

UTAH

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Introduction

The mountain lion or cougar (Felis concolor spp.) is a resident of the mountains, brushlands and open forest throughout Utah (Sparks 1981). It is considered "uncommon" in Utah due to its widespread distribution but low abundance. About the only place it is not found is the 3,000 square miles of barren salt flats (Figure 1).

Taxonomists list two subspecies in Utah. F. c. hippolestes occurs in wilderness areas of northern Box Elder County, the northern Wasatch Range, the Uinta Range, and the area south to and including the Book Cliffs. It is larger and darker than F. c. kaibabensis which occurs in central and southern Utah.

The Utah Wildlife Board is responsible for policy matters relating to the management of mountain lions. This is a five member Board appointed by the Governor. Each member represents a separate region of the state.

Until 1967, mountain lions were unprotected with no restrictions on methods, numbers, or season of take. In fact, the earliest records about cougar in Utah relate to killing of livestock and man's attempts to exterminate them.

Predator Control

Depredation control is one of the biggest cougar management problems in Utah, and apparently, in the southwestern United States. This topic was tackled in 1976 at the first workshop, and we have chosen to address it again. While we discuss this topic later, we need to remember what Ira Gabrielson, one of the first wildlife biologists with 31 years of experience with the precursor of the U.S. Fish and Wildlife Service (and its first director), once said, "No topic in the wildlife field is more controversial than that of predator

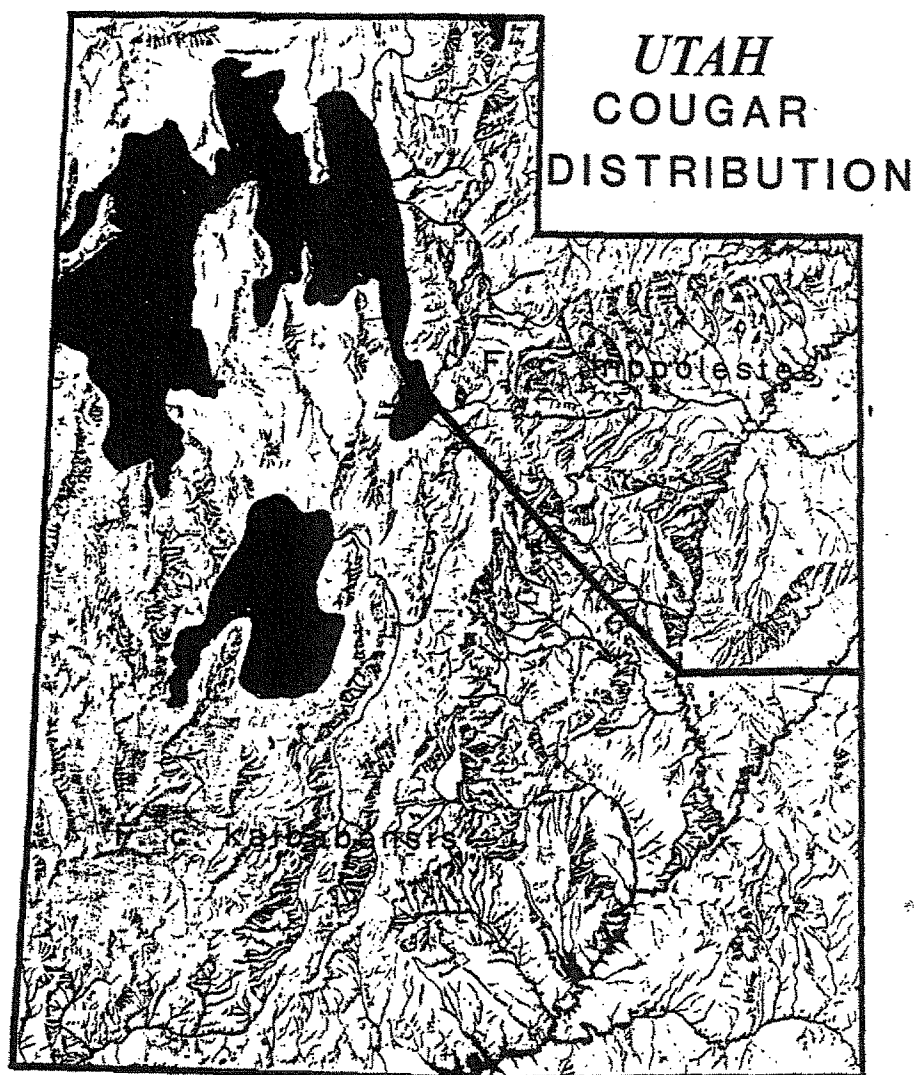


Figure 1. Distribution of the two subspecies, F. c. hippolestes and F. c. kaibabensis, in Utah according to Durrant (1952).

relationships, and on none perhaps is there more loose thought and positive opinion based on insufficient consideration of the evidence that is available." He was committed to scientific wildlife management and was instrumental in the establishment of the first cooperative wildlife research units. I hope we are as committed to finding scientific solutions to our various cougar management problems during this workshop. Perhaps, predator control is one area where our agencies have done a great deal of "doing" without adequate "knowing."

The earliest reported evidence of bounty payments for cougar was in 1886. The State of Utah was paying \$5 each. By 1905, some counties were paying an additional bounty, not exceeding one-half of the state bounty (Table 1).

