly large numbers. Bowhunting is often the most effectiv[illegible] and efficient way to address overabundant deer in these area[illegible] Cuyahoga County is a good example. The 2004–05 archer[illegible] harvest was 443 deer—90 percent of the total county harvest[illegible] Although an insignificant cocntribution to the statewide harvest, the harvest represents over 400 animals that likely would have had to have been taken by less desirable means such as sharp shooting or automobiles. The crossbow accounted for the majority of the harvest. Urban deer problems and problems associated with abundant deer are not unique to Ohio. What is unique is the central role that the crossbow has played in these situations.

Presently [illegible] only seven states where crossbows are legal d[illegible]ire archery season. Many state fish and wildl[illegible] are exploring nontraditional means for controll[illegible]iled deer populations in areas with little or no [illegible]cess. Communities and park systems across Ohi[illegible] U.S. are increasingly employing sharpshooters

Prior to the 1980s, management of Ohio's deer herd depended heavily on shotgun hunters.

photos by Tim Daniel

"Vertical bow numbers had increased to 88,000 [from 82,000 in 1982]."

The growing popularity of bowhunting over the past two decades has given biologists another deer management tool.

to reduce local deer populations. Ongoing research in the Cleveland Metroparks is evaluating the feasibility of reducing a local deer population using only chemical fertility control.

In spite of its widespread success in Ohio, especially in our urban areas, few states are willing to consider adding the crossbow to their management toolbox because of resistance from a vocal minority of hunters. They argue that it does not belong in the archery season and placing it there would reduce opportunity and/or bag limits for all hunters and, in extreme cases, decimate herds. Despite the controversy, many states see the crossbow as a partial solution to shrinking opportunity, an ever-increasing urban deer problem, and as an aid to bolster hunter recruitment and retention.

Crossbows were legalized for deer hunting in Ohio in 1976. Ohio's estimated 1,400 crossbow hunters accounted for 27 of the 23,000 deer harvested that year.

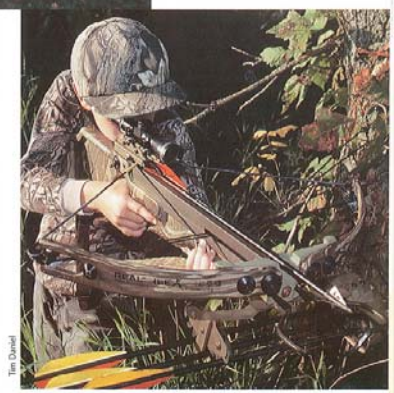
The crossbow harvest exceeded the vertical bow harvest for the first time in 1989 and it has remained that way since. Approximately 30 percent of Ohio's deer hunters use a crossbow each year. Annually, the crossbow accounts for roughly 15 percent of the total harvest. Much of this harvest comes from one of five urban deer units. These units were established in 1994 in areas traditionally prone to under-harvest and overpopulation. The urban deer permit is good for an antlerless deer only. After a slow start, urban deer permit sales have ranged from 18,000 to 25,000 annually. In a typical year, the urban permit will account for around 5 percent of the total harvest, with approximately 35 percent of these deer taken with a crossbow.

Contrary to claims by anti-crossbow groups of herd decimation and severe restrictions on hunting opportunity and harvest, Ohio has never modified regulations governing crossbows or adjusted harvest regulations because of the crossbow. Modern firearms have, and will always account for the majority of the harvest and have the greatest impact on Ohio's deer population. The crossbow has never had a significant statewide impact on the management of the deer herd. Ohio's experience has shown that the crossbow is not an unsafe, hyper-effective hunting implement rivaled only by the shotgun. Hunter success rates are no higher than those for vertical bow hunters. Additionally, the crossbow may help retain and recruit new hunters, especially youth and women.

The primary reason for reduced activity or desertion among active bowhunters is time constraints. Hence, any effort to make bowhunting more accessible, more convenient, or easier would help address the immediate issue of time constraints and the more important issue of hunting in general. Few would argue that the crossbow is much easier to master and remain proficient with than the vertical bow, or that many of the physical limitations imposed by the vertical bow cannot be overcome with the crossbow. Thus, it seems fair to say that the crossbow would help make bowhunting more accessible, easier, and more convenient.

Ohio's deer resource will continue to provide our citizens with countless recreational opportunities, for both hunters and nonhunters alike, well into the near future. It will be the Division of Wildlife's job to try to balance those opportunities with the human-deer conflict situations that will accompany them. Without question, bowhunting and most notably crossbow hunting, will continue to be a most valuable tool for the biologists who work to maintain this balance.

Much of Ohio's annual crossbow harvest comes from the five urban deer zones.



Tim Daniel

Many states see the crossbow as a partial solution to an ever-increasing urban deer problem, and a tool in recruiting and retaining hunters.

