JOB PROGRESS REPORT

State: California

Project Number: W-54-R-10 Project Title: Nongame Wildlife Investigations

Job Number: IV - 1.6 Job Title: Bobcat Study and Survey

Period Covered: July 1, 1977 - June 30, 1978 Job Type: Survey and Inventory

SUMMARY:

Most of the project efforts during 1977-78 were directed towards gathering biological information on the bobcat. This information was needed to satisfy the Endangered Species Scientific Authority (ESSA) that the present harvest of bobcat would not be detrimental to the species in California, to respond to the Department of Interior's request for information concerning the possibly endangered status of the bobcat, and to justify current Department regulations concerning the take of this species.

Biological investigations showed that bobcats occur in 57 of California's 58 counties, in 12 of 13 major habitat types containing more than 2% of California's land, and in 8 of 16 minor habitat types. This land amounts to 92% of California's 100,000,000+ acres. A conservative estimate of the pre-breeding season adult bobcat density was derived from ongoing Department studies on population dynamics and from relative population indices obtained in Department studies and by commercial trappers. Using this method a minimum bobcat population of 61,000 was estimated for California.

Hunter take of bobcat was estimated to be 15,300 animals. A bobcat fur export tag system, with a quota of 6,000, was adopted by the California Fish and Game Commission. A total of 5,111 tags were sold during the 1977-78 season resulting in a total statewide harvest of about 20,000 bobcats.

Distribution data were gathered from 7 national forests and a symposium on the bobcat was sponsored.

BACKGROUND:

Public interest on the bobcat, on both the domestic and international fronts, has increased greatly over the last 10 years. Prior to 1971, the bobcat in California was a nonprotected mammal and there were no restrictions on its take. In 1971, this species was given Nongame status by the California Legislature. Subsequently, in 1974 a season was imposed on the take of bobcat. This season was further restricted to the present 3½ month length in 1976.

The Defenders of Wildlife petitioned the Secretary of the Interior in early 1977 to place the bobcat on the endangered species list. Subjective evaluations, data from Animal Damage Control take, and increased fur prices and commercial demand and take of bobcat led this group to take this action.

In 1973, the United States became a party to the treaty on International Trade in Endangered Species of Wild Fauna and Flora. The treaty restricted trade in endangered species and established procedures to monitor the trade of other species that might be faced with endangerment in the future. The bobcat was one species deemed by the parties to the treaty as a candidate for future endangerment. The

E.S.S.A. was established as the scientific authority to monitor and the U. s. Fish and Wildlife Service was given the management authority over trade as provided by the treaty.

OBJECTIVES:

1. Maintain bobcat populations for nonconsumptive and consumptive uses.

2. Determine the distribution of bobcats and their habitat in California.

3. Understand the population dynamics of bobcats in the various habitat they occupy.

4. Formulate and carry out a management plan to maintain bobcats at an ecologically sound population level within California.

PROCEDURES:

The California Fish and Game Commission inacted regulations requiring persons exporting bobcat from California to purchase an export tag which must be affixed by a Department employee to the pelt before export. This provided an accurate method to determine the commercial take of bobcat. The standard hunter survey questionnaire was modified to eliminate biases previously identified as affecting the results of the bobcat take. Once again a phone survey of respondents was made to check the results of the questionnaire and identify any remaining biases which would influence data on hunter take of bobcat.

Trappers were interviewed to gather data on bobcat take per unit effort, habitats trapped, and amount of area covered while trapping. The U. S. Forest Service was asked to provide recent sighting data from their lands in California.

FINDINGS:

Attached are the reports cited below:

Lee, R. C. 1978. Status of the bobcat in California. Calif. Dept. Fish and Game, Wildl. Mgmt. Branch, Nongame Wildl. Invest. Mimeo report. 6 pp.

