

Nonresident Permits and Kansas Deer Management

Thomas L. Marsh^a

and

Justin Taylor^b

2002 Risk and Profit Conference

Manhattan, KS

Abstract: This paper examines nonresident permits used in Kansas deer management. First, we provide background information on the market for wildlife services/experiences and economically efficient management. Second, we analyze and discuss Kansas Department of Wildlife and Parks data from 1999-2002.

Authors are assistant professor^a and graduate research assistant^b, Department of Agricultural Economics, Kansas State University, Manhattan, KS 66506. This paper is work in progress, indicating results and implications are preliminary in nature. Comments are welcomed and should be directed to tlmarsh@agecon.ksu.edu.

Introduction

Wildlife management is complex in nature. Included in the factors that contribute to the complexity of the problem are: (a) the increasing human population, diversification of interest groups, and changing public perceptions, attitudes, and preferences; (b) the number of county, state, and federal agencies involved, their legislative mandates, and coordination among the agencies; and (c) the wildlife species' impact on property and its legal status, habitat, behavior, or population dynamics (Berryman 1992). For instance, in 1987, twenty-seven different wildlife species were listed as causing the worst crop damage in their respective states (Conover and Decker 1991). Not surprisingly, state fish and wildlife agencies, rather than federal agencies, manage the day-to-day well being of the wildlife resources on private land. Consequently, each state has defined its own legislation and administrative policies that constitute the mechanisms that define how fish and game agencies manage incidences of wildlife depredation. With such a diversity of problems among and within states or regions, no single solution exists to solve human-wildlife conflicts.

Kansas provides an ideal region for a case study of deer. It overflows with an abundance of deer on both private and public lands and is known for its world class trophy bucks. Private lands, in particular, provide critical habitat for deer and other recreational opportunities for the public. Current legislation is altering the Kansas deer management program. Controversy centers around the novel use of transferable nonresident hunting permits for deer.

The paper proceeds in the following manner. First, issues surrounding the market for wildlife services or experiences, and efficient wildlife management are explored. Then, data are presented and discussed about nonresident permits on deer management in Kansas.

Background Information

Wildlife Markets

Wildlife resources, as with any natural resource, are subject to market forces. That is, consumers demand wildlife services or experiences and producers supply the habitat and wildlife stocks. Demand and supply components jointly determine an allocation of wildlife services or experiences in the market place at a point in time. Conceptually, each allocation consists of a market-clearing price for wildlife services and the quantity at that price.

Demand for a natural resource such as wildlife is based on the concepts of use and nonuse values (Freeman 1994). Use value is created by the current direct or indirect use of a resource. For example, hunting or other recreational opportunities (direct) or habitat for fish (indirect). Nonuse or passive use values are values that are independent of people's present use of the resource. Examples include bequeathing natural resources to one's heirs or preserving options for future use of resource. Total benefits attributed to wildlife resource services are derived from the sum of use and nonuse values. Evidence from a survey discussed in Fingerhut (2000) indicates Kansas producers set aside land for hunting and watching wildlife (use values), as well as preserving wildlife for future generations (nonuse values).

Supply of wildlife services can be provided by both public and private entities. Providing wildlife habitat and incurring wildlife depredation has significant costs, which are borne by private landowners or funded by state and federal agencies. Private landowners in agriculture are subjected to well-defined opportunity costs for providing wildlife and its habitat. Public wildlife managers incur prohibitive information requirements and have no means to accurately measure opportunity costs of providing wildlife habitat (Huffman 1995). Total costs of wildlife services generally depend on the mix of private and

public ownership. In Kansas, however, wildlife habitat is supplied almost exclusively by private landowners.

Several implications arise by interpreting wildlife resources from a market perspective. Perhaps most importantly is the implication that wildlife services are not free goods.¹ As the human population increases and imposes greater demands on wildlife resources and habitat, the value of wildlife experiences or services is not likely to decrease. Further, wildlife services are not supplied cost free. Suppliers of wildlife – private landowners and public land managers – incur positive opportunity costs. Given that wildlife resources are not free goods or cost free to provide, the efficient economic solution dictates that the price per wildlife service or experience in the market place is positive. Hence the appropriate question is not whether a fee is justified for wildlife services (e.g., hunting), but rather does the fee represent the true market price.

