BLACK BEAR DATA ANALYSIS UNIT
MANAGEMENT PLAN
NORTHERN FRONT RANGE UNIT
DAU B-3

GAME MANAGEMENT UNITS
7, 8, 9, 19, 20, 29, 38 & 191
NE Region

Prepared for:
Colorado Division of Wildlife

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Date: June 2011

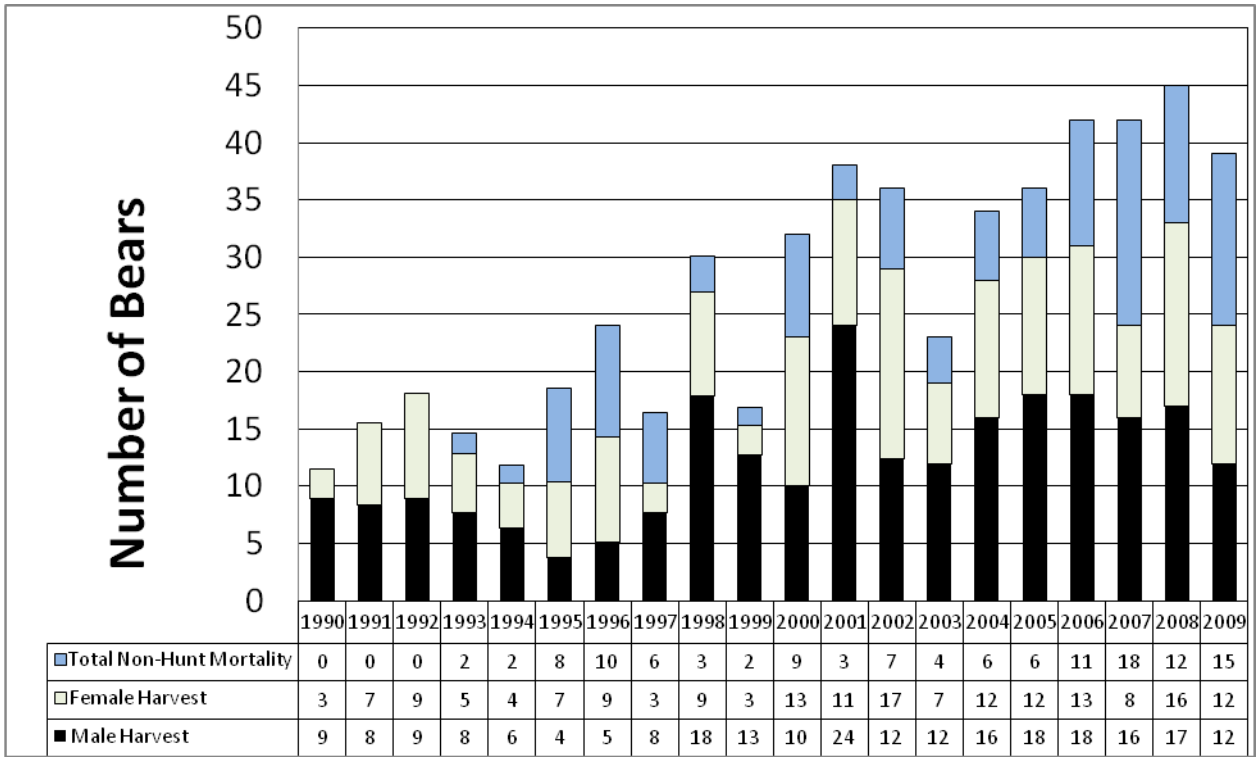
DATA ANALYSIS UNIT PLAN FOR B-3
EXECUTIVE SUMMARY

GMUs: 7, 8, 9, 19, 20, 29, 38 & 191 (Larimer, Boulder, Gilpin and portions of Broomfield, Clear Creek and Jefferson Counties)

Land Ownership: 44% Private, 34% USFS, 10% City/County, 7% NPS, 4% State, 1% BLM

Previous Objective: Stable, no population objective for B-3

Previous Mortality Objectives:
For GMUs 7,8,9,19,20 & 191: Harvest objective- 25, Total mortality objective- 30
For expanded B-3 based on proportional addition of GMUs 29 & 38:
Harvest objective- ~32, Total mortality objective- 50
Current Strategic Goal : Stable Population
Total annual mortality objective: 52 bears
Total annual harvest objective: 32 bears
Mortality objectives are derived and monitored through review of the age structure of bear mortality, the composition of gender in harvest, conflict/damage levels and from bear density estimates, where available.



	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009
Total Non-Hunt Mortality	0	0	0	2	2	8	10	6	3	2	9	3	7	4	6	6	11	18	12	15
Female Harvest	3	7	9	5	4	7	9	3	9	3	13	11	17	7	12	12	13	8	16	12
Male Harvest	9	8	9	8	6	4	5	8	18	13	10	24	12	12	16	18	18	16	17	12

Figure 1. Male harvest, female harvest and total non-hunt black bear mortality in B-3 (1990-2009)

Black bear Data Analysis Unit (DAU) B-3 is located on the northern Front Range of Colorado. The DAU includes all of Larimer, Boulder and Gilpin Counties as well as portions of Weld, Broomfield, Jefferson and Clear Creek Counties. The Game Management Units (GMUs) in B-3 are 7, 8, 9, 19, 20, 29, 38 and 191. Much of Colorado's main human population centers occur within, or immediately adjacent to B-3, including the cities of Fort Collins, Loveland, Boulder, and the communities of northwest Denver. Over half of the 2.49 million acre (10,080 square kilometers) DAU is public land. Eighty-three percent of the DAU or just over 2 million acres is considered overall black bear range. Compared to more productive habitat in Colorado to the west and south, B-3 doesn't have high bear densities.

BACKGROUND

In general, overall annual bear mortality has increased over the last 10 years in B-3. Since 2000, total bear mortality in B-3 has ranged from a low of 23 in 2003 to a high of 45 in 2008, with an annual average of 36.5 bears. Both the 3-year and 10-year annual averages of hunting mortality are 27 bears. The 30-day September high-powered rifle season has the highest average 3-year success rate (~14%) among seasons, and is responsible for approximately 70% of the annual bear harvest in B-3. Archery and muzzleloader hunters contribute an average of 4.7 bears and 1.8 bears, respectively, per year to the harvest and have success rates below 5%. Harvest success rates for hunters in the 4 concurrent rifle seasons are very low; total harvest across all 4 seasons in B-3 averages 1.7 bears per year. Harvest and total mortality rarely exceed current mortality objectives for maintaining a stable bear population in B-3. Game damage claims have averaged 4 per year in B-3 for the last 9 years; only 3 claims have exceeded $4,000 since 2000. Conflicts between bears and humans are not uncommon in B-3; often these are the result of bears using developed habitats and food sources that are associated with people.

A suite of habitat and population models have been developed as part of the revision of the B-3 DAU plan to help provide estimates of the projected bear population in the unit. These include a general vegetation/bear density extrapolation, a use/occupancy surface extrapolation based on habitat classifications, and 2 model simulations with varying constraints (liberal and conservative).

SIGNIFICANT ISSUES

The most significant issue regarding bear management along the northern Front Range relates to managing conflicts between bears and people. These conflicts can take a number of forms including game damage to landowners, property damage to homeowners and direct contact between bears and humans across all landscape types. This management issue and what tools should be used to address it are complex and multifaceted. The structure of a DAU plan focuses on one specific tool, primarily hunting, out of a suite of tools including education, enforcement, habitat modification, that can also be used to manage conflicts. Unfortunately, the types of conflicts that occur with bears and the landscapes they occur in often preclude simple changes in licensing or hunting structure from completely resolving the problem. This DAU plan provides harvest related monitoring structures along with strategic goal alternatives that will directly impact bear population sizes in B-3.

MANAGEMENT ALTERNATIVES

The B-3 DAU is currently being managed for a stable bear population. That requires harvest mortalities and total mortality levels to fall below a threshold. This plan revision outlines three strategic goal alternatives for bear management in B-3. Numeric off-take mortality rates are based on population projections from the habitat models and supporting population models. The result was a presumptive 2009 post-hunt estimate of 400 independent bears.

Increasing the bear population in B-3 for 5 years, then stabilize

To achieve a strategic goal of increasing the bear population in B-3, management criteria applied to determining harvest and total mortality rates would be in the conservative range. Total mortality, or off-take, as a proportion of the population should fall below 7%; based on current population projections the total mortality objective would be <25 bears. Proportion of adult males in the harvest should be greater than 35%, with all females making up less than 30% of harvest. Additionally, adult females should comprise less than 45% of the female harvest.

Stable bear population in B-3

To achieve a strategic goal of maintaining a stable bear population in B-3, management criteria applied to determining harvest and total mortality rates should fall in an intermediate range. Total mortality, or off-take, as a proportion of the population should fall between 7-13%; based on current population projections the total mortality objective would be 52 bears. Proportion of adult males in the harvest should be within 25-35%, with all females making up 30-40% of harvest. Additionally, adult females should comprise approximately 45-55% of the female harvest. Within the framework of an overall stable population, off-take rate flexibility will be maintained to manage for minimized game damage and human/bear conflicts in localized areas of concern.

Decreasing the bear population in B-3 for 5 years, then stabilize

To achieve a strategic goal of decreasing the bear population in B-3, management criteria applied to determining harvest and total mortality rates would be in the liberal range. Total mortality, or off-take, as a proportion of the population could increase above 13%; based on current population projections the total mortality objective would be >52 bears. Proportion of adult males in the harvest can be low, even below 25%, with total female harvest rates going over 40%. Additionally, adult female proportions in the female harvest can account for rates over 55%. Areas with conflict and damage could be suppressed to low levels.

PREFERRED STRATEGIC GOAL

Manage for a stable bear population in B-3. Management criteria used in annual review of harvest and total mortality will fall in the intermediate range. Based on current presumptive estimates of bear density, the harvest mortality objective will be 32 bears, with a total mortality objective of 52 bears. This corresponds to the upper end of the 7-13% total off-take rate supported by the literature for maintaining a stable bear population. Proportion of adult males in the harvest should be within 25-35%, with all females making up 30-40% of harvest. Additionally, adult females should comprise approximately 45-55% of the female harvest. A secondary goal for the B-3 DAU will also be to reduce and mitigate human/bear conflicts and game damage. To meet this goal, there may be infrequent occasions that require exceeding the bear mortality thresholds commensurate with a stable population for highly localized areas. Within the context of a DAU population, this flexibility is compatible with an overall stable goal.

This plan was approved by the Colorado Wildlife Commission on July 8th, 2011

BEAR DATA ANALYSIS UNIT (DAU) B-3

GAME MANAGEMENT UNITS

7,8,9,19,20,29,38 & 191

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INTRODUCTION

The purpose of a Data Analysis Unit (DAU) plan is to give the Colorado Division of Wildlife (CDOW) direction in managing a big game species in a given geographical area. It identifies suitable habitat, gives the herd history and current status, and identifies issues and problems. Key features of a big game DAU plan are the population size and, in the case of ungulates, the herd composition objectives which are developed after considering input from all interested entities. CDOW intends to update these plans as new information and data become available, at least once every ten years.

DAU PLANS AND WILDLIFE MANAGEMENT BY OBJECTIVES

The CDOW manages wildlife for the use, benefit and enjoyment of the people of the State in accordance with the CDOWs Strategic Plan and mandates from the Colorado Wildlife Commission and the Colorado Legislature. Colorado's wildlife resources require careful and increasingly intensive management to accommodate the many and varied public demands and growing impacts from people. To manage the State's big game populations, the CDOW uses a "management by objective" approach (Figure 1). Big game populations are managed to achieve objectives established for DAUs.

DAUs provide the framework to manage individual herds or populations of big game animals. DAUs are generally discrete geographically, and attempt to identify an individual big game population. However, individual animal movements may at times straddle or encompass more than one DAU. This is certainly an issue in the case of black bears. While DAU boundaries are administrative, they represent the best way to encompass the majority of a population within a biological area, and allow the most practical application of management tools such as hunting, to reach objectives. DAUs are typically composed of smaller areas designated as game management units (GMUs), which provide a more practical framework where the management goals can be refined and applied on a finer scale, typically through hunting regulations.

The DAU plan process is designed to balance public demands, habitat and big game populations into a management scheme for the individual DAU. The public, hunters, federal and local land use agencies, landowners and agricultural interests are involved in the determination of the plan objectives through input given during public meetings, the opportunity to comment on draft plans and when final review is undertaken by the Colorado Wildlife Commission.

