PROCEEDINGS
of the
SIXTH WESTERN
BLACK BEAR WORKSHOP

Rich Beausoleil

6th Western Black Bear Workshop

May 5-7, 1997 Ocean Shores WA

Richard A. Beausoleil and Steve Pozzanghera, Editors

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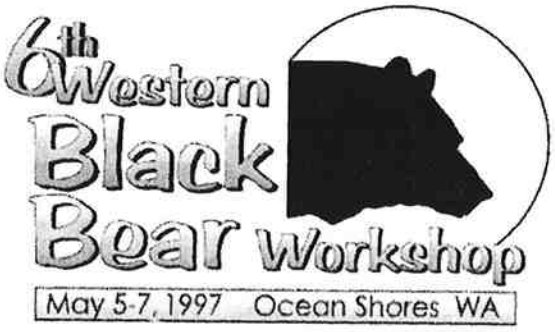

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POSTER PRESENTATIONS

Washington Department of Fish and Wildlife took great pride in hosting the Sixth Western Black Bear Workshop. More than 165 people attended the meeting making it the highest attended workshop to date. Participants represented more than 20 states, several countries, tribal nations and federal agencies. Academic participation was also excellent with a number of university professors and students in attendance. Lastly, numerous members of the public as well as individuals from private organizations added greatly to the diversity of this meeting.

The contributors and participants ultimately were responsible for the success of this workshop. Financial support provided by the International Association for Bear Research and Management, the United States Forest Service, the Wildlife Society, the Washington Forest Protection Association and the Weyerhaeuser Company made the meeting possible. Many thanks to the state fish and wildlife agency representatives who stepped up to the challenge of providing status reports in advance of the meeting. Invited moderators provided outstanding facilitation of the workshop's sessions; speakers gave quality presentations and submitted excellent posters and manuscripts for publication as attested to by this proceedings, and panel members tackled difficult social issues related to bear management and voter initiatives. Without this participation, the workshop would have been just another meeting; with all of your efforts I believe we positively influenced black bear management.... and for that I thank all of you.

Finally, I would like to thank Rich Beausoleil for picking up the pieces from this workshop and completing these proceedings. Rich accomplished in a few short months what had languished for six years! The key topics and issues covered by the 1997 workshop included changing social values and their influence on black bear management, the increasing bear and human conflict, and the impact of technological advances on bear research and science. These same issues continue to challenge black bear professionals in 2003, and I believe this publication sheds valuable light on these topics.

Steve Pozzanghera
Workshop Chair

STATUS REPORTS

ARIZONA BLACK BEAR STATUS REPORT - 1997

RICHARD A. GERHART, Arizona Game and Fish Department, Tucson Region, 555 N. Greasewood Road, Tucson Arizona 85710, USA.
JOHN S. PHELPS, Arizona Game and Fish Department, 2221 West Greenway Road, Phoenix, Arizona 85023, USA.

DISTRIBUTION AND ABUNDANCE

Black bears occur in chaparral, pine-oak and pinyon-juniper woodlands, mixed conifer and spruce-fir forests throughout central and southeastern Arizona. Central Arizona bear habitat occurs as a contiguous block running south of the Mogollon Rim and along the eastern third of the state. In contrast, southeastern Arizona bear populations are geographically isolated on individual mountain ranges. Mountain "islands" of good quality black bear habitat are separated by broad expanses of unsuitable habitat in the valleys between. Upper Sonoran desert habitats are seasonally important when prickly pear fruits ripen.

POPULATION MONITORING

The statewide black bear population in Arizona is estimated at 2,500 individuals occurring on 12,600 mi^2 of occupied habitat, excluding Indian Reservations and National Parks and Monuments. Population data are based on estimates of bear densities for different habitat types; no intensive surveys are done, although annual track counts are accomplished in many management units.

MANAGEMENT OBJECTIVES AND STRATEGIES

The Arizona Game and Fish Department's (AGFD) strategic plan goal for black bear is to manage the black bear population, its numbers and distribution, as an important part of Arizona's fauna. Provide bear hunting and other related recreational opportunities (AGFD, 1995). Management objectives are as follows:

(1) Maintain 1.0 black bears per square mile of high quality bear habitat.
(2) Maintain an annual harvest of no more than 125 female bears (including depredation take), with a total harvest of 250 or more bears (including males).
(3) Provide recreational opportunity to 4,000 to 7,000 hunters per year.
(4) Maintain existing occupied habitat, with emphasis on retention of medium and high quality habitats.

HUNTING LAWS AND REGULATIONS

The majority of bear hunting occurs during the late summer and fall. Three game management units in southeastern Arizona also support limited permit spring hunts. A legal bear is defined as any bear except sows with cubs. Bear season lengths vary by unit, but all management units have an annual female harvest objective. Attainment of a unit's female harvest objective prompts the closure of the hunt the Friday immediately following.

The use of bait is prohibited on all hunts. The use of dogs is allowed during fall hunts, and hunters using dogs take approximately 20% of the annual sport harvest.

HARVEST SUMMARY

Since 1991, when a record low of 101 black bears were taken, annual harvests have risen, averaging 236 animals/year over the three years since 1994. This increase is largely attributable to the lengthening of the fall bear season in many units and drought conditions, which make bears more vulnerable during the fall hunts. Fall sport hunting accounts for 97-98% of the reported bear harvest each year. Depredation take and spring sport harvest account for the remaining 2-3%.

On average, 38% of the annual harvest is female, but the total number of females killed remains below the threshold of 125 identified in the AGFD management objectives.

NUISANCE AND DAMAGE ACTIVITY

Human-bear encounters continue to be a problem due to increased recreational activity in bear habitats and opportunistic foraging in human use areas by animals forced into marginal habitats by 2-3 years of poor natural forage conditions. In 1996, AGFD captured and relocated 40 nuisance black bears. An additional 17 nuisance bears were killed: 12 by AGFD officers and 5 by the public. Only 3 bears were reported taken as stock-killers.

During the last year, 6 injuries have resulted from bear-human encounters throughout the state. In the most serious incident, a teenage girl was attacked and seriously injured by a 450-pound male bear while camping in the Santa Catalina Mountains near Tucson. Although the unprovoked, apparently predaceous attack occurred in an area of high nuisance bear activity, the bear involved in the attack had no known history of being food conditioned or habituated to humans. This incident, combined with several previous incidents of property damage by food-conditioned bears, led AGFD to remove all nuisance bears from recreation areas on

the mountain. In all, 12 bears were removed from this small population. With the exception of the above-referenced male, which was shot and killed by a rescuer during the attack, all bears removed were females or their cubs, and all were habituated to humans to some degree.

Arizona is actively working in partnership with the USDA Forest Service to "bear-proof" recreation areas where these conflicts have occurred. We are currently cost-sharing the installation of food storage containers and bear-proof trashcans on the Coronado National Forest near Tucson.

PUBLIC ATTITUDES; BEAR MANAGEMENT/HUNTING

Unlike some other western states, Arizona has not experienced any recent organized opposition to our bear hunt management activities. However, the management of the public to protect bears and management of bears to protect human safety and property continue to present challenges. Public interest in bear management remains very high and attitudes are polarized, especially with regard to nuisance bear issues. The intentional feeding of bears in some areas has continued for several years, despite public education efforts, repeated warnings and several incidents of property damage caused by food-conditioned bears breaking into summer homes and vehicles. In July 1997, a summer homeowner was cited by an AGFD officer and ultimately convicted of misdemeanor criminal nuisance when she fed bears on her porch after repeated warnings to stop. This was the first such prosecution in the State. Recently, in Pima County, the Board of Supervisors adopted an ordinance, the first of its type in the state, prohibiting the feeding or attracting of bears throughout the county.

RECENT RESEARCH AND PUBLICATIONS

In 1996, a large wild fire burned through the Four Peaks area in the Mazatzal Mountains in central Arizona, an area of high quality black bear habitat where much black bear research was conducted during the 1970's and 1980's. The location of this burn presented AGFD research biologists with a unique opportunity to monitor the response of this well-studied black bear population to the habitat changes caused by the fire. Efforts are underway to capture resident bears in order to monitor habitat use patterns as the population recolonizes the area.

CONCLUSIONS

At present, the Arizona Game and Fish Department is endeavoring to manage some bear populations at a level below carrying capacity in an attempt to decrease the incidence of nuisance bear activities. We hope to accomplish this primarily by lengthening bear seasons within the context of our strategic management guidelines. We continue to work in partnership with other agencies and the public with the goal of maintaining viable black bear populations while minimizing conflicts in a rapidly growing state.

LITERATURE CITED:

Arizona Game and Fish Department. 1995. Wildlife 2000 Strategic Plan. Arizona Game and Fish Department, Phoenix, Arizona, USA.

CALIFORNIA BLACK BEAR STATUS REPORT - 1997

ROBERT W. STAFFORD, California Department of Fish and Game, 1416 Ninth Street Sacramento, California, 95814, USA.

DISTRIBUTION AND ABUNDANCE

Black bears inhabit approximately 138,500 km^2 of California and occur at highest densities in the North Coast, Cascade, Klamath, and Sierra Nevada mountains. Population densities are lower in the Central Coast and Transverse ranges. Range expansions along the southern periphery of their range have recently been documented. The population is estimated to be between 16,000 and 23,000.

POPULATION MONITORING

California uses a monitoring matrix to determine the status of the black bear population. The parameters included in this matrix include age and sex composition of hunter killed bears, overall harvest, hunter effort, and population trend data derived from regression analysis (Table 1). Populations are modeled to assess the effects of various hunting strategies on age structure, sex ratio, and population size. Radio telemetry studies continue in northern California to document survival rates, food habits, and den site characteristics. The efficacy of bait stations as a population index is being evaluated in southern California.

Table 1. Matrix for monitoring the black bear population in California.

Monitoring Technique	Threshold of Concern
Median Ages of Hunter Killed Bears	Female ages < 4.0 years old; or statistically significant reduction in median age for combined sexes
Percent Females in Harvest	> 40 percent
Total Harvest	< 1,000 or statistically significant reduction; Only if reduction is independent of administrative action.
Kill per Hunter Effort and Population Index	Statistically significant changes in both kill per hunter effort and population Index

SPECIES MANAGEMENT PLAN

The black bear management plan is currently being revised. The plan is scheduled for release sometime during 1997. Specific elements in the updated plan include habitat management, hunting and viewing recreation, depredation, law enforcement, research, and public education. The current management plan was prepared in 1985.

MANAGEMENT OBJECTIVES AND STRATEGIES

The primary goal of the black bear management program is to maintain a healthy, viable, and widely distributed black bear population. One element of the program is to provide regulated hunting of bears. Specific objectives of the program are to maintain a minimum median age for female bears of 4.5 years and to maintain a higher percentage of males than females in the annual harvest. The Department strives to minimize impacts to bear habitat by making recommendations to public and private land managers. Public education is emphasized in efforts to reduce bear/human conflicts.

HUNTING LAWS AND REGULATIONS

The California Fish and Game Commission (Commission) has the authority to regulate bear hunting and to adopt regulations for killing bears that cause property damage. Successful hunters must present their bear skull to a Department employee so that a tooth can be removed. Both successful and unsuccessful bear hunters are required to return their bear tags. There is no spring season and baiting is not permitted. Dogs may only be used as a method to pursue and take bears during the general bear season, which varies according to deer zone. The use of dogs for the pursuit or take of any mammal is prohibited in bear habitat between April and early fall. Cubs, bears weighing less than 50 pounds, and females with cubs may not be killed. Tag sales are limited to 15,000.

Beginning in 1994, the Commission adopted regulations that allowed for increased bear harvest. Prior to this time, bear season closed when 1,250 bears were reported taken. This threshold level was increased to 1,500 for the 1994 bear season. Prior to 1996, bear hunting regulations provided for a 23-day archery only season beginning on the third Saturday in August and a 79-day general bear season extending from the second Saturday in October until late December. In 1996, bear hunting regulations were changed so that bear season opened concurrently with deer season (early August to mid-October) throughout most of the state. Additionally, bear hunters were restricted to using only one dog per hunter in areas where the general deer season was open.

HARVEST SUMMARY (1994-1996)

Mean tag sales for the period 1994-1996 were 13,097. In 1996, bear tags sold out (15,000) for the first time since their sale was limited in 1990. An average of 1,602 bears were reported taken by sport hunters. Just over half of these bears were taken in the northern coastal and Cascade mountain ranges. Hunter success has remained relatively unchanged (11-14 percent) due to limitations on bear kill and tag sales. Female bears averaged 40 percent of the harvest over the three year period and made up 42.4 percent of the harvest in 1996. Hunter effort, as determined from hunter surveys, ranged from 16 to 24 bears killed per thousand days hunted. Hunters are also requested to reveal hunting effort on their bear tags. Similar trends were observed from tag data (Figure 2).

Approximately 90 percent of successful bear hunters presented their bear skull to a department employee for tooth removal. The high compliance rate is partially due to notifying all successful hunters of their bear's age. The median age of hunter killed female bears continues to be above our management objectives and has ranged between 4.7 and 5.8 years (Figure 3) since 1993.

Mandatory tag return continued to be beneficial in determining the methods used to hunt bears in California. Prior to the 1996 season, at least two-thirds of the bears reported killed in California were taken with the aid of trailing hounds. In 1996, regulation changes resulted in changes in hunting method. Deer hunters and bear hunters using dogs accounted for 30 and 55 percent of the harvest respectively in 1996.

