BLACK BEAR MANAGEMENT SYSTEM AND DATABASE

NOVEMBER 1990

Maine Department of Inland Fisheries & Wildlife
Wildlife Resource Assessment Section
Mammal Group

TABLE OF CONTENTS

Page

PART I. – BLACK BEAR MANAGEMENT SYSTEM

INTRODUCTION

This document describes the system that Maine Department of Inland Fisheries and Wildlife (MDIFW) biologists use to make bear management recommendations. It includes the process for translating data into management decisions (Part I) and techniques for estimating various bear population parameters (Part II). The goal of the current management system was presented in the 1985 bear assessment.

Bear management recommendations are developed annually. Detailed reevaluation of the bear population's size and status, and its relationship to carrying capacity, occurs at 5-year intervals in conjunction with the assessment and planning process. Consequently, the annual management decision making process uses only a portion of the data collected by MDIFW.

This document does not address social, political, or economic considerations related to bear management. Such considerations will be addressed during the next revision of the bear assessment and goals.

REGULATORY AUTHORITY

Current bear management involves changing hunting regulations within limits set by law (Appendix 1). Beginning in 1990, the annual hunting season extends from the Monday preceding September 1 to November 30. Dogs can be used to hunt bears from September 15 to the day preceding the open firearms season on deer. Hunting over bait will be permitted from the Monday preceding September 1 through September 22. Bait sites used to hunt bear must be cleaned up, as defined by state litter laws, by November 10 annually. Bear trapping season begins October 1 and ends October 31. The annual bag limit is one bear per hunter or trapper. MDIFW can shorten or close the seasons in any portion of the state described by recognizable physical boundaries. Current seasons are not the longest permitted (Appendix I), and the Commissioner may increase season length within limits permitted by statute.

MANAGEMENT GOAL AND OBTECTIVES

The bear management goal and objectives were established in 1985 and 1986, through recommendations made to MDIFW by a big game working group representing various public interest groups.

Assumptions

The management goal and objectives are based on the following assumptions from the 1985 bear assessment:

- carrying capacity declined about 10% in all Wildlife Management Units (WMU) through 1990;

- the 1985 bear population was below carrying capacity in all WMU'S;

- the 1985 bear population was increasing; and

- opportunity to harvest bears will be maintained into the 1990's.

Management Goal

Maintain the bear population at 1985 levels (about 21,000) throughout the State's bear range.

Abundance Objective

Maintain pre-hunt bear population densities at 0.8-1.3 bears/sq. mile of habitat in WMU's 2 and 5; at 0.5-0.7 bears/sq. mile of habitat in WMU's 1, 3, 4, and 6; and at 0.2-0.5 bears/sq. mile of habitat in WMU's 7 and 8.

Harvest Objective

Increase annual harvest levels to 1,500-2,500 bears, or to levels needed to stabilize the bear population.

MANAGEMENT DECISION PROCESS

Current management decisions relate primarily to the goal of maintaining a stable bear population near 1985 levels. However, management options are limited. The geographic distribution of harvests can be controlled only through area closures. In addition, expansion of the bear season or bag limit, or allocation limited numbers of bear permits will require legislative action.

The following sections describe the decision process, input criteria used in decision making, and the management options which may result. The management system produces management recommendations annually.

Decision Making

Decision making is a series of **yes** and **no** answers to questions related to the status of the bear population (Figure 1). As the decision-maker responds to the questions on the basis of input criteria, the flow chart guides him to the appropriate management option.

Criteria for Decision Making

Is the bear population on target, stable, increasing or decreasing within each management unit? These questions are answered by applying the following rules of thumb to the criteria described below to evaluate data inputs.

Criteria A

This input answers the question "Is the population on target (at 1985 levels)?". Bear densities on two MDIFW study areas are re-estimated by applying birth and survival rates obtained from research bears on each area to its 1989 (or more recent) density estimate. One of these density estimates is assigned to the bear population in each WMU, based on its habitat classification and perceived harvest level. If the calculations produce a new density estimate for a WMU that is within the range of densities state(f in the abundance objective, the WMU's population is considered to be on target. The population is considered above target if the new density estimate exceeds the designated range, and below target if it falls below the range.