Consumers not paying the true price per wildlife service are in effect being subsidized or are “free riding” at the expense of another group or society. For example, the normal hunting license fee does not come close to the real cost of providing wildlife resources (Huffman 1995). Suppliers of wildlife services realizing less than market price in a transaction incur an opportunity cost of doing so. This can send incorrect signals to private and public land managers and, subsequently, lead to inefficient levels of wildlife services or experiences offered to consumers. To demonstrate this further, consider the previous example. Free, or nearly free, access to hunt on public lands leads to an open access situation, which results in wildlife stocks that often are overexploited.²

¹ This is exhibited by an individual’s willingness to pay positive amounts for wildlife experiences. See, for example, Anderson and Hill (1995) or the discussion below.

² Note the framework addresses issues of economic efficiency and not issues of wealth distribution. For instance, the egalitarian notion

Market analysis of wildlife resources has additional advantages. The framework provided by a wildlife market furnishes the means to estimate benefits and costs derived from environmental or resource services by consumers. Estimating benefits or costs can be a valuable part of the information base supporting wildlife management.

Efficient Wildlife Management

In theory, the goal of resource management is to identify allocations of resources over time that are consistent with wealth maximization. Luek (1991, 1995) provided a transaction cost model to interpret efficient wildlife management, based on the view that institutions (including government) not only reflect optimizing behavior of individuals but also maximize the net value of resources. He convincingly supported it with empirical evidence. This approach treats both private and public wildlife institutions as the result of efforts to increase the value of wildlife.

Luek (1991) pointed out that establishing ownership of wildlife stocks is costly because the ownership patterns of private land do not always coincide with the population’s habitat. Hence, contracting costs among landowners may eliminate the potential gains they could acquire from specifying their rights to wildlife. Implications arise from the transaction cost approach that are important to understanding economic factors that influence wildlife management. If the relative value of wildlife, the land’s wildlife productivity, or the size of the land holdings increases, then gains from transacting an agreement among landowners increases and the more likely it is that rights to wildlife will be established. Moreover, as the territory or habitat requirements of the wildlife stock increases in size, the gains from transacting an agreement among landowners will decrease and the less likely it is that rights to wildlife will be established. Finally, these results can be reinterpreted to address crop damage by wildlife. If the relative value of wildlife decreases with increases in wildlife

that hunting should be open to all regardless of economic circumstances is not addressed here.

productivity due to crop damage, then the gains from transacting an agreement will decrease and the less likely rights will be established for wildlife. These implications provide unique insight into the controversial use of transferable hunting permits recently introduced as a policy tool in the management of Kansas deer, which is discussed in the case study below.

Historically, the practice of public wildlife agencies not issuing transferable permits in wildlife markets has been a point of contention with economists (Luek 1995). This is because economists view restrictions on trade as limits on the creation of wealth and, hence, social welfare. Transferable (or marketable) permits are desirable policy tools because they provide a system of tradable property rights and they possess desirable economic properties (Baumol and Oates 1988).³ To implement tradable permits, a central planning agency issues an allowable total number of permits.⁴ As permits are transferred, the market-clearing price indicates the opportunity cost of the activity undertaken. An important advantage of the transferable permit is that it has the potential to link the wildlife manager's incentives directly to the wildlife consumer.

Nonresident Permits and Deer Management

Deer populations have made a dramatic comeback in the state of Kansas, but not without conflicts. Since the mid-1980s the whitetail and mule deer populations have grown rapidly in both the eastern and western regions of the state. It is not only the quantity of deer that is relevant in Kansas, but also the quality. Kansas is known world wide for its trophy deer population. Deer with trophy antlers are

³ Transferable permits have necessary least-cost properties that other policy tools such as direct control by public agencies lack. Further, transferable permits have been used extensively to control highly destructive pollutants. See Baumol and Oates (1988) for further background and applications of transferable permits.

