Effectiveness of Patrol Techniques for Apprehending Deer Poachers[1]

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Abstract: Effectiveness of the routine, public cooperation, group, and airplane patrol methods in apprehending closed-season deer violators was determined through questionnaires. Missouri conservation agents submitted 3,551 monthly questionnaires during the 2-year investigation. The mean arrest rates for the public cooperation, group, and airplane patrol methods were not significantly different; however, the mean arrest rate for routine patrols was significantly ($P \leq 0.05$) lower than those for the other methods. Public cooperation patrols produced the highest rates of arrests; nearly 55% of the deer violator arrests were the direct result of citizens' complaints about deer violations.

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Since the late 1960's, manpower allotments, deployment of conservation agents, evaluation of patrol strategies, and determination of the effectiveness of game-law enforcement effort have become important topics for consideration by state fish and wildlife departments (McCormick 1968, Giles et al. 1971, Beattie 1977, Cowles 1977). This interest in enforcement is understandable considering the number of people and the amount of funds budgeted for wildlife law enforcement programs, nationwide. Morse (1980) reported that 32.1% of all employees of state fish and game agencies were enforcement personnel and that enforcement activities cost $167 million in 1979. Cowles (1979) pointed out that inflation, tightened budgets, intense public scrutiny, and greater demand on wildlife resources have placed wildlife ad-

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ministrators under increasing pressure to advance knowledge of the effectiveness of enforcement programs.

In recent years, several state fish and game departments have conducted research to evaluate the effectiveness of wildlife law enforcement effort (McCormick 1968, Ritter 1975). However, the wildlife literature lacks papers providing statistical analysis of data evaluating wildlife law enforcement patrol techniques and strategies (Kaminsky 1974, Ritter 1975).

Published discussions of the effectiveness of different techniques and strategies for patrolling for wildlife violations are generally based on the writers' opinions, although these, in turn, may be based on (unquantified) past experiences (Hines 1964, Milstead 1964, Farrish 1967, Kirkpatrick 1968, Ballew 1971, Lamarche 1972). Perhaps Hazel (1968) summed it up best when he stated that for wildlife law enforcement effort to improve without increasing personnel, administrators must not only find new and more efficient methods, but must evaluate the effectiveness of current patrol techniques used to deter and apprehend wildlife violators.

Missouri's 2-year investigation initiated in July 1979, was designed to: 1) Determine the most effective patrol methods currently used, and to develop new patrol strategies to deter and apprehend closed-season deer poachers, 2) Determine characteristics of closed-season deer violations and, 3) Describe social and economic characteristics of convicted closed-season deer violators. This paper emphasizes the effectiveness of the 4 primary patrol techniques used in Missouri to detect and apprehend deer violators, and reports on the judicial disposition of out-of-season deer violation cases and the volume of public deer violation complaints received by agents during the study.

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Methods

Data on patrol techniques used by Missouri conservation agents to deter and apprehend closed-season deer poachers were collected on a statewide basis using a monthly survey data questionnaire from 1 July 1979, to 30 June 1981. Information compiled monthly on each patrol method included the number of patrol units, agent man-hours, miles driven, number of persons per patrol unit, and the total closed-season deer poaching arrests resulting from each patrol method. In addition, the numbers of casual and verified deer poaching complaints received by each agent each month were recorded. Data concerning judicial dispositions of persons arrested were taken from com-

pleted arrest reports of deer violators arrested and convicted during the study.

Results

Missouri conservation agents completed 3,551 monthly questionnaires that provided data about the enforcement effort used to deter and apprehend closed-season deer poachers. Agents spent 57,256 man-hours, and drove more than 550,000 miles in performance of deer violation enforcement patrols during the 2-year study (Table 1). As a result, they arrested 441 persons suspected of committing 244 violations of Missouri's deer regulations. In addition, the covert unit arrested 11 persons involved in 8 deer violations.

Agents knew only 34% of the convicted violators before their arrests. There was a significant positive relationship between numbers of violators previously reported for deer poaching and whether agents knew the violators ($P < 0.05$). Conservation agents indicated that almost one-third (31%) of the violators had been reported for deer poaching before their arrests. Of violators known by agents, 55% had been reported for prior deer poaching violations; only 19% of the violators not known by agents had been reported for deer violations previously.

Cross tabulations of violators' age classes and whether they were known by the agents indicated that agents knew a significantly higher proportion ($P < 0.05$) of older ($\geq$30 years) violators than younger violators.