The size of the bear harvest as a gross indicator of trends in bear numbers has limited utility because hunter effort is poorly documented and success rates are unknown. In addition, bears frequently make long foraging trips outside their home ranges during fall months, thus confounding efforts to estimate impact of harvest density on local bear densities.

However, if the statewide harvest exceeds the upper level needed to maintain bear numbers at the target of 21,000-4statewide, the population is considered below target.

Criteria B

The birth and survival rates used in calculating changes in bear densities for Criteria A are also used to calculate population growth rates. Population growth rate estimates from MDIFW study areas are considered representative of the rest of bear

range, and are applied to density estimates developed under Criteria A to assess

changes in bear numbers on a WMU basis. Density estimates for the current year are

compared with density estimates from the 3 preceding years (see Criteria A). If this

comparison indicates bear densities in a WMU are changing in the same direction for 2

consecutive years, the WMU's population is considered unstable, and changing at the

indicated (average) rate.

In addition, if no more than 40% of radio-collared female bears on a study area

were to produce litters per year for 2 consecutive years, the population of that area (and

WMU's represented by that area's data) would be considered unstable and declining. If

the survival rates calculated for any age class of monitored female bears were to

decline below 50% on a study area, the population of the WMU containing that study

area would be considered to be declining.

Supporting Criteria

Several additional data collections provide less reliable indicators of the bear

population's size and growth. While they are not key components of the decision-

making process, they are reviewed as a group to lend support to decisions based on the

above criteria.

Animal Damage Control (ADC) records of bear nuisance complaints and

nuisance control permits issued by the Warden Service are examined for supplemental

evidence of changes in bear numbers. Numbers of bear complaints and control permits

can fluctuate widely year-to-year, as they are influenced by a variety of factors unrelated

to changes in bear densities. Consequently, short-term changes in numbers of

complaints or permits are not reliable indicators of population changes. However, if trends in the incidence of these records are sustained over a 3-year period (as indicated by continued change, totaling >50% increase or decrease compared to the year immediately preceding the period), a change in bear numbers is indicated.

Calculated survival rates for eartagged male bears help to support or refute other data regarding population stability. If the calculated survival rate of eartagged male bears over 1 year of age declines below 50% on a study area, the bear population in WMU(S) represented by that study area is(are) considered unstable.

Beginning in 1990, a bear hunting permit will be required of all individuals hunting bear prior to the opening of the firearms deer season. Although number of permits will not be limited, they will permit MDIFW to begin to track hunting success rates by hunting method and region. If success rates decline with time, the population will be considered unstable and declining. Conversely, increasing success rates will indicate an increasing population. If success rates change in the same direction for 2 consecutive years, with an overall change of >15%, the population will be considered unstable and changing in the direction of success rate change.

Management Options

Recommendations from the current management system can produce one or more of the following management actions:

- reduce length of bear season in parts of the state or statewide;

- reduce (in parts of the state or statewide) the portion of bear season that any of the following methods of take are legal: hunting with bait, hunting with hounds, or trapping;

Under current regulatory authority, MDIFW does not have the ability to extend season length outside of the statutory framework, issue a limited number of bear licenses, increase the bag limit, or restrict certain methods of take. However, other possible management recommendations would be to seek authority from the legislature to institute these management options.

Management Option I

Maintain current season length and open area.

Management Option II

Increase the harvest on a statewide or WMU basis. At present, the statewide harvest can only be increased by season extensions if the current season length is shorter than the maximum permitted by statute.

Alternately, the harvest can be increased on a WMU basis by directing harvest pressure into the WMU through season restrictions or closures in other WMU's (those with bear populations below target and stable or declining, or on target but declining). [NOTE: Adjustments to any WMU's season length will require definition of borders or areas based on physical features. Consequently, borders of the area with altered season length will differ slightly from the WMU's border.]