⁴ This assumes the central agency knows the optimal number of permits to issue.

coveted by big game hunters and photographers. However, the dramatic increase in deer populations has also resulted in increased crop damage and wildlife-automobile collisions. Depredation of private property by wildlife is perceived by many interest groups to be a serious and prevailing problem in agriculture (Conover and Decker 1991). Agricultural producers in the US lose in excess of several hundred million dollars annually as a result of wildlife damage to crops and livestock. In 1993 alone wildlife damage to field corn in the US resulted in estimated loss in value of production of nearly \$92 million dollars (NASS). In Kansas, only 6.6% of the land owners reported crop damage in 1964. By 1997, 59% of the landowners reported crop damage.

The number of automobile accidents has increased with increasing deer stocks and is a considerable cost to society. In Kansas alone, the number of wildlife-automobile accidents were only 487 in 1973 but had exceeded 10,000 in 1999 (Kansas Department of Transportation). Assuming the average automobile claim is \$1500 (McCreeley et al., 1996), then it is clear that wildlife-automobile accidents come at a considerable cost to society.

Deer hunting is important to the Kansas economy. The average Kansas deer hunter spends approximately \$700 per year on trip-related food, lodging, transportation, and equipment. Annually, deer hunting adds approximately \$242 million to the Kansas economy (Kansas Department of Wildlife and Parks). Guided hunts for deer typically lasting 5-7 days range from \$2000-3000 per hunt, which do not include the hunting and license fee (Kansas Hunting). The price range for guided hunts in Kansas is similar to other states that offer quality deer hunting. Hence, it is reasonable to assume this represents the market price for deer hunting services.⁵

⁵ Kansas' producers compete with other regions to offer deer hunting to consumers. The market price for hunting services (e.g., guided hunts) is

Recently deer hunting regulations in Kansas were altered to allow landowners an opportunity to apply for transferable nonresident permits. Prior to 2000, a limited number of nonresident hunting license for deer were drawn only by lottery. In 2000, Senate Bill 568 was passed dealing with deer permits for nonresidents and landowners and other deer management issues.⁶ Kansas is one of the first states to allow transferable permits from the landowner to the consumer for the purpose of deer hunting. Resident landowners and all tenants/managers can apply for an antlered or any deer nonresident permit through May 31, or an antlerless-only permit through November 28. They may only apply for a nonresident permit in the unit(s) in which they qualify as a landowner, tenant, or manager. Resident landowners are limited to a single application and are required to submit the full nonresident permit fee. If they obtain a nonresident permit, it may be transferred to anyone, with or without compensation.

Kansas Department of Wildlife (KDWP) and Parks provide specific details restricting the use of hunting permits:

- A transfer application is available at all department offices. The landowner must complete the application and send it with the actual nonresident permit to KDWP in Pratt, Kansas. The application will be processed, a new permit will be reprinted, and sent to the address specified on the transfer application.
- The nonresident permit can only be transferred by the landowner, tenant, or manager who initially received the permit.
- Qualifying landowners, tenants, and managers may hunt with a nonresident permit.

- The permit, even after it has been transferred, will retain the original unit designation, as well as the equipment restriction. Landowners, tenants, or managers may only apply for a nonresident permit in the unit in which they own or operate property.
- A qualifying landowner, tenant, or manager can apply for, and receive, only one nonresident permit. Family members are not eligible for these permits.

Empirical Evidence from Kansas Data

To better understand the nonresident permit process, we examine Kansas Department of Wildlife and Parks data from the 1999, 2000, 2001, and 2002 hunting seasons. Data from 1999, which precedes Senate Bill 568, are included for comparison to 2000-2002. Table 1 provides firearm permits available, applications for the permits, and drawn permits for Kansas. The permits drawn were 3199 in 1999 and 7596 in 2002. Most interesting is the number of Landowner and Nonresident applications that increased from 5041 in 1999 to 16,991 by 2002. As exhibited by the data, Senate Bill 568 has doubled the number of available permits and induced more than a threefold increase in effective demand for these permits.