NUISANCE AND DAMAGE ACTIVITY

California's bear depredation policy strongly discourages relocating problem bears. Property owners are given the responsibility for killing depredating bears after the Department has verified that the damage was caused by a black bear. Black bear depredation continues to increase and a record number of depredation permits (289) were issued in 1995. Bear damage to structures was the most commonly cited reason for requesting a depredation permit. Over the past 5 years, an average of 203 permits were issued and 70 bears were killed annually under the authority of depredation permits. Male bears accounted for approximately 79% of the bears killed.

PUBLIC ATTITUDES TOWARDS BEAR MANAGEMENT AND HUNTING

Black bear hunting, particularly with the use of dogs, continues to be controversial in California. Legislation was introduced early in 1997 that would prohibit using dogs for the take of bear. Several organizations have started organizing in an effort to take this issue to the initiative process in 1998 if the bill does not pass. Intensive lobbying efforts have been undertaken by proponents on both sides of this issue.

In an effort to alleviate public concerns, the Department and the Fish and Game Commission provide numerous opportunities for public comment on hunting regulations. Each year the Department holds annual scoping sessions to discuss bear hunting regulations including a wide range of alternatives. Separate scoping sessions are held to obtain input on Environmental Documents concerning mammal hunting regulations. The Environmental Document regarding bear hunting is produced annually and is open to a 45-day public comment period. Finally, the Fish and Game Commission accepts written recommendations throughout the year. Oral recommendations are accepted at three meetings held during even numbered years.

RECENT RESEARCH

In 1992, the Department initiated a study in the Klamath Mountains to obtain additional information on subadult survival, dispersal, and age specific reproductive rates of female bears. Although almost 100 individual bears have been captured, the specific goals of the project have not been attained because of denning habits of the bears in this area. Many female bears and the majority of females with yearlings have been denning in trees at least 15 m above ground. These bears are therefore inaccessible and we have been unable to determine first year survivorship. Additionally, we are unable to determine survivorship rates for dispersing juveniles because we cannot access them as yearlings to attach a collar. We will attempt using remote cameras in 1997 to get some of this information.

In 1995, we began a parallel study near Mt. Shasta and almost 50 individual bears have been captured. In contrast to the Klamath study area, pulpwood production is the primary forest management goal on this study area. We have not observed similar denning patterns to those on the Klamath study area and are therefore not encountering similar problems.

RECENT PUBLICATIONS

Burton, T., D. Koch, D. Updike, and A. Brody. 1994. Evaluation of the potential effects of sport hunting on California black bears. International Conference on Bear Research and Management 9(1): 231-236.

Burton, S. and F. Schmalenberger. 1995. The use of Telazol for chemical restraint of black bears (*Ursus americanus*) in northern California. California Fish and Game 81(1):29-32.

Koch, D. 1994. Biopolitical management of mountain lions, tule elk, and black bears in California.

International Conference on Bear Research and Management 9(1)561-567.

Stafford, R. 1995. Preliminary observations on den selection by female and subadult black bears in northwestern California. Transactions of the Western Section of Wildlife Society 31:63-67.

COLORADO BLACK BEAR STATUS REPORT - 1997

THOMAS D. I. BECK, Colorado Division of Wildlife, 23929 County Road U, Dolores, Colorado, 81323, USA.

DISTRIBUTION AND ABUNDANCE

There are approximately 75,000 km^2 of habitat suitable for black bears in Colorado. Density estimates have been obtained for areas believed to represent the best habitat (aspen-oak forests) (36 bears/100 km^2) and some of the more abundant, but less valuable high-elevation forests (lodgepole pine-spruce-fir) (8 bears/100 km^2). Crude extrapolation of this range of density throughout the forest types of Colorado suggests a statewide estimate of black bears approximating 11,000.

BLACK BEAR MANAGEMENT DATABASE

Hunter kill statistics obtained from a mandatory check of all hunter-killed bears have been collected since 1979. Since 1991 black bears killed and reported by landowners, CDOW employees, and ADC personnel have also been included in the database. Beginning in 1994, all contacts with the public relative to human-bear conflicts have been recorded. The type of conflict and contributing factors are noted. If bears are trapped for relocation, all handling and marking data also are added to this file.

MANAGEMENT OBJECTIVES AND STRATEGIES

Colorado black bear management objectives continue to be to maintain healthy black bear populations while providing for hunting and to minimize depredations to livestock, crops, and private property. Relocation of bears involved in bear-human conflicts is a last resort, as bears will only be moved one time. Subsequent conflicts will result in the killing of the bear. This protocol is clearly explained to the public when we respond to complaints about bears. Education and information programs are targeted to geographic areas where conflicts are chronic and to selected areas during years of poor fall food conditions.

SPECIES MANAGEMENT PLAN

The statewide black bear management plan adopted in 1990 is still the guiding document. Some managers appear ready to adopt localized management plans based on data analysis units. The development of a reasonably precise density estimation procedure seems to have stimulated interest in more localized management.

HUNTING LAWS AND REGULATIONS

Black bear hunting seasons have been relatively consistent during the years 1994, 1995, and 1996. There have been unlimited entry seasons during the regular rifle deer and elk seasons in October and November. There are 3 such seasons of 5, 12, and 9 day duration. An unlimited bear tag is only good for one of the seasons. There have been controlled entry seasons from September 2-30 each year. Permit numbers were 1,000 in 1994; 2,000 in 1995; and 3,290 in 1996. The initial level of 1,000 was tried for 2 years based on concerns for hunter safety raised by archery deer and elk hunters. The number was increased to 2,000 after no conflicts were reported. The 2,000 cap was initially intended for rifle hunters and an analysis in 1995 indicated about 1/3 of the permits were being used by archers or muzzleloader hunters. Therefore we added specific allocations of permits for these 2 groups in 1996. In addition, 315 permits for the September season were issued for private land only hunts in a large area of south-central Colorado in an effort to reduce bear-human conflicts.

BEAR KILL SUMMARY

In 1994, 363 black bears were killed by hunters; 171 in Sept. and 192 in Oct.-Nov. Total hunter participation was 6,524. Applicants for the 1,000 Sept. permits numbered 1,970.

In 1995, 535 black bears were killed by hunters; 283 in Sept. and 252 in Oct.-Nov. Total hunter participation was 9,304. Applicants for the 2,000 Sept. permits numbered 5,906.

In 1996, 515 black bears were killed by hunters; 228 in Sept. and 287 in Oct.-Nov. Total hunter participation was 8,871. Applicants for the 3,290 Sept. permits numbered 7,486.

In comparing the 4-year period following the change in regulations mandated by the citizen ballot initiative to the 4-year period preceding the change, the following highlights are:

(1) Total bear kill declined 10%, primarily because of the low kill in 1993.
(2) Total kill of female bears increased by 6%.
(3) Geographic distribution of kill has been unchanged.
(4) Proportion of kill among seasons varies with food conditions.
(5) Sex ratio of killed bears varies with season; with Oct.-Nov. ratios similar to early spring seasons. Hunter numbers have increased over license revenue has increased over 117%.

Kill rate for hunters in September using rifles has

consistently remained at near 20%. Kill rate in Oct.-Nov. varies from 3.5 to 5.0%.

NUISANCE AND DAMAGE ACTIVITY

Reports of black bear-human conflicts numbered 811 in 1994, 1,056 in 1995, and 533 in 1996. The area of greatest chronic problems is the region west of Denver, characterized by low bear numbers and high people numbers. Nuisance incidents in most other regions appear to be strongly related to local summer and fall food conditions. CDOW personnel moved 101 bears in 1995 and 46 in 1996.

Colorado law provides that the Colorado Wildlife Commission reimburse property owners for damage to all real and personal property committed by black bears or puma. Damage claims for both species have dramatically increased over the past 3-year period. Claims paid for black bear, adjusted to 1987 dollars, have been $128,600 in 93-94; $137,100 in 94-95; and $297,700 in 95-96. The previous high year was $100,100 in 89-90. Possible factors in the increases include changes in the fiscal conditions of the domestic sheep industry, changes in commodity prices, environmental conditions, and heightened public awareness of state liability for such damages. There is no clear relationship between claim levels and black bear density or hunting levels. Apiary claims have dramatically declined following an aggressive program to provide electric fencing equipment for apiarists.

PUBLIC ATTITUDES TOWARD BEAR MANAGEMENT AND HUNTING

No scientific surveys have been conducted of public attitudes toward black bear management since the 1992 election. The change in policy regarding relocation of nuisance bears generated significant media coverage, especially during the poor food year of 1995. The new policy seems to have discouraged many of the more frivolous calls about bears wandering near homes. Hunters appear to have adapted to the new hunting regulations rapidly as interest in the limited permits continues to increase annually.

RECENT RESEARCH AND PUBLICATIONS

A 4-year project to develop density estimation techniques in various habitats has concluded. The protocol involves a high-density trapping program, followed with camera resighting. It is likely the procedure will be implemented in numerous study sites in sequential years. A by-product of the program was development of a new, cage-type bear trap which resulted in high capture rates, minimal capture bias, and minimal injury to trapped bears. A 3-year evaluation of the utility of moving nuisance bears will continue through 1997, with the final analysis and report prepared by spring of 1998. Currently data are available from about 60 translocated black bears.

CONCLUSIONS

Annual kill of black bears by hunters achieved pre-Amendment 10 levels within 2 years; highlighting the adaptability of Colorado black bear hunters. The change in statutes forced the agency to critically examine the previously assumed utility of hunting for management of bear-human conflicts. New policies were developed following the examination and such policies are currently being evaluated. With the observed kill of female black bears since 1992, it does not appear that the change in hunting regulations had any impact on the growth rate (unknown) of Colorado black bear populations. Damage claims against black bears and pumas have significantly increased since 1991, although the relative role of several causative factors remains unknown.

IDAHO BLACK BEAR STATUS REPORT - 1997

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DISTRIBUTION AND ABUNDANCE

Black bear distribution in Idaho closely corresponds to the distribution of coniferous forests. Bears are found throughout the forested mountains and foothills north of the Snake River plain. Few black bears occur south of the Snake River, except in southeastern Idaho. Most bear habitat is publicly owned (USFS and State).

No reliable black bear population estimators are available. However, the Idaho Department of Fish and Game research has found bear densities of 1.0 bears per 1.3km^2 in the best habitats.

Bear management strategy in several areas depends on a continual supply of bears dispersing from reservoir areas. This concept must be validated and a management philosophy developed.

POPULATION MONITORING SYSTEM

The Department relies on 2 primary methods to collect black bear harvest data: 1) the mandatory check and report program, and 2) the annual telephone harvest survey. The mandatory check and report program, implemented in 1983, requires the hunter to bring the skull and hide (1992) of their harvested black bear to an official check point within 10 days of the kill date and fill out a report form. In most cases, a tooth is extracted from the skull for aging. Pertinent data including the kill date, location of kill, and method of take are recorded on the report form. These data are used to monitor the harvest by comparing them with a set of criteria developed from research data. Compliance with the mandatory report program is unknown.

The telephone harvest survey provides a second estimate of the black bear harvest from tag holders. This survey contacts approximately 10% of bear tag holders and collects information from successful and unsuccessful hunters. Statewide harvest, recreation days, and hunter success are estimated. To collect data valid at the data analysis unit (DAU) level, sampling intensity should be increased to about 30% of bear tag holders.

To refine our bear management program, a means of estimating population size and trend is needed. Techniques are not currently available to estimate population size; however, a method to monitor population trend is being developed. Preliminary validation work was conducted at Priest Lake and Council in 1988 and 1989. The results are promising and we are continuing our efforts to evaluate this methodology in the Council area (Figure 1).

Black Bear Management Criteria

We made the following refinements to the criteria developed for our 1986-1990 black bear management plan (Table 1).

1. Separate median age criteria were established for male and female bears. Because young male bears are dispersing, they tend to be vulnerable. They are over represented in the harvest and depress the overall median age, often below criteria levels. From a population standpoint, it is more important to maintain a median age of at least 6 years among females than a median of at least 5 years in the overall harvest.
2. The criteria for percent adults and percent adult males has been eliminated because they are redundant with other criteria.
3. Criteria developed for the 1986-1990 Bear Plan were designed to indicate over harvest, but were interpreted as population goals. The 1992-2000 plan establishes a 2-tiered system that includes a second set of values more accurately reflecting target levels for a viable, self-sustaining population. Changes in management direction will take place when bear populations are shown to be at or below the "over harvest" median age standards, the population is declining, or the percent of females in the harvest is 40% or more. A decline should be evident for 3 or more years and the severity of the decline (slope of the line) should also be evaluated. The season structure of adjacent DAU's will also be considered to avoid significant changes in hunter distribution. When population parameters fall between over harvest and desired population standards, management actions may be implemented to increase or stabilize the population.
4. We also recognize that certain areas in Idaho provide extensive secure habitat (reservoirs) for bears. Roadless and/or wilderness areas are prime examples. Hunting pressure is light in these core areas, resulting in relatively high median ages and low percent females in the harvest. Because population turnover is low,