Management Option III

Reduce harvest in the WMU by, in order of increasing need: 1) decreasing season length; or 2) closing season until the population recovers.

Criteria and Procedures used to Reduce or Increase Harvest

In the event of an over or under-harvest, action to reduce or increase following year(s) harvests would occur under the following criteria and assumptions. The procedure could be applied on a statewide basis, or to any combination of WMU'S. For simplicity, only a statewide over-harvest is described below.

If the harvest exceeds the level needed to maintain the spring statewide population at 21,000 bears, the following year's spring population is expected to decline below the target level. Management action will depend on the severity of the over-harvest.

In cases where the harvest results in a reduction in 2-year mean spring bear numbers below 1985 levels, the following year's season will be shortened to reduce the harvest. The severity of the excessive harvest will determine how large a reduction in season length is needed. Reduction can occur under a wide array of scenarios involving limits on methods and areas hunted. The Commissioner will determine how the season will be shortened, after considering the social issues surrounding the harvesting of bears. The Wildlife Division's recommendations will focus on the amount of harvest reduction required to reverse the population decline. Supporting information, including distribution of harvest between harvest methods and timing of recent harvests

will be compiled for the Commissioner's reference when shortening season length to adequately reduce harvest reduction.

The population model (based on research data) will be used to project when spring bear numbers will return to 21,000, and the season may be lengthened when this occurs.

Calculation of Desired Harvest Level

Example: 1991

Assume: A 1990 harvest of 2,000 - 2,300 bears.

1.   Spring 1990 population: 17,325 bears

1990 Harvest   - 2,000   2,300

1990 non-hunting loss   - 2,250   2,250

Winter 1991 population: 13,075   12,775

1991 cub production   + 6,135   6,135

Spring 1991 population: 19,210   18,910

*13% of spring population level, based on estimated mean annual extra-legal losses from the population in the mid-80's derived from research and MOTLK data.

2.   Therefore, the spring 1991 bear population estimate (18,910 19,210) is 90 - 91% of the target spring population of 21,000 bears, and 109-111% of the spring 1990 population estimate.

3.   Calculation of the desired 1991 harvest level begins by:

    a)   projecting 1992 population size <u>given no harvest occurs in 1991</u>

Spring 1991 population:	19,210	18,910
Non-hunting mortality (1991):	- 2,500	2,450
Estimated cub production (1992):	<u>3,570</u>	<u>3,570</u>
Spring 1992 population w/ no harvest:	20,280	20,030

    b)   calculating the harvest level which will result in a spring 1992

        population equivalent to the spring 1990 level (i.e. prevent further

        population growth).

Subtract Spring 1990 population est.:	<u>-17,325</u>	<u>17,325</u>
Estimated harvest to prevent pop. growth: ------------------------------------	2,955	2,705

        These two parameters are useful for bracketing further discussion

        of harvest recommendations.

4.   Population modeling under two harvest regimes (continued harvesting at

    about 2,150 bears/year; no harvests) provided population projections for

    trend analysis. Spring population estimates generated by the model were

averaged as running 2year means, to smooth the annual fluctuation in bear numbers produced by synchronous breeding.

<div align="center">2-year Mean Population Estimate</div>

Harvest Regime	1989-90	1990-91	1991-92	1992-93
2,150 bears/yr				
during 1991,1992	18,973	18,378	18,739	19,321
No Harvest 1991,1992			19,430	21,878

Therefore, to permit population growth, the harvest should be restricted to <2,700 bears in 1991 and 1992. To ensure continued population expansion toward our 21,000 bear objective, a reasonable harvest objective is to contain the 1991 harvest at the 2,000 2,300 level estimated for 1990.

Discussion of Season Options

Example: 1991

The season options discussed fall under two scenarios: retaining the 1990 season framework with minor alterations, or returning to the season framework of the late 1980's with substantial delay in opening date.