The strategic goals and specific mortality objectives defined in the plan guide a long term cycle of annual information collection, information analysis and decision making. The end product of this process is a recommendation for numbers of hunting licenses for the DAU (Figure 1). The plan also specifically outlines the management techniques that will be used to reach desired objectives. The fact that DAU plans are reviewed and revised on a 10 year basis provides assurances against the often-dynamic fluctuations experienced by Colorado's big game herds. Changes in land development, public attitudes, hunter success, hunter access, research results, disease prevalence and game damage may all contribute new information needed when reviewing or revising a DAU plan. The CDOW strives to maintain a tight link between the inclusion of publics in the development of objectives and the yearly iteration of data collection, analysis and renewed decision-making to reach those objectives.

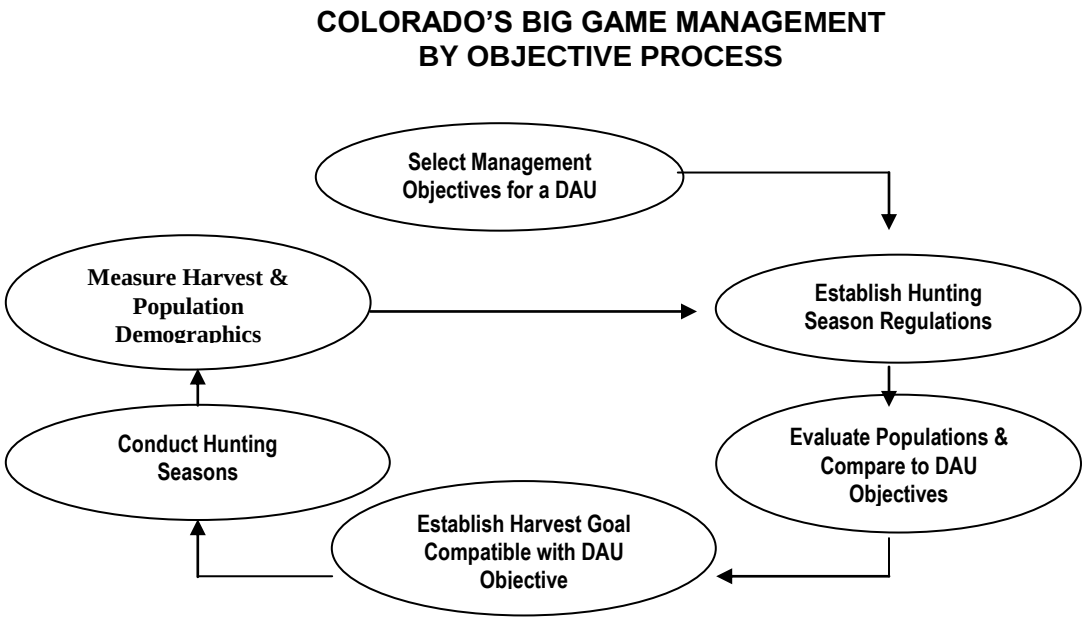

Figure 1. Management by objectives process used by the CDOW to manage big game populations on a DAU basis.

DATA ANALYSIS UNIT DESCRIPTION

Location

Data Analysis Unit (DAU) B-3 is located on the northern Front Range of Colorado. It is bounded on the north by the Wyoming state line, on the west by the Larimer-Jackson County line and the Continental Divide, on the south by US 40 and I-70, and on the east by I-25. The DAU includes all of Larimer, Boulder and Gilpin Counties as well as portions of Weld, Broomfield, Jefferson and Clear Creek Counties. The Game Management Units (GMUs) in B-3 are 7, 8, 9, 19, 20, 29, 38 and 191. Much of Colorado's main human population centers occur within, or immediately adjacent to B-3, including the cities of Fort Collins, Loveland, Boulder, and the communities of northwest Denver.

While managed by a number of agencies, just over half of the 2.49 million acre (10,080 square kilometers) DAU is public land (Figure 2). The US Forest Service (USFS) manages 34% of the land in the DAU, or 846,400 acres. City and County land management departments within the DAU manage 10% of the surface area or 239,500 acres. The National Park Service (NPS) is the next largest public land manager with over 170,000 acres (7% of the DAU). The NPS lands are nearly all accounted for by Rocky Mountain National Park. The state of Colorado manages about 4% of the DAU or 99,000 acres which are mostly held as State Wildlife Areas and Colorado School Board lands. The Bureau of Land Management (BLM) is the land manager for 1% of the DAU (31,200 acres) which is mostly made up of sections in northern GMUs 7 & 8 and central GMU 29. The remaining lands within the DAU are in private ownership.

Eighty-three percent of the DAU or just over 2 million acres is considered overall black bear range. Much of what is not considered bear habitat is the urban corridor along I-25/ Highway 287. Approximately 30% of the DAU is considered summer concentration habitat for black bears (Figure 3).

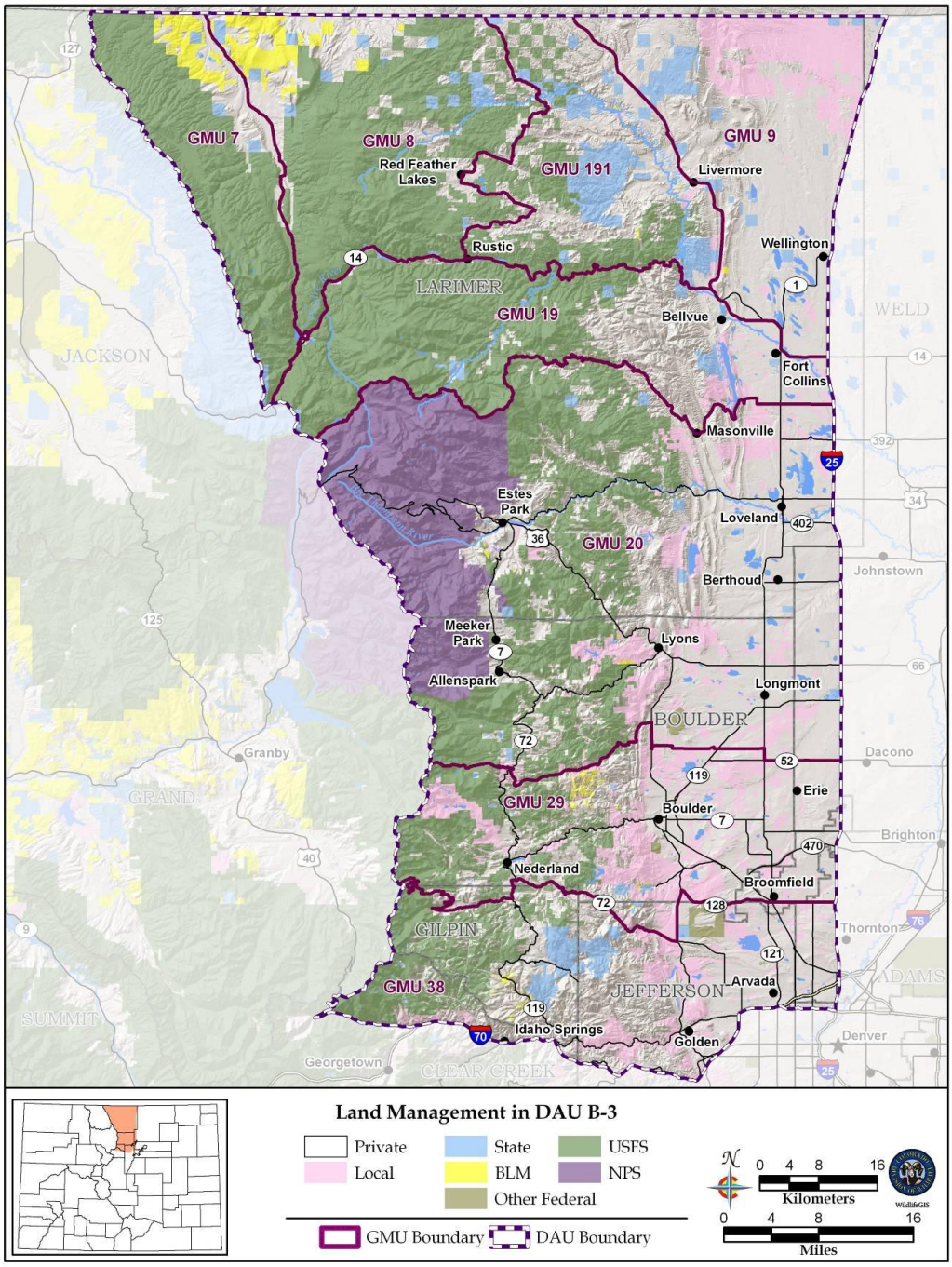

Figure 2. Location and land ownership in B-3.

Land Use and Land Status

Human development along the northern Front Range is perhaps the dominant issue when evaluating bear management in B-3. In the last 2 decades, nearly all of the counties in B-3 have experienced record levels of human population growth, as well as commensurate increases in roads, property subdivision, and development in bear habitat.

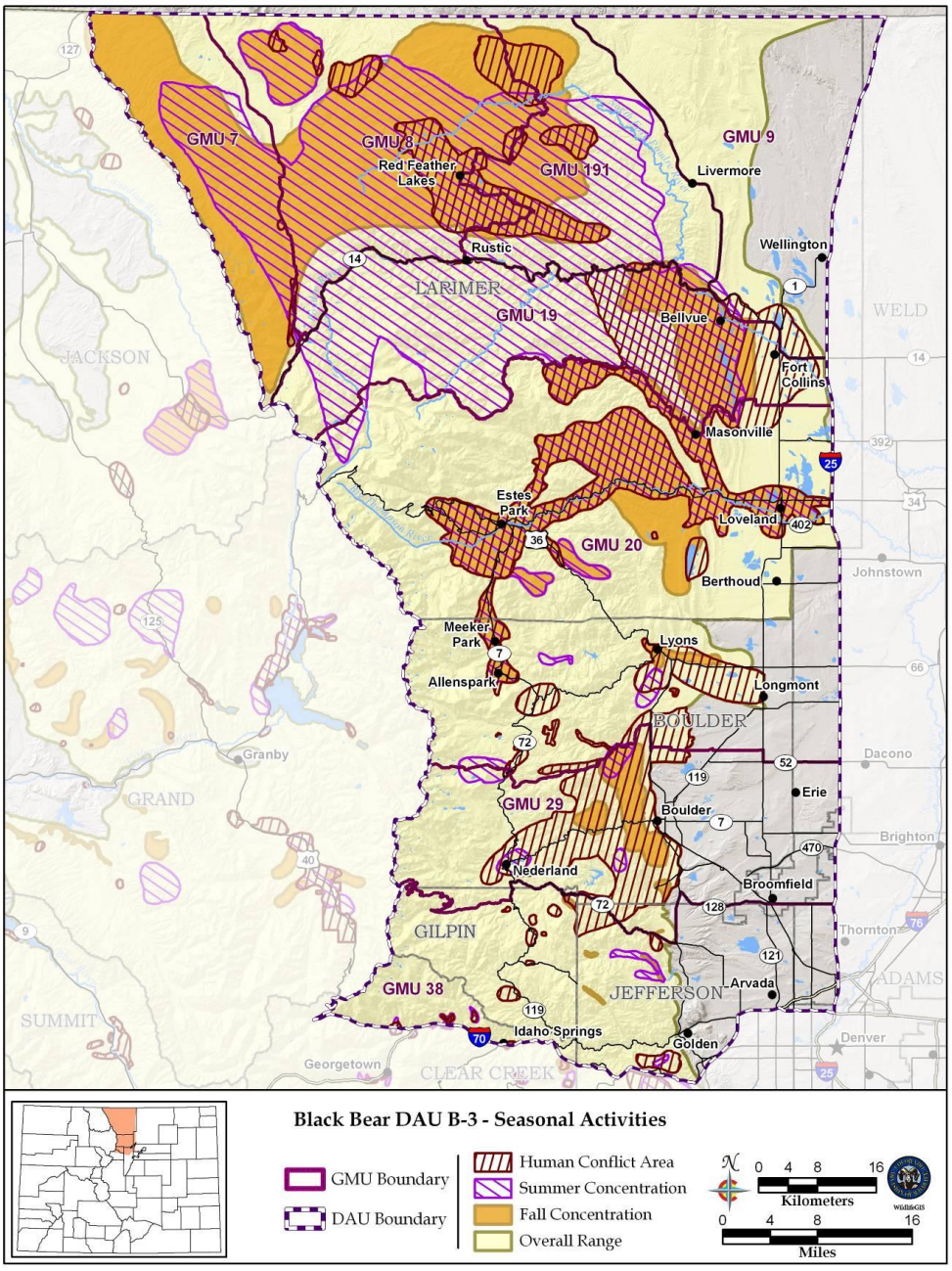

Figure 3. Black bear activity layers in B-3

Topography & Climate

Elevations in the DAU range from over 14,000 feet at the top of Longs Peak on the western side of the unit to 5,000 feet along I-25 at the eastern border. The climate in B-3 is generally characterized by hot summers and mild winters, particularly at middle and lower elevations in the DAU. Winter snowfall events can be significant, particularly along the western side of the DAU above 8,000 feet. Most annual precipitation comes in the form of snow; however summer moisture in the form of rain can have a significant impact on the growth of plant forage sources used by bears. Annual precipitation totals on the eastern edge of the DAU are near 15 inches, while higher elevations that receive significantly more snow have annual totals in the 20-30 inch range.

