

**PENNSYLVANIA GAME COMMISSION
BUREAU OF WILDLIFE MANAGEMENT
RESEARCH DIVISION
PROJECT ANNUAL JOB REPORT**

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TITLE: Elk Research/Management

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TITLE: Elk Population Survey/Elk Harvest Management

PERIOD COVERED: 1 July 2002 to 30 June 2003

COOPERATING AGENCIES: Department of Conservation & Natural Resources, Bureau of Forestry (BOF) and Bureau of State Parks; Bureau of Aviation; St. Marys Airport Authority, St. Marys, Pennsylvania; Penn State Animal Diagnostics Laboratory, Pennsylvania State University, University Park, Pennsylvania.

WORK LOCATION(S): Cameron, Clearfield, Clinton, Elk, and Potter Counties

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Abstract: Elk (*Cervus elaphus*) marked with radio-collars were used to calculate a mark-resighting population estimator and to monitor elk range expansion. Crews from the Pennsylvania Game Commission (PGC) and Department of Conservation and Natural Resources' Bureaus of Forestry and State Parks conducted a winter aerial elk survey on 21-31 January 2003. I estimate the elk population to be 552. Known elk mortalities (50) were recorded 31 January 2002 through 31 January 2003. Crop-damage kills (17) and elk-vehicle collisions (11) were the leading causes of known elk mortality. Seventy hunters participated in the 6-day elk season from 18-23 November 2002. Sixty-one elk (32 antlered and 29 antlerless) were harvested during the second elk season in 70 years. All elk tissue and blood samples (60) tested for chronic wasting disease (CWD), tuberculosis, and brucellosis were negative. I recommend that a new elk survey be evaluated and conducted in September and/or October 2003 that includes estimates for the southern and northeastern (expanded) part of the elk range as well as the northwestern (traditional) part, and we continue the elk check station to collect biological data and monitor herd health.

OBJECTIVE

1. To measure annual changes in demographic characteristics of the elk population, monitor herd distribution, and document elk harvest.

METHODS

As in previous years, elk ≥ 1 year old were captured and fitted with radiocollars (Advanced Telemetry Systems, Isanti, Minnesota, USA). Free-ranging elk were captured using a Pneu-Dart Cartridge (Pneu-Dart Inc., Williamsport, Pennsylvania, USA) dartgun and 1 cc Pneu-Darts. Carfentanil citrate (Wildlife Laboratories, Inc., Fort Collins, Colorado, USA) was used

as the immobilizing drug and the antagonist was Naltrexone (Wildlife Laboratories, Inc., Fort Collins, Colorado, USA). Elk were captured using 1 cc doses of Carfentanil citrate (3 mg/cc). Following processing, each elk received 1.25 cc of Naltrexone (50 mg/cc) intravenously and 3.75 cc subcutaneously.

Each captured adult elk was equipped with a numbered yellow radiotransmitter collar. Transmitters were at 150-151 MHz frequency and powered by lithium batteries.

Population Survey

Radiocollared elk were used to calculate a population estimate using Chapman's mark-resighting estimator (Pollock et al. 1990). Prior to the survey, survey unit using a Cessna 182 fixed-wing aircraft equipped with a null telemetry receiving system recorded locations of all radiocollared elk. The northwestern part of the range (formally referred to as Traditional or Primary Elk Range) was divided into 25 survey units that were surveyed in numerical sequence to minimize effects of elk movements on sightings during the survey. Two Bell Jet Ranger 206-B helicopters equipped with null telemetry receiving systems were used for the survey. Ground crews (2) with telemetry receiving equipment were available, if necessary, to verify sightings. Southern units (13-25) were surveyed on the first day, and units 1-12 were surveyed the second day.