1.   Scenario I (1990 Season Regulations)

Assuming a 1991 harvest objective of 2,000-2,300 bears, statistics from 1990

and previous seasons formed a basis for projecting the 1991 harvest, given no season

alterations:

Method/Timing	1990 (Estimated)	1991 (Prolected)
Bait/Dogs (weeks 1-5)	1,440	1,200 - 1,600[1,2]
Trapping (weeks 6-9)	50	50
Dogs (weeks 6-9)	150 - 175	150 – 175[2]
Firearms Deer (weeks 10-13)	400 - 650	200 – 300[3]
SEASON	2,040 - 2,315	1,600 - 2,125

Assumptions for the 1991 projection:
[1]Baiting success and effort will combine to produce a 5-week harvest $\leq$1989 level (1,500 bears).
[2]No change in houndsmen's success or effort from recent years (1989).
[3]Bear harvest during the November Firearms Deer season will be low, following pattern established since 1984.

This harvest projection coincides with the objective harvest range for 1991

(2,000-2,300 bears). Consequently, no change in season dates would be required in

1991.

2.   Scenario II (Return to common opening for bait and hounds)

Given a return to a common opening for both baiting and hounds, the 1989

statistics provided a basis for a "guesstimate" of 1991 harvest levels produced by

various opening dates. The 1989 rate of kill was assumed to be encountered in 1991,

and a mean rate of kill of 51 bears per day was calculated for use in harvest reduction,

based on harvest over weeks 2-5 in 1989. This assumption may not adequately

account for accelerated harvest rate due to compression of hunting effort into a shorter

season.

Delav	Opening Date	Est. Reduction	Est. Harvest
I week	2 September	300 bears	2,400
2 weeks	9 September	600 bears	2,100
3 weeks	16 September	900 bears	1,800
4 weeks	23 September	1,200 bears	1,500
5 weeks	30 September	1,500 bears	1,200

The following table of 1989 kill by week is included for reference while assessing

the impact of season options.

Table 1. 1989 Maine bear harvest by week of season and method of kill.

killweek	bait	dogs	trapped	deer	total
1	713	41	3	0	867
2	454	50	14	0	566
3	224	45	10	0	304
4	115	45	11	0	181
5	88	53	4	0	162
6	54	48	7	0	127
7	30	51	4	0	97
8	9	31	0	0	53
9	8	33	2	54	106
10	2	0	0	98	98
11	1	0	0	58	58
12	0	0	0	55	55
13	0	0	0	16	16

Total column may include bears with unknown method of kill.

Assuming the 1991 rate of kill in September is similar to the 1989 harvest, and

that a 2,700 bear harvest would occur in 1991 given season dates similar to 1989 (late

August opening):

a.   A harvest rate of 51 bears/day is used to calculate the number of days to

be removed from the season to achieve a harvest of 2,000-2,300 bears.

This was the average kill rate for weeks 2-5 of the 1989 season.

2,700 - 2,300 = 400 bears

2,700 - 2,000 = 700 bears

400 bears
51 bears/day = 7.8 or 8 hunting days

700 bears
51 bears/day = 13.7 or 14 hunting days

b.   The season would be shortened by 8 days to reduce the harvest to 2,300

bears, and by 14 days to reduce the harvest to 2,000 bears.

c.   To account for the effects of an ever-increasing rate of harvest/day or the

impact of compressed hunting effort, the season reductions would be

rounded up to the next full-week increments, and a 2-3-week reduction

would be recommended for 1991. To achieve a harvest of near 2,000

bears, the opening date would be delayed by 3 weeks, through the

Coinmissioner's rule-making authority.

CHRONOLOGY OF BEAR MANAGEMENT ACTIVITIES

By law, the bear season dates and area with an open season must be finalized and made public prior to February 1st of any year. Therefore, it is necessary to make season recommendations, hold public hearings, and set the next season dates before results of the previous season can be completely analyzed (Table 1). If necessary, a public hearing to establish regulations for the next year's bear season would be held prior to mid January.

Bear management recommendations are developed at 5-year intervals, because much of the information used in the decision making process is only meaningful when analyzed over several years. The 2-year reproductive cycle of female bears and annual variation in fall food production can produce year-to-year fluctuations in cub production. Consequently, trends in birth rates only become apparent when 4+ years of data are pooled.