Table 2 breaks down the number of nonresident firearm permits available for all applicants by Kansas deer management unit (1-18) and hunt category (Antlerless Only, Whitetail Either Sex, Whitetail Antlerless Only, and Muzzleloader Any Deer) from 1999-2002. The most evident trend for Antlerless Only, Whitetail Either Sex, and Muzzleloader Any Deer categories is that the total number of applicants per permit have increased dramatically from 1999 to 2002. Examining the ratio of applications to available permits indicates that units 1, 2, 16, and 18 received the most applications per permit. In 2002, Unit 16 had 12.5 applications per permit. In contrast, units 4, 6, and 10 had the least number of applications per permit over the same period. In 2002, Unit 10 had 1 application for every 2 permits.

determined by hunting consumers and land wildlife suppliers across the US and Canada.

⁶ A landowner is an owner of farm or ranch land of 80 acres or more located in the state of Kansas.

To better summarize the data in Table 2, we used Poisson regression analysis to identify factors that influence the number of applications for nonresident firearm permits.⁷ The number of applications from 2001 and 2002 were regressed on indicator variables identifying 1) if the applicant was a nonresident (N), 2) if the year was 2002 (yr2), 3) if the hunt was either Whitetail Either Sex (WES) or Muzzleloader Any Deer (MAD), and 4) if the deer management region bordered another state [Nebraska (Neb), Colorado (Col), Missouri (Mis), and Oklahoma (Ok)]. Also, included as an independent variable was the number of available permits (Per). Hence, the representative applicant is a 2001 landowner applying for an Antlerless Only permit and not in a border region.

The results of the Poisson regression analysis are provided in Table 3. The estimated parameters are all significant at the .0001 level. The results indicated that more applicants will apply for Nonresident Whitetail Either Sex or Muzzleloader Any Deer permits than Landowner Antlerless Only permits. Interestingly, more applicants are likely to apply for the border regions joining Nebraska, Colorado, and Oklahoma than non-border management regions (units 4,5,6, and 14). However, fewer applications are expected in management regions adjoining Missouri than non-border management regions.⁸ The year indicator variable indicates a shift up in the number of applications in 2002 relative to 2001. Finally, the application numbers are positively correlated with the number of permits issued by KDWP.

Further inspecting the Poisson parameter estimates provides additional information. More individuals would be expected to apply for the Whitetail Either Sex permit than the Muzzleloader Any Deer permits. More applicants are anticipated

from Oklahoma, Colorado, and Nebraska border regions, respectively. The Wald 95% confidence intervals indicate the relevant parameters are statistically different from one another.

Summary

Wildlife Market Perspective

Wildlife services are not free goods. Consumers are willing to pay significant prices for wildlife services or experiences. Further, wildlife services are not supplied cost free. Suppliers of wildlife – private landowners and public land managers – incur positive opportunity costs. The appropriate economic question is not whether a fee is justified for wildlife services (e.g., hunting), but rather does the fee represent an efficient market-clearing price.

Efficient Wildlife Management

Several factors are important to understanding wildlife management. If the relative value of wildlife, the land's wildlife productivity, or the size of the land holdings increases, then gains from transacting an agreement among landowners increases and the more likely it is that rights to wildlife will be established. Moreover, as the territory or habitat of the wildlife stock increases in size, the gains from transacting an agreement among landowners will decrease and the less likely it is that rights to wildlife will be established.

Deer Management in Kansas

The introduction of transferable nonresident permits as policy tools in the management of Kansas deer stocks will alter the benefits and costs of the interest groups involved. Who are the winners and the losers? The winners may well be nonresident hunters and private landowners with large tracts of land suitable for deer habitat and servicing hunters. The resident hunters may be the losers. However, this will depend on, among other factors, the total stock of deer, total number of nonresident permits offered, and geographical location.

⁷ Poisson regression analysis is the appropriate estimator for count data (Greene 1990).

⁸ This may be due to population or other factors not included in the regression model.

KDWP through the Walk-In Hunting Access Program has taken significant steps to assure access to private lands for wildlife enthusiasts. KDWP will be further challenged to alter deer management strategies to jointly accommodate hunting access, the use of transferable permits, and to control deer populations. The use of transferable permits as policy tool requires further investigation to identify appropriate parameters (i.e., total number of nonresident permits offered) that will better ensure program goals are being achieved for the betterment of society.