Vegetation

Principal vegetation classes across the DAU include ponderosa pine, lodgepole pine and foothills shrub (mountain mahogany, bitterbrush). There is a relatively smaller component of aspen and spruce/fir as well in B-3. Besides the aspen vegetation class, none of the coarse-scale vegetation communities support high densities of bears on their own. Natural forage sources important to bears exist at a much finer scale in B-3. The primary finer-scale vegetation class of highest use, however, would be the riparian communities closely associated with the ponderosa pine forests and foothills shrub components.

Natural bear habitat could be considered fair to poor in much of B-3 relative to other parts of Colorado as the northern Front Range is devoid of hard mast food sources (i.e.- oakbrush) (Figure 4), bears must rely on soft mast production (e.g. chokecherries, wild plums, etc), and other forage types for their nutritional needs. While natural food sources may be moderately productive at best, bears living near human communities along the northern Front Range have another significant source of high-quality nutrition in the form of anthropogenic food. This would include all sources associated with human activities including trash, pet food, compost piles and bird feeders. This is in addition to food associated with traditional human agricultural activities including corn and vegetable fields, orchards and livestock.

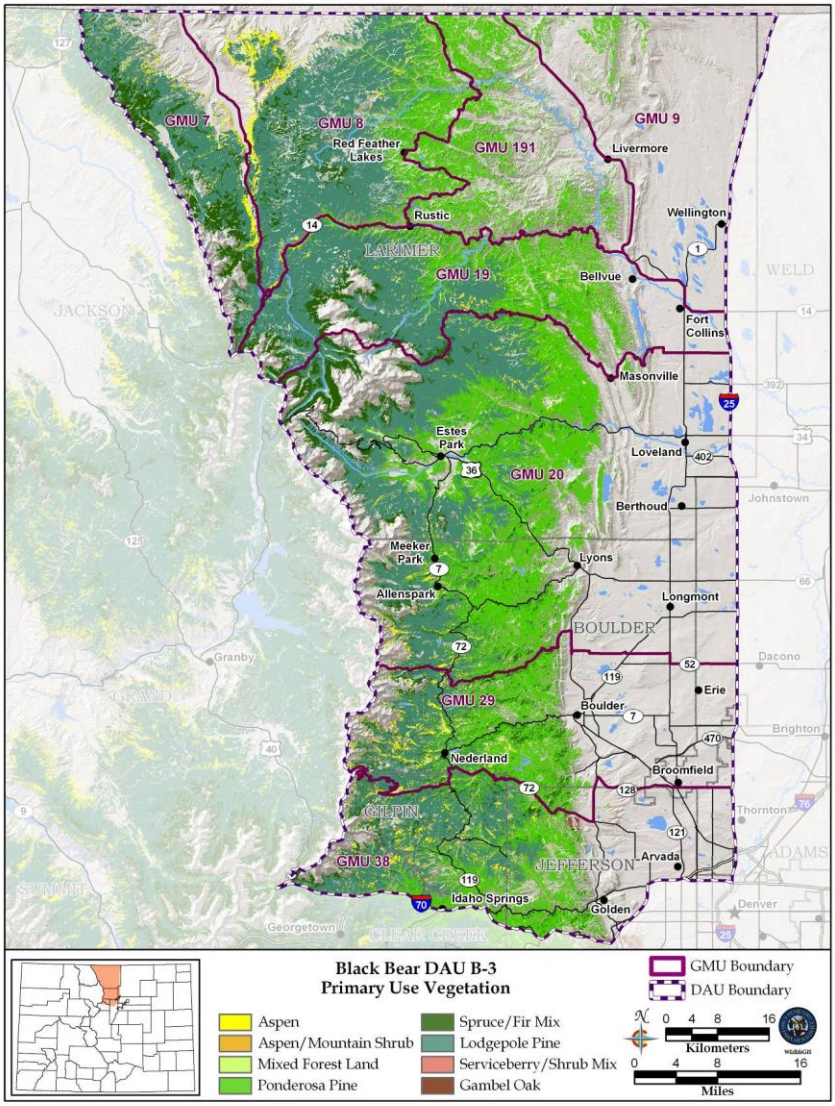

Figure 4. Vegetation classes in B-3.

MANAGEMENT HISTORY

Administrative boundary change

The boundaries of B-3 are being expanded in 2011 as part of this DAU plan rewrite process. In recent history, the DAU B-3 has been comprised of GMUs 7,8,9,19,20 and 191 (see Figure 2). GMUs 29 and 38 were previously part of DAU B-19. As revealed by evaluations of bear habitat, mortality causes and management issues during the initial phases of the DAU planning process, GMUs 29 and 38 were arguably more similar to the northern Front Range than to units to the south. While all bears in Colorado could be considered part of one large meta-population, the similarities between GMUs 7, 8, 9, 19, 20, 29, 38 and 191 as non-oakbrush habitats, having high human development levels and non-hunting mortality factors all argued for incorporating 29 and 38 in B-3 as part of this DAU plan revision. This DAU plan will present historic data and future objectives for an expanded B-3. All historic data will include GMUs 29 and 38 unless otherwise noted.

Hunting Seasons

Prior to 1935, black bears were not considered a game animal, which afforded them no protection from being shot on sight if they were encountered, or preyed on livestock. In 1935, they were awarded some protection by being classified by the state legislature as a game animal. This established limits on the annual harvest and on the number of licenses that an individual could possess. From 1935 to 1963, bears were hunted in the fall usually concurrently with the annual deer and elk seasons. In 1964, a spring hunting season was established with unlimited licenses available. This continued until 1986, when licenses for the spring season were limited (Beck 1991). The fall hunting seasons occurred concurrently with the established deer and elk seasons and licenses were unlimited until the limited September rifle seasons were established in 1989. Hunters wishing to hunt bears during the established deer and elk season still had access to unlimited licenses until 2005 when license caps were established for these licenses.

In 1992, a constitutional amendment was passed and changed bear hunting within the state by preventing bear hunting until after September 1st and outlawed the use of bait and dogs as aids for hunting black bears. Since 1992, the annual hunting seasons have begun on September 2nd annually.

Since 2000, hunting seasons have started with an early, limited, rifle season that runs from September 2nd through September 30th each year, along with concurrent archery, muzzleloader, first, second, third and fourth rifle season licenses. Under the current season structure, the four concurrent seasons are 5 days, 9 days, 9 days and 5 days in length. Harvest is concentrated in the limited September rifle season as it is concurrent with the initial phases of the bear hyperphagia period. Harvest and success rates decline as hunting seasons progress through the fall months (October-November) due to bears entering the initial stages of hibernation.

License Allocation history

License allocations in B-3 have only had one change in the last 10 years. From 1999-2004 archery, muzzleloading, and concurrent rifle (first, second, third and fourth big game rifle seasons) licenses were specified in B-3, but unlimited in number. Beginning in the fall of 2005, those licenses became over-the-counter (OTC) with caps. That meant that a limited number of licenses (capped number) were issued for each huntcode, but licenses could be purchased without going through the limited draw (bought first-come, first-served). This however, had no functional impact on concurrent rifle season bear hunter opportunity, as the license cap was rarely reached. Archery and muzzleloader hunters did see an impact in opportunity in going from unlimited to OTC with caps, as those licenses often sell out within a few days of going on sale. The September rifle licenses available in B-3 have been limited and specified since 1999. Because GMUs 29 and 38 were part of DAU B-19 until 2010 and licenses for those 2 units were valid in a number of other GMUs, it is impossible to separate license allocations for those 2 units. Therefore Figure 5 only shows the license numbers for the original B-3 GMU alignment (7, 8, 9, 19, 20 and 191).

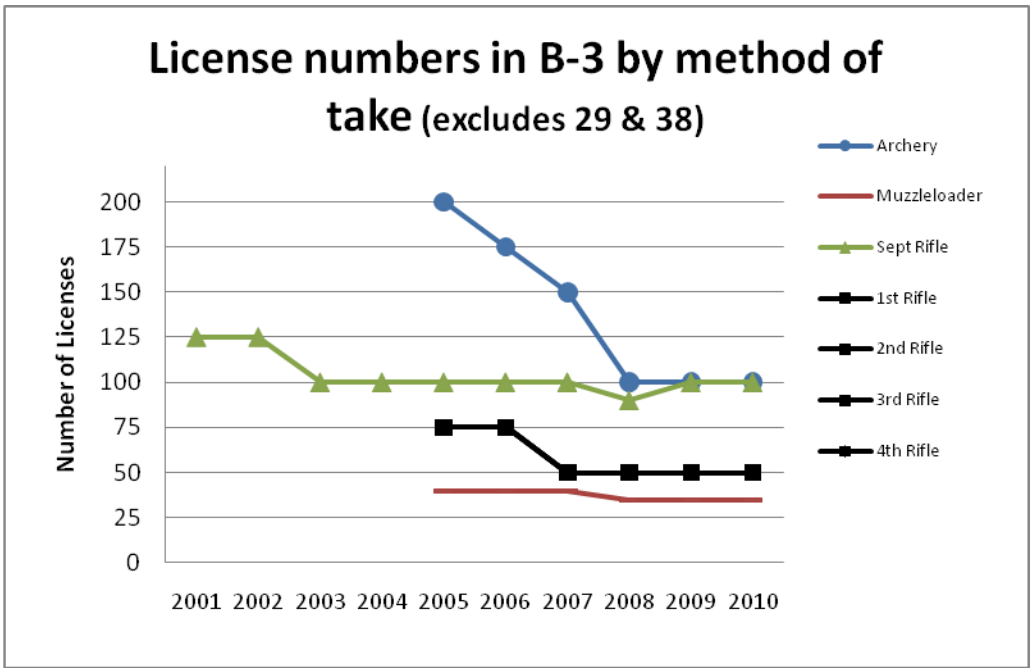

Figure 5. Ten-year license history in B-3 (without GMUs 29 and 38)

Mortality- Harvest and Non-Harvest

In general, overall annual bear mortality has increased over the last 10 years in B-3 (including GMUs 29 and 38) (Figure 6). Since 2000, total bear mortality in B-3 has ranged from a low of 23 in 2003 to a high of 45 in 2008. While 10-year average annual bear mortality is 36.5, the 3-year average is slightly higher at 41.7 bears. Mortality from hunter harvest has stayed consistent over the past 10 years, with the 15% increase in total mortality coming from an increase in non-harvest mortality sources. The 10-year average of hunting mortality is 27.5 bears per year, with a nearly identical 3-year average of 27 bears.