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Crossbow Season Expansion

Evolution of Crossbows in the US

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Crossbow Committee

Crossbow Season Expansion

Evolution of Crossbows in the US

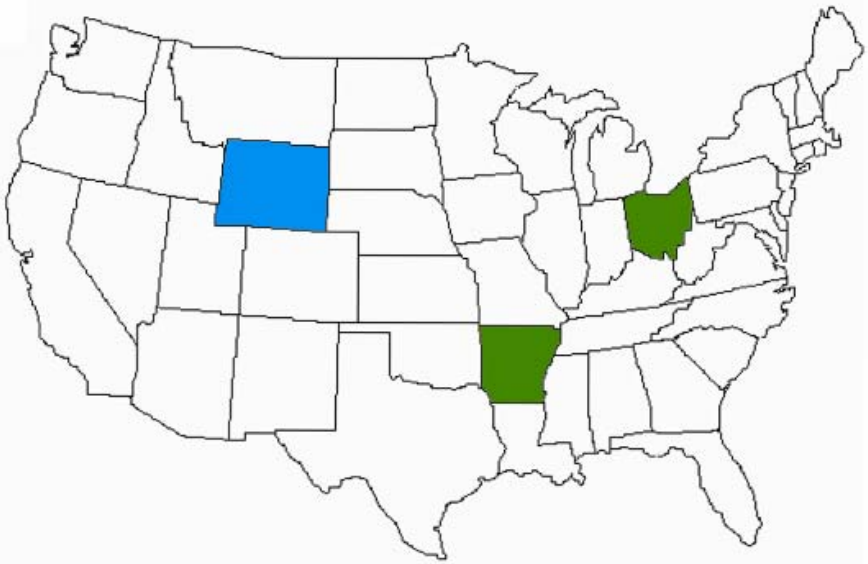
30 yrs ago

Ohio
Arkansas

Archery Trade Association
Crossbow Committee

Crossbow Season Expansion

Evolution of Crossbows in the US



20 yrs ago

Wyoming

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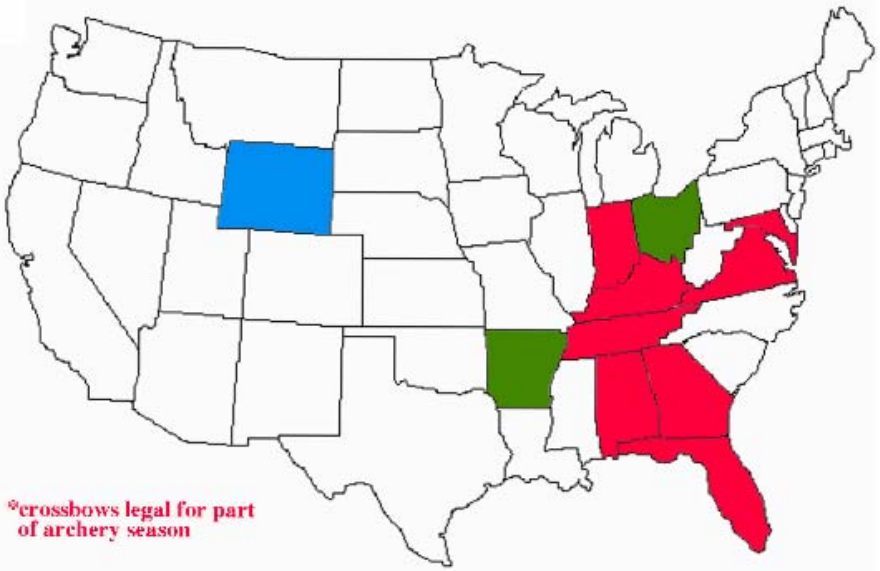
Crossbow Season Expansion

Evolution of Crossbows in the US



Since 2002

*Indiana
Georgia
*Maryland
Alabama

Tennessee
Virginia
Florida
Kentucky

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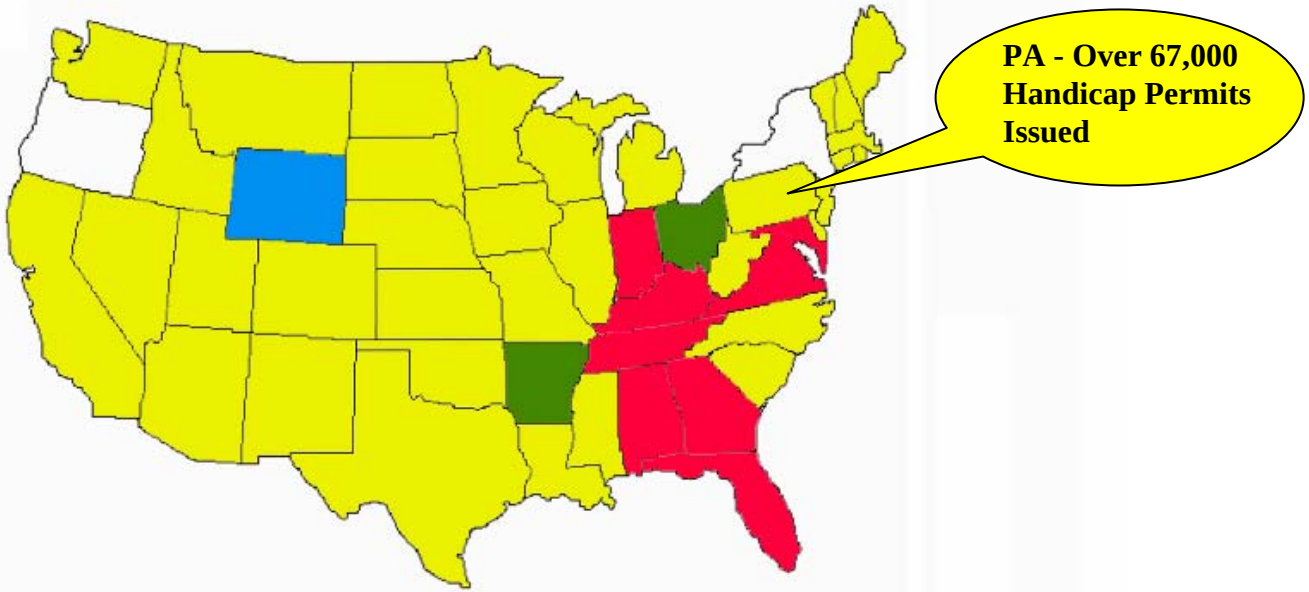
Crossbow Committee