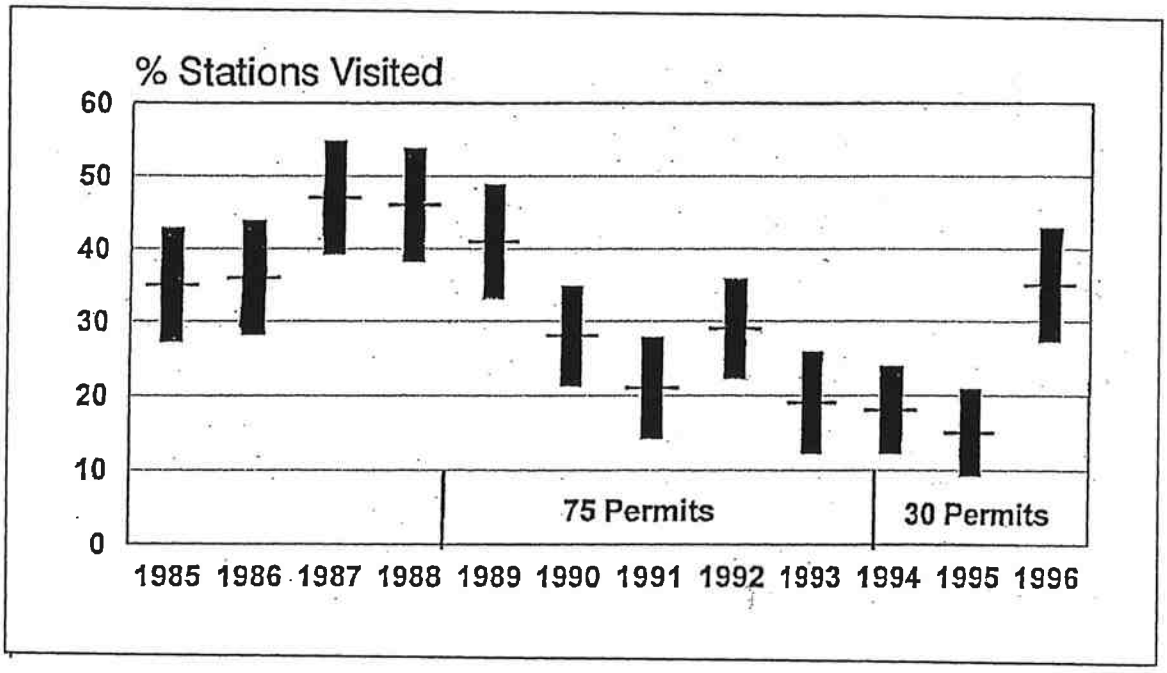

Figure 1. Council bait station survey results, 1985-1996

there is little vacant habitat and young bears, especially males, are forced to disperse into surrounding less secure habitats where harvest rates are often high. These young dispersing males will dominate the harvest statistics in the surrounding areas. Median age criteria for the DAU may be violated, even though the core or reservoir population is secure and will continue to supply a surplus of dispersing bears. Current harvest criteria may not apply in these situations. The key is to ensure that the harvest remains focused on the dispersing bears and does not compromise the reservoir population. In such cases, management direction will be based on the Department's discretion and interpretation of a variety of factors including perceived bear population status, social considerations, and other nonhunting factors (i.e., weather patterns).

5. In some DAU's, bear harvest is consistently low, resulting in small samples from which to monitor harvest parameters. This may lead to inaccurate conclusions. Hence, harvest criteria will be applied only to DAU's in which average annual harvest is at least 30 bears. When harvest is <30 bears, the criteria do not apply, and management decisions will be based on professional judgment.
6. Black bear are difficult to observe because they are shy and often occupy forested areas. They are also difficult to census, therefore, we are developing scent station surveys to monitor population trends. Experimental testing of the scent station survey technique in 1988 showed it can detect large (>20%) declines in bear populations (Figure 1). Though it may not detect small population changes, it is a useful technique when used in conjunction with harvest criteria. The scent station methodology will be considered for all appropriate DAU's.

Table 1. Criteria used to monitor black bear harvest in Idaho.

Criteria	Overharvest[a]	Desired Level[b]
Percent Female	≥40%	≤35%
Median Age	≤3 years	≤5 years
Males	≤2 years	≤4 years
Females	≤4 years	≤6 years
Bait Station Survey	Declining	Stable or Increasing

[a] Reflects an overharvested population
[b] Reflects a self-sustaining, viable population with a diverse age structure

MANAGEMENT OBJECTIVES AND STRATEGIES

1992-2000 GOALS AND OBJECTIVES

1. Maintain or improve black bear populations and distribution in Idaho.
2. Distribute recreational opportunity throughout black bear habitat in a manner that is

consistent with population objectives and provide a variety of hunting opportunities.

3. Improve harvest information by improving compliance with the mandatory check and report program and by requiring that the hide be checked in addition to the skull.
4. Increase the sample of bear tag holders contacted during the annual telephone harvest survey to derive a harvest estimate within ± 10% for select Area 1 DAU's and ± 20% for other DAU's and statewide.
5. Continue to monitor management criteria with goals reflecting a viable population and guidelines indicating over harvest according to the 2-tiered system presented in Table 1.
6. Monitor the bear population response to changes in season framework using our biological criteria and take steps to reduce harvest when data indicate the need.
7. Obtain better data on the economic and social value of black bear.
8. Manage bears to reduce conflicts among competing user groups.
9. Consider initiating research to;
    a. Establish the link between harvest criteria and the characteristics of the standing population.
    b. Determine age- and sex-specific vulnerability to different harvest techniques.
    c. Test and refine the reservoir concept as a management philosophy.
10. Work with the Outfitters and Guides Board to set quotas in DAU's where a harvest reduction is needed. This will include evaluating new license and renewal applications.
11. Develop a set of habitat management guidelines for black bear.

SPECIES MANAGEMENT PLAN

Idaho is divided into 5 areas for purposes of managing black bear populations (Figure 2, Appendix A). Area 1 includes habitats that vary from dense, semi-coastal forests to patchy forest habitats along dry river breaks. Abundant road access and proximity to human population centers characterize Area 1 DAU's. Area 2 includes habitats similar to Area 1, but not as accessible by road and not as close to major population centers. Area 3 has limited access and much of it is officially designated as Wilderness. Area 4 includes a variety of habitats that are generally dry shrub and grass types with few berry-producing plants. The livestock industry is a major resource user of public lands in Area 4. Area 5 includes most of the irrigated lands in southern Idaho and the drier, desert portions of the state. Habitat quality in Area 5 is marginal for black bear and few bears occur there. Based on similarities in habitat, road access, and proximity to urban population centers, 3 of the 5 black bear management areas (Area 1, 2, and 4) are divided into smaller groups, data analysis units (DAU's), to facilitate analysis of harvest information (Figure 2).

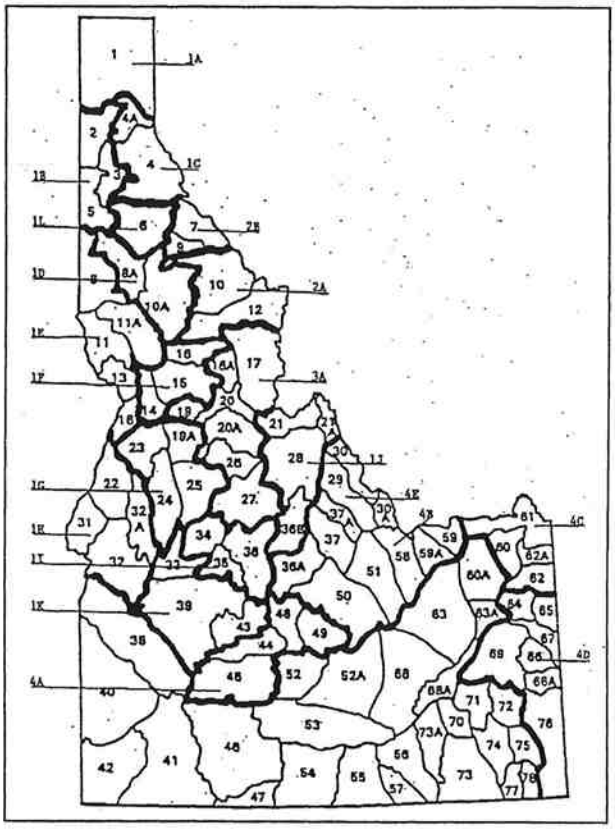

Figure 2. Twenty (20) data analysis units (DAU's) for black bear management in Idaho.

The 1992-2000 Black Bear Plan refines our management program for black bear by incorporating data collected from the Department's mandatory check program.

There are several significant differences between the 1986-1990 and the 1992-2000 Black Bear Management Plans. The 1992-2000 plan:

1. Prioritizes the management alternatives the Department will consider when harvest adjustments are deemed necessary.
2. Refines the management criteria developed for the 1986-1990 Bear Plan by evaluating male and female bear ages separately, putting more emphasis on the percent of females in the harvest, and providing a 2-tiered system of guidelines comprised of a set of values indicating an over harvested population and a

second set reflecting a viable, self-sustaining population (Table 1).

3. Modifies Department philosophy to recognize the value of harvest criteria to indicate the need for harvest reductions. When criteria for a DAU are violated, steps will be taken to reduce harvest.
4. Assumes the presence of bear populations in "reservoir" areas that, because of road access and habitat condition, receive little hunting pressure. The only significant hunting in these areas occurs along river corridors and other major access routes. Under these circumstances, harvest is focused on the young, dispersing animals; consequently, the harvest criteria will rarely meet management objectives, though a majority of the population is largely unhunted and possesses a satisfactory age structure.
5. Provides that black bear tags are not valid until the 2nd day after purchase.
6. Recommends actions to achieve better compliance in the mandatory check program. This will improve the database considerably and provide better insight into population dynamics, status, and trend.
7. Implements a tagging system for bear hides similar to that for mountain lion. This requirement will improve the quality of harvest data and compliance with the mandatory check.
8. Opens the spring harvest season April 15. Biologically, this is more reasonable than the April 1 opener because few bears emerge from hibernation before mid-April and should improve relations with landowners concerned about damage to road systems while they are wet.
9. Opens the fall harvest season September 15.
10. Offers a dog-training season that opens the day after the harvest season closes, in all units that offer such a season, and closes on July 31.
11. Identifies research and other data needs.
12. Specifies a set of regulations regarding baiting for black bears that will be uniformly enforced throughout the state on state, federal, and private lands.
13. Realigns some game management units into different DAUs to facilitate better management of black bears in those units.

RESEARCH

Although the Idaho Department of Fish and Game is not conducting any research on black bear at this time, Jeff Rohlman and I are continuing to investigate methods for releasing captive raised orphan cubs back into the wild. Jeff and I continue to place orphans in vacant dens in late November or early December. Our sample sizes are limited (n=30) at this time, but we believe this technique continues to show promise. Twelve orphans released in 1995 were radio-collared to evaluate survival rates for orphans that remained in their dens (10) and for those that abandoned their dens (2) shortly after release. All twelve orphans survived until their radios fell off the following summer. Future releases will concentrate on evaluating the effectiveness of artificial dens.

During the June 1998, Jeff and I will trap the Council study area to develop additional data on the correlation between catch per unit effort and bait station results.

HUNTING LAWS AND REGULATIONS

Idaho offers five (5) controlled hunts for black bear; all other seasons are general hunts. The spring season opens 15 April and closes in May or June, depending on the specific management unit. The fall season opens on 15 September and closes on 31 October in most units. Hunting with dogs or bait is prohibited in management units within grizzly bear recovery zones. Specific hunting regulations include:

1. Either sex bear may be taken, except females accompanied by young;
2. Dogs may be used in management units with a hound season to take or pursue black bears, but only if the following conditions are met:
    a. a firearm season (excluding muzzleloader) for deer or elk is not open in the area to be hunted;
    b. the owner or person having control of the dogs in the field has a valid hound hunter's permit in possession; and,
    c. during pursuit seasons, bears may be pursued and treed but not captured, killed, or possessed.
3. All successful bear hunters must comply with the Department's Mandatory Check and Report Program within 10 days of the date of kill; and,
4. Black bears may not be trapped, snared, or otherwise captured or held without a permit issued by the Director

Conflicts with grizzly bears

The grizzly bear is classified as a "threatened" species by the U.S. Fish and Wildlife Service. The Department currently restricts the use of dogs and bait to hunt black bears in grizzly bear Recovery Areas (Units 1, 62, 62A, and part of 61). This strategy, in conjunction with intensive public relations work and selected road closures, seems to be effectively reducing

grizzly bear mortality. This strategy will be continued and its effectiveness monitored to minimize or eliminate bear/human conflicts.

Baiting Recommendations

The following standards were adopted to regulate bear baiting in Idaho.

1. Timing of the baiting season:
    a. No baits may be placed for the purposes of attracting or taking black bear prior to the opening of the black bear season.
    b. All structures, bait containers and materials must be removed and excavations refilled when the site is abandoned or within seven (7) days of the close of the black bear season.
2. Location of bait sites:
    a. No bait site may be located within 200 yards of any free water (lake, pond, reservoir, spring, stream); maintained trail; or any road.
    b. No bait site may be located within one-half mile of any designated campground or picnic area, administrative site, or dwelling.
3. Types of bait:
    a. No parts of or whole game animals, game birds, or game fish may be used to attract black bear.
    b. The skin must be removed from any mammal parts or carcasses used as bait.
4. Bait containers:
    No bait may be contained within paper, plastic, metal, wood, or other nonbiodegradable materials, except that a single, metal container with a maximum size of 55 gallons may be used if securely attached at the bait site.
    a. Baits may be contained in excavated holes if the diameter of the hole does not exceed 4 feet.
5. Establishment of bait sites:
    a. Any structures constructed at bait sites using nails, spikes, ropes, screws, or other materials must be removed when the site is abandoned by the permit holder or within seven (7) days of the close of the black bear season.
    b. All bait sites must be visibly marked at the nearest tree or on the bait container using a tag supplied by the Department
6. Baiting permit administration:
    a. All persons placing or hunting over bait must possess a baiting permit issued by the Idaho Department of Fish and Game
    b. Each hunter may possess only one Idaho Department of Fish and Game baiting permit each year and may maintain up to three (3) bait sites.
    c. No person may hunt over an unlawful bait site.
    d. Limits on the number of bait sites that can be established by outfitters should be specified in their operating plans.
    e. Guides and clients of outfitters are not required to obtain a baiting permit, but they must have a copy of the outfitter's permit in their possession while hunting over a bait site.
    f. Baiting permits will be issued by mail or in person at Idaho Department of Fish and Game regional and subregional offices beginning March 1 each year.
    g. Permits will be valid for the calendar year in which they were issued.
    h. Possession of an Idaho Department of Fish and Game baiting permit does not exempt the permit holder from any restrictions placed on users of federal, state, or private lands.