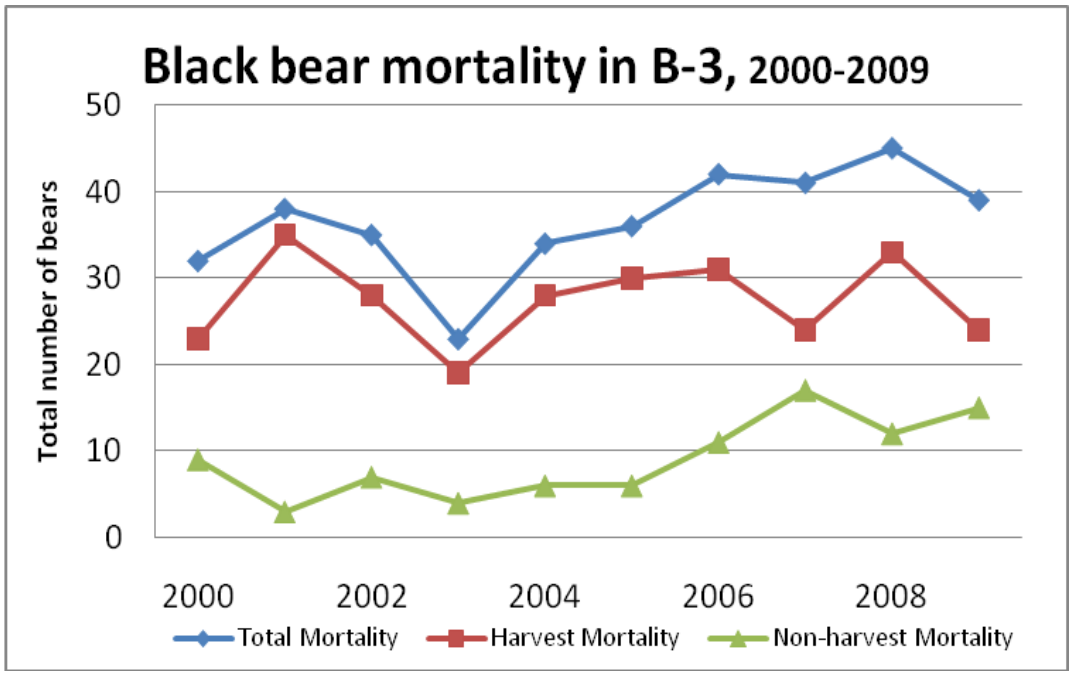

Figure 6. Total black bear mortality in B-3

Harvest mortality and total mortality vary significantly by GMU, but are proportionally consistent across the last 10 years. Game Management Unit 20 has the highest levels of harvest and total mortality in the DAU, followed by GMUs 191, 19 and 38 (Figure 7). Harvest levels appear to be roughly proportional to the amount of fall bear habitat, GMU size and hunting access levels. Total mortality contributions per GMU follow the same ranking order as harvest mortality.

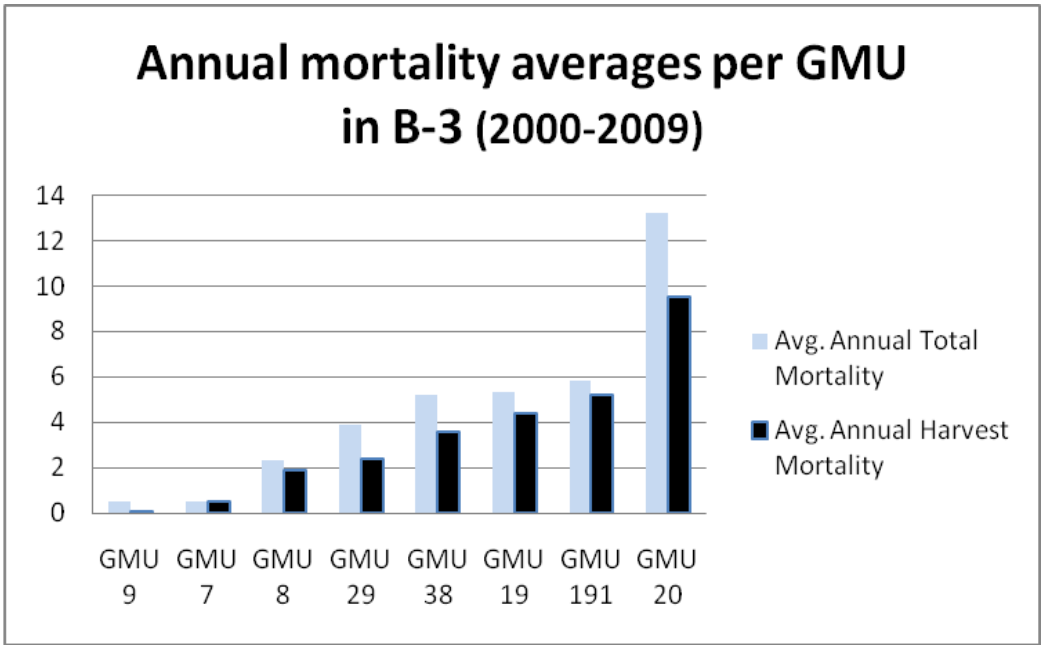

Figure 7. Annual average hunting and total mortality by GMU (2000-2009)

The proportion of females in the B-3 harvest has fluctuated over the last 20 years (Figure 8). Some of this variation is due to the relatively small annual harvest numbers in B-3 where a difference of a few females in either direction can impact the proportions. While the proportion can vary significantly in any given year, the 3-year and 10-year averages of female proportions in harvest and non-harvest mortality are remarkably similar. The 3-year average proportion of females in the harvest was 44%, while the 10-year average was 43%. Both the 3-year and 10-year average proportions of females in non-harvest mortality were 33%.

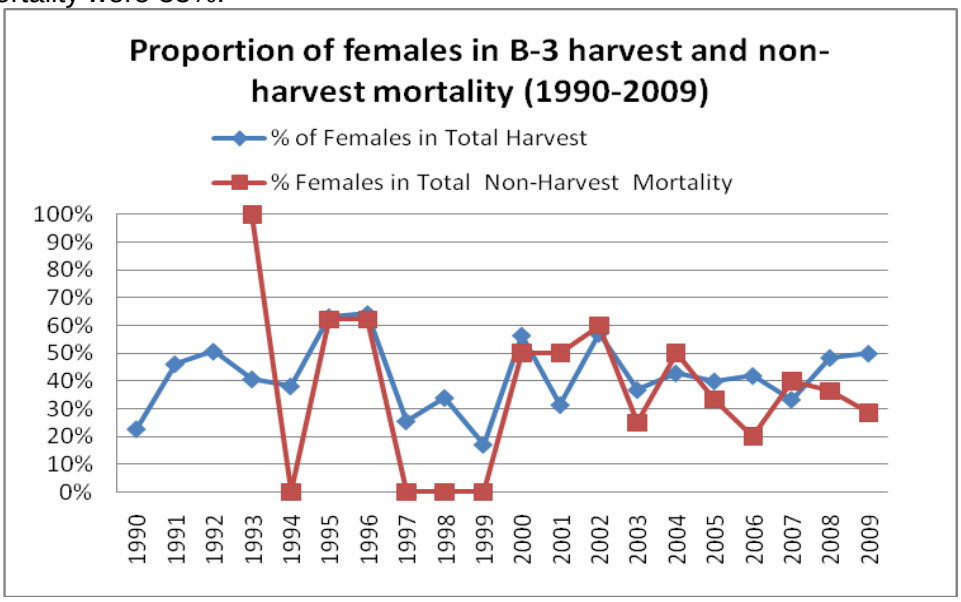

Figure 8. Proportion of females in B-3 harvest and non-harvest mortality

Mortality- method of take

Among methods of take, the September rifle season has the highest average 3-year success rate (~14%), and is responsible for approximately 70% of the annual bear harvest in B-3 (Table 1). Archery hunters contribute an average of 4.7 bears per year to the harvest and have a 3-year average success rate around 5% in B-3. Muzzleloaders harvest an average of 1.8 bears per year in B-3 with a 3% success rate. The total harvest of all the combined rifle seasons is similar to muzzleloading, with 1.7 bears harvested per year. While always very low, harvest success rates during the regular rifle seasons varies from 1-3% in the first and second rifle seasons to nearly 0% in the third and fourth when many bears are unavailable for harvest due to the onset of hibernation.

YEAR	Archery Harvest	Muzzleloader Harvest	September Rifle Harvest	1st-4th Rifle Season Harvest
2000	4	3	16	0
2001	7	4	21	3
2002	2	2	24	0
2003	2	1	14	2
2004	3	1	21	3
2005	4	2	22	1
2006	6	2	22	1
2007	8	1	15	0
2008	7	2	20	4
2009	4	0	17	3
Average	4.7	1.8	19.2	1.7

Table 1. Black bear harvest history, by method of take, in B-3 (2000-2009)

Mortality- age and gender

Beginning in 2007, a premolar was extracted from harvested bears and other deceased bears handled by CDOW. These teeth were collected and submitted annually for aging via cementum annuli sectioning. Since bear age data have only been collected for 3 years, the sample sizes particularly when broken into classes, can be small (total sample across 3 years in B-3 is 126 bears).

The technique of counting annual rings in cementum of bear teeth is a reliable method for determining ages of black bears (Harshyne et al. 1998, Costello et al. 2004). This is especially true for bears less than five years of age. For bears five years of age or older, errors increased with the age of the bear (McLaughlin et al. 1990, Harshyne et al. 1998, Costello et al. 2004). Since most female black bears in Colorado do not reproduce until their 5th year, classification of females into sub-adult (non-reproducing) and adult (reproducing) age classes using cementum annuli is quite reliable. Therefore, all female black bears age five and over are considered adults for the purposes of harvest data analyses. Based on the sample of 5 female bears with a reproductive history in B-3, this classification breakpoint at 5 years of age was supported.

Below are figures showing the frequency of each bear year-class, by gender from the 2007-2009 data set (Figure 9 & 10). Both harvest and non-harvest mortality sample sizes are greatly skewed towards the sub-adult age classes. In the case of males, the majority of black bear mortalities were in the 1.5-2.5-year old classes. Given that in cases of hunter harvest the selection should be towards bigger, older male bears, the fact that adult males are nearly absent in both harvest and non-mortality sources could be an indication that the bear population in B-3 is being heavily harvested (see further discussion in Management Considerations section).

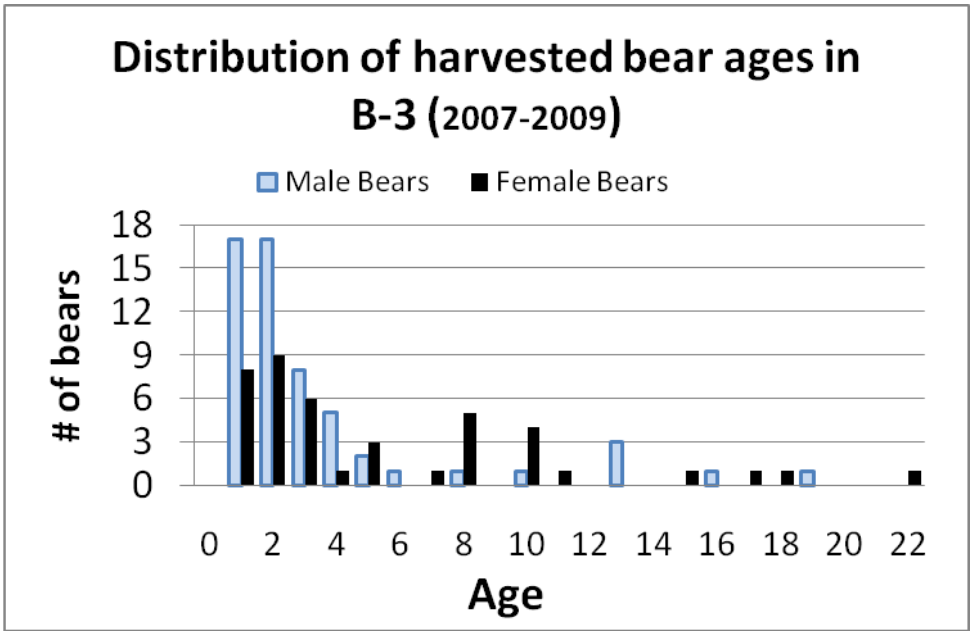

Figure 9. Age distribution of harvested bears in B-3 (2007-2009)