The first federal appropriation for predator control was made in 1915. The following year, the first cougars were taken by professional federal trappers and hunters. This temporary emergency appropriation was designed to increase livestock production for allied nations in Europe during World War I.

In 1921, the Utah Legislature authorized predator control activities by the State Board of Agriculture. Trappers were employed to use poisons for the "extermination" and "eradication" of predatory wild animals. Two years later, appropriated funds were insufficient to pay all the bounty claims. In 1925, no claims were paid so that funds could be used to pay the 1924 deficit. Funding problems arose again in 1929 and 1932.

In 1925, the Federal Division of Predator and Rodent Control was formed, and in 1931 Congress passed the Animal Damage Control Act. The control of mammal predation on livestock has been a federal program since this Act was passed. The purpose of the USFWS Animal Damage Control program is to "(1) ensure ecologically sound, socially acceptable animal damage control activities, and, (2) to assist in reducing wildlife damage to man's interests."

In Utah, the number of cougar reported taken by bounty, outnumbered cougar taken by professional trappers by as much as 4 to 1 before 1950. The peak of bounty claims during the 1950's corresponded with peaks in indices of deer numbers (Table 1). The bounty program was discontinued on June 30, 1959. Between 1927 and 1983, the Utah Division of Wildlife Resources spent \$837,328 on bounty payments and depredation control.

In 1972, Nixon ordered a ban on the use of toxicants on federal lands, and the EPA cancelled the registration of 1080 sodium cyanide and strychnine. Emergency use of M-44 by certified applicators was authorized in 1975.

The Utah State Agricultural and Wildlife Damage Prevention Act of 1975, as amended in 1979 and again in 1982, created a cooperative state Animal Damage Control program. This program is funded by contributions

Table 1. History of predator control and reported cougar taken in Utah, 1896-1983.

Year	Bounty Fees Paid Per Cougar	Bounty Cougar Taken	Total Predator Control Expenditures (Utah DWR) \$	Number Cougar Taken By Professional Trappers	Number Of Cougar Taken By Livestock Operators	Sport Harvest	Minimum Total Cougar Taken ^d
1896	\$5	--					
1901	\$5-\$10	--					
1903	\$5	--					
1905 ^a	\$5	--					
1907 ^a	\$2.50	--					
1909	--	--					
1913	\$10	44					44
1914	--	62					62
1915	--	50					50
1916	--	34		31			65
1917	\$15	44		30			74
1918	--	48		11			59
1919	\$25	17		20			37
1920	--	27		6			33
1921	\$30	21		37			58
1922	--	17		11			28
1923	--	6 ^b		5			11
1924	--	16 ^b		5			21
1925	\$30	-- ^c		6			6
1926	--	1	277.63	11			12
1927	--	24		20			44
1928	--	49	200.09	18			67
1929	--	-- ^d		31			31
1930	--	122	158.30	32			154
1931	--	86		26			112
1932	--	-- ^e	273.71	60			60
1933	--	--		61			61
1934	--	--	481.30	25			25
1935	--	--		107			107
1936	--	--	324.15	68			68
1937	--	--		26			26
1938	--	--	10,284.66	19			19
1939	\$15	-- ^f		41			41
1940	--	--	764.81	27			27
1941	--	--		26			26
1942	--	--	25,092.23	25			25
1943	--	-- ^g		22			22
1944	--	120	28,754.27	48			168
1945	--	174		61			235
1946	--	161	30,788.07	0			161
1947	\$15	121		14			135
1948	--	162	21,117.11	49			211
1949	--	126		29			155
1950	--	85	15,636.40	58			143
1951	--	88		77			165
1952	--	85	23,835.69	53			138
1953	--	60		55			115
1954	\$20	62	23,135.48	74			136
1955	--	129		39			168

Table 1. (con't.)

Year	Bounty Fees Paid Per Cougar	Bounty Cougar Taken	Total Predator Control Expenditures (Utah DWR) \$	Number Cougar Taken By Professional Trappers	Number Or Cougar Taken By Livestock Operators	Sport Harvest	Minimum Total Cougar Taken ^d
1956	--	50	25,554.70	57			107
1957	--	54		56			110
1958	--	37	26,043.21	56			93
1959	-- ^h	45		66			111
1960	--	--	22,499.55	61			61
1961	--	--		71			71
1962	--	--	26,049.84	76			76
1963	--	--		99			99
1964	--	--	25,000.00	103			103
1965	--	--		117			117
1966	--	--	25,000.00	88			88
1967 ⁱ	--	--		52		98	150
1968	--	--	15,000.00	44		51	95
1969	--	--	15,000.00	39		127	166
1970	--	--	15,000.00	27		127	154
1971	--	--	15,000.00	30		94	124
1972	--	--	15,000.00	21		51	72
1973	--	--	15,000.00	14		66	80
1974	--	--	15,000.00	5		103	108
1975 ^j	\$35	--	25,000.00	22	2	176	200
1976	--	--	25,000.00	17	2	167	186
1977	--	--	32,048.00	8		177	185
1978	--	--	34,905.00	24	2	210	236
1979	--	--	34,900.00	11		265	276
1980	--	--	34,900.00	14	3	205	222
1981	--	--	35,000.00	16		185	201
1982	--	--	44,500.00	11		205	216
1983	--	--	60,000.00	6	1	172	179
1984	--	--	74,800.00				

837,328.20

^aCounty could pay additional bounty not to exceed one-half of the State bounty.^bFunds insufficient to pay all bounty claims presented.^cNo bounty paid, funds used to pay 1924 deficit.^dNo funds available for bounties.^eFunds exhausted and overdrawn.^fState law amended to cooperate with Federal Government.^gOctober 1, bounty payments were again initiated.^hCougar bounty payments discontinued June 30, 1959.ⁱNo permit or license required to take cougar prior to 1967.^jAmount of bounty to be set by the State Board of Agriculture and the State Predatory Animal Damage Control Committee.

of the livestock industry and a matching amount from the state general fund. Funding from the livestock industry is between \$0.60 and \$1.00 per head imposed on sheep and \$0.17 and \$0.50 for cattle. This is a voluntary contribution program. In addition, our Division must contribute 25 percent of the amount deposited in this account during the previous year. DWR contributed \$60,000 in 1983 (Table 1).