Almost 76% of the violators were cooperative when arrested by conservation officers. The remaining poachers were reported to be belligerent or violent because they either made verbal threats of violence or required some amount of physical restraint in the arrest process. On the average, 1.8 violators were arrested per violation. A single agent made the arrests in 57%

Table 1. A summary of total enforcement effort allocated to each patrol method used to deter and apprehend deer poachers by Missouri conservation agents, 1979–81.

	Total Patrol					
Patrol Method	Units	Man-Hours	Miles	Personnel	Arrests	Violations
Routine	7,775	43,039	417,810	8,226	145(32.9)[a]	73
Public cooperation	1,866	7,452	81,660	2,028	241(54.6)	145
Group	359	3,379	25,841	634	25(5.7)	12
Airplane	326	3,386	29,094	514	30(6.8)	14
All methods	10,326	57,256	554,405	11,402	441	244

[a] Percent of total.

of the violations, and no more than 2 agents were involved in making arrests in 91% of the violations. Violators refused to stop for an agent's signal in only 12% of the violations detected.

Cross tabulations of violators' behaviors with age class of violators and the number of agents involved in arresting violators were made. No significant relationships were observed with any of these comparisons.

Slightly over 60% of the agents' efforts to investigate and prevent deer violations were made in October (20.7%) and November (40%) during both years of the study combined. Over 75% ($n = 345$) of deer poaching arrests were made in October (28.5%) and November (47.8%). The number of deer violators arrested per month and man-hours agents worked each month on deer violation patrols were closely correlated ($R^2 = 0.98$, $P < 0.01$).

Effectiveness of Patrol Methods

Conservation agents used 4 principal methods to patrol for closed-season deer violations. Patrol techniques were classified as follows:

1. *Routine*—The movement through or stakeout of an area within an assigned enforcement district. Inspections and any subsequent arrests are incidental to the agents' movements, and do not result from information received from public cooperators.

2. *Group*—Involves 2 or more patrol units with 1 to 2 agents per unit. This method is used when wildlife violations are numerous and occur over a large area.

3. *Public Cooperation*—Patrols made after a citizen notifies an agent that a wildlife violation has occurred. This usually involves 1 agent per patrol unit.

4. *Airplane*—Coordinated air-ground patrols involving aircraft equipped to allow pinpointing the specific map location of a suspected violation. Several ground patrol units are required.

During deer violation patrols, agents averaged 5.5 man-hours, traveled an average 54 miles, and arrested an average 0.04 poachers per patrol (Table 2). In total, conservation agents averaged 1 deer violation arrest for every 129.8 man-hours in all methods of patrol. They detected 1 closed-season deer violation in which arrests occurred for every 234.6 man-hours worked in enforcement of deer regulations (Table 2).

Each agent averaged 2.9 deer violation patrols per month during the project (Table 3). In performance of deer patrols, agents averaged 16.1 man-hours, traveled 156.1 miles and apprehended 0.12 poachers per month (Table 3). Annually, agents averaged 193.2 hours in patrols.

Table 2. Resources invested by patrol units and results of 4 principal patrol methods used to deter and apprehend deer poachers in Missouri, 1979–81.[a]

Patrol Method	Mean Values Per Patrol Unit				Mean Man-Hours Per	
	Man-Hours	Miles	Personnel	Arrests	Arrest	Violation
Routine	5.53[b]	53.73	1.03	0.02	296.8	589.5
	(7.26)[c]	(66.88)	(0.61)	(0.27)	(14.6)	
Public cooperation	3.99	43.76	1.09	0.13	30.9	51.4
	(36.48)	(304.33)	(3.04)	(1.37)	(16.1)	
Group	9.41	71.98	1.76	0.07	135.2	281.6
	(245.65)	(1,699.22)	(39.82)	(5.84)	(83.0)	
Airplane	10.39	89.24	1.58	0.09	112.9	241.8
	(318.01)	(2,581.52)	(33.14)	(6.84)	(69.6)	
All methods	5.54	53.69	1.10	0.04	129.8	234.7
	(5.47)	(50.16)	(0.61)	(0.18)	(4.9)	

[a] Confidence intervals (95%) were not shown for the mean values because 3,551 of a total population of 3,554 were sampled.
[b] Estimated mean.
[c] Standard deviation.