Crossbow Season Expansion

Evolution of Crossbows in the US



Handicapped, Elderly
and/or Rifle Season

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Crossbow Surveys and Studies

- New Jersey Hunter Crossbow Opinion Poll
- Cornell University/Kentucky Crossbow Survey
- Georgia Wildlife Harvest 2003-2004 Crossbow Discussion

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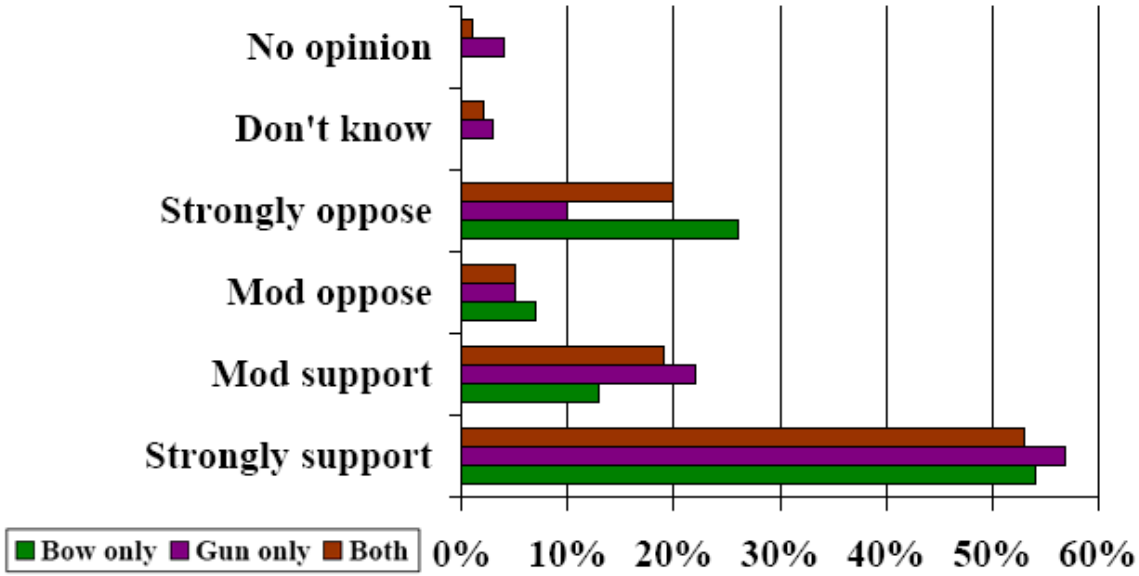
N.J. Survey

Q2. Would you support the introduction of crossbows for deer hunting in NJ?
BY USER GROUP



No significant difference between user groups on support; significant difference on opposition.

BOW ONLY HUNTERS
Total support: 67%
Total opposition: 33%
(n=54) Sampling error +/-13%

GUN HUNTERS ONLY
Total support: 79%
Total opposition: 14%
(n=231) Sampling error +/-6%

BOTH BOW & GUN
Total support: 72%
Total opposition: 25%
(n=717) Sampling error +/-4%

New Jersey Division of Fish and Wildlife
An Assessment of New Jersey Resident Hunter Opinion on Crossbow Use, 2007 Published 2008
Page 9 of 26

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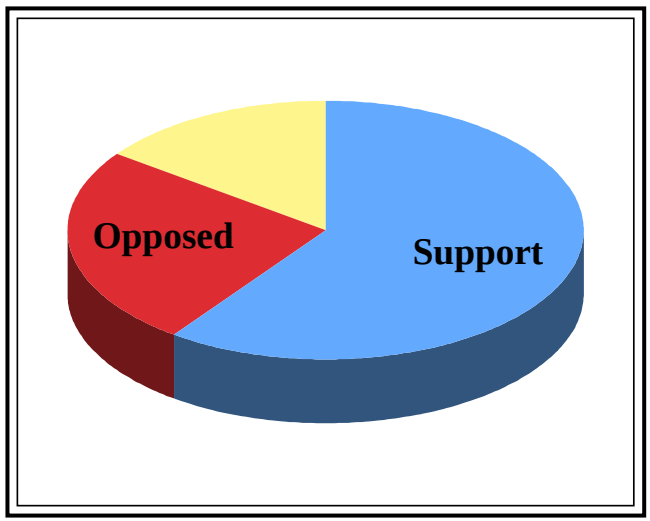
Cornell University
Kentucky Crossbow Survey

Respondents were asked if they would support or oppose expanding crossbow season from its current time frame to a time frame that runs concurrently with archery season.