Empirical Evidence

Kansas Department of Wildlife and Parks data from the 1999-2002 hunting seasons indicate that the number of available permits has doubled and the number of applications has more than tripled with implementation of Senate Bill 568.

Examining the ratio of all applications to available permits indicates that units 1, 2, 16, and 18 received the most applications per permit from 2000 to 2002. In 2002, for example, Unit 16 had 12.5 applications per permit. In contrast, units 4, 6, and 10 had the least number of applications per permit over the same period. In 2002, Unit 10 had 1 application for every 2 permits.

Results from a Poisson regression model on 2001 and 2002 data provide insightful information. Results indicate that more individuals would be likely to apply for the Whitetail Either Sex permit than the Muzzleloader Any Deer permits. More applicants are anticipated from Oklahoma, Colorado, and Nebraska border regions, respectively, than non-border deer management regions or the deer management regions bordering Missouri. In fact, fewer applications are likely in management regions joining Missouri than non-border management regions. Finally, application numbers are positively correlated with the number of permits issued by KDWP.

References

Anderson T. L. and P. J. Hill. *Wildlife in the Market Place*. Rowman and Littlefield Publishers, Inc., Lanham, Maryland, 1995.

Baumol, W. J. and W. E. Oates. *The Theory of Environmental Policy*. Second Edition, Cambridge University Press, 1988.

Berryman, J.H. "The Complexities of Implementing Wildlife Damage Management," *Trans. 57th N.A. Wildl. & Nat. Res. Conf.* (1992), Wildlife Management Institute, Washington D.C.

Bromley, D.W. "Regulatory Takings: Coherent Concept or Logical Contradiction?", *Vermont Law Review* Vol. 17:647-683 (1993).

Conover, M.R. and D.J. Decker. "Wildlife Damage to Crops: Perceptions of Agricultural and Wildlife Professionals in 1957 and 1987," *Wildl. Soc. Bull.* 19:46-52, 1991.

Farmers & Wildlife. *Enhancing Wildlife on Private Lands*. Volume 4, Issue 1. January 1998.

Fingerhut, K. A. 2000. *The Attitudes of Agricultural Producers in Kansas Towards Conservation and Wildlife*, Masters Thesis, Department of Agricultural Economics, Kansas State University, Manhattan

Freeman, A. M. *The Measurement of Environmental and Resource Values: Theory and Methods*. Resources for the Future, Washington, D. C. 1994.

Greene, W. H. 1990. *Econometric Analysis*. MacMillan Publishing Company, New York.

Huffman, J. L. 1995 "In the Interests of Wildlife: Overcoming the Tradition of Public Rights." In *Wildlife in the Market Place*, eds T. L. Anderson and P. J. Hill. Rowman and Littlefield Publishers, Inc., Lanham, Maryland.

Kansas Department of Wildlife and Parks (KDWP). Nonresident Deer Permits. <http://www.kdwp.state.ks.us/hunting/deerinfo.html>, August, 2000.

Kansas Hunting. <http://www.hunt-fish.com/Hunting/Kansas-H/kansas-h.html>, August 2000.

Luek, D. "The Economic Nature of Wildlife Law," *The Journal of Legal Studies*, Vol. XVIII, No.2, June 1989.

Luek, D. "Ownership and the Regulation of Wildlife." *Economic Inquiry*, (April 1991):249-260.

Luek, D., J. L. 1995 "The Economic Organization of Wildlife Institutions." In *Wildlife in the Market Place*, eds T. L. Anderson and P. J. Hill. Rowman and Littlefield Publishers, Inc., Lanham, Maryland.

McCreedy, C.D., C.C. McCreedy, and P.L. McCreedy. 1996. "Economic Impacts of the White-tailed Deer in Indiana." FNR-160, Dept. Forestry and Natural Resources, Purdue University, West Lafayette, IN

National Agricultural Statistics Service, 1994.

Table 1. Kansas Department of Wildlife and Parks nonresident deer draw data from 1999 to 2002 (firearm permits available, number of applicants, and permits drawn).