A twelve member Damage Prevention Board, appointed by the Governor, is responsible for wildlife damage prevention policy, programs, and control methods. It is the policy of this Board to require justification for cougar removal. The following guidelines are used to document problems and identify actions to control the damage.

1. Reports of damage are investigated by Animal Damage Control (USFWS) personnel and a record made of all confirmed and unconfirmed damage;
2. When practical, the local conservation officer will be contacted before ADC personnel initiate warranted control action;
3. If control is initiated before contact can be made with the local conservation officer, ADC personnel must inform the DWR as soon as possible after the action;
4. A report of the action taken must be submitted to the State ADC office immediately after completion;
5. Usually, action must be initiated within 30 days after the date of damage;
6. No cougar less than one year old will be intentionally destroyed;
7. Hides will be disposed of by the U.S. Fish and Wildlife Service.

In all damage complaint cases, the conservation officer should investigate the alleged damage or potential damage. A written report should be submitted to our office immediately following the investigation.

The Division does not assume financial responsibility for depredation by cougar, but is responsible for investigating and, where possible, alleviating damage or potential damage.

Provisions for cougar depredation control in our proclamation now reads: Livestock owners or their employees on a regular payroll, and not those hired specifically to take cougar, are authorized to take cougar "molesting, or about to molest, livestock." As an alternative measure, these livestock owners may notify the Division, which will then authorize a local cougar hunter to take the offending animal. It is mandatory that the stockman report in writing within seventy-two (72) hours to us all cougar taken. These animals will remain the property of the state and must be delivered to a Division office or employee within 72-hours. The owner of the livestock upon which the depredation occurred may purchase one (1) damage permit per year to legally possess a cougar. Damage permits must be obtained prior to taking the cougar, and no damage permits will be issued after the depredating cougar has been killed.

It might be interesting to note the amount of mountain lion depredation in Utah (Table 2). In 1983, Federal-ADC files indicate that 1,313 livestock were reported killed by cougar. The economic loss to the livestock industry was \$90,545. This represented 0.09 percent of all livestock in Utah and 0.02 percent of the total gross value of all livestock in Utah. Cougar predation made up 4.4 percent of all predator losses in Utah that year.

Most of the depredation cougar are taken in May, June, July, and August, based on our data (Figure 2). This would indicate that depredations are significantly higher during summer months, when livestockmen are on summer range, than other months of the year ($X^2 = 48.29$, 11 d.f., $P < 0.005$).

Presently, we are faced with periodic legislative attempts at requiring us to pay cougar damage claims. Because of our previously mentioned liberal regulation on livestock operator's right to kill cougar "molesting or about to molest" livestock and because of our Division's involvement in the present state damage control program, we have not been required to make these payments yet.

The confirmed loss of livestock due to cougar has varied from 405 in 1978, to 172 in 1982 (Figure 3). There has not been an identifiable increase in confirmed losses since 1973. During this time, the number of depredating cougar taken has not changed appreciably (Table 1).

Table 2. The number and proportion of livestock losses due to cougar predation based on data in USFWS-ADC file: Statistic, 1983.

Class of Livestock	Reported	Verified	Total	Percent	Livestock	Total Current
	Number of Livestock Killed	Number of Livestock Killed	Number of Livestock in Utah ^a	<u>Losses of Total</u> Reported	<u>Verified</u>	Market Value of Livestock Losses
Cattle	5	0	950,000	0.00	0.00	\$ 1,355
Sheep	550	105	489,000	0.1	0.02	37,990
Lambs	756	202	71,000	1.06	0.28	47,900
Horses	2	1	?	--	--	--
Other	0	1	--			3,300
Total	1,313	309	1,510,000	0.09	0.02	\$90,545