PROPERTY DAMAGE/DEPREDATION POLICY

By Memorandum of Understanding, the Department and ADC agreed that the following procedures will be used to handle depredation bears:

1. ADC has the responsibility for control of black bears committing livestock depredations and other agriculture-related depredation problems.
2. The Department has the responsibility of controlling black bear in nuisance and human safety situations. ADC may handle such complaints at the request of the Department if mutually agreed by both parties.
3. In areas where public safety is of concern and in non-livestock agricultural complaints, ADC shall use culvert traps whenever practical, and shall use culvert traps in classified grizzly bear habitat unless determined to be impractical.
4. Snares used in classified grizzly bear habitat must be sufficient to hold any grizzly bear that may be inadvertently trapped.
5. Any black bear taken must be reported on the Department's Big Game Mortality Report form. The report and the bear

skull or jaw shall be submitted to the affected region within thirty (30) days of the date of the kill. All salvageable bear parts (pelts, claws, and teeth) remain the property of the Department and must be submitted to the affected region or disposed of according to its instructions.

RESPONSE AND REPORTING REQUIREMENTS (PROPOSED):

Regional personnel will respond to all reported black bear depredation incidents within 48 hours, either by phone or in person. The type and level of response will be consistent with the nature of the complaint. Incidents involving human safety or significant property damage will receive high priority and the personal attention of the responsible employee. Those incidents involving low risk situations may be handled by phone, if an obvious solution is available.

The responsible regional employee, under authority of the Regional Supervisor, will verify the validity of each complaint, determine the appropriate action, and, if necessary, initiate control actions.

A report will be submitted to the Regional Wildlife Manager, using form D-3, by the person handling each depredation complaint within seven (7) days of the conclusion of the problem.

RESPONSE CATEGORIES AND REMEDIAL ACTION (PROPOSED):

It is the Policy of IDFG that the emphasis of the black bear depredation program be placed on the prevention of black bear problems. To that end, Department personnel are encouraged to work with state and federal land management agencies and the public to eliminate attractants for black bears before any removal actions are initiated. In situations where chronic bear depredation problems are occurring, Department personnel should be prepared to recommend permanent solutions to the problem that will eliminate the source of the problem (the attractant) rather than removing bears periodically

Category 1 Situations: These situations involve black bears that have caused minimal or no damage and appear to be first time offenders. These situations can be characterized by bears conducting nocturnal raids of garbage cans and dumpsters, eating pet foods, or climbing domestic fruit trees in or adjacent to areas of good bear habitat or travel corridors. In these situations attractants should be removed or secured by the complainant (including picking fruit and feeding pets indoors) and the bear allowed to resume its natural feeding habits. Hazing and other non-lethal techniques are appropriate methods to use in these situations. If the bear is located in an area that is not suitable bear habitat, the bear should be removed from the area using appropriate trapping methods and released in suitable habitat.

Category 2 Situations: These situations involve black bears that have become habituated to humans and are nuisance problems. These bears are often involved in repeated bold daytime time raids on trashcans and dumpsters, feeding on dog or horse food near residences, disturbing campsites, or damaging commercial fruit trees or apiaries. Bears that have been previously captured and have returned to areas of human habitation are included in this category. Category 2 bears should be trapped, ear-tagged, removed from the area and released not less than 50 airline miles from the capture site in suitable black bear habitat.

Category 3 Situations: These situations involve black bears that have caused significant real property damage to a dwelling, structure, and vehicle, are a threat to human safety, or are chronic offenders (involved in 2 or more depredation situations). Corrective action in these situations requires that the offending bear be removed from the population (euthanized) using the most expedient means.

Category 4 Situations: These situations involve black bears that meet the criteria described in Category 3, but involve unique circumstances where the use of culvert traps and snares is not practical. In these situations, Depredation Permits may be issued to the public to assist

GUIDELINES FOR HANDLING DEPREDATION BLACK BEARS (PROPOSED):

(1) Only IDFG personnel are authorized to capture and relocate nuisance black bears, except that ADC personnel may capture bears involved in livestock depredations as indicated in the MOU between IDFG and ADC.

(2) Any black bear that is trapped and handled by IDFG in a depredation situation should be ear-tagged prior to release.

(3) All black bears captured and immobilized during or less than 2 days from an open black bear season should be held in a culvert trap or other suitable facility for 24 hours to make sure the bear is fully alert before releasing it. While it is held in captivity, adequate water and shelter from extremes in weather should be provided by the person responsible for trapping the bear.

(4) Culvert traps and snares set for black bear should be checked by the person responsible for handling the complaint or his\her designee prior to 0800 hours each day the trap is set.

(5) Snares should be anchored to fixed objects (live trees) using a car hood spring or tire (with back-up safety strap) to minimize potential for

injury to the bear during the period between capture and immobilization.

(6) Adequate signs should be posted around all culvert traps and snares to warn people that nuisance bears are in the area and that traps have been set to capture these animals. These signs should be posted near the trap sites and along trails and roads entering the area.

(7) Release sites for captured nuisance black bears should be coordinated with the appropriate land management agency and be approved by the Regional Supervisor.

(8) To address potential human safety concerns, Department employees are encouraged to request that land management agencies close or restrict the use of campgrounds where nuisance black bears are active until the source of the problem (attractant) has been removed and the offending bear has moved on or is trapped. Culvert traps and snares should not be set in or adjacent to campgrounds if there is any concern about human safety in the area.

(9) Black bears that are captured in depredation situations that have serious injuries or disease conditions should be euthanized in a humane manner rather than released.

(10) Malnourished cubs of the year that appear to be orphaned should be placed in an approved rehabilitation facility. These cubs should only be released when their body condition has improved to the point where they have a reasonable probability of surviving on their own and natural food supplies are abundant. If natural food supplies are scarce, the cubs should be retained and conditioned in a rehabilitation facility until hibernation lethargy has occurred, and then released into artificial or natural den sites in remote areas, or held over until adequate spring foods are available.

(11) Any black bear that has bitten a person should be euthanized and tested for exposure to rabies. Any bear that has injured a person should be euthanized in a humane manner.

(12) Regional personnel should attempt to identify "at risk" areas for depredation problems and develop programs to alleviate attractive nuisances.

13) Black bears involved in killing livestock should be killed in a humane manner. If the offending animal is a female accompanied by young of the year, the young should be captured and relocated or turned over to a wildlife rehabilitator, if it is unlikely that they would survive on their own.

Appendix A, Table 1. Area 1 season framework.

DAU	Unit	Season	1992-2000
1A[a, c]	1	Spring	April 15-May 31
		Dog training	None
		Fall	Sept. 15-Oct 31
1B[b]	2, 3, 4	Spring	April 15-May 15
		Dog training	None
		Fall	Sept. 15-Oct 31
1C[b]	4, 4A	Spring	April 15-May 15
		Dog training	May 16-July 31
		Fall	Sept. 15-Oct 31
1D[b, c]	8A, 10A	Spring	April 15-May 15
		Dog training	May 16-July 31
		Fall	Sept. 15-Oct 31
1E[b]	8, 11, 11A, 13	Spring	April 15-May 15
		Dog training	None
		Fall	Sept. 15-Oct 31
1F[b]	14, 15, 16, 18	Spring	April 15-May 15
		Dog training	May 16-July 31
		Fall	Sept. 15-Oct 31
1G	19A, 23, 24, 25	Spring	April 15-May 15
		Dog training	May 16-July 31
		Fall	Sept. 15-Oct 31
1H	22, 31, 32, 32A	Controlled Hunt	
		(see Controlled hunt season framework)	
1I	34, 35, 36	Spring	April 15-June 7
		Dog training	June 8-July 31
1J	21, 21A, 28, 36B	Spring	April 15-May 15
		Dog training	May 16-July 31
		Fall	Sept. 15-Oct 31
1K[d]	33, 39, 43	Spring	April 15-May 15
		Dog training	May 16-July 31
		Fall	Sept. 15-Oct 31
1L[b, c]	6	Spring	April 15-May 15
		Dog training	May 16-July 31
		Fall	Sept. 15-Oct 31

[a] Unlawful to use dogs, except during the 9/15-10/9 controlled hunt
[b] Unlawful to use dogs, except 5/1-5/15 and 9/15-9/30
[c] Unlawful to use bait
[d] Except that portion of Unit 33 within the Middle Fork of the Payette River drainage downstream from but excluding Powder House Gulch drainage is closed to dog training

Appendix A, Table 2. Area 2 season framework.

DAU	Unit	Season	1992-2000
2A	10, 12	Spring	April 15-June 15
		Dog training	June 16-July 31
		Fall	Sept 15-Oct 31
2B	7, 9	Spring	April 15-June 15
		Dog training	June 16-July 31
		Fall	Sept 15-Oct 31

Appendix A, Table 3. Area 3 season framework.

DAU	Unit	Season	1992-2000
3A	16A, 17, 19, 20, 20A, 26, 27	Spring	April 15-June 15
		Dog training	None
		Fall	Sept 15-Oct 31

Appendix A, Table 4. Area 4 season framework.

DAU	Unit	Season	1992-2000
4A[a]	44, 45, 48, 49	Spring	April 15-May 22
		Dog training	May 23-July 31
		Fall	Sept 15-Oct 31
4B	50, 51, 58, 59, 59A	Spring	April 15-June 7
		Dog training	June 8-July 31
		Fall	Sept 15-Oct 14
4C	60, 61, 62, 62A	Spring	April 15-June 15
		Dog training	June 16-July 31
		Fall	Sept 15-Oct 14
4D[b, c]	64, 65, 66, 66A, 67, 69, 76	Spring	April 15-June 7
		Dog training	June 8-July 31
		Fall	Sept 15-Oct 14
4E	29, 30, 30A, 36A, 37, 37A	Spring	April 15-June 15
		Dog training	June 16-July 31
		Fall	Sept 15-Oct 31

[a] Unlawful to use dogs, except 4/15-5/22
[b] Unlawful to use bait or dogs in that portion of Unit 61 east of Howard Creek in Clark County and all of Units 62 and 62A
[c] Only Unit 61 west of Howard Creek in Clark County in DAU 4C is open during the training season

Appendix A, Table 5. Controlled hunt season framework.

DAU	Unit	Season	1992-2000
1	1[a, c]	Spring	None
		Dog training	None
		Fall	Sept 15-Oct 9
22	22, 31[a, b, c]	Spring	April 15-May 15
		Dog training	May 16-July 31
		Fall	Sept 1-Sept 30
32	32, 32A[a, b, c]	Spring	April 15-May 15
		Dog training	May 16-July 31
		Fall	Sept 1-Sept 30

[a] Bait prohibited
[b] Bait and dogs prohibited
[c] Female with young protected

MONTANA BLACK BEAR STATUS REPORT - 1997

GARY OLSON, Montana Department of Fish, Wildlife and Parks, 300 N. Virginia, #303, Conrad, Montana, 59425, USA.

DISTRIBUTION AND ABUNDANCE

The range of black bears in Montana is generally restricted to forested habitats in the western half of the state, including isolated central and southern mountain ranges. While black bears occupy forested habitats on both sides of the Continental Divide, the moist forests of northwest Montana are considered to be the most productive habitat. Approximately 45% of the state (66,000 sq. mi.) is considered occupied black bear habitat

Statewide distribution of black bears has probably changed little in the past several decades. However, an increase in rural homebuilding activity, particularly in western Montana, continues to impact black bear habitat. Nuisance complaints are increasing, and as subdivision activity accelerates, more bears will be destroyed or displaced from former habitats.

With a few exceptions, little is known about densities of bears in Montana. In northwestern Montana, however, density estimates on three study areas ranged from 0.06-0.56 bears per square km). Home range sizes for black bears in Montana range from 53-225 square km for males and 14-137 square km for females. No statewide black bear density estimates are available.

POPULATION MONITORING

Hunter harvest data continues to provide age and sex information about black bear populations. A statewide telephone questionnaire survey is conducted annually to sample black bear hunters and hunting activity in Montana. Information on sex, season of kill, number of hunters, hunter days, total harvest and percent success are summarized by region. There are seven administrative regions in Montana, five of which have huntable populations of black bears.

In addition, teeth are collected from harvested bears (mandatory turn-in) to determine age for each harvested animal using cementum annuli analysis. Sex, age, area, date and season (spring or fall) of kill are tabulated. A statewide database of age and sex information collected since 1985 is currently being compiled by the author. Reproductive performance using cementum annuli information is underway at the FWP Diagnostic Laboratory (Montana State University campus). DNA sampling of hair and tissue samples has also been initiated in the past few years.

Late summer aerial surveys of high elevation shrubfields in the northwestern part of the state have provided useful reproductive and density information since 1982. Survey success is directly correlated to huckleberry and mountain ash distribution and is not applicable to other areas where these species are limited or lacking.

Photo survey areas have been established in several parts of the state. Data from camera stations using baits (some with tetracycline) appear to be sensitive to population numbers and harvest rates.