Prior (≤ 2 hours) to each unit survey, the fixed-wing aircraft was used to locate all radiocollared elk in the unit. Maps depicting flight patterns were used to navigate during transect flights. Helicopters flew at ground speeds of 97-113 km/hr (60-70 mph) at 92 m (300 ft) elevation above the surface. Transects were spaced 0.40 km (1/4 mi.) apart in an effort to obtain 100% ground coverage of each unit. Helicopters deviated from transects only when necessary to count groups of elk and verify other required information for observed elk. Radiotelemetry equipment in the helicopter was not used to locate collared elk during transect flights, enabling observers to record elk locations through visual sightings. Immediately following each unit survey, the helicopter crews contacted the observer in the fixed-wing aircraft and reported the number, sex, and location of each elk group sighted. The observer in the fixed-wing aircraft confirmed the helicopter crews' data and notified the crews of the transmitter frequencies, sexes, and locations of all radiocollared elk missed during transect flights. The helicopter crews then used telemetry equipment to locate missed elk groups and record the required data. In addition, all radiocollared elk seen during transect flights, were verified with radiotelemetry equipment following transect flights.

Survey crews (2) consisted of a pilot, seated on the right side of the helicopter, a left forward observer (crew leader and navigator), a left rear observer (primary), and a right rear observer (secondary). During transect flights the navigator was responsible for adherence to flight plans, for locating elk forward and to the left of the helicopter, and for determining the numbers, sexes, and ages of elk in each group. The primary observer was responsible for locating elk to the left of the helicopter and determining number, sex, and age of all radiocollared elk in each group. The secondary observer was responsible for locating elk to the right of the helicopter, for recording starting and ending times and group sizes in each unit, for

maintaining radio contact with the fixed-wing aircraft, and for tracking missed radiocollared elk.

A group was defined as 1 or more elk separated by ≥ 137 m (≥ 450 ft) from another elk or group of elk. Group size, sex and age composition, location, and number of radiocollared elk were recorded for each group.

The remaining part of the range was surveyed from the ground using vehicle and snowmobile. Depending on availability and weather, a helicopter was used to assist with counting elk. Using sighting reports gathered during and prior to the formal survey of the northwestern part of the range, PGC and BOF employees and private citizens verified the existence of elk outside of the formal survey area (northwestern corner) and determined numbers and sex and age composition. Additionally, radiocollared elk outside the northwestern corner of the range were located and recorded. The elk counted during this part of the survey were added to the estimated total from the northwestern part of the range to arrive at the population estimate.

Mortalities

Known elk deaths were recorded from 31 January 2002 to 31 January 2003. Mortalities were recorded by cause, date of death, sex, age, and location for each elk. Field or laboratory necropsies were performed to determine cause of death, when appropriate.

Harvest

Commission personnel manned a check station in Quehanna Wild Area during the 6-day elk season from 18-23 November 2002; successful hunters were required to visit the check station within 24 hours of harvest. All elk were inspected, and a harvest report was completed. Sex, age, weight, antler and body measurements, harvest time and location, hunter information, and previous tagging information were recorded. A central incisor was removed for cementum age analysis. Blood samples were collected in the field by hunters for brucellosis testing. Tissue samples were collected for CWD and tuberculosis.

RESULTS

Population Surveys

The elk survey was conducted January 21-31, 2003. Helicopter crews flew the northwestern part of the range from 21-24 January. Sixteen radiocollared elk were available during transect flights. Sighting probability of radiocollared elk was 63% ($n = 16$). Crews sighted 275 elk during transect flights. Chapman's mark-resighting estimator calculated 404 elk in the northwestern part (Table 1). The minimum verified number of elk in this part was 269.

Ground and aerial searches were conducted using radiotelemetry and elk "sign" in the expanded range 24-31 January 2003. Using combined ground and aerial observations we recorded a minimum of 148 elk in the southern and northeastern portions of the range during the survey. Elk were located in Clinton (52), Cameron (80), Clearfield (12), and Elk (4). We simply added these known elk (148; Table 2) to the Chapman Estimate of 404 (Table 1) within the northwestern portion for an estimated total of 552 (Table 3).

Ground and aerial crews observed 423 (76%) of the estimated 552 elk. The bull:cow and cow:calf ratios were 26:100 and 34:100, respectively.