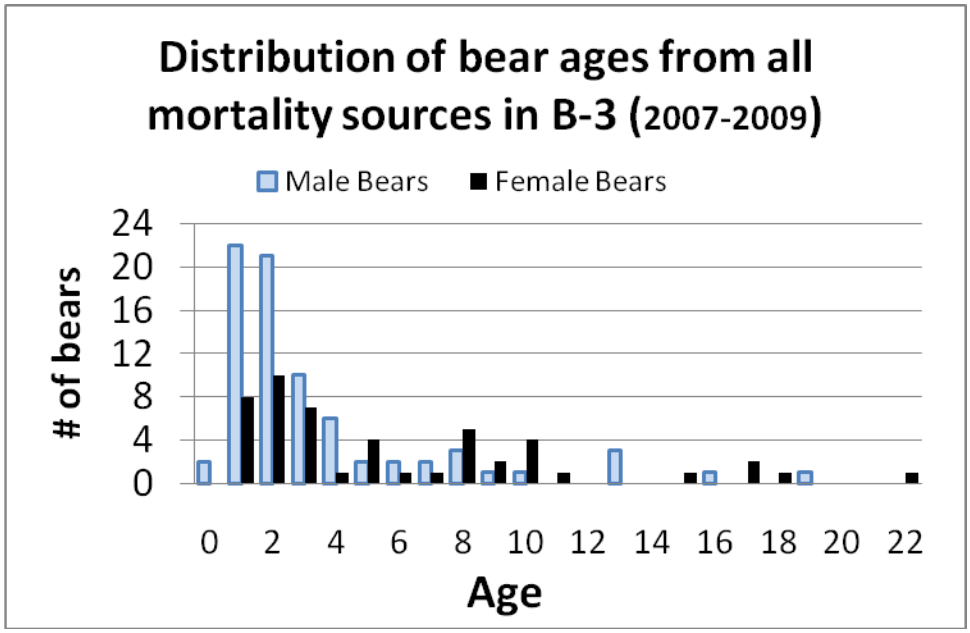

Figure 10. Age distribution of bears from all mortality sources in B-3 (2007-2009)

Game Damage and Human Conflict Management

There have been 37 black bear claims paid out in B-3 in the 9 years since personal property claims were removed from CDOW liability (August 2001). Over half these claims were for beehives, with the rest being for livestock or growing crops. The mean claim payment since 2001 is $1,720, with a range from $65- $16,000. During these nine years only 3 claims have been for over $4,000; one of livestock and two for growing crops. The majority of the claims have been in GMU 20 (22), followed by GMU 19 (9). Game management units 29, 38 and 191 have had 2 claims each, and there have been no claims in GMUs 7, 8 and 9.

Human conflicts with black bears in B-3 are not unusual occurrences. In many cases, human interactions with bears are reported to the CDOW call centers or field staff. This subset of conflicts is

documented in written form by CDOW staff and range from a second hand report of a bear being seen in a town or suburb to a physical incident between a bear and a person. While there is evidence that the frequency of conflicts is increasing over the long-term in Colorado (Baruch-Mordo et al 2008), conflict reports provide a snapshot of individual incidents, lumping reports into categories or evaluating summary statistics can be misleading. There are a number of issues related to capturing the location of the incident versus the location the report was filed from, the reliability of some reports and the bias in reporting associated with increased media coverage on an event or location that can all significantly increase or decrease the number of conflict reports. The CDOW continues to document reported human conflicts with bears, and will continue to improve and refine the system and methods used for collecting and synthesizing those reports. Bears involved in conflicts will be handled per policy at the discretion of the field officer or supervisor.

Current harvest and total mortality objectives

Since B-3 is being expanded to include GMUs 29 and 38, it is difficult to back-calculate a historic mortality objective including these two GMUs from another DAU. The 2010 harvest mortality and total mortality objective for the original DAU (GMUs 7,8,9,19,20 & 191) was 25 bears and 30 bears, respectively. It is difficult to establish what proportion of the DAU objective GMUs 29 and 38 accounted for in the previous DAU they were in, as the objectives were set at the DAU scale and don't include GMU-specific objectives. The entire DAU that included GMUs 29 and 38 had a harvest mortality objective of between 11-20 bears and a maximum total mortality objective of 40 bears. Approximate historical allocation of harvest proportions would attribute ~7 bears to harvest and 13 bears to non-harvest mortality sources in those 2 GMUs. A coarse evaluation of those previous harvest densities and proportions suggest an approximate historic harvest objective in B-3 of 32 bears with a total mortality of approximately 50 bears.

MANAGEMENT CONSIDERATIONS

HABITAT MODELS

Two different habitat models have been developed to relate bear use, occupancy and forage value to project possible populations by extrapolating bear densities. The population projections use densities derived from relevant Colorado/Wyoming data and from literature. Managers applied densities representative of similar habitats and vegetation types in Colorado to develop population projections and then select population ranges which best represent current conditions in the DAU.

General Vegetation/Bear Density Extrapolation

The first model was developed by Gill and Beck (1991) in an unpublished report to the Colorado Wildlife Commission and was modified by Apker (2003) in an internal CDOW report. This model applies subjective probable black bear densities for different vegetation types to the amount of land area of those vegetation types in the various GMUs. The vegetation type amounts for this model were derived from landsat GAP project coarse vegetation types. This vegetation/density model provides a snapshot extrapolation of possible bear population size in Colorado based on current vegetation classes and both measured and projected bear densities in those vegetation classes from the 1990s. This model and its subsequent extrapolation yields a projected bear population in B-3 of 303 black bears (Table 2).

Common Name	Square Miles of Veg. Class in DAU	Acres of Veg. Class in DAU		Bear Density as 1 bear/X mi2	Bear Numbers
Aspen	28	17883		1	28
Bristlecone pine	11	7115		10	1
Douglas fir	51	32909		8	6
Forest dominated wetland/riparian	24	15641		10	2
Lodgepole pine	725	464258		10	73
Mesic upland shrub	52	33149		6	9
Mixed conifer	8	4860		10	1
Mixed forest	1	630		6	0
Ponderosa Pine	895	572716		6	149
Shrub dominated wetland/riparian	11	7049		10	1
Spruce fir	297	189975		10	30
Subalpine meadow	27	17530		10	3
TOTAL	**2131**	**1363715**			**303 bears**

Table 2. B-3 bear numbers based on vegetation extrapolation

Use/occupancy density surface

General classes of habitat that occur in B-3 are presented in Figure 4 using CDOW Basinwide GIS Vegetation Classification data. Each of these vegetation classes has been further refined relative to bear use/occupancy and relative forage value. This resulted in a two tiered habitat ranking system presented below. Use/occupancy was defined at 4 levels; primary, secondary, edge, and out (or not bear habitat). See also Figure 4 for a graphic depiction of the use/occupancy habitat types in the DAU. Relative forage value was rated for primary, secondary, and edge habitat at 3 levels; high, moderate or low based upon the perceived potential of those habitats to provide forage for black bears.

Use/occupancy terms are defined as follows:

Primary – cover types that bears typically and normally are found at various times of year.
Secondary – cover types that bears occasionally use but are not preferred.
Edge – cover types infrequently used, but bears may utilize when adjacent to Primary cover types.
Out – cover types that are not black bear habitat or those in which bears would only travel through.

The results of this analysis provides tables of bear habitat in terms of its relative use and state of occupancy and then for those habitats with varying levels of use, what their potential relative forage value may be. This resulted in a matrix for assigning habitat quality and subsequently for assigning bear densities to different habitat quality to extrapolate a potential population. The population results for B-3 can be incorporated into modeling or used as a comparison to independent population model runs (Table 3).

The following table provides the results of this surface area analysis for B-3.

HABITAT TYPE	INDEPENDENT BEAR DENSITY	SQ. KILOMETERS OF HABITAT TYPE IN B-3	PROJECTED POPULATION
Out, not bear habitat	0	3,153	0
Primary	8.1- HIGH	4,566	370
Primary	2.5- LOW	4,566	114
Secondary	2.5- HIGH	93	2
Secondary	1.35- LOW	93	1
Edge	8.1- HIGH	2,189	177
Edge	2.5- LOW	2,189	55
Total	***HIGH***	***10,000***	***549 bears (independent)***
Total	***LOW***	***10,000***	***170 bears (independent)***

Table 3. Results of habitat surface area analysis for use/occupancy population estimate in B-3

Published black bear densities across Rocky Mountain States range from 1.35 bears/100 square-kilometer in Rocky Mountain National Park (Baldwin and Bender 2007) to 31-77 bears/100 square-kilometers in Idaho (Beecham and Rohlman 1994). However, two 2009 Colorado mark-recapture surveys indicate higher densities than those found by most studies, analyses, or management reports in the western US (44-85 bears/100 square-kilometer)(Apker et al. 2010). Although density estimates are influenced by the size of the study area and the methods by which density estimates were derived (see Apker et al. 2010); overall habitat quality in the two 2009 study areas in Colorado is probably better than that found in most other study areas. It should also be noted that both the Colorado 2009 survey areas were selected in large part because they were considered among the highest overall quality habitat in Colorado and the exact survey grid areas were structured to include mostly the highest quality cover and forage value habitat for the survey season. The only published data collected within B-3 is Baldwin and Bender (2007), but the work conducted adjacent to B-3 across the Wyoming line in the Snowy Range (Grogan 1997) also provides a comparison. Baldwin and Bender (2007) cite an independent black bear density of 1.35 bears/100 square-kilometer in their study in higher elevation habitat in Rocky Mountain National Park (RMNP). While some of B-3 is certainly comparable to the study site in RMNP, in general, the habitat surveyed by Baldwin and Bender (2007) falls somewhere in the middle to lower range of quality relative to the rest of B-3. Grogan (1997) describes 3 study sites in the Snowy Range of Wyoming he used to estimate bear densities, all of which have lodgepole and spruce/fir canopies as the predominant vegetation class. A large component of B-3 is lodgepole forest, but the ponderosa and foothills shrub communities are largely absent in Grogan's study sites. He estimated independent bear densities across all study sites and all years to be 2.5-2.8 bears/100 square-kilometer, depending on some assumptions related to population closure. His highest estimate was in study area 1, which resulted in 7.2 independent bears/100 square-kilometers but the variance was quite large.

Several other correlates of bear habitat use/occupancy are also available to managers in B-3 including harvest density/locations, roadkill/highway crossings, and conflict hotspots. An evaluation of B-3 harvest locations superimposed on the basic categories of bear habitat use and occupancy indicates that most harvest, and presumably most of the bears, are found (in the fall) in primary habitat or within edge habitat that very closely adjoins primary habitat (Figure 11). The significant exception to this would be the presence of bears, as documented through roadkill, harvest and conflicts, in high densities in some localized areas of edge habitat (those associated with human food sources).

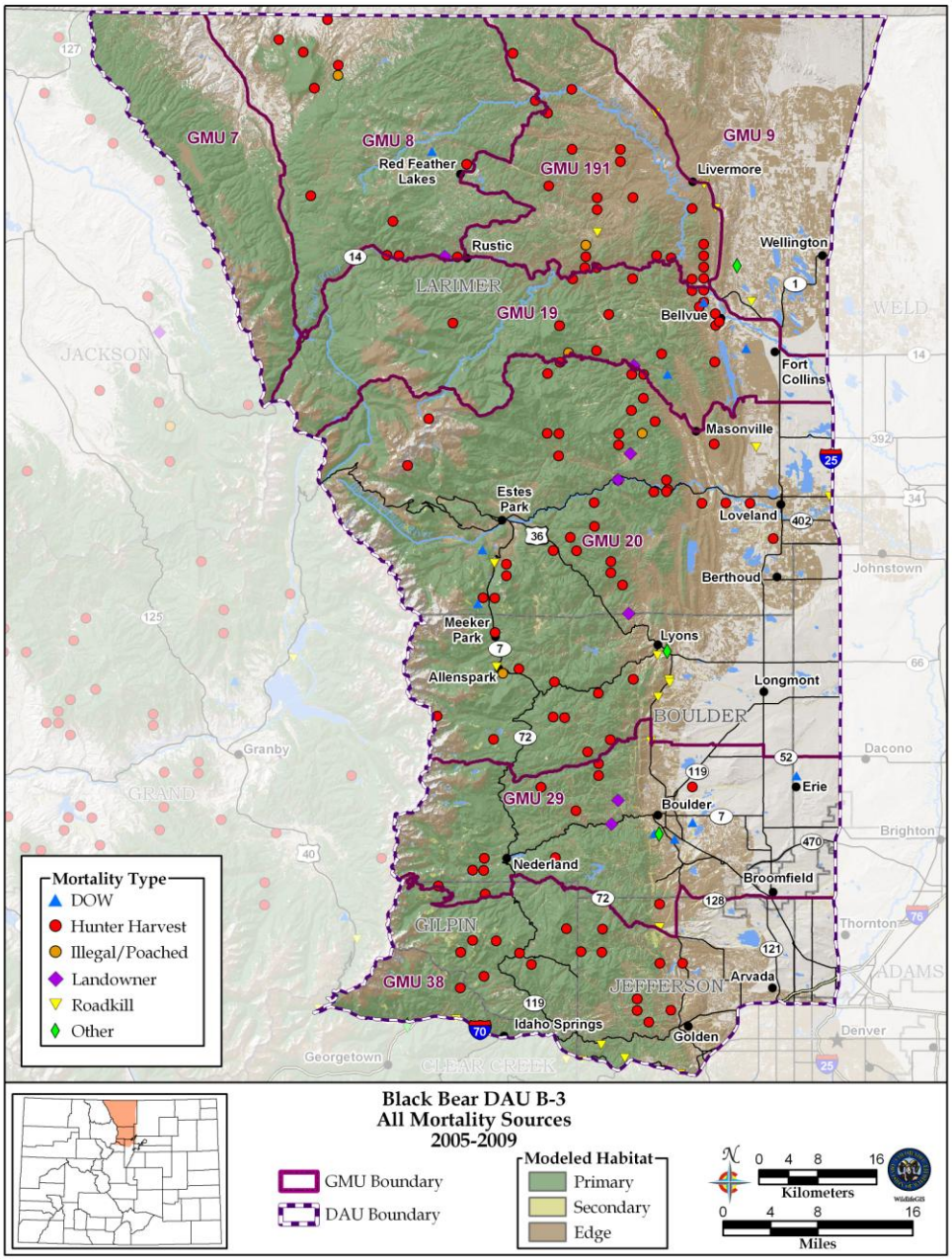

Figure 11. Location of bear mortalities in B-3 (2005-2009)