Agents used the routine method substantially more often than any other patrolling technique (Table 1). Agents worked 43,039 (75.2%) man-hours and drove almost 420,000 (75.4%) miles in conducting routine patrols for closed-season deer violators. Overall, 145 poachers (33%) were apprehended in routine patrols.

Agents used both the roving and stakeout strategies when performing routine patrols. Each of these strategies was used successfully to apprehend deer violators; however, staking out an area resulted in almost 18% more poachers being caught than did simply driving through an area.

Statewide, agents using the routine method averaged 5.5 man-hours per patrol unit (Table 2). They arrested 0.02 deer violators per routine patrol unit. Overall, agents detected a closed-season deer violation in which the violators were arrested for every 589.5 man-hours of enforcement effort allocated to this method. There was 1 deer violator arrest per 300 man-hours, because almost 2 ($\bar{X} = 1.96$) arrests occurred in each deer violation observed during routine patrols (Table 2).

On a monthly basis, 2.2 routine deer violation patrols were conducted per agent statewide (Table 3). On the average, each agent worked 12.1 man-hours and apprehended 0.04 deer violators with the routine method.

Almost 86% of the total man-hours allocated to the routine patrolling technique occurred from October through March. Annually, each agent worked 145.2 (75.2%) man-hours per year in performance of routine patrols.

The second most-used patrol method involved public cooperators who reported suspected deer violations. Agents conducted over 1,800 public co-

Table 3. Participation by agents in each patrol method used to deter and apprehend deer poachers in Missouri, 1979–81.[a]

Patrol Method	Mean Values Per Agent Per Month			
	Patrols	Man-Hours	Miles	Arrests
Routine	2.19[b]	12.11	117.66	0.04
	(3.70)[c]	(26.58)	(246.30)	(0.36)
Public cooperation	0.52	2.10	22.99	0.07
	(1.28)	(6.28)	(66.72)	(1.43)
Group	0.10	0.95	7.28	0.01
	(0.55)	(6.74)	(40.08)	(0.14)
Airplane	0.99	0.95	8.19	0.01
	(0.46)	(5.97)	(46.33)	(0.16)
All methods	2.91	16.11	156.12	0.12
	(4.73)	(32.97)	(303.86)	(0.63)

[a] Confidence intervals (95%) were not shown for the mean values because 3,551 of a total population of 3,554 were sampled.
[b] Estimated mean.
[c] Standard deviation.

operation patrols during the study (Table 1). Conservation agents worked almost 7,500 (13%) man-hours, and drove more than 82,000 (14.7%) miles while investigating deer violation complaints. This enforcement effort resulted in the apprehension of 241 deer poachers, or 54.6% of the violators caught (Table 1).

On the average, 4.0 man-hours per patrol unit were worked by agents involved in public cooperation patrols conducted statewide (Table 2). Overall, 0.1 deer violators were arrested for each patrol unit responding to a citizen deer violation complaint. Agents apprehended 1 deer poacher for every 30.9 man-hours allocated to the investigation of deer poaching complaints. For each deer violation in which the poachers were caught, agents averaged 51.4 man-hours, and made 1.7 arrests per violation (Table 2).

Statewide, each agent averaged 0.52 public cooperation patrols each month and arrested 0.07 deer violators as a result (Table 3). Man-hours per agent per month peaked in October (20.6%) and November (32.9%). On an annual basis, agents allocated 25.2 (13%) man-hours per agent for responding to public deer violation complaints.

Conservation agents invested 3,379 (5.9%) man-hours in group patrols, and arrested 25 (5.7%) suspected deer poachers during the study (Table 1). Statewide the group patrol method was successfully used to detect 12 closed-season deer violations in which arrests were made over the state.

Agents averaged working 9.4 man-hours per group patrol unit in the field (Table 2). The mean arrest rate was 0.07 deer poachers per group patrol unit. Overall, 1 deer violation in which arrests occurred was detected

for every 281.6 man-hours agents spent conducting group patrols. This was an average of 1 deer poacher arrest per 135.7 man-hours, as approximately 2 ($\bar{X} = 2.01$) poachers were arrested per deer violation detected using this method (Table 2).

Each agent averaged 0.10 group patrols, or 0.95 man-hours each month (Table 3). The group method resulted in 0.01 deer violator arrests per agent per month. Agents worked 11.7 man-hours (6.0%) per year in performance of group deer violation patrols.