- **Approximately 60% supported crossbow expansion**
- **Approximately 25% opposed crossbow expansion**



Note - The Cornell University is based on completed surveys from 3,240 hunters and 360 landowners. The report was conducted for Kentucky Department of Fish & Wildlife Resources.

Archery Trade Association
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Harvest of Wildlife - Georgia

2003-2004 Crossbow Experience

- **2003 - 04 season was the second year of general crossbow use. Previously permitted for hunters with certified disabilities**
- **Increase in archery deer hunters + 11.6%**
- **Increase in archery deer harvest + 44.3%**
- **Increase in crossbow hunters + 55.3%**
- **Increase in deer harvest with a crossbow + 168.0%**
- **Crossbow hunters represented 24.8% of archery hunters**
- **Crossbow hunters represented 9.1% of all hunters**
- **Crossbow harvests represented 21.8%% of archery harvests**
- **Crossbow harvests represented only 2.6% of all harvests**

Nick Nicholson, Senior Wildlife Biologist, GA Department of Natural Resources

Archery Trade Association
Crossbow Committee

Harvest of Wildlife - Georgia

2003-2004 Crossbow Experience

- **13.5% of respondents previously used crossbows under the handicap rule**
- **31.1% of respondents had no prior experience using archery equipment for hunting - approximately 6,900 hunters**
- **Success rate for compound bow hunters + .51 deer per hunter**
- **Success rate for crossbow hunters + .49 deer per hunter**
- **Estimated increase in archery hunters + 9,300**
- **Approximately half (46.4%) of new archers using crossbows were over 50 year old**

Nick Nicholson, Senior Wildlife Biologist, GA Department of Natural Resources

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Georgia Archers Hunters Age Analysis