Year	Permits Available	Number Applicants	Permits Drawn
1999	3476	5041	3199
2000	14987 ^a	8519	8139
Landowner	7468	1242	918
Nonresident	7519	7277	7221
2001	7804 ^b	12440	7793
Landowner	---	2866	1700
Nonresident	---	9574	6093
2002	7581 ^b	16991	7596
Landowner	3791	5827	3112
Nonresident	3790	11164	4484

^a Includes Antlerless Only, Whitetail Either Sex, Muzzleloader Any Deer, and Whitetail Antlerless Only.

^b Includes Antlerless Only, Whitetail Either Sex, and Muzzleloader Any Deer.

Table 2. Kansas Department of Wildlife and Parks firearm permits and all applicants by management region from 1999 to 2002.

Deer Management Unit	1999		2000		2001		2002	
	Permits	Applicants	Permits	Applicants	Permits	Applicants	Permits	Applicants
Unit 1 - Antlerless Only	21	40	80	48	80	88	80	62
Whitetail Either Sex	39	131	164	192	56	279	44	262
Whitetail Antlerless Only	20	12	172	19	-	-	-	-
Muzzleloader Any Deer	12	73	28	209	28	184	28	482
Total	92	256	444	468	164	551	152	806
Unit 2 - Antlerless Only	20	19	74	27	74	42	74	17
Whitetail Either Sex	20	77	110	103	51	153	36	147
Whitetail Antlerless Only	-	-	114	1	-	-	-	-
Muzzleloader Any Deer	12	318	28	427	28	536	28	637
Total	52	414	326	558	153	731	138	801
Unit 3 - Antlerless Only	15	17	62	23	62	46	62	29
Whitetail Either Sex	42	86	220	143	121	254	98	304
Whitetail Antlerless Only	30	11	288	24	-	-	-	-
Muzzleloader Any Deer	13	12	30	36	30	70	30	95
Total	100	126	600	226	213	370	190	428
Unit 4 - Whitetail Either Sex	25	23	132	53	109	115	100	114
Whitetail Antlerless Only	45	4	342	16	-	-	-	-
Muzzleloader Any Deer	7	6	18	8	18	10	18	17
Total	77	33	492	77	127	125	118	131
Unit 5 - Whitetail Either Sex	25	53	132	91	112	158	94	277
Whitetail Antlerless Only	40	4	342	9	-	-	-	-
Muzzleloader Any Deer	10	22	24	18	24	28	24	29
Total	75	79	498	118	136	186	118	306
Unit 6 - Any Deer	40	40	198	79	-	-	-	-
Whitetail Either Sex	-	-	-	-	165	73	174	116
Antlerless Only	50	2	460	1	-	-	-	-
Muzzleloader Any Deer	8	7	20	3	-	-	-	-
Total	98	49	678	83	165	73	174	116
Unit 7 - Whitetail Either Sex	47	100	264	230	242	332	196	485
Antlerless Only	-	-	54	7	54	31	54	18
Whitetail Antlerless Only	30	22	342	25	-	-	-	-
Muzzleloader Any Deer	12	23	30	33	30	26	30	55
Total	89	145	690	295	326	389	280	558

Table 2. (continued)