Present information on bear survival comes from small annual samples of radio-collared females and eartagged males. Pooling 4+ years of data on survival produces estimates with smaller confidence limits.

Forest inventory data used in assessing carrying capacity is only collected at 5-year intervals as well. Consequently, the annual decision making process uses broad rules of thumb to establish the criteria used in answering questions about the size and stability of the bear population.

Table 1. Bear season schedule.

	Start	Finish
Department Regulation Proposal		November
Rule Making:		
Regulation to sect. of State		November
Regulation Advertised		December
Public Hearing		January
Advisory Council Meeting		January
Regulation Adopted		prior to February 1
Registration:		
Books Ordered		May
Tags Ordered		May
Stations Established		May
Tagging Material Issued		May
Season (Framework)		Monday preceding Sept. 1 - Nov. 30

PART II. – BLACK BEAR MANAGEMENT DATABSE

BEAR DATA COLLECTION SUMMARY

Bear Harvest Data

Registration Data

Every legally harvested bear must be registered at a big-game registration station (Appendix II), where a metal seal is affixed to it and information on the bear's sex and age, location of kill, hunter, and hunting method are recorded in registration booklets (Appendix III). These booklets are inspected periodically by District Wardens, and delivered by Warden Lieutenants to the Data Entry Section of the Bureau of Resource Management soon after the close of the bear season (mid-December).

Harvest data are coded and entered into a data base on the IBM Mainframe of the Bureau of Data Processing during the winter months (Appendix IV). Data entry is usually completed by early February. This information is then transferred electronically to the University of Maine's (UM) computer system (Appendix V), and a copy of the registration data is filed on the Furbearer-Bear Project's Personal Computer (PC) in the Bangor Research Headquarters.

Registration data are edited, analyzed, and summarized on the UM system by Furbearer-Bear Project (FBP) personnel using a series of computer programs (Appendix VI). Analyses include review of the geographical distribution of the harvest, its sex and age distribution, chronological distribution, and distribution by method of take (Appendix XVI). This process is usually completed by late March, when a short summary report and a map of the harvest by township are made available to MDIFW personnel and the public.

Beginning in 1990, a mail survey of hunters purchasing bear permits will be completed annually. This sampling will provide information on hunting effort and success rate by hunting method, geographical area, and time of season. Each year's results will be compared to previous seasons' data for trends in success, providing an index to population stability.

Bear Population Data

Research Studies

FBP personnel visit dens of radio-collared research bears in 3 study areas (Appendix VII) during January, February, and March (Appendix VIII). Condition of these bears and their offspring, and characteristics of their den sites, are recorded and coded by FBP personnel (Appendix VIII) This information is entered into the IBM Mainframe by the Data Entry Section (Appendix IV), and then transferred electronically to a data base in the FBP's PC at the Bangor Research Headquarters during April (Appendix IX).

Bears are live-trapped in the Bradford Study Area from May through July to augment the existing sample of radio-collared female bears (Appendix VIII). Resulting capture data are coded by FBP personnel and submitted to the Data Entry Section for entry into the IBM Mainframe in September.

Throughout the year, radio-collared bears are located using light aircraft. Each bear is located about twice a month from April-November, and an additional 2-3 times during the winter denning period. Habitat, activity, and locational data are recorded by pilots flying under contract with the Department (Appendix XI), and then coded by FBP personnel. Approximately twice each year, capture and relocation data are entered into

the IBM Mainframe by the Data Entry Section (Appendix IV), and then transferred to the

FBP's PC where they are proofed by FBP personnel (Appendices VIII, IX).

Eartags from research bears killed during the hunting season, at damage or

nuisance sites, by vehicles, or by other causes are reported to the FBP by MDIFW

personnel and by the public in written or oral form. Eartags from most hunter-harvested

bears are shipped to Augusta in special eartag envelopes provided with the registration

materials, but some tags are reported only in the margins of the registration booklets.