MANAGEMENT OBJECTIVES AND STRATEGIES/ MANAGEMENT PLANS

A draft black bear management plan was finished in early 1993. Because the management plan outlined major changes, an EIS was completed in 1994, in compliance with the Montana Environmental Policy Act. Montana stresses hunting as a primary tool to manage bear populations. Recreational activities associated with hunting and viewing are also integral to black bear management.

Providing adequate protection to female bears to insure population viability is the most important aspect of the management plan. Additional objectives include: improve monitoring data on population status, composition, and trend; improve the quality and quantity of biological data; improve the flexibility of the annual harvest in order to be responsive to population trend data; enhance public understanding of black bear biology, habitat requirements, and management.

Management criteria limit the harvest of females to 40% of the annual harvest while maintaining a median age of 6 years in females and 4 years in males. Failure to meet these criteria for three consecutive years in any of the 26 bear management units (BMU's) prompts re-evaluation of management strategies in that unit.

A statewide black bear progress report is in the final stages of completion and should be available in late summer, 1997. This progress report will summarize harvest information, depredation and nuisance activity, research, and management trends. In addition, a statewide database of sex and age information will be available based upon compilation of tooth return information.

HUNTING LAWS AND REGULATIONS

Resident black bear licenses cost $15, non-resident $120. Bear licenses are offered separately from both resident and non-resident big game combination licenses.

Montana maintains a spring and a fall hunting

season. There are 26 bear management units (BMU's) in Montana. Spring hunts begin April 15 and end May 31 (several BMU's close May 15). Fall hunts start September 15 and end ends the Sunday following Thanksgiving. Some southern Montana BMU's have a total quota and a female subquota.

Females with young (cubs and older) or individual cubs may not be taken. Hunters may be required to physically return to the kill site for inspection. It is illegal to bait or hunt with dogs. No scents may be used to attract black bears. It is unlawful to sell or purchase any part of a black bear except for complete hides, heads, or mounted specimens. Hunters are prohibited from wasting black bear meat unless determined to contain trichinella. Trichinella testing is optional and free of charge. Harvested black bears must be reported within 5 days and the hunter must present the complete hide and skull for inspection and removal of a tooth.

HARVEST SUMMARY

Black bear hunters harvest an average of 1,443 bears per year (Figures 1 and 2). Spring seasons account for 49% of the total harvest. Since 1985, females accounted for 29%-38% of the harvest. Spring season females average 30% of the total spring black bear harvest, 32% percent during the fall period.

Comparison of information from the annual hunter questionnaire and tooth data indicate a disparity in reporting (Figure 3). Hunters responding to the telephone survey indicate lower numbers of females harvested than the mandatory skull inspection and tooth collection information. Mandatory inspections (tooth return) average 80% of hunter questionnaire harvest rates.

Tables 1 and 2 summarize harvest age information for male and female black bears since 1985 (first year of mandatory skull inspection). Statewide, harvest median ages of female black bears continues to exceed management criteria. Percent females in the total harvest falls under the 40% criteria established in 1994, however. Individual bear management units continue to be scrutinized and evaluated to insure harvest management objectives are met.

Generally, median ages for females are highest during the spring hunting season. Median ages tend to drop in the fall due to larger numbers of subadult bears taken in late September and early October. More older males are taken in the spring hunt, possibly due to increased vulnerability during the breeding season.

Maximum recorded ages for harvested black bears in Montana from 1985-95 is 31 years for both males and females, occurring in 1993 and 1995, respectively.

Seasonal numbers of Montana black bear hunters since 1978 are shown in Figure 4. Fall hunters outnumber spring hunters, probably due to the number of hunters afield during elk and deer seasons. Since 1978, an average of 5,463 hunters pursue bears in the spring, and 8,012 during the fall season, for a total of 13,475 hunters annually.

Hunter success and effort during spring and fall seasons is presented in Table 3. Spring and fall hunters have approximately the same rates of success, particularly since 1989, with an average success rate of 10.8%. Hunter effort, measured as hunter days divided by numbers of bears harvested, averages 71 days per bear since 1985.

NUISANCE AND DAMAGE ACTIVITY

The FWP Wildlife Laboratory at Bozeman records and analyzes data collected on hides, skulls and carcasses from black bears throughout Montana that are killed due to accidents, illegal activities, and nuisance

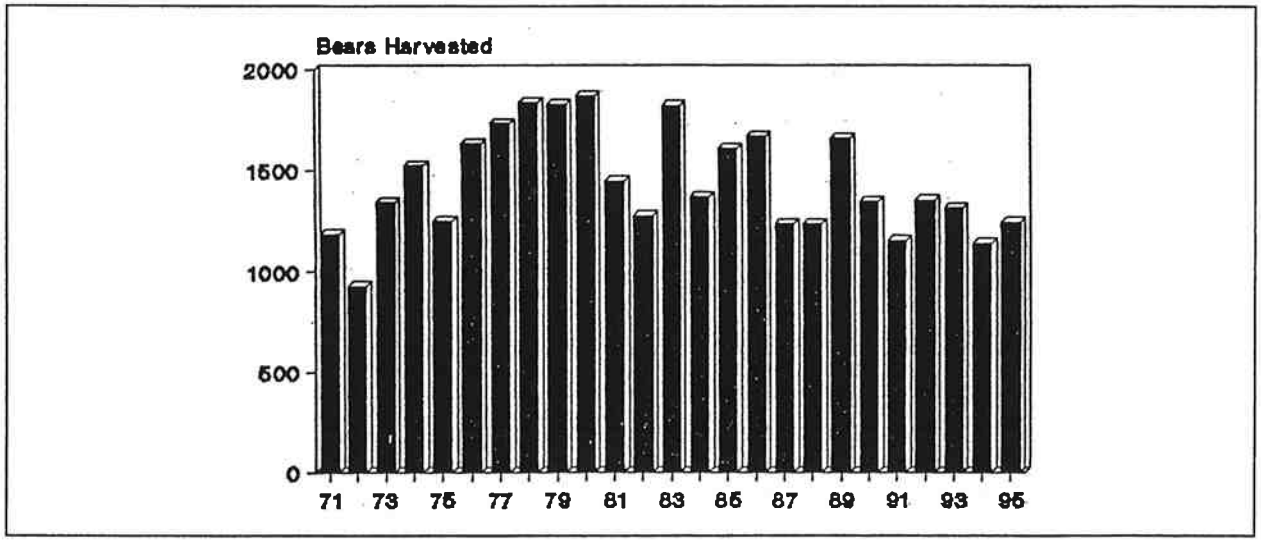

Figure 1. Bear harvest 1971-1995 (questionnaire)

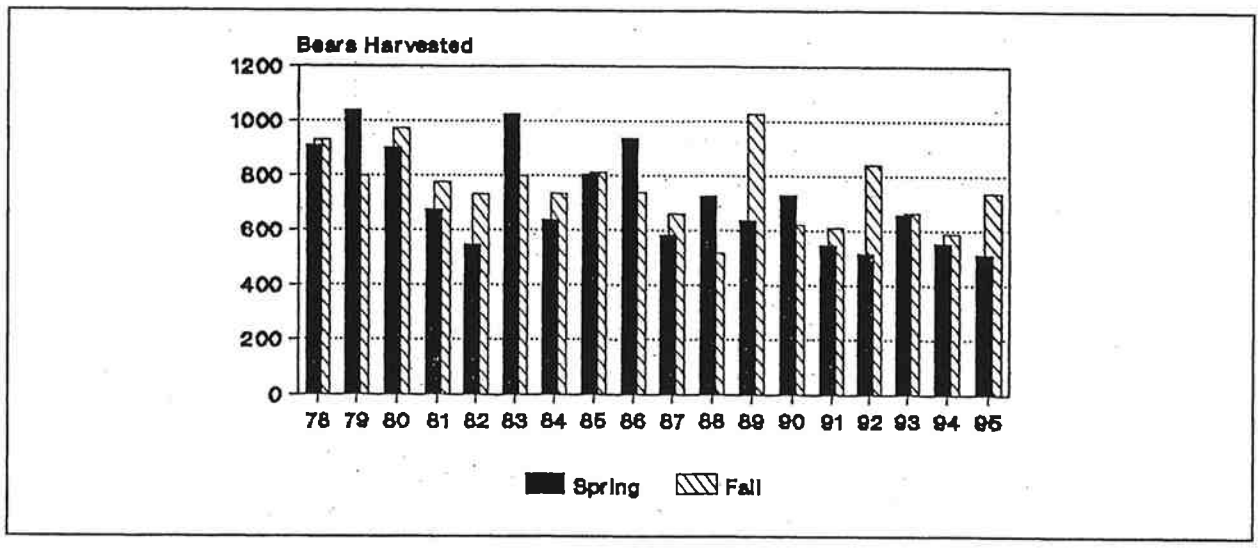

Figure 2. Seasonal bear harvest 1978-1995 (questionnaire)

control actions. During 1986-95, the annual non-hunting loss of black bears reported at the laboratory has ranged from 20-64, with highest numbers in 1993-94. Work is progressing on the detailing of non-hunting mortality in Montana.

Black bear damage control activities by APHIS/ADC have increased in recent years. Damage is mostly related to sheep and beehives. There were approximately 68 ADC control actions directed toward black bears in 1995, resulting in 23 mortalities. During 1986-95, numbers of bears killed in control actions has ranged from 8-40.

Statewide, September is the month with the highest percentage of black bear non-hunting mortalities. Generally, spring and fall months comprise the majority of non-hunting related activity.

PUBLIC ATTITUDES; BEAR MANAGEMENT / HUNTING

An assessment of bear hunting in Montana was conducted by Brooks (1993). Respondents were asked a variety of questions about bear management and hunting. The three top reasons for bear hunting in Montana were to be in the outdoors, to be in a natural setting, and for the solitude. Bagging a trophy bear was ranked very important to only 17% of the sample. Walking closed roads and walking into likely areas were preferred methods of hunting bears.

Bear hunting is a major hunting activity in Montana. Based upon the number of hunter days, total net economic value associated with black bear hunting is approximately $5,000,000 annually. Residents

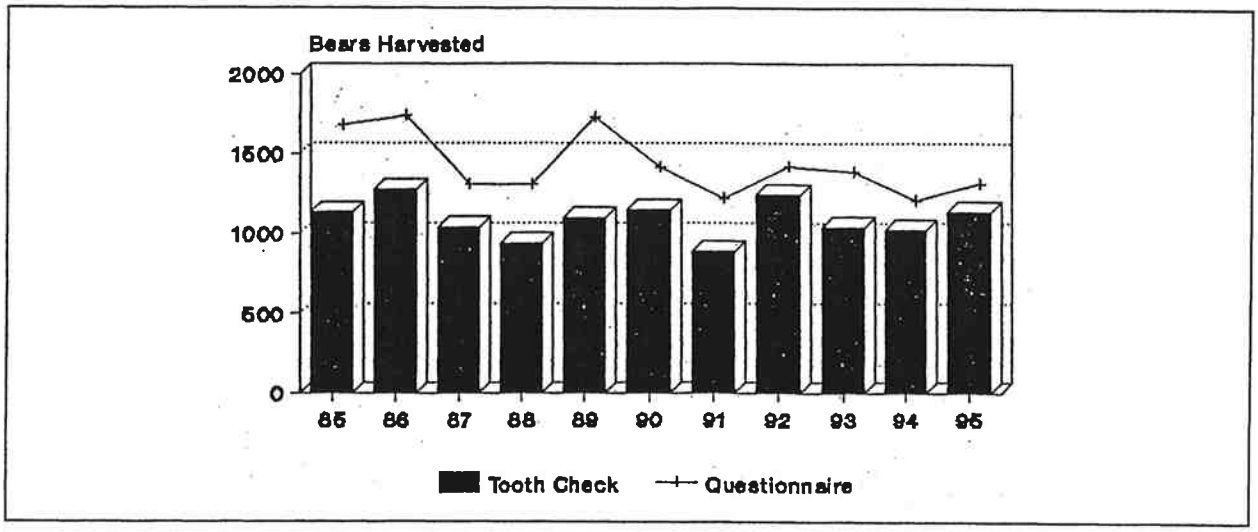

Figure 3. Bear harvest comparison, 1985-1995.

Table 1. Statewide Age Data for Females

Year	N	Mean Age	Median Age	Mode	% Females in Harvest	Max Age
1985	439	5.9	4	2	33	25
1986	493	6.7	5	3	34	28
1987	391	6.4	6	4	30	23
1988	351	5.6	5	2	29	22
1989	421	6.1	5	1	37	22
1990	453	6.5	5	2	34	29
1991	324	6.3	5	3	31	24
1992	436	5.9	4	2	34	29
1993	349	6.4	4	2	30	27
1994	315	5.8	4	2	31	27
1995	438	5.7	4	2	38	31

reported spending an average of $39.40 per day, non-residents $83.83. Residents spent an average of $197.00 per trip, non-residents $503.08.

A more recent survey of Montanan's beliefs about hunting, viewing, and trapping (McCollough et al 1995) revealed that well over 90% of the respondents opposed any efforts to eliminate hunting and most supported hunting as a management tool. The survey also indicated that 49% of the men and 14% of the women sampled were active hunters.