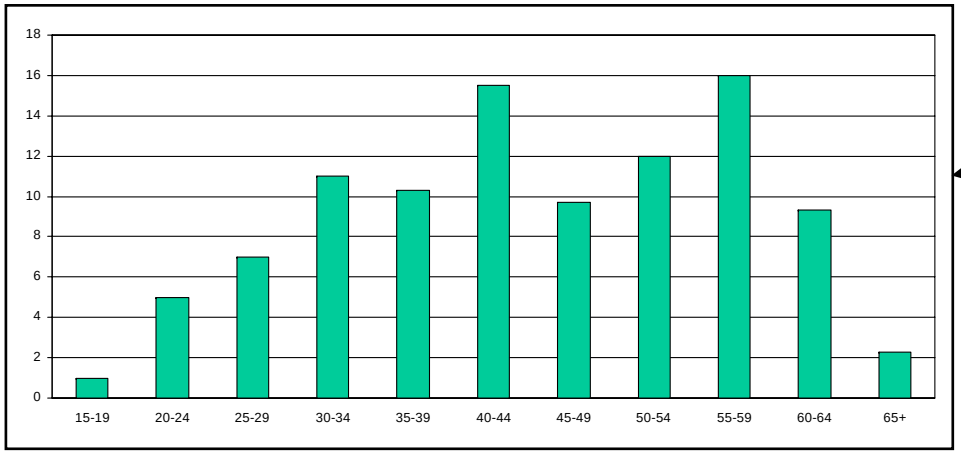


Figure 1:
Age Structure of 2003-2004 Georgia Crossbow Hunters

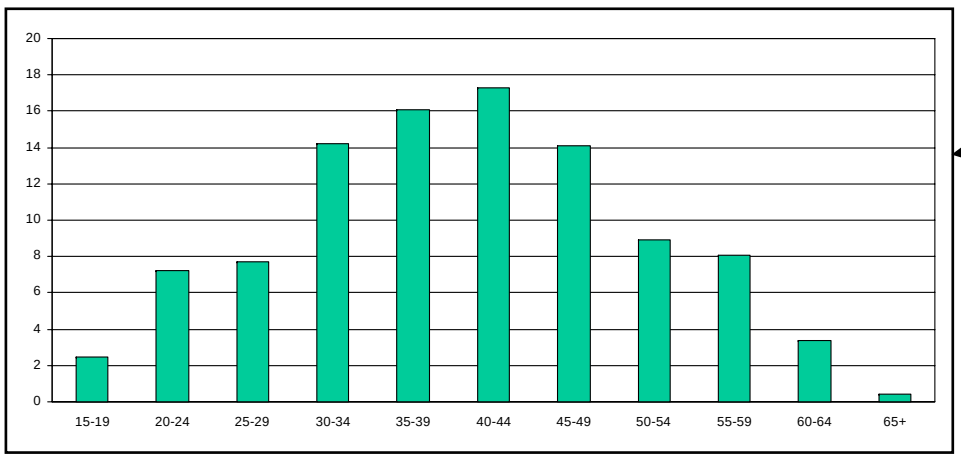
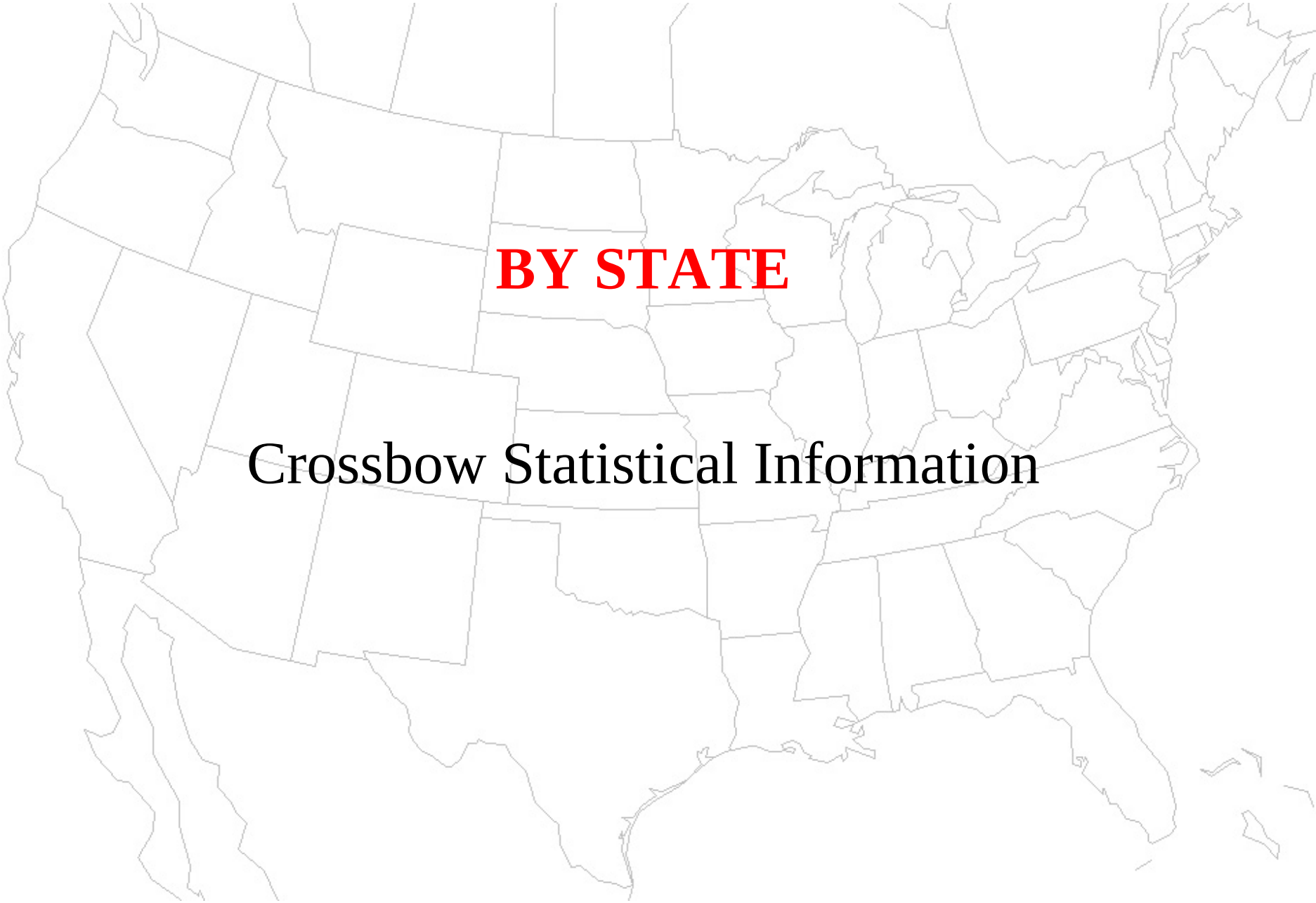


Figure 2:
Age Structure of 2003-2004 Georgia Vertical Bowhunters

Reproduced with permission: Harvest of Wildlife in Georgia, 2003-2004 Crossbow Discussion Pages 1-4 of 4



BY STATE

Crossbow Statistical Information

Archery Trade Association
Crossbow Committee

New Season Review

- Georgia
- Virginia
- Maryland
- Tennessee

Archery Trade Association
Crossbow Committee

Georgia Deer Harvest Summaries

2001-2002 Archery Harvest (crossbows not archery)

- Archery Deer Hunters 96,721
- Archery Buck Harvest 14,000
- Archery Doe Harvest 30,600
- Total Archery Harvest 44,600
- Average Deer/Hunter 0.5

FACT
GA Total Hunters: 416,833
GA Crossbow Archers: 17,322
4.1% of Hunters participated in first year (2002)

2002-2003 Archery Harvest (including crossbow)*

- Archery Deer Hunters 97,392
- Archery Buck Harvest 6,300
- Archery Doe Harvest 31,500
- Total Archery Harvest 37,800
- Average Deer/Hunter 0.4

	02/03	03/04	04/05	05/06
Crossbow Hunters	17,322	22,136	22,738	21,454
Crossbow Harvest	4,429	10,313	9,380	9,564
% of Archery Harvest	12.0%	22.0%	22.0%	19.7%
% of Total Harvest	1.0%	3.0%	3.0%	2.5%

Source: Georgia – DNR/Deer Harvest Summaries/Updated 1-11-2007. 2002-2006 Harvest Summaries

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Virginia Hunter Participation