Unit 8 - Any Deer	80	112	374	215	-	-	-	-
Whitetail Either Sex	-	-	-	-	317	422	350	571
Antlerless Only	50	29	428	26	-	-	-	-
Muzzleloader Any Deer	12	11	28	23	-	-	-	-
Total	142	152	830	264	317	422	350	571
Unit 9 - Any Deer	77	73	352	171	-	-	-	-
Whitetail Either Sex	-	-	-	-	325	224	336	375
Antlerless Only	40	14	312	18	-	-	-	-
Muzzleloader Any Deer	13	6	34	12	-	-	-	-
Total	130	93	698	201	325	224	336	375
Unit 10 - Any Deer	198	144	704	201	-	-	-	-
Whitetail Either Sex	-	-	-	-	537	254	588	307
Antlerless Only	40	23	370	32	-	-	-	-
Muzzleloader Any Deer	25	12	56	28	-	-	-	-
Total	263	179	1130	261	537	254	588	307
Unit 11 - Any Deer	165	174	726	323	-	-	-	-
Whitetail Either Sex	-	-	-	-	664	691	780	960
Antlerless Only	50	53	450	68	-	-	-	-
Muzzleloader Any Deer	32	68	72	50	-	-	-	-
Total	247	295	1248	441	664	691	780	960
Unit 12 - Any Deer	250	374	550	651	-	-	-	-
Whitetail Either Sex	-	-	-	-	327	741	356	1070
Antlerless Only	30	14	562	14	-	-	-	-
Muzzleloader Any Deer	17	39	44	58	-	-	-	-
Total	297	427	1156	723	327	741	356	1070
Unit 13 - Any Deer	55	73	132	68	-	-	-	-
Whitetail Either Sex	-	-	-	-	91	136	98	155
Antlerless Only	10	2	128	1	-	-	-	-
Muzzleloader Any Deer	4	10	12	9	-	-	-	-
Total	69	85	272	78	91	136	98	155
Unit 14 - Any Deer	275	289	616	476	-	-	-	-
Whitetail Either Sex	-	-	-	-	478	670	542	813
Antlerless Only	40	18	428	30	-	-	-	-
Muzzleloader Any Deer	21	25	50	31	-	-	-	-
Total	336	332	1094	537	478	670	542	813

Table 2. (continued)

Unit 15 - Any Deer	100	149	396	167	-	-	-	-
Whitetail Either Sex	-	-	-	-	329	307	368	652
Antlerless Only	40	5	368	18	-	-	-	-
Muzzleloader Any Deer	11	8	36	14	-	-	-	-
Total	151	162	800	199	329	307	368	652
Unit 16 – Whitetail Antlerless Only	20	7	250	16	-	-	-	-
Whitetail Either Sex	42	262	176	791	180	1386	162	2213
Muzzleloader Any Deer	8	47	22	166	22	326	22	94
Total	70	316	448	973	202	1712	184	2307
Unit 17 – Whitetail Antlerless Only	20	1	250	5	-	-	-	-
Whitetail Either Sex	42	74	176	152	137	306	88	493
Antlerless Only			20	2	20	5	20	3
Muzzleloader Any Deer	10	15	44	158	44	74	44	133
Total	72	90	490	317	201	385	152	629
Unit 18 – Whitetail Antlerless Only	10	2	86	5	-	-	-	-
Whitetail Either Sex	15	21	66	80	61	212	46	302
Muzzleloader Any Deer	6	2	14	31	14	107	14	146
Total	31	25	166	116	75	319	60	448

Table 3. Poisson regression results for 2001-2002.

Distribution Poisson
 Dependent Variable App
 Observations Used 128

Criteria For Assessing Goodness Of Fit

Criterion	DF	Value	Value/DF
Deviance	118	11992.1515	101.6284
Scaled Deviance	118	11992.1515	101.6284
Pearson Chi-Square	118	17190.9914	145.6864
Scaled Pearson X2	118	17190.9914	145.6864
Log Likelihood		86479.6822	

Analysis Of Parameter Estimates

Parameter	DF	Estimate	Standard Error	Wald 95% Confidence Limits		Chi-Square	Pr > ChiSq
Intercept	1	1.9174	0.0597	1.8003	2.0344	1030.92	<.0001
N	1	0.5436	0.0148	0.5146	0.5725	1354.00	<.0001
WES	1	2.0045	0.0562	1.8942	2.1147	1269.97	<.0001
MAD	1	1.5578	0.0576	1.4449	1.6707	731.77	<.0001
Neb	1	0.1522	0.0204	0.1122	0.1922	55.64	<.0001
Co1	1	0.3349	0.0212	0.2934	0.3764	250.37	<.0001
Mis	1	-1.1482	0.0366	-1.2198	-1.0765	986.07	<.0001
Ok1	1	0.7780	0.0183	0.7421	0.8138	1811.44	<.0001
Per	1	0.0027	0.0001	0.0026	0.0029	1773.58	<.0001
yr2	1	0.2751	0.0145	0.2466	0.3035	359.05	<.0001