Table 2. Statewide Age Data for Males

Year	N	Mean	Median	Mode	Max
1985	702	4.9	4	2	22
1986	778	4.9	4	3	24
1987	647	5.4	4	2	26
1988	576	5.3	4	2	30
1989	682	4.6	3	1	20
1990	687	5.0	4	2	22
1991	579	5.0	3	3	25
1992	805	4.2	3	2	28
1993	689	4.8	3	2	31
1994	707	4.6	3	2	29
1995	699	4.5	3	1	27

Table 3. Hunter Success and Effort

Year	Overall Success (%)	Spring Success (%)	Fall Success (%)	Hunter Effort days/kill
1985	12	14	10	51
1986	11	15	9	56
1987	8	9	7	88
1988	10	14	8	71
1989	12	12	12	61
1990	10	13	8	76
1991	9	10	9	84
1992	11	9	13	69
1993	11	11	10	71
1994	10	10	10	74
1995	9	9	10	81

CONCLUSIONS

Montana black bear populations appear to be healthy and generally stable. However, failure to initiate the proposed long-term research program will delay validation of established management criteria or development of better ones. Hunting seasons may become more conservative in order to meet female median age management criteria. Rural subdivisions, particularly in the southwest and western part of the state are continuing to encroach into black bear habitat, creating additional depredation and nuisance problems. Black bear management in Montana will stress conservative harvest of females until better information becomes available. Viewing bears in their natural habitat and educating the public about the role of bears and hunting in the environment will also continue to be important.

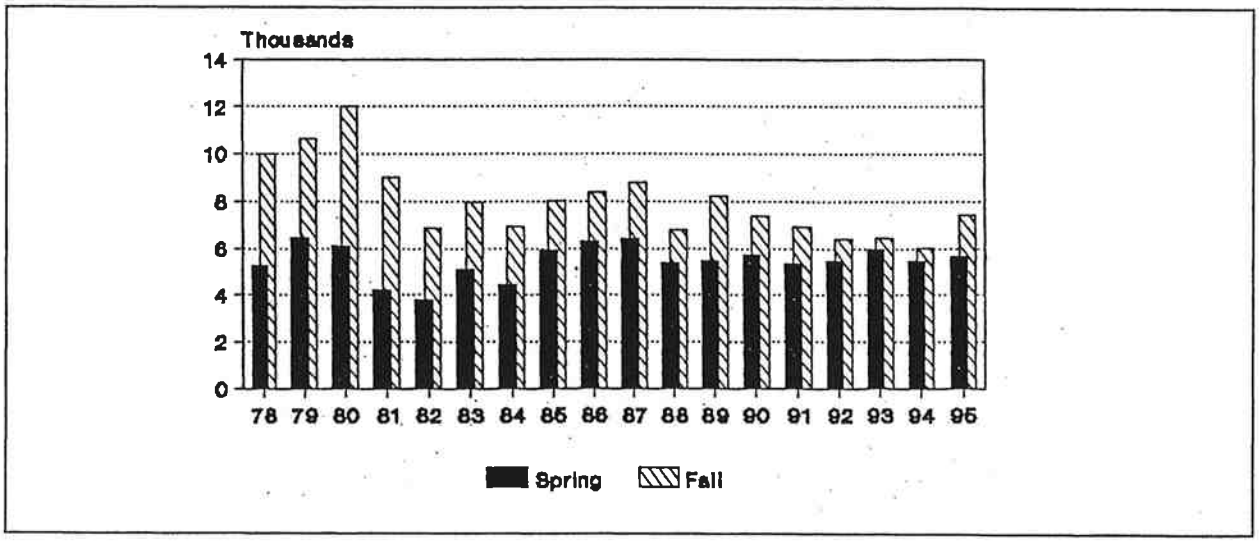

Figure 4. Bear hunters, 1978-1995 (questionnaire)

RECENT RESEARCH

The Final Environmental Impact Statement for Black Bear Management in Montana completed in 1994 stated that FWP will commit to design a research effort to evaluate and refine management targets for black bear populations and consider it as part of its biennial budgeting process (draft Black Bear Research Prospectus, August, 1995). Studies were designed to compare black bear populations inhabiting continuous tree cover habitats of western Montana and smaller populations that live in more isolated island mountain ranges in the central and southern portion of the state. Four prospective study areas were advanced in 1995, with substantial funding established for projects beginning in 1997.

Unfortunately, due to public and political pressure to address mule deer declines and increasing numbers of predators in southwestern Montana, funding for the black bear research program has been eliminated. MFWP will now move into predator-prey related studies involving cougar and lynx. When, or if, black bear research will be reinstated is unknown at this time.

Reintroduction of orphaned black bear cubs has been evaluated since 1989 (Madel 1996). The reintroduction project was set up to test the effectiveness of returning orphaned cubs to native Montana habitats, and monitoring survival rates. Approximately 10-15 black bear cubs are orphaned each year in Montana, due to illegal harvest of sows, or vehicular accidents. Denning placement appears to be the most successful method for re-establishing young bears into natural habitats. Based on 6 years of reintroductions along the Rocky Mountain Front, 44% (7 bears) survived 1 year or more, 56% died in the first year following placement.

Waller and Mace (1997) discuss characteristics of ahunted black bear populations in the Swan Mountains of Montana. They observed that median ages of both males and females were consistent with that of a heavily hunted population. Sex ratio remained constant during the study and was consistent with that of a lightly exploited population. They concur with other authors that sex ratios are of limited value for estimating population trend and harvest rate.

Aune (1994) conducted early summer photo surveys in southwestern Montana from 1992-95. Comparisons of the photo-detection rate indicate that increased effort to detect bears theoretically correlates with lower numbers. Preliminary evidence suggests that the survey method is sensitive to the total population and may be sensitive to total harvest.

Tetracycline biomarkers were used in conjunction with remote cameras during 1994 in the same study area. Twenty-two teeth were examined from harvested bears during the next fall and spring, with only one showing a fluorescent marker. The monitoring of black bears using remote cameras and tetracycline biomarkers could prove to be very useful to managers but further studies are necessary to better evaluate these techniques.

CONCLUSIONS

Montana black bear populations appear to be healthy and generally stable. However, failure to initiate the proposed long-term research program will delay validation of established management criteria or development of better ones. Hunting seasons may become more conservative in order to meet female

median age management criteria. Rural subdivisions, particularly in the southwest and western part of the state are continuing to encroach into black bear habitat, creating additional depredation and nuisance problems.

Black bear management in Montana will stress conservative harvest of females until better information becomes available. Viewing bears in their natural habitat and educating the public about the role of bears and hunting in the environment will also continue to be important.

RECENT PUBLICATIONS

Aune, K.E. 1994. Comparative ecology of black and grizzly bears on the Rocky Mountain Front, Montana. International Conference on Bear Research and Management 9(1):365-374.

Aune, K.E. and P. Schladweiler. 1995. Wildlife laboratory annual report, February 1995. Montana Department of Fish, Wildlife and Parks, Helena, Montana, USA.

Brooks, Robert. 1993. Montana bioeconomics study: a contingent valuation assessment of black bear hunting, hunter attitudes and economic benefits. Montana Department of Fish, Wildlife and Parks.

Kasworm, W.F. and T.J. Thier. 1994. Adult black bear reproduction, survival, and mortality sources in northwest Montana. International Conference on Bear Research and Management 9(1): 223-230.

Madel, M.J. 1996. Rocky Mountain Front grizzly management program: four year progress report. Montana Department of Fish, Wildlife and Parks.

McCollough, S.A., G.L. Dusek, and D.E. Dolson. 1995. A survey of Montanan's beliefs about hunting, viewing, and trapping. Montana Department of Fish Wildlife and Parks.

Montana Department of Fish, Wildlife and Parks. 1994. Final environmental impact statement: management of black bears in Montana. Helena, Montana, USA.

Waller, J.S. and R.D. Mace. 1997. Characteristics of a hunted black bear population, Swan Mountains, Montana. Draft. Montana Department of Fish, Wildlife and Parks.

NEVADA BLACK BEAR STATUS REPORT - 1997

SAN STIVER, Nevada Division of Wildlife, Box 10678, Reno, Nevada, 89520, USA.

DISTRIBUTION AND ABUNDANCE

Black bear populations in Nevada are found only in the Sierra Nevada and adjacent mountains in far western Nevada. These bears are found in relatively high densities, but population numbers are low because of the limited amount of habitat. Occasional sightings occur in far northeastern Nevada: however, numbers are very low. The estimated population of bears in Nevada is approximately 300 individuals.

POPULATION MONITORING

Nevada conducts no annual population assessments. In the late 1980's and early 1990's, a project was completed that assessed distribution and density of bears in the state.

MANAGEMENT OBJECTIVES AND STRATEGIES

The major objective of bear management in Nevada is the prevention and resolution of damage complaints. We provide general public information advising people of measures that may preclude human contact and discouraging the feeding of bears. If we receive complaints, we usually try to resolve the situation by providing techniques to the person with the bear problem. If this does not work ort the bear is deemed to be a potential threat to the person with the bear problem, we attempt to capture the bear. Captured bears are usually released in areas with lower human densities. Bears that pose a human risk or have caused livestock depredations are killed.

SPECIES MANAGEMENT PLANS

Nevada does not have an operational species management plan.

HUNTING LAWS AND REGULATIONS

Nevada does not hunt bears.

HARVEST SUMMARY

No harvest

NUISANCE AND DAMAGE ACTIVITY

Nuisance complaints seem to be variable. We receive an average of 26 complaints per year. Damage complaints have always been limited. In recent years, livestock activity has decreased and so have depredation complaints.

PUBLIC ATTITUDES: BEAR MANAGEMENT AND HUNTING

Since we do not hunt bears, the public has no particular issue to focus on. Some concern has developed regarding nuisance bears. Most input to the agency favors reducing bear numbers.

RECENT RESEARCH AND PUBLICATIONS

Nevada black bears: ecology, management, and conservation. 1993. Biological Bulletin #1.

CONCLUSIONS

Bears and bear habitat in Nevada are limited but secure. Expansion of dwellings and backcountry use will increase the number of nuisance complaints.

Table 3. Hunter Success and Effort

Year	Overall Success (%)	Spring Success (%)	Fall Success (%)	Hunter Effort days/kill
1985	12	14	10	51
1986	11	15	9	56
1987	8	9	7	88
1988	10	14	8	71
1989	12	12	12	61
1990	10	13	8	76
1991	9	10	9	84
1992	11	9	13	69
1993	11	11	10	71
1994	10	10	10	74
1995	9	9	10	81

NEW MEXICO BLACK BEAR STATUS REPORT - 1997

WALTER C. HAUSSAMEN, New Mexico Department of Game and Fish, P.O. Box 25112, Santa Fe, New Mexico 87504, USA.

DISTRIBUTION AND ABUNDANCE

Black bears are distributed throughout all New Mexico mountain ranges with coniferous forest and mixed woodland habitat types. This includes about 73,835 km² or about 23.7 percent of the state's area.

A statewide population estimate of 3,000 bears has been used since the mid 1960's. Indications from 1990's harvest data and model simulations indicate that the statewide population may fluctuate between 3,000 and 4,000.

POPULATION MONITORING

Population monitoring is done by using harvest data and information. A mandatory pelt tagging program and a hunter mail questionnaire have been used since 1978 to monitor hunter activity and harvest. Successful hunters are required to present the hide to a Department employee for tagging and data collection. These data include hunter identification, management unit(s) hunted, harvest location, date and sex of the harvested animal, hunter aided with guide and or dogs, eartag or tattoo marks, and a premolar tooth is collected. Trends in numbers and sex and age structure of harvested animals are used to draw inferences about population trends and numbers.

MANAGEMENT OBJECTIVES AND STRATEGIES

Statutory responsibility of the New Mexico State Game Commission (Commission) and Department of Game and Fish (Department) is to provide and maintain an adequate supply of black bear for public recreation and to protect private property and human health and life. In this regard, the Commission and Department make regulations allowing hunting. Management policies help to minimize the impacts of bear nuisance and depredation conflicts. A public education campaign helps minimize the frequency of conflicts between people and bears.

SPECIES MANAGEMENT PLANS

Development of a statewide management plan will begin in late 1997

HUNTING LAWS AND REGULATIONS

License fees are established by law. Bear licenses are sold over-the-counter in unlimited quantities. The bear license was separated from the general hunting license in 1982 with the resident fee of $12.50 and the non-resident fee of $121.00. Resident fess were $10.50 and non-resident fees were $76.00 from 1983 to 1991. Non-resident fees fluctuated around $150.00 from 1992 to 1995. License fees in 1996 were $30.00 for residents and $150.00 for non-residents.

Hunting regulations have become more restrictive since 1991. Spring hunts were eliminated in 1992 and fall hunts were reduced from about four months to two months in length. These restrictions were the result of a several years of harvest age data indicating that the proportion of young animals was decreasing in the harvest, possibly indicating overharvest of adults or a decrease in recruitment.

Spring hunts were open for about twelve weeks during the months of April through June from 1978 through 1983. They were reduced to about six weeks during April and May from 1984 through 1990. The 1991 spring hunt was four weeks during April. Fall seasons were sixteen to eighteen weeks during August to December each year from 1978 through 1991. Since 1991, fall hunts have been six to eight weeks during September and October.

Other regulations include: 1) one bear per season except that females with cubs may not be taken, 2) dogs are allowed to pursue bear with the licensed hunter present from the time dogs are released for pursuit, 3) baiting is not allowed, and 4) legal weapons include center-fire rifles and handguns, muzzle-loading rifles, shotguns with slugs and bows and arrows.

HARVEST SUMMARY

Harvest records from the mandatory pelt tagging program from 1983 are presented in Table 1. Interpretation of these data do not present a compelling case that over-harvest has occurred, although some indications indicate that over-harvest could have occurred. Of concern is the increased number of bears harvested each year since 1989, especially in 1994 and 1995. An indication that over-harvest did not occur is that the proportion of males in the harvest is always greater than for females.

The proportion as well as the number of females harvested annually has increased since 1991. It is not known if this is due to an increase in female bears or to hunt strategies and methods.