^a Utah Agricultural Statistics, 1983

^b Sheep and Lambs Combined

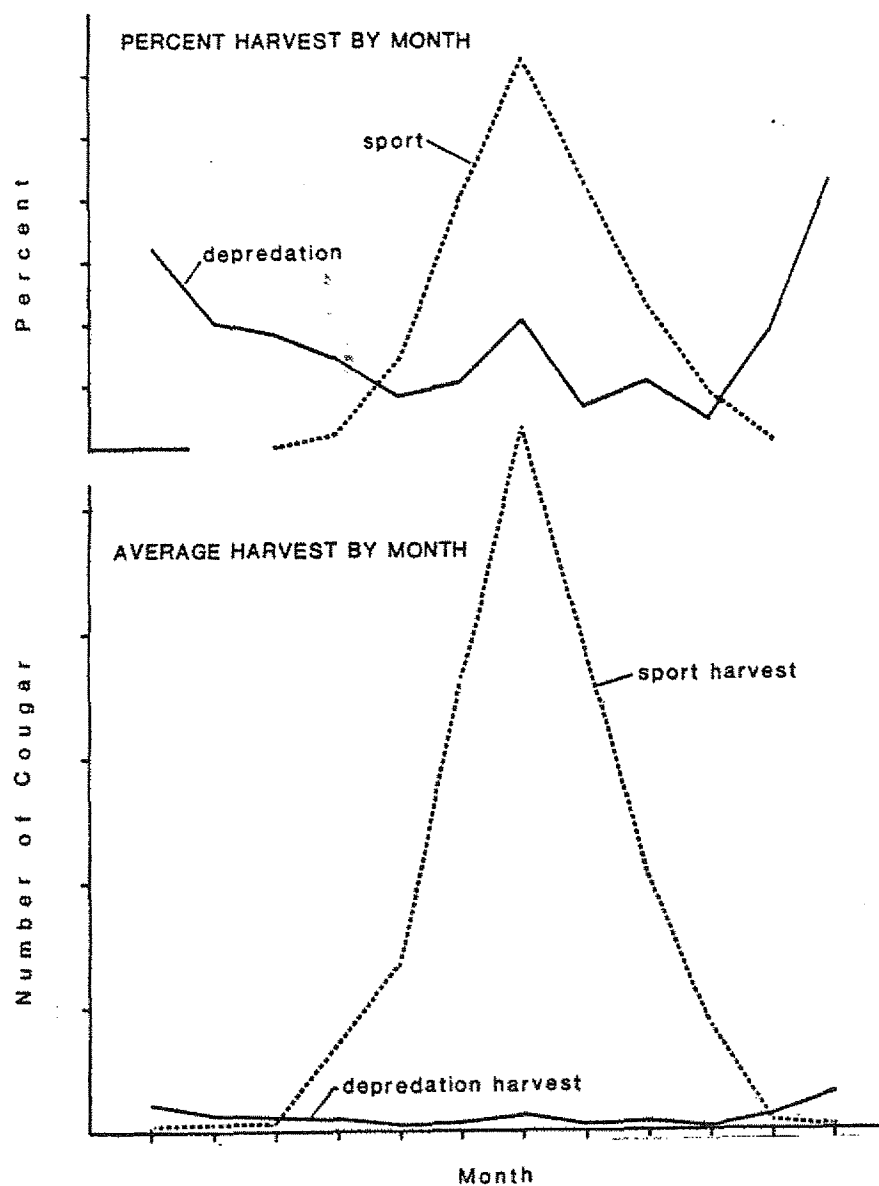


Figure 2. Number and proportion of total cougar taken by month, 1975-83.