Mortality Density and Rates

The amount of human-caused mortality in relation to the amount of suitable habitat available is another method to gauge the impacts of human-caused mortality on black bear populations. This can be useful in illustrating impacts on a more local scale and standardizing mortality between DAUs with varying habitat suitability. The number of human-caused mortalities can be divided by the area of primary and secondary habitat.

Thus B-3 with 4,659 km2 of primary and secondary habitat and an average of about 37 bears killed per year over the past 10 years = a mortality density of 0.79 bears/100km2. Then assuming that the bear population is about 400 bears, which is roughly the mid-point between the various habitat and population model projections, then the median bear population density in the DAU is about 8.6 bears/100km2. Using these figures to calculate a mortality rate yields .0.79/8.6 = 9%. It is likely that

some human-caused non-harvest bear mortality occurs in B-3 that is undetected, but it is unlikely that the average ten-year total mortality exceeds 45 bears. At that level the mortality rate would be about 11% with the median bear population density.

Miller (1990) demonstrated that under optimal conditions of reproduction and survival, maximum sustainable total mortality for black bears could be as high as 14.2%. Beck and White (1996 unpublished) conducted black bear population simulation analyses which, given their assumptions, produced stable bear populations with annual mortality at up to 15%.

It is unlikely that bears annually experience optimum reproduction and survival conditions due to environmental variation affecting forage conditions and black bear vulnerability to mortality factors. Therefore, we have formulated mortality rate thresholds associated with different management strategies which are somewhat lower than the foregoing:

Management Strategy	Mortality Rate Threshold
Increasing	< 7%
Stable	7% - 13%
Decreasing	> 13%

Forage Condition - Mast Production Surveys

Mast production surveys have been conducted since 2008 in parts of B-3. Unfortunately, given the absence of hard mast (oakbrush) in the DAU, the usefulness of these surveys is limited to assessing the condition of the annual soft mast crop (chokecherries, plums, etc). Area field staff will continue with mast surveys but the proportional weight of the data from these surveys to population projections will not be significant compared to the contribution of the rest of the suite of management metrics. This can be used as supportive data when projecting reproductive rates, cub survival, vulnerability to harvest and other factors related to modeling and predicting population trends for the upcoming year.

POPULATION MODELS

Deterministic population models were developed on a framework of annual biological, harvest and density assumptions to project assumed populations using available data. We used a starting population at the higher end of the range taken from the early 1990s vegetation/density extrapolation and projected it to 2014. We used plausible values for age specific survival, number of cubs per litter, and the model includes input values to account for changes to reproduction and mortality rates due to poor forage years. For years 2008 and 2009 we had actual forage condition monitoring data. For prior years we used the relative amount of non-hunt mortality to provide an index of forage conditions. The models use mortality data with harvest as a direct model input and non-hunt mortality adjusted upward since we know our records do not document all non-hunt mortality.

While the models do yield population estimates, these estimates are predicated on many plausible, yet assumed input values. The results do appear to conform to population extrapolations derived by the habitat models. Nonetheless, the value of the models is most worthwhile in the population trajectories and responses to mortality and forage condition variability than the absolute population numbers they produce.

Two models in B-3 are compared; one projects a liberal population with attendant liberal, but plausible model parameters, the other is a conservative population projection with more conservative parameters.

Assumptions common to both Liberal and Conservative Models

The initial population size of 450 bears and the starting age distributions for both models was derived from extrapolations of habitat quantity and known bear densities from the literature. Sex ratio at birth was assumed to be 50/50, with an average litter size of 2. Based on 2007-2009 tooth data, there were 5 adult female bear samples in B-3 that allowed for evaluation of primapatry and birth interval. This sample supports using 5 as the age of female primapatry in B-3 and using a birth interval of 2

years between liters. Both models employ a non-harvest multiplier of 1.5 that increases the value of the reported non-harvest mortality.

Subadult and adult survival rates were largely midpoints of published ranges in New Mexico and Colorado (Costello et al. 2001, Beck 1991, Beck 1997), while cub survival fell within published ranges but was modulated by a mast index that is intended to reflect documented forage conditions on a yearly basis. Given the weak influence of mast in B-3 cub survival rates were assumed to be slightly lower but less variable than in models of mast-driven systems. Predicted population and age structure levels beyond the current year (2010) relied upon the continuation of assumptions used in the preceding years, as well as projected future mortality levels at levels necessary to stabilize the population.

Liberal Model

The assumptions used specifically in the liberal model include cub survival rates of 40% in poor food years, 60% in average food years and 68% in good food years. Annual age and gender specific survival rates are unaffected by natural or human forage conditions, although the forage condition or mast index that modulates cub survival rates does minimally impact age class totals.

Modeling efforts using the liberal inputs outlined above yields a 2009 posthunt population estimate of 805 bears, with 248 cubs, 354 females and 203 males. Excluding cubs, the 2009 B-3 estimate of independent bears is 557.

Conservative Model

The assumptions used specifically in the conservative model include cub survival rates of 40% in poor food years, 57% in average food years and 65% in good food years. Annual age and gender specific survival rates are generally 1-2% lower than those used in the liberal model, and are unaffected by natural or human forage conditions.

Modeling efforts using the conservative inputs outlined above yields a 2009 posthunt population estimate of 651 bears, with 204 cubs, 301 females and 145 males. Excluding cubs, the 2009 B-3 estimate of independent bears is 446.

MORTALITY COMPOSITION AND MANAGEMENT CRITERIA

Black bear vulnerability to harvest and other mortality factors varies depending upon differences in habitat, hunter effort or pressure, access, and forage conditions. Bears are less vulnerable where cover is dense over large geographic areas. They are more vulnerable where vehicle access is good. The greatest influence in annual variation in bear vulnerability is forage conditions. When natural forage quality or availability is poor bears must become much more mobile in search of food, especially during fall hyperphagic periods. Increased mobility tends to result in bears being more visible to hunters, more likely to encounter human food sources, more frequently found along or crossing roads, and more concentrated in areas where there may be relatively more forage available. All of these tendencies can result in increased hunter harvest, increase human conflict mortality, more roadkills and other forms of mortality. Not all segments of bear populations are equally vulnerable, however, regardless of other influences. Hunting pressure affects harvest rate, which affects age structure, sex ratios, and densities of black bear populations. Adult males are typically most vulnerable because they are bold (often use open areas) and have larger home ranges. When hunters are able to select between bears they will also favor larger-bodied bears. Sub-adult males are slightly less vulnerable. Consequently, the adult male segment of a population is the first to be reduced under hunter pressure. As harvest rates increase, the proportion of sub-adult black bears (those less than 5 years old) in the harvest typically increases, whereas the proportion of adult males declines. **A low percentage of adult males (≥5 years old) in the harvest may be an indication of over-harvest**. This criterion is a more sensitive indicator of black bear population levels than median age (Idaho Dept. of Fish and Game 1998). The mean percent of adult males in the harvest in relatively stable populations in Idaho (Beecham and Rohlman 1994) and New Mexico (Costello et al. 2001) under moderate to high harvest levels was 30% and 28%, respectively. Studies of black bear populations in Alaska, Virginia, and Arizona showed

similar relationships between lightly and heavily hunted populations. **Therefore, 25% to 35% adult males in the harvest could indicate a stable black bear population**. Levels lower than 25% may indicate a higher level of harvest, which has reduced the adult male segment of the population; whereas levels higher than 35% may indicate a much lighter harvest level. Based on the 3 years of available data in B-3, it appears that current harvest levels could be high, as adult males only comprise 10% of the total harvest (Figure 12). This over-representation of sub-adults males (and under-representation of mature males) could also be at least partially explained by the significant portion of conflict or specifically-targeted bears that appear in the harvest. License holding hunters are often directed by friends or CDOW staff to specific areas to harvest bears that may be creating conflicts and these individual animals are often sub-adults.

As harvest levels increase and additional adult and sub-adult males are removed from an area, the proportion of females in the harvest begins to increase (Fraser et al. 1982, Kolenosky 1986, Beecham and Rohlman 1994), because female are least vulnerable, especially if accompanied by cubs. The average percent females in the harvest of black bear populations under moderate and high hunting pressure in Idaho (Beecham and Rohlman 1994) and New Mexico (Costello et al. 2001) was 35% and 40%, respectively. Beecham and Rohlman (1994) suggest a desired proportion of female harvest of 35% to maintain a stable population, whereas Beck (1991) suggested maintaining <40% females in harvest. **Therefore, a range of 30% to 40% females in the total harvest could indicate a stable black bear population**. Data Analysis Unit B-3 appears to be at the top end of the stable range using this indicator, with a 42% female harvest rate over the last 3 years (Figure 12). Proportions higher than 40% may suggest reduction of the number of females in the population. Monitoring this criterion helps ensure a stable reproductive portion of the population and the ability of the population to rebound in the event of a decline.

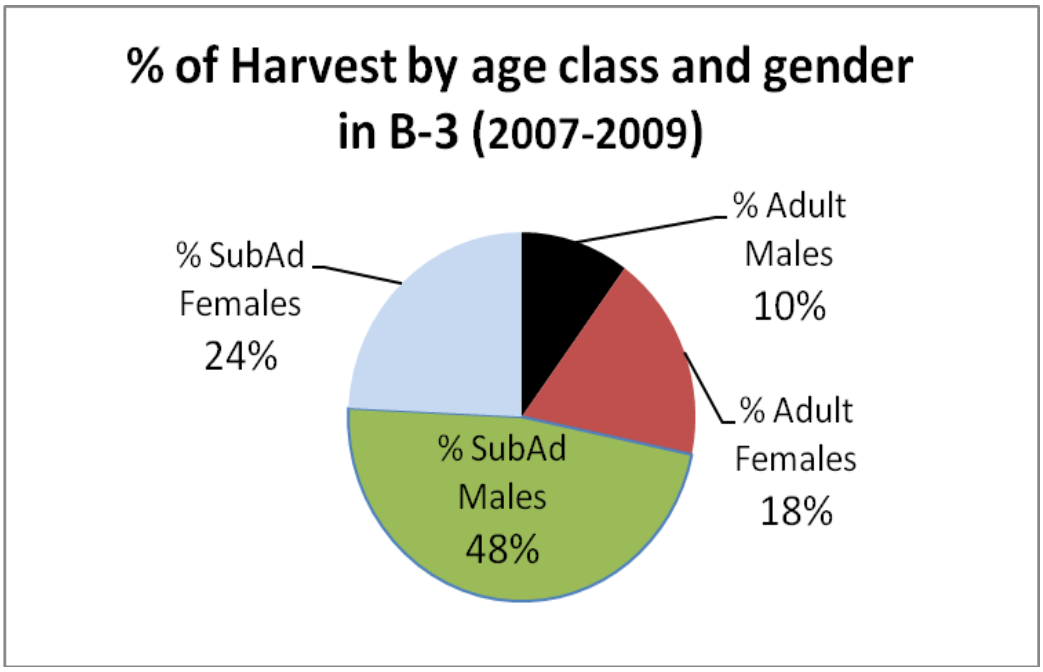

Figure 12. Bear harvest in B-3 by proportion of age class and gender

With increasing harvest of a black bear population, younger females are removed and older females become more common in the harvest. **Thus, the proportion of adults in the female harvest should rise with harvest rates, increasing mean age of females in the harvest** (Kolenosky 1986, Beecham and Rohlman 1994). This phenomenon is especially important with late-reproducing species like bears, since removing adult females has the enhanced effect of not only reducing the number of bears in the population, but also decreasing reproductive potential of the population and, thus, its ability

to respond to declines. The delayed response of slow reproducing populations to reductions was noted by Harris (1984) and was demonstrated in modeling efforts by Miller (1990), who predicted black bear populations reduced by 50% would take an average of 17 years to recover if hunting pressure was reduced by 25%.