Once such reports are received by the FBP, a death certificate form is completed

(Appendix VIII), and the information is coded and shipped to the Data Processing

Section in Augusta where it is entered into a data management system (Appendix IV).

These data are usually entered on an annual basis, and are transferred electronically to

the FBP PC in Bangor, where they are proofed and entered into a database

(Appendices VIII, IX).

Estimates of densities, recruitment rates, and mortality rates of bears living on

MDIFW study areas are developed from tagging and telemetry data, and are used as

input for a crude life equation model. The density estimates and model are used to

evaluate changes in bear numbers in each of the 8 Wildlife Management Units (WNU)

through extrapolation of bear density estimates from MDIFW study areas.

Bear-Man Conflicts

Nuisance Complaints and Control Permits

Records of bear nuisance complaints (Appendix XI) and nuisance control permits

(which allow the killing of bears)(Appendix XII) are maintained by the Warden Service.

These records are completed by District Wardens and submitted to Augusta through their respective Division offices on a weekly basis. Historical summaries of nuisance complaints exist, but this information has not been computerized since 1985. Nuisance complaint levels and control permit records are reviewed occasionally for trends in the number of incidents and changes in the geographical distribution of bear-man conflicts (Appendix XVII).

Warden Service complaint records are reviewed by Wildlife Division staff in Augusta on an annual basis, and records which indicate the death of bears are computerized. This information is shipped to the Furbearer-Bear Project Leader for summarization.

Standard summaries of these data include a series of tables which document **some** mortality other than legal kill (MOTLK)(Appendix XIII). However, observations of natural mortalities are usually lacking from these records. Consequently, they are used only as an indicator of gross changes in bear numbers, and MOTLK is estimated from MDIFW research studies.

Habitat Evaluation

Five-year Evaluation

Habitat conditions are reevaluated at 5-year intervals, as part of the planning update (Appendix XV).

LIST OF APPENDICES

I. LAWS AND RULES GOVERNING BEAR SEASONS

II. BEAR REGISTRATION STATIONS: CRITERIA FOR THEIR SELECTION, AND STATION LISTING

III. REGISTRATION MATERIALS -- ACQUISITION, DISTRIBUTION, AND RECOVERY PROCEDURES

IV. PROCEDURES FOR COMPUTER ENTRY OF BEAR STUDY DATA

V. PROCEDURES FOR THE TRANSFER OF BEAR STUDY DATA FROM THE STATE COMPUTER SYSTEM TO THE UNIVERSITY OF MAINE COMPUTER SYSTEM

VI. PROCEDURES FOR ANALYSIS OF BEAR REGISTRATION DATA..

VII. MDIFW BEAR STUDY AREAS: DESCRIPTIONS AND LOCATIONS.

VIII. PROCEDURES FOR COLLECTION, CODING, AND MANAGEMENT OF BEAR RESEARCH DATA

IX. PROCEDURES FOR TRANSFERRING BEAR STUDY DATA TO THE FURBEARER PC

X. FLYING CONTRACT TERMS

XI. BEAR NUISANCE COMPLAINT RECORDS

XII. BEAR NUISANCE ANIMAL CONTROL PERMIT RECORDS

XIII. BEAR MORTALITY OTHER THAN LEGAL KILL: DATA COLLECTION, ENTRY, ANALYSIS

XIV. PROCEDURES, DATA SETS, AND ANALYSES INCLUDED IN EVALUATING THE STATUS OF MAINE'S BEAR POPULATION

XV. PROCEDURES FOR ASSESSING THE RELATIONSHIP BETWEEN MAINE'S BEAR POPULATION AND CARRYING CAPACITY

XVI. ANALYSIS OF HARVEST DATA INCLUDED IN EVALUATING THE STATUS OF MAINE'S BEAR POPULATION

XVII. ANALYSIS OF NUISANCE COMPLAINT AND BEAR DAMAGE CONTROL PERMIT RECORDS INCLUDED IN EVALUATING THE STATUS OF MAINE'S BEAR POPULATION

BLACK BEAR MANAGEMENT SYSTEM

APPENDICES

Available Upon Request