First year crossbows considered Archery

License Sales – Archery vs. Crossbow						
License	2003	2004	2005	2006	2007	Grand Total
101 – Sportsman's Hunting and Fishing					3,156	3,156
119 – Resident Archery	58,237	58,477	58,697	52,173	48,346	275,930
120 – Non-Resident Archery	2,847	2,931	2,798	2,561	2,611	13,748
140 – Non-Resident Crossbow				628	778	1,406
149 – Resident Crossbow				15,039	19,605	34,644
Grand Total	61,084	61,408	61,495	70,401	74,496	328,884
Archery	100.0%	100.0%	100.0%	77.75%	72.64%	
Crossbow	0.00%	0.00%	0.00%	22.25%	27.36%	
Total	100.0%	100.0%	100.0%	100.0%	100.0%	

License Sales – Big Game (Bear, Deer & Turkey)						
License	2003	2004	2005	2006	2007	Grand Total
101 – Sportsman's Hunting and Fishing					3,156	3,156
115 – Resident Bear, Deer & Turkey	230,306	230,908	226,627	221,581	208,397	1,117,819
116 – Non-Resident Bear, Deer & Turkey	17,392	17,376	16,498	15,979	15,159	82,404
Grand Total	247,698	248,284	243,125	237,560	226,712	1,203,379

Source: VA Department of Game and Inland Fisheries. Reproduced with permission from Carman Houston, IMS Department.

Archery Trade Association
Crossbow Committee

2005-2006 Summary - Virginia

FACTS:

- **VA Total Archery Hunters: 74,496**
- **VA Archery Growth Rate +21.1% (61,495 to 74,496 in one year)**
- **VA Crossbow Hunters: 19,605 (Crossbows: 26% of archery license sales in two years)**

Source: Virginia Department of Inland Game and Fisheries. 2005-2006 Deer Kill Summary. Page 1 of 2.

Archery Trade Association
Crossbow Committee

Maryland – Total Harvest Comparison 2005-2006

COUNTY	BOW			FIREARMS			MUZZLELOADER			TOTAL		
	Antlered	Antlerless	Sub Total	Antlered	Antlerless	Sub Total	Antlered	Antlerless	Sub Total	Antlered	Antlerless	G
Allegany	578	319	897	1407	892	2299	443	414	857	2428	1625	
Anne Arundel	300	544	844	390	840	1230	156	397	553	846	1781	
Baltimore	827	1781	2608	754	1635	2389	306	903	1209	1887	4319	
Calvert	223	283	506	343	728	1071	152	380	532	718	1391	
Caroline												
White-tailed	160	235	395	497	1082	1579	163	550	713	820	1867	
Sika	0	0	0	0	2	2	0	0	0	0	2	
Carroll	480	681	1161	947	1841	2788	246	706	952	1673	3228	4901
Cecil	279	482	761	585	1383	1968	231	380	611	1095	2245	3340
Charles	412	567	979	889	1405	2294	325	737	1062	1626	2709	4335
Dorchester												
White-tailed	141	183	324	568	1269	1837	170	428	598	879	1880	2759
Sika	118	135	253	369	462	831	235	180	415	722	777	1499
Frederick	548	801	1349	1464	2558	4022	405	1194	1599	2417	4553	6970
Garrett	516	416	932	1502	1055	2557	476	541	1017	2494	2012	4506
Harford	465	669	1134	494	1045	1539	232	609	841	1191	2323	3514
Aberdeen Proving Ground	115	331	446	90	173	263	81	172	253	286	676	962
Howard	284	718	1002	311	780	1091	120	339	459	715	1837	2552
Kent	304	416	720	723	1577	2300	274	593	867	1301	2586	3887
Montgomery	549	1165	1714	627	1850	2477	229	692	921	1405	3707	5112
Prince George's	292	493	785	486	855	1341	192	487	679	970	1835	2805
Queen Anne's	256	404	660	663	1474	2137	228	529	757	1147	2407	3554
St. Mary's	250	419	669	554	1027	1581	211	595	806	1015	2041	3056
Somerset												
White-tailed	131	152	283	494	1162	1656	172	550	722	797	1864	2661
Sika	1	0	1	0	2	2	0	0	0	1	2	3
Talbot	163	281	444	568	1218	1786	169	435	604	900	1934	2834
Washington	644	908	1552	1879	3561	5440	551	1452	2003	3074	5921	8995
Wicomico												
White-tailed	180	255	435	646	1453	2099	187	633	820	1013	2341	3354
Sika	5	3	8	10	6	16	5	4	9	20	13	33
Worcester												
White-tailed	189	292	481	919	2233	3152	234	742	976	1342	3267	4609
Sika	19	20	39	33	46	79	3	6	9	55	72	127
TOTAL	8429	12953	21382	18212	33614	51826	6196	14648	20844	32837	61215	94052