The percent of adults in the female harvest, rather than mean or median age of the females in the harvest, can also be used to gauge the presumed population trajectory. Averaged over a three-year period, this criterion provides a more meaningful measurement of female harvest age structure, especially in areas with small sample sizes. The mean percent of adult females in the harvest of two New Mexico black bear populations under moderate and high harvest pressure was 55% and 70%, respectively (Costello et al. 2001). The mean percent adult females in the Wyoming statewide female black bear harvest from 1994-2005 was 47%, with a range of 32% – 57%, **suggesting that 45 – 55% adult female harvest provides a stable proportion of adult females** (Wyoming Game and Fish Dept. 2007). In B-3, adult females comprised 43% of the female harvest from 2007-2009, indicative of a stable population under this criteria (Figure 13).

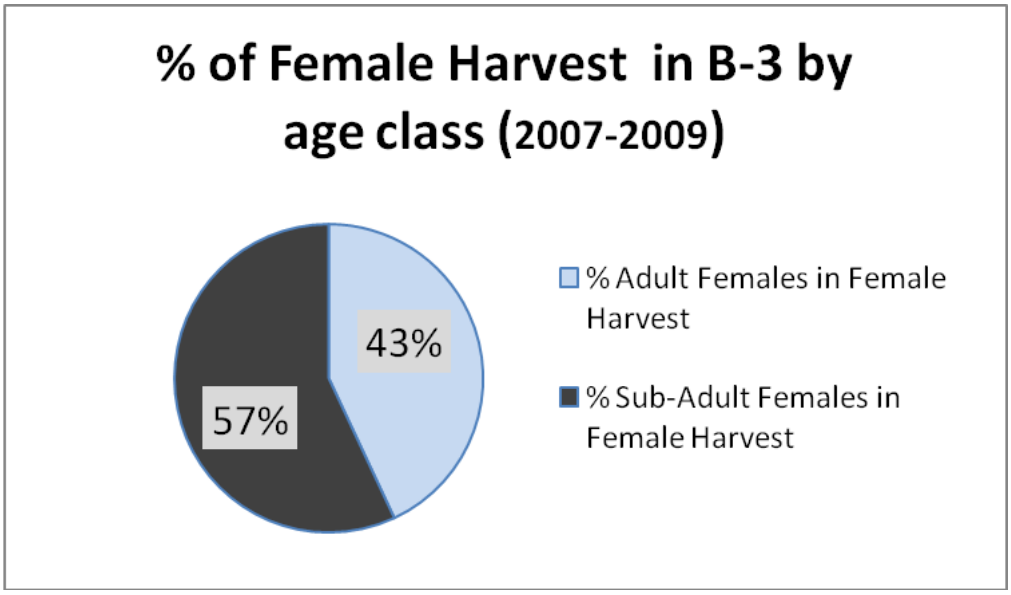

Figure 13. Proportion of female harvest, by age class in B-3.

Looking at criterion independently could give very different results than when considering them together. For instance, looking only at the reduced percentage of adult males in the harvest (10%) may indicate that the population is under a heavy harvest regime. However, evaluating the other criteria in B-3 shows a slightly increased proportion of total females (42%), relative to a stable population, while the adult female component in the harvest falls within the stable range. Other scenarios could also occur in the future, whereby a high percentage of adults in the female harvest, assessed independently, would indicate population reduction. However, when the percent adult males and percent females in the harvest are both in the population increase or stable range, the population might actually be thriving. This situation might occur if B-3 is adjacent to or has an area providing a source of immigrating black bears. Source areas can be defined as areas of suitable habitat with little to no human-caused mortality that may provide dispersing bears to surrounding areas (Beecham and Rohlman 1994, Powell et al. 1996). Areas adjacent to sources may have a lower proportion of adults in the harvest due to sub-adults dispersing to occupy vacant home ranges of harvested bears. These areas may also be able to rebound more quickly from overharvest (Beecham and Rohlman 1994). Dispersing sub-adult males may also supplement surrounding populations and absorb much of the harvest to the point where female harvest remains low and adult females comprise a higher proportion of the population. This

over-representation of sub-adult males could be an influence in B-3 where the composition of harvest can be impacted by field staff directing individual hunters towards locations with conflict bears.

To better evaluate harvest data, black bear seasons are set for a five year period as with most other big game species in Colorado. We recommend that harvest objectives and attendant license allocations be set for three-year periods. This would allow for a more complete analysis of the effects of harvest by holding dates and quotas the same for each three-year season cycle. In order to increase the sample size of the harvest data and to reduce the influence of high or low annual harvest rates due to environmental or other factors, three-year running averages will be used in harvest data analyses rather than analyzing annual data independently. While the evaluation of harvest criteria will be analyzed using a three-year average, data from the previous 10 years (two black bear generations) or longer should be analyzed to illustrate longer-term trends in harvest and related population trends.

SOCIAL FACTORS

The social factors that influence management scenarios in B-3 include game damage and human conflicts. As stated above in the game damage section, the 9-year annual average number of game damage claims in the DAU is 4, with the largest number being for apiary damage. Most of these beekeepers are small, non-commercial operations with a relatively small numbers of hives. A single bear in one night can, however, significantly impact a landowner/beekeeper with a small number of hives. The majority of claims in B-3 have been in Larimer County; this may be a reflection of the habitat and significant number of rural, small acreage landowners that exist who keep bees or small numbers of hobby livestock. One consistent, localized game damage situation occurs northwest of Fort Collins on a series of irrigated corn fields. These fields are located immediately adjacent to the foothills (and good bear habitat) and bears gather in these fields in late summer when the corn is mature enough to provide security (through height) and high-value food (when corn ears are tassled). Based on aerial observations of damage and data from 2 radio-collared animals, bears have been monitored using these fields to the exclusion of all other habitat types during August and September until the corn is cut, which typically occurs in late September.

Significant direct human conflicts with black bears in B-3 typically involve a bear entering or attempting to enter a home, cabin, trailer or car. These conflicts are dealt with by CDOW field staff differently depending on severity of the incident, other site-specific qualities and whether the bear in question had been previously handled by the CDOW. There is a CDOW policy on handling bears that have already received a first “strike”, as well as procedures to follow if a bear makes physical contact with a person.

STRATEGIC GOALS AND MANAGEMENT OBJECTIVES

PROCESS FOR DEVELOPING STRATEGIC GOALS AND MANAGEMENT OBJECTIVES

Public Process

In August of 2010 two public meetings were held in Loveland and Denver to provide an opportunity for public stakeholders to comment on future management scenarios in B-3. The meetings were advertised in the local media, CDOW website and through a press release. Attendance was low with 15 attendees total across both meetings. A survey was provided for all attendees to give comments on bear population goals and other comments directly related to management (Appendix A). These comments are briefly summarized below and were included in development of the draft plan.

Question	Number of responses
What strategic population goal do you prefer?	8 supported a stable population goal, 2 an increased goal, 2 a decreased goal, and 3 had no response
Do you live in the DAU?	14 of 15 live in the B-3 DAU
Are you a hunter?	4 of 15 were hunters
Have you had bear damage?	4 of 15 had experience bear damage

After the initial public outreach the draft plan was developed and posted on the CDOW website for 30 days for further public review and comment (March-April 2011). The draft plan was also made available to impacted federal, county and local municipality land management and natural resource agencies for comment. The draft plan was also shared with the Northern Larimer County HPP Committee for committee comments. Three comments were received during this phase of the process. The USFS- Canyon Lakes Ranger District letter (Appendix B) states a preference of either a stable or increasing bear population goal. The other 2 comments didn't relate to bear population management or offer input on strategic goal alternatives.

STRATEGIC GOALS

Subsequent total mortality and harvest objectives are presented as a range of probable amounts necessary to achieve the strategic goal of the DAU. Annual monitoring of mortality amounts, gender and age structure, Colorado black bear density study, and annual forage condition survey results are all incorporated into determining annual mortality objectives. However, the models and their results have not been validated with demographic data from Colorado bear populations. Moreover, the data that have been collected and used for model inputs are relatively new efforts. We anticipate that models will change and be improved over time and at present must be viewed as **presumptive** estimates. Therefore, although the plan identifies mortality and age and gender objectives, these are initial values. Modeling will be conducted every other to every third year, while other mortality data and demographics are collected and analyzed annually. Population extrapolations based on predicted densities, range-wide or within vegetation associations, will be re-evaluated as new data is gathered via research and mark-recapture surveys. While unlikely, objectives may be periodically adjusted in order to achieve the DAU strategic goals based on changes in the information sources above. Specific objectives will be documented in annual objective sheets approved by the Colorado Wildlife Commission. These objective sheets will also govern annual license levels to achieve the DAU strategic goals.

Three Alternative Strategic Goals in B-3 were considered

Increasing the bear population in B-3 for 5 years, then stabilize

To achieve a strategic goal of increasing the bear population in B-3, management criteria applied to determining harvest and total mortality rates would be in the conservative range. Total mortality, or off-take, as a proportion of the population should fall below 7%; based on current population projections the total mortality objective would be <25 bears. Proportion of adult males in the harvest should be greater than 35%, with all females making up less than 30% of harvest. Additionally, adult females should comprise less than 45% of the female harvest.

Stable bear population in B-3

To achieve a strategic goal of maintaining a stable bear population in B-3, management criteria applied to determining harvest and total mortality rates should fall in an intermediate range. Total mortality, or off-take, as a proportion of the population should fall between 7-13%; based on current population projections the total mortality objective would be 52 bears. Proportion of adult males in the harvest should be within 25-35%, with all females making up 30-40% of harvest. Additionally, adult females should comprise approximately 45-55% of the female harvest. Within the framework of an

overall stable population, off-take rate flexibility will be maintained to manage for minimized game damage and human/bear conflicts in localized areas of concern. While compatible with an overall stable DAU goal, minimizing/mitigating conflicts and damage could require that on an infrequent basis, mortality rates surrounding small local conflict areas could surpass the above thresholds.

Decreasing the bear population in B-3 for 5 years, then stabilize

To achieve a strategic goal of decreasing the bear population in B-3, management criteria applied to determining harvest and total mortality rates would be in the liberal range. Total mortality, or off-take, as a proportion of the population could increase above 13%; based on current population projections the total mortality objective would be >52 bears. Proportion of adult males in the harvest can be low, even below 25%, with total female harvest rates going over 40%. Additionally, adult female proportions in the female harvest can comprise account for rates over 55%. Areas with conflict and damage could be suppressed to low levels.

MONITORED DATA TO INFORM MANAGEMENT

All known dead black bear, from both harvest and non-harvest sources, are checked by CDOW staff to obtain biological information. The proportion in total mortality of each gender will continue to be closely monitored on an annual basis to assure that female mortality rates are not contrary to the DAU strategic goals. Age structure in total mortality and reproductive history are derived from extraction of a premolar tooth from bears when bear harvest and non-hunt mortality is reported through the mandatory check.

In 2009 and 2010, hair snag surveys were conducted in two locations in Colorado. Additional hair snag survey areas may be established in the future during the term of this DAU plan. Results about bear density, gender, and possibly age structure from these surveys may be incorporated into the habitat model/density extrapolations.

Because of low reproductive rates, black bear populations cannot sustain high harvest levels over prolonged periods. Research has shown that high harvest levels can quickly reduce black bear populations to levels where severe reductions in harvest quotas and season lengths may be necessary for greater than 10 years for full recovery of a population (Miller 1990, Beecham and Rohlman 1994). Therefore, the following harvest criteria will be assessed at the DAU level, with each DAU strategic goal set to achieve the criteria for reduced, stable, or increasing black bear numbers.