LIVESTOCK LOSSES DUE TO COUGAR

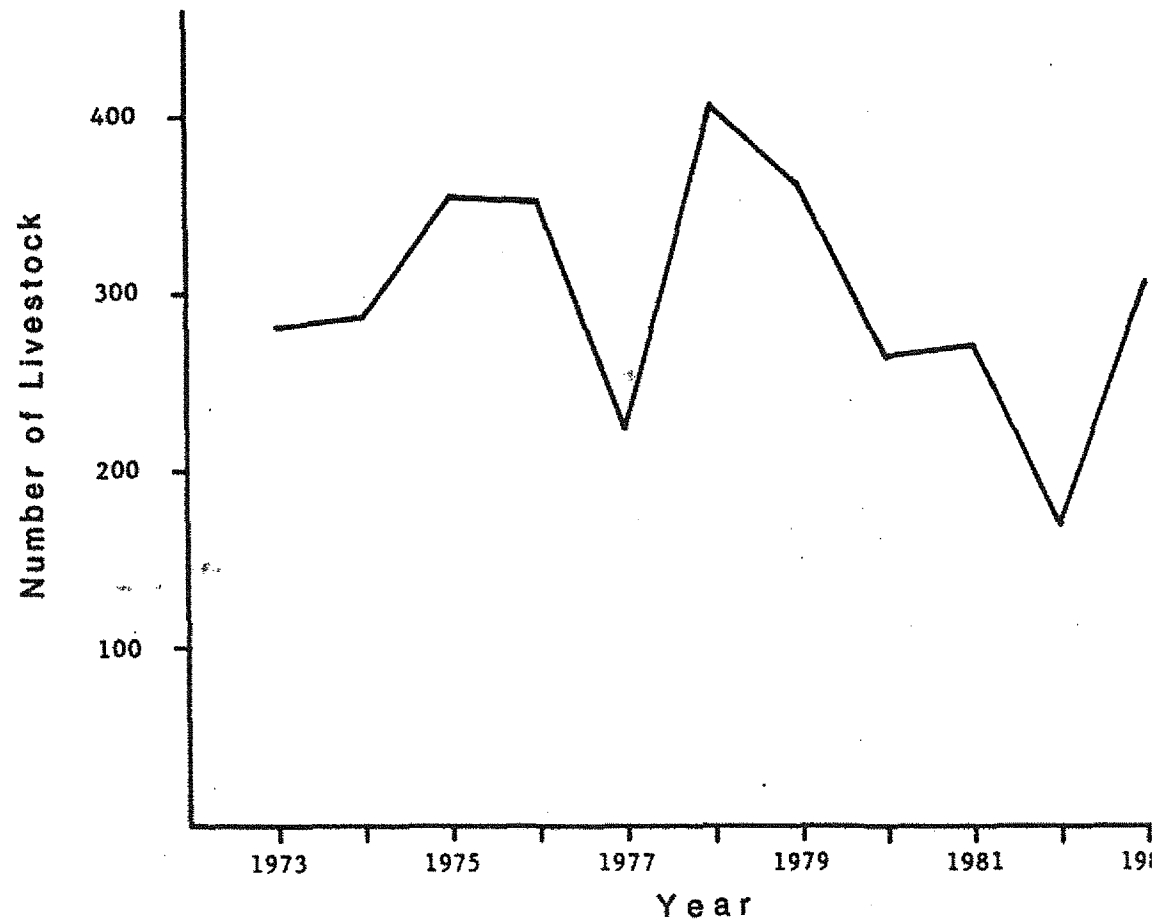


Figure 3. The number of confirmed livestock (sheep, lambs, cattle, and calves) cougar from 1973 to 1983. Data was collected on the basis of an Oct September fiscal year by USFWS Animal Damage Control personnel in Ut

Guiding

Another of the problems we have faced over the years has been obtaining guide regulations that are agreeable to the majority concerned. We have a history of noncompliance, illegal activity, and fluctuating regulations.

In 1967, nonresidents acting as guides, were required to purchase a \$300 guide permit (Table 3). This high fee resulted in abuses. Guides apparently were purchasing a nonresident kill permit for \$150 and hunting on this permit instead of the \$300 guide permit. DWR only sold one nonresident guide permit in 1967 and one in 1968. In 1968, a more realistic fee schedule of \$150 for nonresident guide permits and \$50 nonresident hunting permit was approved. In 1969, the Commission required a \$20 guide license for residents.

In 1970, at the request of the Utah Big Game Houndsmen Association (UBGHA), the commission agreed not to allow any nonresident guides in Utah. This remained in effect until 1974. Presently, the UBGHA has 200 members with 100 active.

In 1971, nonresident hunters were required to obtain the services of a properly licensed resident guide before hunting mountain lion in Utah. In 1974, the Wildlife Board dropped this requirement and nonresidents were again permitted to guide in Utah. In 1981, guide certificates of registration were increased to \$250 for nonresidents and \$100 for residents.

Hunting Regulations

Harvest regulations have become more specific and more restrictive generally since 1967, although the reported harvest of cougar has increased since they were protected (Table 1).

On January 25, 1967, the Utah Fish and Game Commission declared the mountain lion to be a protected game animal and established hunting regulations. The Utah Woolgrower's Association support this reclassification, although one year later the legislature revoked the right of the Commission to grant protected status to any wildlife.

The regulations for 1967 and 1968, allowed the taking of any number of mountain lions at any time. No permit or fee was required for the resident hunter. Nonresidents were required to purchase a permit at a cost of \$150.

Table 3. History of guide, kill permit, and pursuit permit fees in Utah.

Year	Guide Fee (\$)		Kill Permit Fee (\$)		P
	Nonresident	Resident	Nonresident	Resident	Nonres
1967	300	0	150	--	-
1968	150	0	50	--	-
1969	150	20	50	1	-
1970	*	20	100	1	-
1971	*	20	100	15	-
1972	*	20	100	15	-
1973	*	20	100	15	-
1974	150	20	150	15	1
1975	150	20	150	15	1
1976	150	40	150	15	1
1977	150	40	150	15	1
1978	150	40	150	15	1
1979	150	40	150	15	1
1980	150	40	150	15	1
1981	250	100	150	15	1
1982	250	100	150	25	2
1983	--	--	150	25	*
1984	--	--	150	25	*
1985	--	--	250	25	*

* No nonresident guides permitted in Utah

**Nonresident pursuit not allowed

In 1969, the Commission required that residents possess a hunting license while hunting, and lowered the cost of a nonresident hunting permit to \$50. Hunters were required to tag their kill. Tags were \$1 each. There was no limit on the number of tags that could be bought or the number of mountain lions that could be taken.

A limit of two cougars per hunter per season was established in 1970. Cougar hunting was not permitted on elk, moose, buffalo, or bighorn sheep units during their respective seasons.

In 1971, a shorter season was recommended for the northern half of the state (Table 4). For the first time, a 5 1/2 month season from November 1 to April 15 was approved. The remainder of the state was open year-round. A season limit of one cougar was established. Hunters were required to have a license (deer, combination, or small game), permit and tag.

The entire state was placed under the November 1 to April 15 season in 1972. The season limit remained one cougar. It became illegal to take any kitten with spots or cougar with kitten(s). The required licenses, permits, tags, and fees did not change from the previous year. All harvested cougar had to be taken to an officer for measurement and removal of a canine tooth to be used for aging.

Year-round hunting in the southcentral and southwestern areas of the state was again permitted in 1976. In 1977, hunters were allowed to harvest two cougar in southwestern Utah. The cost of the second permit was the same as the first (resident - \$15, and nonresident - \$150). Second permits were allowed due to increased complaints by livestock owners and the consensus of opinion by our field personnel that the population could sustain additional harvest.

In 1978, hunters were still required to report kills within 48 hours for the purpose of providing harvest information and physical measurements, but a satisfactory method of aging based upon cementum annuli was not found, so the removal of one canine was no longer required.

In 1979, the Henry Mountains were reopened to hunting and the Boulder Mountain in southcentral Utah was closed for a long-term cougar study. The northwestern portion of the state was reopened with a limited number of permits per county.