94,052 Harvest Total

21,302 Archery Harvest Vertical and Crossbow

3,174 Crossbow Harvest

15% of archery total

4.3% during archery season

10.7% during other seasons

COUNTY	Crossbow Season			All Other Times			Grand Total
	Antlered	Antlerless	Total	Antlered	Antlerless	Total	
Allegany	16	20	36	69	36	105	141
Anne Arundel	6	30	36	32	55	87	123
Baltimore	15	119	134	96	185	281	415
Calvert	8	14	22	20	36	56	78
Caroline	3	12	15	14	29	43	58
Carroll	12	30	42	54	62	116	158
Cecil	6	12	18	31	32	63	81
Charles	14	27	41	44	67	111	152
Dorchester							
White-tailed	3	6	9	15	19	34	43
Sika	5	10	15	12	8	20	35
Frederick	11	24	35	49	49	98	133
Garrett	19	37	56	50	42	92	148
Harford	18	44	62	56	99	155	217
Aberdeen Proving Ground	3	17	20	5	22	27	47
Howard	10	51	61	48	101	149	210
Kent	7	7	14	27	33	60	74
[illegible]	23	70	93	57	148	205	298
[illegible]	4	13	17	38	47	85	102
[illegible]	[illegible]	15	20	19	40	59	79
[illegible]	3	23	26	22	43	65	91
[illegible]							
[illegible]	2	14	16	19	28	47	63
[illegible]	[illegible]	0	0	1	0	1	1
[illegible]	[illegible]	17	22	16	38	54	76
[illegible]	5	45	80	73	88	161	241
[illegible]							
[illegible]	3	9	12	14	18	32	44
[illegible]	[illegible]	0	1	0	0	0	1
[illegible]							
White-tailed	2	10	12	12	37	49	61
Sika	0	1	1	2	1	3	4
TOTAL	239	677	916	895	1363	2258	3174

Source: Maryland DNR. Written and Compiled by the Deer Project Staff: L. Douglas Hotton, Deer Project Leader. Maryland Deer Project 2005-2006 Annual Report Table 21

Archery Trade Association
Crossbow Committee

Tennessee – Harvest Comparison

Deer Harvest – Annual Weapon Totals											
	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006
Statewide Kill (Gun)*	121,563	121,074	130,335	116,759	129,580	131,864	132,265	137,598	154,746	106,015	113,928
Statewide Kill (Muzzleloader)	- - -	- - -	- - -	- - -	- - -	- - -	- - -	- - -	- - -	33,935	39,220
Statewide Kill (Archery)**	20,933	22,897	18,931	20,384	19,900	20,756	18,272	19,117	19,331	16,346	16,270
Statewide Kill (Crossbow)	- - -	- - -	- - -	- - -	- - -	- - -	- - -	- - -	- - -	3,800	5,519
Total Statewide Kill	142,496	143,971	149,266	137,143	149,480	152,620	150,537	156,715	174,077	160,096	174,937
WMA Kill (Gun)*	4,060	3,772	3,698	3,774	3,630	2,901	3,246	2,908	3,118	3,324	3,784
WMA Kill (Muzzleloader)	- - -	- - -	- - -	- - -	- - -	- - -	- - -	- - -	- - -	1,130	1,311
WMA Kill (Archery)**	1,222	949	1,101	1,056	999	835	904	818	1,135	1,009	1,058
WMA Kill (Crossbow)	- - -	- - -	- - -	- - -	- - -	- - -	- - -	- - -	- - -	168	312
Total WMA	5,845	5,405	5,560	5,491	5,160	4,348	4,718	4,358	4,780	5,631	6,465
Total Fort Campbell	1,289	965	849	863	883	631	887	707	685	652	691
No. of Counties Reporting	95	95	95	95	95	95	95	95	95	95	95
GRAND TOTAL	149,630	150,341	155,675	143,497	155,523	157,599	156,142	161,780	179,542	166.379	182,093

* Prior to 2005, Gun kills were a combination of both modern gun and muzzleloader
** Prior to 2005 Archery kills were a combination of both modern archery and crossbow

2.2% 3.0%

Crossbow Percentage of total harvest

Source: Big Game Harvest Report 2006-2007, Tennessee Wildlife Resources Agency Technical Report 07-01 Management Issue

Old Season Review

- Wyoming
- Arkansas
- Ohio

Archery Trade Association
Crossbow Committee

Statewide Harvest By Method - Arkansas

Table 2A Method	2002 - 2003	2003 - 2004	2004 - 2005	2005 - 2006
Archery	6,934	6,232	8,720	7,793
Crossbows	2,815	2,946	4,374	3,650
Muzzleloaders	19,515	10,992	18,248	13,911
Modern Gun	95,187	86,965	100,115	103,641
Entire Season	124,451	107,135	131,457	128,995
Total Archery	9,749	9,178	13,094	11,443
Compounds	6,934	6,232	8,720	7,793
Crossbows	2,815	2,946	4,374	3,650
	% Total Harvest	*% Total Harvest*	*% Total Harvest*	*% Total Harvest*
Total Archery	7.8%	8.6%	10.0%	8.9%
Compounds	5.6%	5.8%	6.6%	6.0%
Crossbows	2.3%	2.7%	3.3%	2.8%

Harvest Results 2005 - 06

Hunters checked 132,415 deer during the 2005-2006 deer season. This is a 0.5 percent increase from the 2004-2005 harvest of 131,639.

The adult buck harvest decreased 3 percent (70,480) from the 2004-2005 harvest of 72,486. The doe harvest also remained stable with a 1 percent decrease (47,464 to 47,229).

Source: Arkansas Game and Fish. 2003-2004 Deer Season Summary. Page 7 of 28.

Arkansas Game and Fish 2005-2006 Deer Summary. Pages 8 and 10 of 40.