-Total mortality

Monitoring harvest and overall mortalities totals in relation to projected population size will be important in interpreting mean age and relative proportions of age/gender classes as indices. Based upon the selected strategic goal the total mortality off-take range that would allow managers to reach that goal will be:

Strategic Goal	Total Mortality Off-take Range
Increasing	< 7%
Stable	7% - 13%
Decreasing	> 13%

-Proportion of mortality by age and gender

As described in the previous section, the following 3 harvest criteria will be monitored annually, using a 3-year average in B-3.

	Strategic Goal		
	Decreasing	**Stable**	**Increasing**
% of Adult Males in Total Harvest	**< 25%**	**25 - 35%**	**> 35%**
% of All Females in Total Harvest	**> 40%**	**30 - 40%**	**< 30 %**
% of Adult Females in Total Female Harvest	**> 55%**	**45 - 55%**	**< 45%**

-Forage condition (mast production) monitoring

Annual forage condition/mast production surveys will be conducted in representative GMUs in B-3. Results of these surveys will be considered annually, however given the absence of hard mast in B-3, the extent to which this index will modulate objectives will be very limited.

-Game Damage & Human Conflict:

Levels of submitted game damage claims and documented conflicts between humans and bears will be evaluated on an ongoing basis. In most cases, management efforts will be targeted at individual bears/locations that are involved in these situations. Management actions include a wide array of techniques and strategies that are employed on a case by case basis including, but not limited to, hazing, trapping/moving and lethal removal.

MANAGEMENT OBJECTIVES- Preferred Strategic Goal

The preferred Strategic Goal alternative in B-3 is to maintain a stable black bear population.

Stable bear population in B-3

To achieve a strategic goal of maintaining a stable bear population in B-3, management criteria applied to determining harvest and total mortality rates should fall in an intermediate range. Total mortality, or off-take, as a proportion of the population should fall between 7-13%; based on current population projections the total mortality objective would be 52 bears. The hunter harvest objective would be 32 bears. Proportion of adult males in the harvest should be within 25-35%, with all females making up 30-40% of harvest. Additionally, adult females should comprise approximately 45-55% of the female harvest. Within the framework of an overall stable population, off-take rate flexibility will be maintained to manage for minimized game damage and human/bear conflicts in localized areas of concern. While compatible with an overall stable DAU goal, minimizing/mitigating conflicts and damage could require that on an infrequent basis, mortality rates surrounding small local conflict areas could surpass the above thresholds.

The specific total mortality and harvest objectives are based on present information and assumptions about population status and trajectory. These represent starting points in an ongoing process. Annual changes to mortality and harvest objectives are anticipated based on new information and evaluation of monitored data. Annual quantitative objectives will be documented in DAU objective sheets approved by the Colorado Wildlife Commission during annual regulation cycles.

The different models/techniques used to predict a bear population estimate in B-3 yields the following:

Vegetation/ Bear Density extrapolation = 303 independent bears
Use/occupancy density model population extrapolation = 170- 549 independent bears

Both population models under two different paradigms support the range of population projections developed through the habitat modeling process.

Liberal Population Model for 2009 = 805 bears (557 independent)
Conservative Population Model for 2009 = 651 bears (446 independent)

For purposes of calculating mortality objectives to correspond with the strategic goal in the DAU, **a 2009 presumptive post-hunt population of 400 independent bears** will be used. This is based on the suite of models and extrapolations above and is supported by the ranges provided by those estimates. Overall mortality and hunter harvest objectives will be calculated based on this population projection and application of the harvest criteria that are appropriate for the selected strategic goal.

Mortality Objectives – 3-year running average

Total Mortality Objective

In order to achieve a DAU strategic goal of a stable bear population in B-3, it is estimated that the annual total mortality should be 52 bears. This is at the upper end (13%) of the appropriate off-take range (7-13%) for maintaining a stable population.

Hunter Harvest Objective

Annual hunter harvest objectives are determined by deducting the 3-year running average amount of non-hunter mortality from the total mortality objective. If the strategic goal is to maintain a stable population, then hunter harvest objectives could be adjusted up or down to (presumably) increase or decrease the rate population growth or decline. Based on a total mortality objective of 52 bears, the hunter harvest objective will be 32 bears.

Age & Gender Structure (harvest composition) in Hunter Harvest Objective

It is estimated that the 3-year running average proportion of age and gender structure in hunter harvest should meet the following criteria:

Harvest Criteria	Strategic Goal	
	Stable	
% of Adult Males in Total Harvest	25 - 35%	
% of All Females in Total Harvest	30 - 40%	
% of Adult Females in Total Female Harvest	45 - 55%	

Game Damage and Human Conflict Objectives

Standard CDOW management techniques will be employed in B-3 to reduce game damage and human conflicts with bears. When management of specific individual bears, or several bears inhabiting a small localized area, requires direct removal (due to game damage or conflict), the flexibility for managers to do so will be there. Bear mortality contributed from these situations may, in rare cases, exceed the above thresholds, however given the infrequent nature and very limited spatial scale of these conflict mortalities, this is still considered compatible with a stable strategic goal. Other methods of non-lethal intervention will be used when the conditions and individual situation warrant it.

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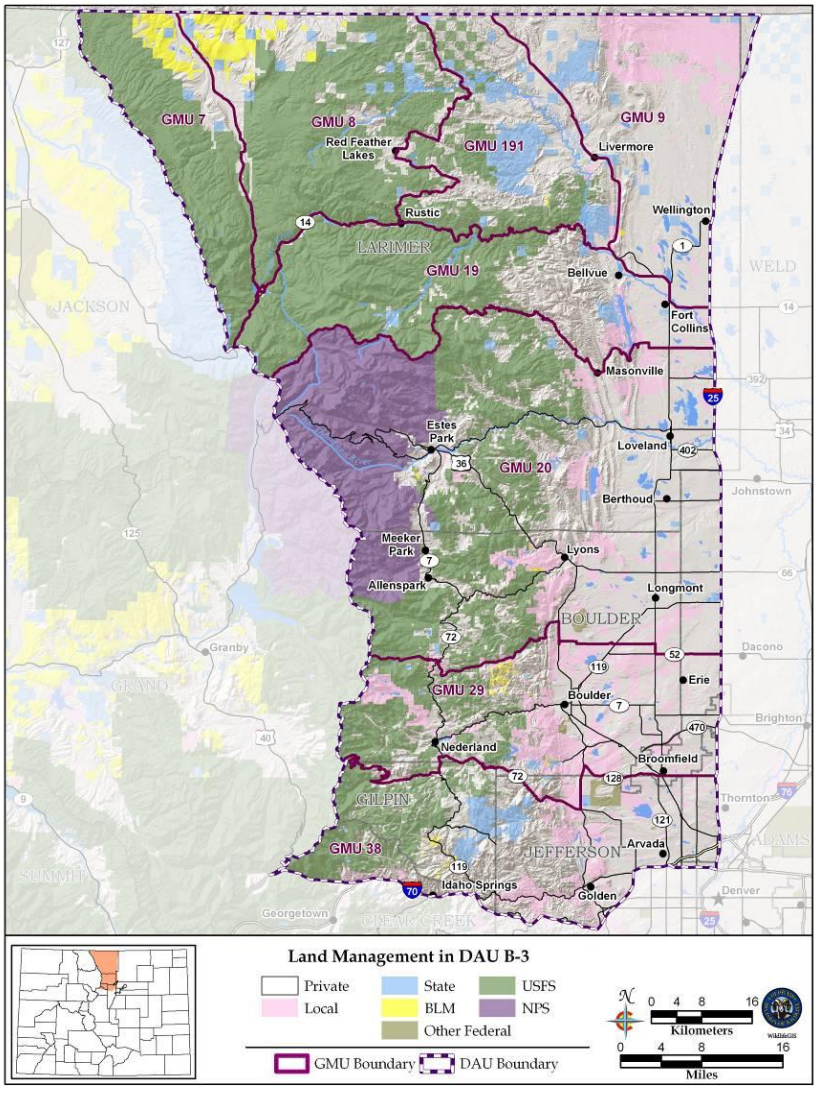
APPENDIX A
PUBLIC SURVEY, AUGUST 2010

Northern Front Range Black Bear Data Analysis Unit B-3
Game Management Units 7, 8, 9, 19, 20, 29, 38 & 191
Loveland and Denver Public Meetings -August 2010

COMMENT FORM

The Colorado Division of Wildlife is beginning the updating process on the black bear management plan for the Northern Front Range. Getting written input from the diverse spectrum of stakeholders is the first part of this process.
Bear Data Analysis Unit (DAU) B-3 (Larimer, Boulder, Gilpin and portions of Clear Creek, Jefferson and Broomfield Counties) is a diverse mix of bear habitat types, land ownership and human densities (see map below).



As such, a Northern Front Range bear management plan must be flexible enough to balance hunting and non-hunting bear mortality sources with long-term population goals over the entire DAU while also addressing localized damage issues.
The following questions will help CDOW managers understand your desires regarding black bear population management in Game Management Units (GMUs) 7,8,9,19,20,29,38 &191. Please write any other comments you may have at the end of this form.

Black Bear Population Strategic Goals (please select preferred)

_____Stable: Maintain current bear population numbers. Bear hunting opportunity will likely remain similar to current levels, but may fluctuate in response to mortality from other sources such as bear-vehicle collisions. Small localized bear management areas

within the DAU would be managed for minimizing bear conflicts.

_____Increased: Allow the bear population to increase. In the short term this strategy may result in decreased hunting opportunity. In the long term, increased bear numbers may result in an increase in the number of bear-vehicle accidents.

_____Decreased: Allow bear numbers to decrease to a lower, but sustainable level. Hunting licenses would likely increase, at least in the short term and/or in portions of the DAU. Small localized bear management areas within the DAU would be managed for minimizing bear conflicts.

Why did you select that particular management goal (increase, decrease, stable)?

What town/city do you live in ?_____

Do you consider yourself a bear hunter?_____

Have you ever hunted black bears?_____

Have black bears caused any damage to your property? _____

If so, what type of damage was caused by black bears?_____

Other comments on bear management along the Northern Front Range:

APPENDIX B.
United States Forest Service- Canyon Lakes Ranger District comment

USDA United States Department of Agriculture | Forest Service | Canyon Lakes Ranger District
2150 Centre Avenue, Building E
Fort Collins, CO 80526-8119
Voice: (970) 295-6710 TDD: (970) 295-6794
Web: www.fs.fed.us/r2/arnf
Fax: (970) 295-6795

File Code: 2610
Date: April 6, 2011

Mark Vieira
Colorado Division of Wildlife
317 W. Prospect
Fort Collins, CO 80526

Dear Mark:

~~This letter is to submit comments on CDOW's Draft Black Bear Management Plan for DAU~~ B-3. My comments are specific to the Canyon Lakes Ranger District (CLRD) portion of the B-3 Bear DAU that overlaps the Arapaho-Roosevelt National Forest. This includes GMUs 7, 8, 191, and 19 within Area 4, and the portion of GMU 20 within Area 2 that overlaps CLRD. My staff has reviewed the plan, and I have discussed it briefly with my recreation staff regarding black bear/human conflict issues at our recreation sites. Although there have been minor bear/human conflicts at some of our recreation sites in the past, these instances have been limited, and likely a function of bear attractants rather than too high of a bear population. I also recognize that you have management discretion under any alternative to directly address bear/human conflict situations on a case by case basis, as discussed in the plan.

Consequently, we do not see a need to reduce the bear population and would not favor the alternative to decrease the B-3 bear population for 5 years, then stabilize. With regard to the other two proposed alternatives, we can support either maintaining a stable bear population at the current estimated level, including flexibility to mitigate or reduce localized game damage and human/bear conflicts, or increasing the bear population for 5 years, then stabilize.

I would like to be notified or receive the draft plan again once a preferred alternative is selected, and then to receive the finalized plan. Thank you for the opportunity to comment on your Draft B-3 Black Bear Management Plan. Should you have questions or wish to discuss this further, please contact myself or Dale Oberlag.

Sincerely,

Kevin W. Atchley

KEVIN W. ATCHLEY
District Ranger

cc: Mark Leslie, Larry Rogstad