Table 4. Synopsis of cougar season dates, permit and harvest information, 1970-83.

Year	Season Dates	Regular Permits Sold*	Regular Season Hunters	Hunter- Days Afield	Regular Season Afield	Hunter- Days Cougar	Percent Hunter Success	Total Harvest
1970-71	April 16, 1970 to April 15, 1971	324	207		94		45.4	124
1971-72	November 1, 1971 to April 15, 1972, part April 16, 1971 to April 15, 1972, part	101	92		51		55.4	72
1972-73	November 1, 1972 to April 15, 1973	114	108		66		61.1	80
1973-74	November 1, 1973 to April 15, 1974	201	176	963	103	9.35	58.5	108
1974-75	November 1, 1974 to April 15, 1975	305	286	1,499	176	8.52	61.5	200
1975-76	November 1, 1975 to April 15, 1976	363	332	2,379	167	14.25	50.3	186
1976-77	April 16, 1976 to April 15, 1977, part November 1, 1976 to April 15, 1977, part	377	344	2,098	177	11.85	51.5	185
1977-78	April 16, 1977 to April 15, 1978, part November 2, 1977 to April 15, 1978, part	482	408	2,443	210	11.63	51.5	236
1978-79	April 16, 1978 to April 15, 1979, part November 1, 1978 to April 15, 1979, part	502	436	2,312	265	8.72	60.8	276
1979-80	November 1, 1979 to April 15, 1980	556****	442	3,081	205	15.03	46.4	222+
1980-81	April 16, 1980 to April 15, 1981, part November 1, 1980 to April 15, 1981, part	479****	411	2,496	185	13.49	45.0	201+
1981-82	April 16, 1981 to April 15, 1982, part November 2, 1981 to April 15, 1982, part	521****	432	3,526	205	17.20	47.5	216+
1982-83	April 16, 1982 to April 15, 1983, part November 3, 1982 to April 15, 1983, part December 1, 1982 to February 28, 1983, part	506***	435	3,278	172	19.06	39.5	179+

*First required on July 1, 1969.

**Purchase first required on April 15, 1975.

***Includes cougar harvested on damage permits. Government trapper harvest is on a fiscal year basis.

****Includes 27 restricted area permits.

+Reported kill--not estimated.

Table 5. Number and percent of annual sport harvest of cougar in Utah by month, 1976-1983.

YEAR	Number and Percent (%) of Annual Sport Harvest by Month													TOTAL
	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC	JAN	FEB	MAR	APR	
1976-77	1	1			1		3	5(3.4)	8(5.4)	53	38	22	13	147
1977-78(HARSH)		1	2	1	1		1	10(5.2)	35(18.2)(23.4)	66	38	10	3	192
1978-79		1		1	1		2	26(11.2)	47(20.2)(31.4)	83	38	12	8	253
1979-80								19(9.3)	55(26.8)(36.1)	63	32	23	9	205
1980-81(MILD)								14(7.6)	27(14.6)(22.2)	35	62	36	9	185
1981-82						4	2	15(7.3)	45(22.0)(29.3)	62	38	23	7	205
1982-83		2	1	1	1	2		12(7.0)	52(30.2)(37.2)	43	28	19	10	172
TOTAL	1	5	3	3	4	6	8	101(7.5)	269(20.1)(27.6)	405	274	145	59	1,339

In 1980, twenty-five second cougar permits for southcentral and southwestern Utah were made available from the Cedar City office. A second cougar permit was issued only after proof was given that the first cougar had been taken. These permits were offered on a first-come, first-served, basis.

period, (2) to hunt during the off-season for other species, and (3) to train dogs on dry ground.

Our data indicate that about 28 percent of our sport harvest occurs in November and December (Table 5). Closing these two months will not result in a 28 percent decline in total harvest since more animals will be available in January than there would be normally. We expect a 20 percent decline in total harvest as a result of a two-month delay in season opening.

Nonresident cougar permits were raised from \$150 to \$250; with the \$30 nonresident license, it now costs \$280 for a nonresident to hunt cougar in Utah.

We are aware of instances where harvested cougar are not being brought to us to be checked. We know that several are being taken out-of-state each year without being reported. We also receive comments each year about hunters taking more than one cougar. Now the tag on the permit is only temporary and valid for 48 hours following date of kill. After this time, a permanent possession tag or seal must be affixed to the hide by an officer. The mandatory seal provides greater hunter incentive to have sex and age information recorded. It should cut down on the illegal taking and transport of cougar. If you hear of interstate transport of illegal Utah cougar which do not have a permanent seal, I am sure Mr. Paul Woodbury, our Chief of Law Enforcement, would appreciate hearing from you (1-800-662-3337).

We need complete information from the majority of hunters to accurately determine cougar harvest. In the past, to get 80 to 90 percent return, we have sent two questionnaires to each permittee and followed up with telephone contacts to the nonrespondents. This was frustrating and time consuming. We felt that if cougar hunters were going to enjoy the privilege of hunting, they ought to at least complete a simple form of hunt information so we have better information to

manage the resource. Hunters are now required to report either a kill or unsuccessful effort on a mail questionnaire or no permit will be issued in the subsequent year.