Belluomini, L. A. 1978. Estimated hunter take of bobcat in California during 1977. Calif. Dept. Fish and Game, Wildl. Mgmt. Branch, Nongame Wildl. Invest. Mimeo report. 8 pp. + append.

The population dynamics of unharvested bobcat populations in San Diego County and eastern Siskiyou County will be reported under Project E-W-2, Jobs IV-l.6 and IV-1.7.

A total of 5,111 bobcat tags were sold to about 310 individuals during the 1977-78 season. This is a believed decrease of about 300 bobcat furs from the number believed exported in the 1976-77 season.

Using habitat data estimated for 1980 as provided in the California Fish and Wildlife Plan (1965), the total land available for bobcat habitation in California was estimated at over 92,225,OOO acres (144,000+ mi^2) (Table 1).

Habitat types used by bobcat were identified through literature sources, Department studies, and interviews with hunters and trappers in California.

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Table l.- Habitat available for bobcat habitation and estimated population density of bobcats of that habitat type.

	Habitat Type	1980 Estimated Area - mi^2	Estimated Bobcat Density - #/mi^2
1.	High desert	23,700	0.2
2.	Pine-fir-chaparral	20,200	0.25
3.	Agriculture	17,500	0.05
4.	Grassland	13,400	0.2
5.	Chaparral	13,300	2.0
6.	Low desert	13,500	0.1
7.	Woodland-grass	8,900	1.0
8.	Inland sagebrush	5,700	0.25
9.	Juniper-pinyon	5,000	0.25
10.	Woodland-chaparral	4,200	1.0
11.	Coastal forest	4,300	0.5
12.	Urban-industrial	6,500	0.0
13.	Lodgepole pine	3,400	0.5
14.	Redwood	2,700	0.1
15.	Coast sagebrush	2,500	0.25
16.	Barren	2,800	0.0
17.	Pine-fir-sagebrush	2,300	0.2
18.	Lakes, bays, reservoirs	2,600	0.0
19.	Hardwood	1,800	0.25
20.	Others	2,400	0.0-0.2

* * *

Population densities were estimated using density data from Department studies (E-W-2 studies) and by using trapper catch rates as an index of bobcat density (Tables 2 and 3). Trapper catch rates were expressed as the number of trap nights needed to catch one bobcat and the number of bobcats caught per square mile of area trapped when this was known or per square mile of area derived from the length of trap line and average trap spacing. These data by themselves are only indices, but when compared with similarly derived indices from Department studies, where absolute densities are known, bobcat densities may be estimated. These density estimates were then used to develope average densities for the major habitat types in California (Table 1).

The indices derived from trapper effort, both by commercial trappers and by Department researchers, also could be compared with similar effort data by Department animal control trappers (McLean 1934). Thus present population densities may be compared with historical densities (Table 2), even if present areas do not exactly correspond to areas from which historical data is available.

Table 2. Density indices of bobcats in California derived from trapping effort.

County	Primary Target of Trapping Effort	Density Index 1: Number of trap-nights per bobcat 1975-76	1976-77	1977-78
S.W. Humboldt	various sp.			35
E. Humboldt	various sp.			30
N.E. Lassen	coyote	285	400	625
E. Plumas	coyote			102
E. Tehama	bobcat		23	74
Lake	various sp.			22
S. San Mateo	bobcat		46	21
S.W. Santa Clara	bobcat	93	85	54
W. Fresno, S. San Benito & S.E. Monterey	coyote			57
Inyo	unknown	6	20	68
N.E. Kern	coyote			667
Central Santa Barbara	bobcat			19
S. Santa Barbara	bobcat			14
E. Ventura	coyote			52
S. Kern	bobcat		89	78
N. Los Angeles	fox-bobcat			56
entral Los Angeles	unknown			98
iverside	unknown			31
N.E. San Bernardino	unknown			40
E. San Bernardino	bobcat	28	21	19
Department study - Lava Beds N.M.	bobcat			954[1/]
Department study - San Diego Co.	bobcat			98[2/]
Trinity	coyote-bobcat			792[3/]
N.E. Tehama, W. Lassen & Ventura	coyote-bobcat			352[3/]
N. Lake, E. Mendocino & W. Glenn	coyote-bobcat			311[3/]
El Dorado & Amador	coyote-bobcat			698[3/]
N. Tuolumne & Santa Clara	coyote-bobcat			571[3/]
San Benito	coyote-bobcat			145[3/]
Kern, Fresno, Merced & Butte	coyote-bobcat			180[3/]
San Bernardino	coyote-bobcat			238[3/]
San Diego	coyote-bobcat			56[3/]