Elk distribution during aerial surveys was recorded during 21-31 January 2003. As expected, the majority of the elk were located in the northwestern part of the range.

As in past years, numerous elk have been sighted outside the northwestern part. In addition to translocated elk, colonization of the Quehanna Wild Area and southern Potter County appears to be increasing as more elk have established themselves in the area. With the increase in habitat work in the expanded range, I predict that more elk will colonize in new areas of the expanded range in future years.

Mortality

I compiled records on 50 known elk mortalities (excluding legal harvest) from 31 January 2002 to 31 January 2003 (Table 4). Crop damage kills (17), elk-vehicle collisions (11), and illegal harvests (8) were the leading causes of known elk mortality, which increased from 2001 (37). This increase was attributed to the increase of crop damage kills. Expected to increase as the elk population increased, the number of known elk mortalities has generally decreased relative to the total elk population since 1975.

Harvest

Seventy hunters participated in the 6-day elk season from 18-23 November 2002. Sixty-one hunters successfully harvested an elk (Table 5). Twenty-nine antlerless and 32 antlered elk were harvested in Elk and Cameron Counties. Average estimated live weight of cows was 435 lbs and 676 for bulls. Cementum aging analysis showed cows averaged 6.2 years old and 6.0 for bulls. All elk tissue and blood samples tested for CWD, tuberculosis, and brucellosis were negative.

RECOMMENDATIONS

1. Develop a standard elk survey protocol and a population estimator from previously conducted surveys based on: 1) Chapman's mark-resighting estimator, 2) the minimum verified number of elk, and 3) the number of elk observed during first-time helicopter flights.

2. Monitor elk range expansion within the 835 mi² range using radiocollared elk.

3. Monitor movements of translocated nuisance elk using radiotelemetry via vehicle and aircraft.

4. Maintain the elk check station to collect biological data and continue disease testing of harvested elk.

Table 1. Aerial elk survey results within the northwestern part of the elk range based on Chapman's (1951) marked-resighting population estimate ($n = 16$) in Cameron and Elk Counties, Pennsylvania, January 2003.

Sex and Age	Number		%
	Verified	Estimated	
Branched-antlered bulls	41	60	15
Spike bulls	12	19	4
Adult cows	174	254	63
Calves	48	71	18
Unknown	0	0	
Total	275	404	100

Table 2. Combined aerial and ground count results in the expanded elk range in portions of Cameron, Clearfield, Clinton, and Elk Counties, Pennsylvania, February 2003.

Sex and Age	Number		%
	Verified	Estimated	
Branched-antlered bulls	23	23	16
Spike bulls	3	3	2
Adult cows	66	66	45
Calves	39	39	26
Unknown	17	17	11
Total	148	148	100

Table 3. Results of the aerial survey and ground and aerial counts of the entire elk range, Pennsylvania, February 2003.

Sex and Age	Number		%
	Verified	Estimated	
Branched-antlered bulls	64	83	15
Spike bulls	15	22	4
Adult cows	240	320	58
Calves	87	110	20
Unknown	17	17	3
Total	423	552	100

Table 4. Causes and number of known elk mortalities by sex and age (yr) in Cameron, Clearfield, Clinton and Elk Counties, Pennsylvania, 31 January 2002 to 31 January 2003.

Cause	Males			Females			Unknown	Total
	<1	1-2	>2	<1	1-2	>2		
Crop Damage		3	8	1	2	3		17
Highway			1	6		4		11
Illegal		1	1	2		3	1	8
Unknown			2			3	1	6
Train			3	1		1		5
Accidental			1			1		2
Brainworm						1		1
Total		4	16	10	2	16	2	50

Table 5. Number of elk harvested by day in Cameron and Elk Counties, Pennsylvania, November 2002.

Day	Antlerless	Antlered	Total
1	16	10	26
2	7	7	14
3	2	5	7
4	3	6	9
5	0	2	2
6	1	2	3
Total	29	32	61