Airplane patrols resulted in conservation agents arresting 30 (6.8%) persons suspected of committing 14 closed-season deer violations (Table 1). Agents worked almost 3,400 (5.9%) man-hours, and drove slightly more than 29,000 (5.2%) miles while performing these enforcement patrols.

Conservation agents spent an average of 10.4 man-hours and apprehended 0.09 deer violators per airplane patrol unit (Table 2). Airplane patrols resulted in 1 deer poacher being caught for every 112.9 man-hours that agents worked. On the average, 241.8 man-hours were required to detect each deer violation detected by airplane patrols (Table 2).

A mean number of 0.09 airplane patrols was conducted per agent per month. Each agent worked 0.10 man-hours while performing these patrols. Using the airplane, each agent arrested 0.01 deer poachers per month during the period of this investigation (Table 3). On a yearly basis, each agent worked 11.4 (5.9%) man-hours using this patrol method.

Judicial Disposition of Deer Violation Cases

As of 1 January 1982, 398 poachers had been convicted of violating Missouri's deer regulations in closed season. The remaining 54 persons arrested either were acquitted ($n = 12$), had charges dismissed ($n = 21$), or had trials still pending ($n = 21$) when analyses were completed. The statewide conviction rate was 92.3% when only completed deer cases were considered.

Punishments levied on convicted deer poachers included fines, probation, and jail sentences. Some violators received only fines, while others were given a fine in addition to probation or jail terms. In a few instances, the violators were given only probation. Overall, 389 convicted violators (97.7%) were at least fined. The remaining 2.3% of convicted poachers received only probation and/or jail sentences.

Missouri judges often sentenced a violator to a gross fine and then suspended a portion of it. For example, 57 convicted violators (14.7%) were sentenced to gross fines of $500 or more, but only 38 (9.7%) actually were required to pay a net fine of this amount.

On the whole, gross fines averaged $221 (CI = ±$19) per convicted

violator as compared to a significantly ($P < 0.05$) lower average net fine of \$193 (CI = ±\$16). In addition, almost 30% of the convicted violators were placed on probation and their hunting and fishing privileges in Missouri revoked for 1 to 24 months. Forty-nine convicted violators (12.3%) were sentenced to jail terms; however, only 8 (2.0%) actually served time in jail.

It was hypothesized that judges would be more lenient on the young or unemployed violators or, conversely, give harsher net fines to those with previous arrest records. Analyses revealed no significant differences in net fines according to the violator's age, work status, or arrest record.

Public Deer Violation Complaints

Public cooperators informed agents of 3,412 unconfirmed closed-season deer violations during the study. This was an average of almost 1 (SD = 2.2) complaint per agent per month statewide.

During October and November of both years combined, each agent averaged 6 (SD = 11.6) unconfirmed deer violation complaints, or a total of 1,744 during the project. Overall, slightly less than 82% of these complaints occurred from September through February.

Of the 3,412 complaints reported to conservation agents only 1,556 (45.6%) were verified as actually representing violations. Overall, each agent verified 0.43 (SD = 1.2) deer violation complaints each month. During October and November, verified complaints were reported at a mean of 3.0 (SD = 5.0) per agent per month.

For all protection regions, the total number of verified public deer violation complaints was significantly ($R^2 = 0.85$, $P < 0.05$) correlated with the number of complaints that resulted in deer violator arrests. Further, there was a significant ($R^2 = 0.91$, $P < 0.05$) relationship between verified deer violation complaints and total number of deer violators arrested. In other words, numbers of deer violation complaints verified by agents were linked to numbers of deer violators arrests.

Discussion

Conservation agents worked almost 8% of their on-duty man-hours in the deterrence and apprehension of closed-season deer violators. Effectiveness of the routine, public cooperation, group, and airplane patrol methods in detecting deer violations was variable. For example, routine patrols were conducted almost 3 times more frequently than the other methods combined, but resulted in the apprehension of only one-third of the deer violators. On the other hand, the public cooperation, group and airplane methods were

used in the arrests of 66% of the violators, and required only one-fourth the patrol effort of the routine method.

Mean arrest rates resulting from public cooperation, group, and the airplane patrols were not significantly different. However, the mean arrest rate for the routine method was significantly ($P < 0.05$) lower than that of each of the other methods. These results must not be interpreted to mean that routine patrols were not useful to the enforcement of deer regulations and, therefore, should be discontinued. Conservation agents typically have used routine patrols to benefit the Missouri Department of Conservation in many ways other than catching violators. Routine patrols generally have been used to contact all sportsmen observed within the area patrolled. The routine method has resulted in agents being visible and able to visit with sportsmen in a friendly atmosphere. This method, therefore, has provided agents with positive opportunities to meet and inform the public of Department programs. Consequently, routine patrols have been not only a useful enforcement strategy, but have been valuable in improving Department relations with Missourians.