1/ Refers to known bobcat density of 0.25 bobcats per mi^2
2/ Refers to known bobcat density of 3 to 4 bobcats per mi^2.
3/ Refers to data gathered in 1932-33 (McLean 1934).

Table 3. Density indices of bobcats in California derived from trap line length or estimate area trapped.

County	Primary Target of Trapping Effort	Density Index 2 Number of bobcat taken per unit area 1975-76	1976-77	1977-78
N.E. Lassen	coyote	0.04[1/]	0.02[1/]	0.01[1/]
E. Plumas	coyote			0.19[1/]
E. Tehama	bobcat			0.45[1/]
S. San Mateo	bobcat		90.25[1/]	49.00[1/]
S.W. Santa Clara	bobcat	45.56[1/]	144.00[1/]	256.00[1/]
Inyo	unknown	0.83[2/]	1.33[2/]	
Santa Barbara	bobcat			0.89[1/] 4.59[2/]
E. Ventura	coyote			15.96[2/]
S. Kern	bobcat		11.39[1/]	18.12[1/]
N. Los Angeles	fox-bobcat		0.46[1/]	0.08[1/]
E. San Bernardino	bobcat	3.36[2/]	2.25[2/]	4.12[2/]
Department study-Lava Beds N.M.	bobcat			0.0002[1/] 0.16[2/3/]
Department study-San Diego Co.	bobcat		5.98[1/]	5.98[1/4/]
			3.43[2/]	3.43[2/]

1/ Data calculated from length of trap line and known take using formula $\frac{1}{\left(\frac{\ell}{n-1}\right)^2}$ where l = trap line length and n= the number of bobcats taken

2/ Data calculated from the number of bobcats taken from a known area.
3/ Data refers to a known bobcat density of 0.25 bobcats per mi^2.
4/ Data refers to a known bobcat density of 3 to 4 bobcats per mi^2.

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Using the estimated habitat acreage and the estimated bobcat density per habitat type, a statewide total estimate of 61,000 bobcat can be made. This estimate must be considered as a minimum, pre-breeding season population estimate. Density estimates were made on the conservative side and the known density base used relied on minimum adult densities.

The use of bobcat habitat was evaluated and the trends of bobcat habitat were considered. Land ownership patterns determine the human use of the land; 1964 data on land ownership (Calif. Fish and Wildlife Plan 1965) showed almost 52% of California's 100,353,920 acres to be in private ownership (Table 4); land where access for hunting and trapping is restricted. Of the remaining publicly owned lands, only 34,939,790 acres are under U. S. Forest Service or Bureau of Land Management control and open to unrestricted access by hunters and trappers. However, a good portion of even these lands is in wilderness or roadless areas where access is difficult and at times impossible, especially in winter during the bobcat season.

Table 4. California land ownership (Calif. Fish and Wildlife Plan 1965).