Another problem we have had is that a guide will book a hunter and they will hunt off the guide's permit. A cougar is taken by the hunter and the guide donates the cougar to the hunter. The donation slip is filled-out with the guide's or a family member's permit and license numbers. The cougar is now legal for transport out-of-state. But now, we require that the permanent seal be attached before the hide can be donated, eliminating this loophole if they are checked.

Method of Taking

Trapping of mountain lion was authorized in Utah until 1971. Now the Proclamation reads, "It shall also be unlawful to take cougar with a trap or snare, and any cougar taken accidentally while trapping predators or furbearers shall remain the property of the State of Utah and may not be possessed by the trapper." The only restrictions we have on weapons is that no crossbow or rimfire cartridge except .22 long-rifle or .22 magnum may be used.

Harvest Information

The use of harvest data to reflect population changes depends on several tenuous assumptions. Some of these assumptions are: (1) hunters provided accurate information; they did not lie or guess, (2) vulnerability of cougar from year to year due to snow conditions and hunter access are constant, (3) prey winter movements and vulnerability remain constant over the years, and (4) experience of houndsmen changing through time - becoming a lost art, proficiency changes, (5) hunter selection for mature males. Accepting these assumptions are presumptive in Utah, but harvest information is all we have. Rather than emphasizing the development of new population survey techniques, I believe our research should result in correction and weighting factors to negate these influences and make the harvest data better.

From 1972 to 1975, the number of hunters and reported harvest increased at almost geometric rates (Figure 4). From 1975 to 1979,

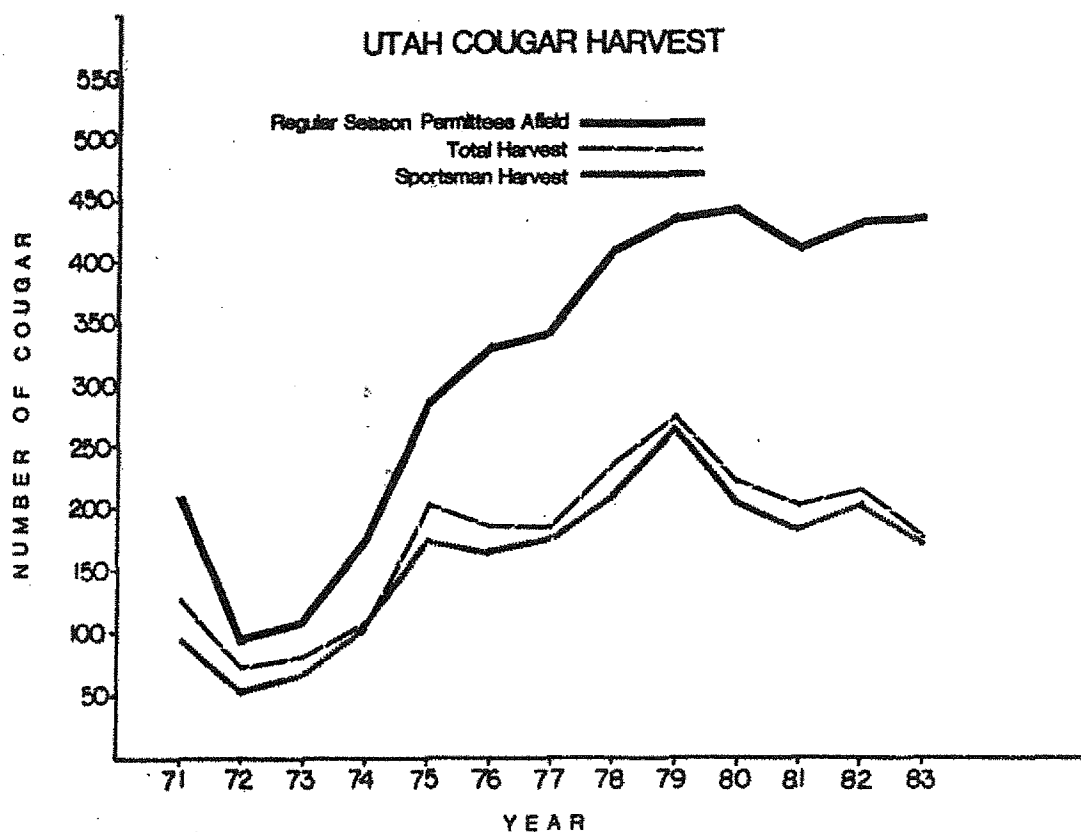


Figure 4. Trend in hunters afield and reported harvest of cougar in Utah, 1971 - 1983.