Agents have used the public cooperation, group, and airplane methods more selectively in order to maintain some degree of secrecy about their presence in the patrolled area. Only hunting parties that were suspected of committing game-law violations were contacted in most of these patrols, and the hunters often were defensive about being checked. As a result, these inspections often resulted in tense or unfriendly confrontations between the agent and the suspected violators.

These 3 patrol methods appeared to be more reliable enforcement techniques than the routine method. However, the higher mean arrest rates per agent per month observed with public cooperation, group, and airplane patrols probably were influenced by the larger land areas patrolled, and the fact that agents inspected primarily hunting parties that were strongly suspected to have committed a deer violation.

Perhaps the most important discovery of this study was the previously unmeasured value of public cooperators in apprehending deer violators. As indicated by the results, citizen complaints accounted for the detection of almost 60% of the deer violations in which arrests occurred. In addition, this patrol method was the least costly in time and money, and resulted in the apprehension of over one-half of the deer violators. Awareness of these enforcement results should increase every agent's understanding of the importance of good relations with the public, and the value of citizens in detecting game-law violations.

Even though the mean arrest rates of the public cooperation, group, and airplane methods were similar, fewer violators were arrested as a result of

group and airplane patrols than by patrols based on public complaints. This fact probably reflects patrol effort more than anything else.

In the present study, a major drawback to the group and airplane methods was cost of moving agents across several counties to the area to be patrolled. However, the deterrent value of both of these methods in addition to their effectiveness in apprehending violators was sufficient to justify the higher costs, in my opinion. As indicated by Hazel (1968), improved planning could probably reduce these costs.

In this study a direct relationship was observed between verified complaints and the number of violators arrested. These data suggested that the more numerous citizen complaints, the greater the number of arrests that should occur. However, there may be a threshold phenomenon. Historically, public cooperators' deer violation complaints may not have been frequent enough to reach a threshold level above which arrests would not be increased.

Perhaps agents can use public cooperator complaints as a measure to the actual number of deer violations that are occurring in their assigned enforcement districts. This information could be useful in determining the amount and types of patrol effort that should be most successful in apprehending deer violators. For example, in areas where public relations with citizens is good, but citizen deer violation complaints are few, agents probably should not allocate as much patrol effort to deterring deer violations. On the other hand, in areas where deer violation complaints are high and public relations is minimal, agents perhaps should devote more effort to patrolling for closed-season deer violations.

Judicial Punishment

In Missouri a closed-season deer violation is classified by state legal statutes as a Class B misdemeanor. Individuals convicted of this violation can be punished by a maximum sentence of a $500 fine and 90 days in jail. In the current study, there were no reports of Missouri's judges sentencing a convicted deer violator to the maximum punishment allowed by law. On the contrary, 80% of the convicted deer violators paid net fines of $250 or less, and 44% only paid net fines not exceeding $150. Jail sentences were rare and, in all but 8 instances, were totally suspended by the presiding judge. Overall, punishments appeared no more severe for multiple game-law violators than for first-time offenders.

The wide variation in gross and net fines could be construed by some potential violators as an indication of judicial leniency toward deer poaching. This factor, more than any other perhaps, has contributed to decreasing the role of punishment in preventing deer violations statewide. Furthermore, weak penalties make it profitable for any individual interested in commer-

cialization of venison to poach deer. Some individuals have been reported to have made large amounts of money from the selling of deer meat as well as deer antlers (Farnsworth 1980).

A common suggestion made by game-law enforcement personnel for reducing major wildlife violations is to increase the severity of punishment. Under many circumstances this appears to be a worthy recommendation. However, criminological literature has persistently shown that severity of punishment is only 1 variable in controlling a potential criminal's actions, and alone cannot reduce crime.

Decker et al. (1980) pointed out that the probability of a violator being apprehended for a deer violation is unknown, and perhaps may be more of a factor in a potential violator's decision to commit a game violation than the possibility of being punished severely if caught and convicted. Consequently, it appears that research must be continued not only to establish the deterrent value of punishment, but also to evaluate the probability of apprehension of game-law violators in addition to determining what factors motivate people to violate game laws.

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