PUBLIC

FEDERAL LANDS	Acreage	
Forest Service	19,970,522	
Bureau of Land Management	14,969,268	
Department of Defense	4,233,650	
National Park Service	4,060,941	
Bureau of Reclamation	1,105,443	
Corps of Engineers	96,674	
Fish and Wildlife Service	75,231	
Atomic Energy Commission	7,593	
Miscellaneous	10,396	
Total Federal		44,529,718
STATE LANDS		
Parks and Recreation	696,927	
Lands Commission	634,653	
Public Works	197,521	
Fish and Game	115,329	
Division of Forestry	73,634	
Water Resources	53,198	
University and Colleges	47,015	
Reclamation Board	12,542	
Miscellaneous	109,395	
Total State		1,940,214
CITY LANDS	769,823	
COUNTY LANDS	617,133	
SPECIAL DISTRICTS	466,590	
SCHOOL DISTRICTS	85,307	
		1,938,853
PUBLIC LAND TOTAL		48,408,785

PRIVATE

PRIVATE LAND	Acreage	
Agricultural Lands	36,853,851	
Commercial Forest Lands	8,025,120	
Urban-Industrial Lands	2,744,428	
Rural Homesite Lands	1,100,000	
Rural Business Site Lands	221,736	
Unused Lands	3,000,000	
PRIVATE LAND TOTAL		51,945,135

TOTALS

Public Land	48,408,785
Private Land	51,945,135
TOTAL AREA OF STATE	100,353,920 acres

Habitat types occupied by bobcat were estimated to undergo a reduction of 1.7% from 1963 to 1980 (Calif. Fish and Wildlife Plan 1965). The actual decrease in available habitat is unknown at this time. The actual reduction in habitat potentially occupied by bobcat will not be known until the publishing of the next edition of the California Fish and Wildlife Plan, sometime in 1982.

Follow-up distribution data, similar to that obtained for Fresno County (see W-54-R-8, Job IV-1.1) and northeastern California (see W-54-R-9, Job IV-1.2) were gathered from Six Rivers, Plumas, Tahoe, El Dorado, Sierra, Los Padres and Angeles national forests. As with the previous studies, recent sightings were generally widespread and a function of human visitation to any one area and the reporting system employed by the individual national forest. Four hundred and ninety sightings were reported, with 23, 47, 33, 51, 54, 104 and 178 sightings from each of the respective forests.

A bobcat symposium was presented to the public and biologists from state and federal agencies and from academic institutions. The results from the Department's 2 field studies were presented and the data on the present status of the bobcat were presented and discussed.

ANALYSIS:

Methods used to determine hunter take through the hunter survey questionnaire are now giving data similar to that derived by the telephone check. Apparently the present wording of the questionnaire regarding the take of bobcat provides an accurate estimate of hunter take.

The full potential of the biological information which could be provided by the tag program is not being approached. Fur dealers are purchasing a large portion of the tags so that the total number of commercial bobcat trappers and hunters is unknown. Likewise, there is no data gathered on the age and sex and county of take. Tag buyers include hunters as well as trappers, and the portion of the take by each method remains unknown and partially duplicates the take reported by the hunter survey questionnaire results.

Direct communication with a number of trappers provided a great deal of data. Since many trappers keep accurate records of their field operations during the season, there is a large untapped pool of information which could be used to provide population dynamics data for the many habitat types in the state. This would alleviate the need to study bobcat populations in all habitats and areas of the state, would give valid data on the health of regional bobcat populations, and would substantially reduce the amount of effort and cost needed to understand and monitor the bobcats throughout California.

RECOMMENDATIONS:

1. Perform baseline studies on bobcat populations in various habitat types to develop a basis by which data derived by trapper's effort and future monitoring studies can be compared to.

2. Develop a series of population models for the bobcat populations and use as the management base.

3. Collect age, sex and kill location data from all hunters and trappers purchasing export tags.

4. Continue with present hunter survey questionnaire as basis for determining hunter kill of bobcat.

LITERATURE CITED:

California Department of Fish and Game. 1965, 1966. California Fish and Wildlife Plan. California Department of Fish and Game, Sacramento. 3 Vol.

McLean, D. D. 1934. Predatory animal studies. California Fish and Game 20:30-36.

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