The greatest fluctuations in harvest occurred in years when regulation changes reduced hunting opportunity or when license fees were increased. Non-resident license sales dropped by 27% and resident license sales by 37% from 1985 to 1986 (Table 2). This drop may have occurred because the spring hunt was

Table 1. Statewide black bear pelt tag records from 1978-1996.

Hunt Year		1983	1984	1985	1986	1987	1988	1989	1990	1991	1992	1993	1994	1995	1996
Total pelts tagged		229	259	258	229	297	291	358	384	275	229	348	625	526	385*
Totals by sex	Females	86	101	94	84	104	101	103	151	99	91	152	259	213	168
	Male	142	158	160	145	192	188	254	232	176	137	196	364	313	213
Totals by season	Spring	88	111	87	68	56	55	78	80	48					
	Fall	141	148	171	161	241	236	280	304	227	229	348	625	526	385
Totals by method	with aids	171	192	179	134	181	170	170	238	172	119	170	243	244	
	with none	57	67	76	95	115	115	183	145	103	108	175	380	278	
Totals by age and sex	Sub-Adult female			23	31	33	31	29	39	26	25	49	73	61	
	Sub-Adult male			60	58	70	84	100	69	46	58	113	154	125	
	Adult female			38	46	60	52	60	99	59	48	93	163	120	
	Adult male			54	67	106	79	126	129	93	67	68	169	164	
	Unk.	229	259	82	27	28	44	42	47	51	30	25	64	56	

* Data may not include a few pelt tag records and are not yet completely summarized for 1996

set to begin about 6 weeks earlier in 1986 and bear hunting was closed during fall elk hunts for the first time in 1986. Non-resident license sales dropped 63% and resident license sales dropped 32% from 1991 to 1992 (Table 2). This drop may have occurred because the non-resident license cost increased from $76 to $151, the spring hunt was closed, and the fall hunt was shortened from four to two months.

NUISANCE AND DAMAGE ACTIVITY

The Commission is authorized to protect domestic livestock, cultivated crops, private property, and to protect human health and life. Domestic livestock owners or their employees may hunt, take, capture or kill any bear, which has killed domestic livestock. Commission regulation and department policy establish guidelines to address bear depredation.

Department employees respond to depredation or nuisance complaints as a priority activity, generally within 24 hours of receiving a complaint. Upon documenting property loss or threat to human safety, non-lethal actions are taken to resolve the conflict. These methods include live trapping and transplanting, scare techniques such as rubber bullets and public education. When non-lethal means fail to alleviate the conflict or because non-lethal means are not expected to be effective, a Depredation Permit is issued to authorize destroying the offending animal.

The number of destroy permits issued has risen sharply since 1993 (Table 3). This may be in part due to more nuisance bear complaints being resolved by destroying the offending animals or because the number of conflicts is growing. Complaints were numerous in 1994 due to a prolonged drought.

PUBLIC ATTITUDES; BEAR MANAGEMENT / HUNTING

There has been a growing concern that bear populations are declining in New Mexico, especially among the non-hunting public. Some groups would like to see more restrictive hunting regulations to reduce legal harvest. In contrast, some hunting groups would like to see more liberal hunting because they believe there to be more bears than ever

Table 2. Numbers of bear licenses sold and bear pelts tagged statewide by resident and non-residents

Year	Resident licenses sold	Nonresident licenses sold	Total licenses sold	Pelts tagged by residents[a]	Pelts tagged by nonresidents[b]	Total pelts tagged
1983	2153	524	2677			229
1984	2883	455	3338			259
1985	3424	433	3857	98	41	258
1986	2147	318	2465	149	60	229
1987	2736	429	3165	182	100	297
1988	3001	478	3479	183	91	291
1989	3860	554	4414	247	105	358
1990	4142	685	4827	226	149	384
1991	4120	691	4811	125	146	275
1992	2814	254	2438	141	76	229
1993	3023	347	3370	226	105	348
1994	4377	498	4757	443	155	625
1995	5551	760	6311	268	189	526
1996	5513	767	6280	**	**	385

[a] Pelt tags with known state of residency; the difference between total pelts and the sum of resident and nonresident pelts is the number of pelts with residency not recorded.
[b]Data are not yet summarized

before. Public values and beliefs about harvesting bears and methods used, such as dogs, complicate the issue of population numbers and population viability. This dilemma places the Department in a position of needing a more refined and accurate understanding of bear population status and numbers, the effect hunting has on population changes and the broader public values and beliefs about hunting bears.

RECENT RESEARCH AND PUBLICATIONS

A field and analytic study was started in 1992 to provide a refined and more accurate understanding of bear population status and numbers and the effect of hunting on population changes. The field portion of the study has been focused of quantifying annual reproductive and survival rates of adult females, cubs and yearlings, and the food supply in terms of annual mast production on two study areas. The analytic portion of the study is focused on developing a population model based on population parameter information from scientific literature and from data collected in the field study. The field study has focused efforts on radio marking a sample of 30 adult females on each study area in order to adequately quantify the desired reproductive and survival rates. The sample was achieved on one study area in 1996 and will probably be reached on the second study area in 1997.

Preliminary indications are that the identified population parameters can be estimated from statistically valid samples. In addition, an apparent association between mast production and birth rates exists. Plans are to continue the field study for three years to collect data at the desired sample size and more accurately quantify these population parameters and to quantify a mathematical relationship between specific bear population parameters and mast production.

Publications are limited to Pittman-Robertson Grant W-131-R annual reports. A five-year final report

Table 3. The number of depredation permits issued each year from 1983-1996 and the number of nuisance complaints in which offending bears were trapped and transplanted during 1995 and 1996.

Year	1983	1984	1985	1986	1987	1988	1989	1990	1991	1992	1993	1994	1995	1996
Depredation Permits	8	7	11	17	10	15	40	14	14	16	20	67	29	40
Nuisance Complaints													47	13

will be forthcoming in August 1997.

CONCLUSIONS

The New Mexico Department of Game and Fish has made some important and major improvements in its management of the black bear. Harvest data and information have been compiled, analyzed and population status and numbers interpreted as well as can be expected. Although population status and trend remain unknown, we have a much better sense that the statewide bear population has been stable or slightly increasing since 1978. Indications of population decline appear to be visible for one or two years at a time and may reflect normal annual fluctuations in bear numbers. An understanding of what we know and what we don't know about black bear populations has emerged through the research process.

It has become apparent that a more clear understanding of human values regarding this species is important in managing for public satisfaction and for species viability. There is much to be accomplished in managing black bear to provide and maintain an adequate supply for public recreation, whether that be for hunting or for intrinsic value. The commitment to develop a species management plan will help chart the course of this management journey. The investment in research and development will help us understand bear population changes along the way.

OREGON BLACK BEAR STATUS REPORT - 1997

DONALD WHITTAKER, Assistant Staff Biologist, Oregon Department of Fish and Wildlife, 2501 SW First, P.O. Box 59, Portland, Oregon, 97207, USA.

DISTRIBUTION, ABUNDANCE, AND POPULATION MONITORING

Oregon Department of Fish and Wildlife (ODFW) does not attempt to actively survey populations. However, biologists estimated 25,000 bears were present in Oregon in 1993 (Oregon's Black Bear Management Plan, ODFW 1993). This estimate was an extrapolation of research results from studies conducted in NE and SW Oregon, as well as published results of studies conducted elsewhere and is likely very conservative.

Since1993, conservative harvest limits, and protection of cubs and females with cubs have likely allowed the populations to at least remain stable. Recent harvest results (~50% drop in harvest resulting from Measure 18) would allow for a slight population increase. Additionally, there is little evidence to suggest a dramatic decrease in abundance or a shift in black bear distribution.

MANAGEMENT OBJECTIVES, STRATEGIES, AND REGULATIONS

Significant change has occurred in how ODFW manages black bears. This change is primarily a result of changes in state statute brought about by Voter Initiative (Measure 18) in November 1994. Most important, voters successfully changed statute making the use of bait and hounds illegal for hunting black bears in Oregon. As a result, ODFW has changed management strategies to include a more liberal season structure for bears. Most changes occurred during spring. Several new seasons have been added, including a southwest region-wide spring season with unlimited license sales. Additionally, ODFW extended tag sale deadlines to accommodate later purchase of bear tags.

SPECIES MANAGEMENT PLANS

No significant changes have occurred to Oregon's Black Bear Management Plan. However, the plan is scheduled for revision during 1998.

HARVEST & DAMAGE SUMMARY

Recent Oregon black bear harvest and damage is summarized in Table 1.

PUBLIC ATTITUDES

Inference on public attitudes relating to black bear management in Oregon is difficult to make. This is due in part to a lack of reliable data. However, as demonstrated by two opposing voter initiatives (Measure 18 in 1994, Measure 34 in 1996) affecting bear management in Oregon, the public does indeed have strong opinions relating to carnivore management. Specifically, most opinions are related to the use of bait and hounds to hunt bears and lions.

Generally speaking, attitudes surrounding bear management are polarized either strongly for or strongly against the use of hounds and bait to harvest bears. What is heard by ODFW personnel, however, may only represent the viewpoints of the very vocal segments of the public. Regardless, election results in 1994 and 1996 suggest that at least the voting public does not support the use of bait and dogs for hunting bears. However, this may also primarily represent the views of highly urbanized areas in western Oregon. The same viewpoint may not necessarily prevail in more rural areas of the state.

RECENT RESEARCH AND PUBICATIONS

Two Oregon research projects focus on black bears. The study being conducted in NE Oregon is in

Table 1. Summary of recent black bear harvest and damage in Oregon, 1992-1996.

	Harvest		Damage		Total
Year	Spring	Fall	#Complaints	# Mortalities	Mortalities
1992	155	805	291	220	1180
1993	167	1179	436	134	1480
1994	200	1250	327	151	1601
1995	62	624	537	205	891
1996	127	880	---[1]	---	1007[2]

[1] Damage information for 1996 has not been fully compiled at time of writing.
[2] Total mortality figure for 1996 does not include damage related mortality.

its final stages and final reports and publications are pending. The SW Oregon study will likely conclude within two years. Both studies have complimentary objectives and much of the information is presented elsewhere in this volume.

One significant publication has been produced in cooperation with USDA Forest Service and the Blue Mountains Natural Resource Institute. This publication is an information brochure detailing the importance of large den trees in the life history of black bears. Information is based on data from the NE Oregon bear study and is suitable for most publics.

CONCLUSIONS

Black bear management continues to be challenging in Oregon. Similar to other state wildlife management agencies, ODFW faces increasing demands, changing management options, and decreases in fiscal resources. ODFW will, however, attempt to develop management solutions as diverse as the challenges it faces.

SEQUOIA AND KINGS CANYON NATIONAL PARKS BLACK BEAR STATUS REPORT - 1997

JILL OERTLEY, Sequoia and Kings Canyon National Parks, Three Rivers, California, 93271, USA.

INTRODUCTION

The goals of the Sequoia and Kings Canyon National Parks' black bear management continue to be to protect and perpetuate the natural distribution, ecology, and behavior of black bears free of human influences. Objectives to accomplish this include eliminating human food availability and human activities that may influence bear populations, minimizing human-bear interactions that result in a learned orientation of bears toward people, and providing visitors the opportunity to appreciate black bears in their natural environment (SEKI 1992).

Proactive methods used to accomplish these objectives include providing bear-proof facilities in developed areas, public education, and enforcement of food storage and other wildlife related regulations. Reactive management methods used include various aversive conditioning techniques, administering closures of areas, monitoring bears' behavior and park wide incident trends, and tolerating or eliminating individual nuisance bears (SEKI annual bear reports).

PROACTIVE MANAGEMENT

Bear-proof facilities

Adequate bear-proof food storage facilities to accommodate all visitors' food supply is a chronic problem. Budgets have been insufficient to purchase the needed additional food storage lockers needed to outfit all campsites and trailheads in the two parks. Every year, outside funding is sought to help make up for this shortfall. Over the last few years, donations have been received to purchase about 50 of the 1,500 needed for front country sites. Some garbage facilities have been funded with outside money, and are bear-resistant, due to efforts of the maintenance division and garbage contractors.

Recent Management Gains

There have been improvements made in the last few years relating to bear-proof facility technology that is being used or planned in these Parks.

Backcountry or wilderness travel with stock has caused food storage challenges for decades. A local stock packer produced an aluminum, locking pannier designed to be bear-proof to help meet this challenge. The Parks' resource managers provided input to the design and arranged testing by grizzly bears at the Fresno Zoo. Then they tested it in the park with more dexterous black bears that were already conditioned to human food. The final product was successful in baffling all test bears, and since then, the product has also received approval by the International Grizzly Bear Committee (IGBC). For more information on these panniers, contact W.E. DeCarteret, 30547 Mehrten Drive, Exeter, CA 93221.

The technology and development branch of the U.S. Forest Service, in San Dimas, California, also contacted park staff for input on bear-proof designs they were developing. As a result of cooperation and feedback during the development, this USDA branch came up with a much-improved latching system for the bear-proof lockers, incorporating a spring-loaded removable handle. Plans for this design, available through the Forest Service Technology and Development Center, are public domain. Potential buyers can have manufacturers competitively bid to make this product. This latch design can also be retrofitted on some double-doored lockers purchased previously from California Prison Industries. That design proved to be less than bear-proof. Some individual black bears had learned they could manipulate the double spring latch by pressing down on the upper knob with their lips, while simultaneously pushing upward on the lower knob with a paw. The ability to retrofit these lockers with an improved style latch will save the Parks the expense of completely replacing them.