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Ohio 2006 Hunter Survey

Estimated number of Deer Hunters by Hunter Group, Fall 2006							
	PAID Deer Hunters (325,000)		**SENIOR** Deer Hunters (40,000)		**LANDOWNER** Deer Hunters (100,000)		**ALL** Deer Hunters (475,000)
Hunting Device/Season	**% of group**	**Hunters**	**% of group**	**Hunters**	**% of group**	**Hunters**	**Hunters**
Vertical Bow	36	115,000	5	2,000	31	30,000	150,000
Crossbow	43	140,000	23	10,000	28	25,000	175,000
Total Archers		255,000					**300,000**
Shotgun	85	275,000	[illegible]	25,000	90	90,000	400,000
Muzzleloader	63	200,000	27	10,000	35	35,000	250,000
		730,000*					

***Total greater than 325,000 due to hunters hunting with more than one weapon during hunting season**

78.4% of Ohio Hunters hunted with Archery in Fall 2006; 255,000 of 325,000 paid hunters

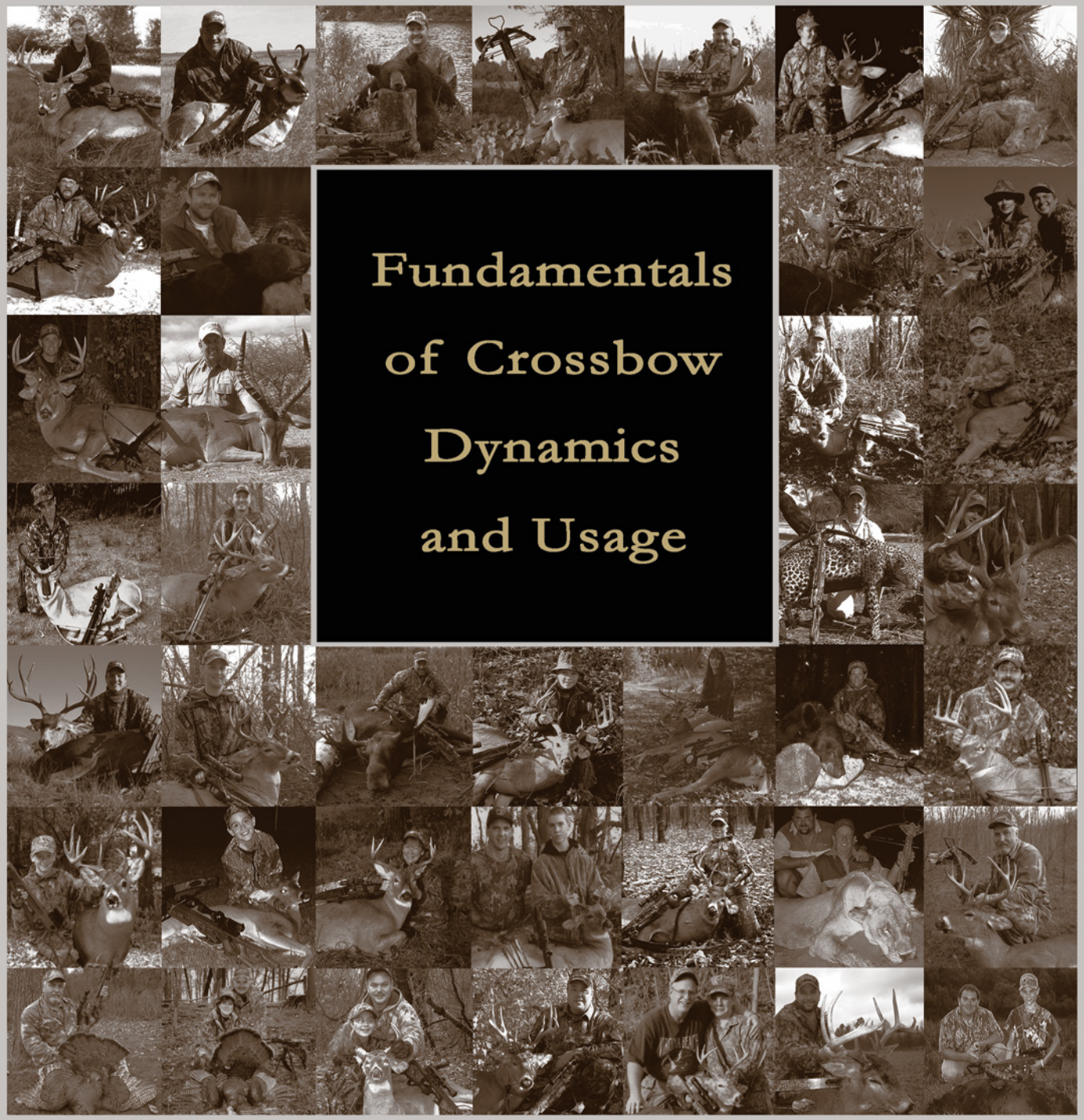
Source: Napier. T.L. and C.T. Smith. (2006). Ohio hunter participation rates. Unpublished data, Ohio State University, Columbus.

Where Do We Go From Here?

➢ We don't know where crossbow hunters are coming from.

- We need some additional studies and surveys
- We need to be able to separate bow hunters and crossbow hunters

ATA is ready to help gather this info



Fundamentals of Crossbow Dynamics and Usage