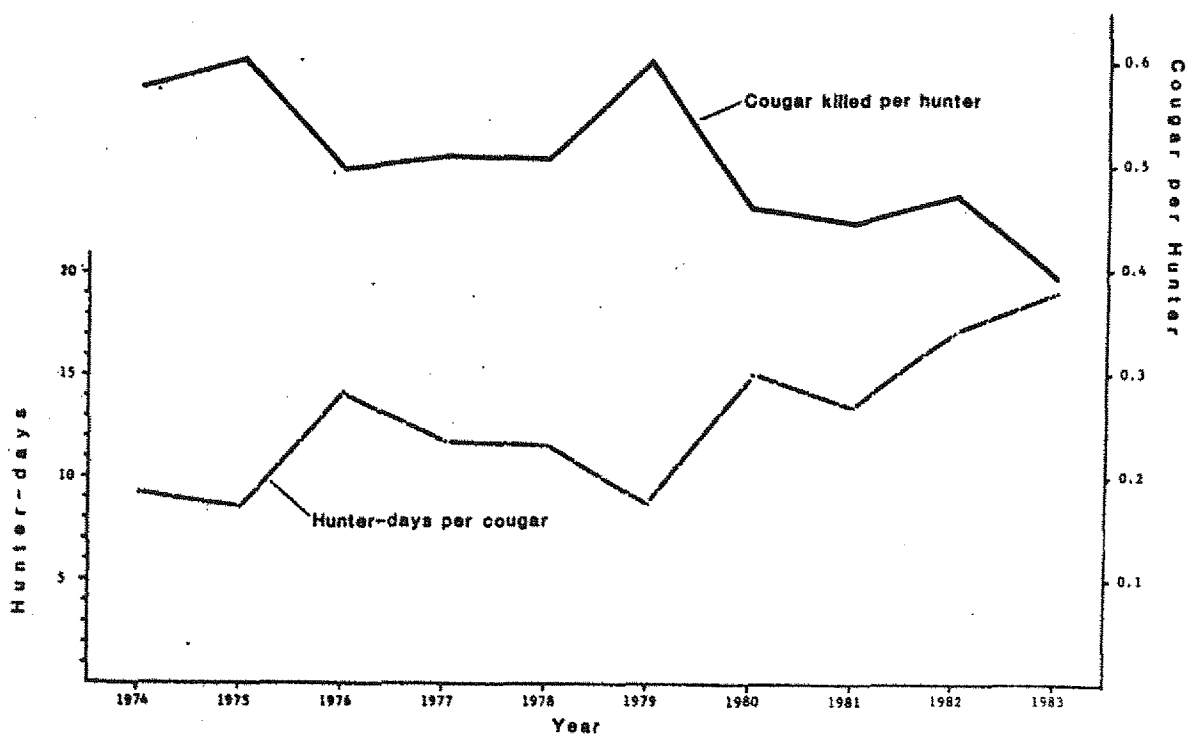


Figure 5. Trend in hunter effort and hunter success in Utah, 1974-83.

hunters continued to increase, while reported harvest increased at a slower rate. Since 1979, hunters have increased slightly while reported harvest has declined.

Trend indices based upon hunters, hunter days, and harvest may indicate a declining population since 1979 (Figure 5). Hunter success in 1983 was the lowest since 1967. Hunter success this year was 40 percent compared with a 52 percent average. The number of days required to harvest a cougar has also increased significantly since 1979 from about 9 days to 19 days in 1983. The average days during this period was about 13 days.

I'm also somewhat concerned about the interpretation of an apparent change in the age structure of harvested cougar in 1983 (Table 5). More sub-adults (12-24 months), were reported harvested this year than in previous years. I believe the explanation is this. While we have required mandatory checks for sex and age, since 1970, aging has been fairly subjective, and probably biased toward older ages due to the influences of hunter prestige. In 1983, we adopted the cementum junction technique which possibly has resulted in more animals correctly classified as sub-adults than would have been classified previously.

However, if the aging techniques yield comparable data, then there was a significant increase in hunter caused mortality on juvenile animals in 1983. If transient subadults are more vulnerable to hunting than adults which the Boulder Study tends to indicate, then the actual proportion of juveniles in the population was much less than 30 percent, suggested by Horrocker in Idaho Stable population in 1983. This would indicate a very smaller young age class and a declining population.

At the present time, cougar provide recreational sport hunting for 500 hunters for over 2,500 hunter days annually. Our management goal is to maintain the population at a level in balance with its prey and harvest the annual surplus. By 1990, we expect 50 percent hunter success and about 15 hunter/days per cougar killed. Total harvest should be around 250. In the future, I see further refinement and more specific management of cougar. Possible changes could be quotas by management units, special procedures to reduce livestock depredations and reduce illegal activity, and refinement in the analysis of harvest data.

Research

The first published mountain lion research in Utah was by Robinette et al. in 1961. Not much research work had been done on cougar in Utah until 1978. That year, Dr. Fred Lindzey of the Utah Cooperative Wildlife Research Unit, began research in southern Utah. This work continues and is a cooperative effort of Utah DWR, U.S. Fish and Wildlife Service, and the Wyoming Cooperative Wildlife Research Unit. The goal of the study is to add to our knowledge about cougar ecology, behavior, and population dynamics. During the first three years, graduate students gathered baseline data on population dynamics, movement patterns, and feeding habits. Master's Theses by Bruce Ackerman and Tom Hemker detail these results. During the last three years, Dan Barnhurst has continued to collect this information as well as determine the vulnerability of cougar to hunting. Dan will report on these research results later in the program. We intend to continue for a few more years emphasizing the effects of known cougar removal on the reproductive potential of the population. Specific information being sought is:

1. Effort required to successfully capture and kill a cougar;
2. Number of chases that result in the capture of a cougar;
3. Sex and age classes of cougars most likely to be captured;
4. Percentage of a cougar population that can be removed with a specific amount of hunter effort;
5. Vulnerability of young;
6. Replacement rate of residents removed by hunting;
7. Reproductive condition and history.

Some results of management significance are: (1) Although mountain lion breed year-round, 10 of 16 litters were born from October through December; (2) These kittens were vulnerable to mauling by dogs until they were several months old; (3) These kittens were likely to be orphaned since they only occasionally accompanied the adult female, and therefore, hunters would not know that the female had kittens; and (4) juveniles dispersed at 16 to 19 months of age or late the second winter or spring.

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