All lockers recently purchased for use in developed (front country) areas have been at least 25 cubic feet in capacity to better accommodate the typical amount of food brought by contemporary visitors. The original bear-proof lockers installed in the Parks were less than 10 cubic feet; many modern coolers do not fit inside the older lockers. As these smaller lockers become irreparable, they will be phased out in front country areas. Meanwhile, they serve as overflow storage for busy periods.

Also, during the last few years, the Research and Development branch of the U.S.D.A. Forest Service has been researching garbage facilities for animal resistance. Their technical bulletin, #9523 1205 SDTDC, entitled *Animal Resistant Garbage Containers*, summarized available products. Since that publication was completed, a new bear-proof dumpster design has been developed by an Inyo National Forest engineer, and these plans are also public domain. This

design incorporates a counterbalanced lid for safety and ease of use, and is self-latching. Sequoia and Kings Canyon National Parks have plans to continue to seek funding for purchasing this type of dumpster.

Public Education and Law Enforcement

All divisions continue to contribute greatly to the crucial objective of educating the public. The brochure, *Bears are Not to Blame,* which was jointly designed by Yosemite and Sequoia and Kings Canyon National Parks, is being revised. Various types of bear-related interpretive information are available in park and local newspapers, at visitor contact locations and in evening programs, to name a few.

A minor but effective action that took place in 1995 and 1996 was the placement of new signs in the campgrounds. Previously, food storage and other regulations had been posted on the bulletin boards near the self-serve fee collection area. Many campers, especially those arrived late at night, often claimed they had not seen the regulations, and left food in their vehicles. The food storage regulations are now posted prominently on a food storage locker in every campsite. The sign at the entrance of the campgrounds read: "*Caution-- Active Bear Area. Proper food storage is the law and your responsibility. Instructions are posted at your campsite.*"

Some National Parks' law enforcement staffs have a zero tolerance policy for food storage violations. Sequoia and Kings Canyon National Parks have varying degrees of tolerance in the different local areas. Park rangers give more verbal and written warnings than official citations. All are educational tools. Usually word of citations spreads rapidly in a campground. Food storage compliance checks consistently reveal that compliance is significantly higher when visitors are personally contacted by Park personnel who explain the importance of proper food storage.

RESPONSIVE OR REACTIVE MANAGEMENT

Aversive Conditioning Techniques

Aversive conditioning is a tool secondary to food availability control. According to the Parks' bear management plan, techniques used will not result in permanent injury to the bear, are not done from a position that could injure people or property, are explained to visitors in the vicinity, and are documented (SEKI, 1992).

Aversive conditioning seems to have little long-term effects. The use of aversive conditioning is labor intensive, and is generally not considered a viable method to rehabilitate "problem" bears. It is probably more instrumental in preventing bears that are naive of human influences from adopting undesirable foraging techniques. Unfortunately, the bears that are already habituated or conditioned take up most of the staff's time and efforts.

Wrist rockets are the tools of choice for chasing off persistent bears, and are used by many uniformed employees in Sequoia and Kings Canyon National Parks. Other tools used are water delivery systems such as fire hoses and toy water launchers that can project a quart of water 20 to 30 feet. Pepper spray, issued to law enforcement rangers and bear technicians, is used in certain situations, such as when a bear approaches an occupied parked car.

Electrification is used on a case-by-case basis in the Parks. Electric fences have been used with some success around temporary contractor camps, temporarily vacant houses, and backcountry camps. In some instances, the building itself is wired, around windows and doors, or the steps leading to the entrance. In other cases, a perimeter fence enclosing an area of concern is erected. Electrification, as with most other aversive conditioning techniques, works best as a preventive measure, rather than as a responsive technique. Once bears have learned there is a reward on the other side, they may withstand the unpleasantness of the electrical stimulus to obtain human food (SEKI annual bear report, 1995).

In 1996, another electrification idea was tried to keep bears from breaking into vehicles. A non-functioning vehicle was donated to the Parks' Resource Management division. There had been a high incidence of car break-ins by bears in several campgrounds that summer. The donated vehicle was towed to these active campgrounds and wired to a fence charger so that all metal car parts could produce an unpleasant shock. The car was "baited" with a smelly and visible *empty* cooler so there would be no reward if a bear did enter the vehicle. If the car does receive bear damage, it will be incorporated into a display to illustrate the consequences of improper food storage. A campground visitor reported seeing a bear touch the electrified chassis and recoil from the shock. Identification of the bear was inadequate to learn if or how the bear's future behavior was altered. To ensure public safety, the vehicle was marked with signs and flagging. Bears were observed walking just outside the perimeter of the flagging, and may have learned to avoid cars marked in such a way. This experiment may not have been successful in training bears to avoid all cars, but there was a benefit gained in visitor awareness that food attracts bears and contributes to property damage. Campground rangers reported that food storage compliance improved during the time this decoy car was present in the campgrounds.

A new shipment of food storage lockers was placed, uninstalled, in an active campground in the summer of 1996. Perhaps in an attempt to gain entry,

bears toppled and rolled several boxes on several nights. A locker was then baited and electrified with a fence charger for about a week. Locker rolling decreased after this action.

Management Actions

A noteworthy management action of 1995 includes the early closure of a foothill campground in response to bear-related incident rates. Vehicle damage rates were as high as 25% on some nights. The major contributing factor for this was inadequate food storage; funding was not readily available to rectify the situation. To protect the public from likely property damage, to reduce the park's liability and to protect the native wildlife resources from negative human influences, a recommendation was made and approved to close one of the two area campgrounds in August. This was carried out three weeks before the normal seasonal closure.

The closure seemed to have positive resource management and visitor protection results. Before the campground had been closed, a dozen bears could be seen in a single night in this campground that has 28 campsites. The second campground in the area is about three miles from this one. Bear-related problems were slightly less there, partly because more food storage was available. The bear-related vehicle damage decreased in this foothill area by 88% in the next few months. During July and August, when both campgrounds were open, there had been 54 incidents reported of bear-related vehicle damage in both campgrounds. During September and October, this number fell to a total of six (SEKI annual bear report, 1995).

Unintentional management actions that had indirect positive effects on Park bear populations, were the government shutdowns in late 1995 and early 1996.

In early December, a bear committee meeting was assembled to discuss alternatives for dealing with increased bear-related incidents in a foothill area. Although 40% of the attendees had voted for destruction of one or two individual bears, the majority felt that there was not enough evidence to incriminate individual bears; many bears had been active in this campground. The recommendations were carried out to isolate suspected individuals from the population, and closely monitor activities to ascertain which bears were engaged in destructive behavior. However, shortly after one of the suspected bears was trapped to isolate it, the second government shutdown went into effect. The bear was released, and soon the park was devoid of visitors as well as employees. Telemetry was conducted the morning of the shutdown, and the days following the reopening of the parks to record the locations of collared bears in this local area. The latter monitoring found all the collared bears had moved away from developed areas. For the next three months, after reopening, there were no bear-related incidents or any marked bear reported in this subdistrict. Although some Sierra Nevada bears enter winter dormancy around late December, some do remain active all winter, taking advantage of available food in the foothill chaparral and oak woodlands (Graber, 1990). The high level of undesirable bear activity that occurred up to the day the parks closed, presumably was curtailed earlier with the removal of unnatural foods, and started later the next spring. An untold result of a government shutdown is the benefit to conditioned black bears of suddenly being cut off from all human influences.

Pending Management Plans and Development Changes:

The Sequoia and Kings Canyon National Parks' black bear management plan was last revised in 1992. This plan will be revised in 1997 and will be consistent with Government Performance and Results Act emphasizing results and desired conditions, versus efforts and outputs.

Another planning document currently being developed is the Parks' Wilderness management plan. Bear-related issues will be addressed in this document. Unlike other parks, Sequoia and Kings Canyon National Parks placed cables, then food storage lockers, in the backcountry over the last 15 years (Ingram, 1995). This management was in response to an increase in bear-human incidents involving wilderness users above elevations where black bears had historically foraged, even above treeline.

Since the installation of food storage lockers in the backcountry, portable bear-proof food canisters have become more available. Neighboring agencies, associations, and retailers are striving to make canister rentals and sales available near popular trailheads originating in or near wilderness areas in the Sierra Nevada. The day may come when National Parks like Sequoia and Kings Canyon and Yosemite require canister use in certain situations. Currently, backcountry visitors to Sequoia and Kings Canyon National Parks have the following options for storing food in the backcountry; portable bear-proof containers, food-storage lockers or cables, a posted 24-hour human guard, and counterbalancing food and garbage. Backcountry park visitors are encouraged to use portable bear-proof canisters or food lockers.

The human guard is not always effective, difficult to enforce and may put a human at risk of injury. The counterbalance method of suspending food is allowed but not preferred for several reasons. In many backcountry areas, there is a scarcity or absence of appropriate trees. Where there are only a few such trees, the act of counterbalancing can cause damage to this

limited resource. This method can also result in discarded rope left dangling in trees. Proper counterbalancing is an art, and most backcountry users never really master the technique. They may think that they have based on their record of avoiding a negative encounter with a bear when their food is counterbalanced. However, there have been many reports of experienced "counterbalancers" eventually losing their food to a persistent bear. There is a possibility that some bears have learned how to obtain food that was counterbalanced with sanctioned methods. Black bears are very innovative, and it may be our species turn to evolve new ways to keep our food from them.

Upcoming Development Changes

The Giant Forest developments, including most buildings, are planned for removal beginning in 1997. The deteriorating housing and lodge areas had many bear-human incidents due in large part to the lack of structural integrity. The replacement development planned for the Wuksachi area farther to the north will not be completed for several years. Bear management staff will have the opportunity to provide input during the planning process. The challenges include vehicle food storage issues. Vehicles will be parked farther away from their destination of Giant Forest, which will result in more cars parked for longer periods. During the interim between razing one development and constructing the other, there will be other bear management challenges as well. There are and will continue to be multiple contractor camps in black bear habitat.

PARK WIDE BEAR ACTIVITY UPDATE

Bear-human incidents

These parks experienced above average bear activity in 1995, which has been the trend following severe, lengthy winters in the Sierra Nevada. Incident levels have not been that high since 1983, the year before the first bear-proof food storage lockers were installed (Figure 1). Other areas in black bear habitat in the western U.S. also reported high levels of bear activity in 1995 (personal conversations with staff from Lassen and Yosemite National Parks, Whiskeytown National Recreation Area, and Inyo and Toiyabe National Forests).

In Sequoia and Kings Canyon National Parks, there were 513 reported bear-human incidents in 1995. The 1996 total of 300 was much closer to the 10-year average of 313.

Activity began early in the 1995 with certain

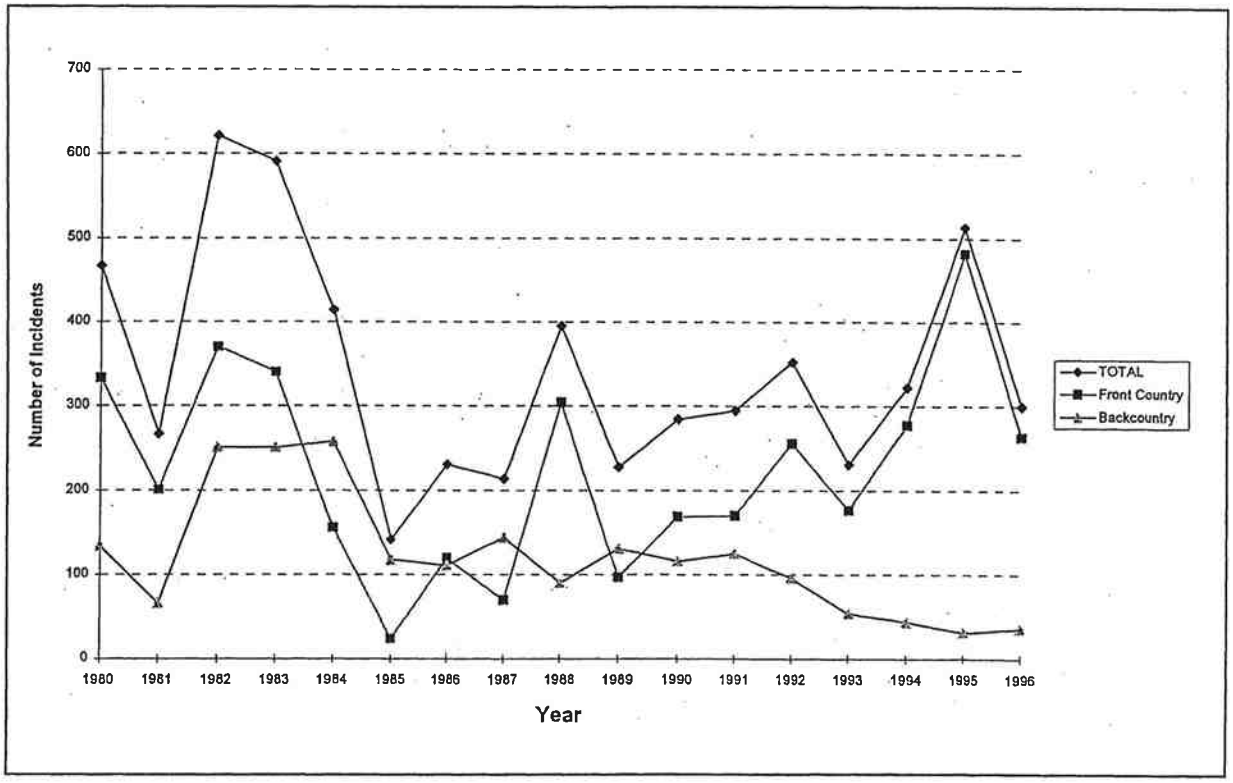

Figure 1. Sequoia and Kings Canyon National Parks bear incident trends, 1980-1996.

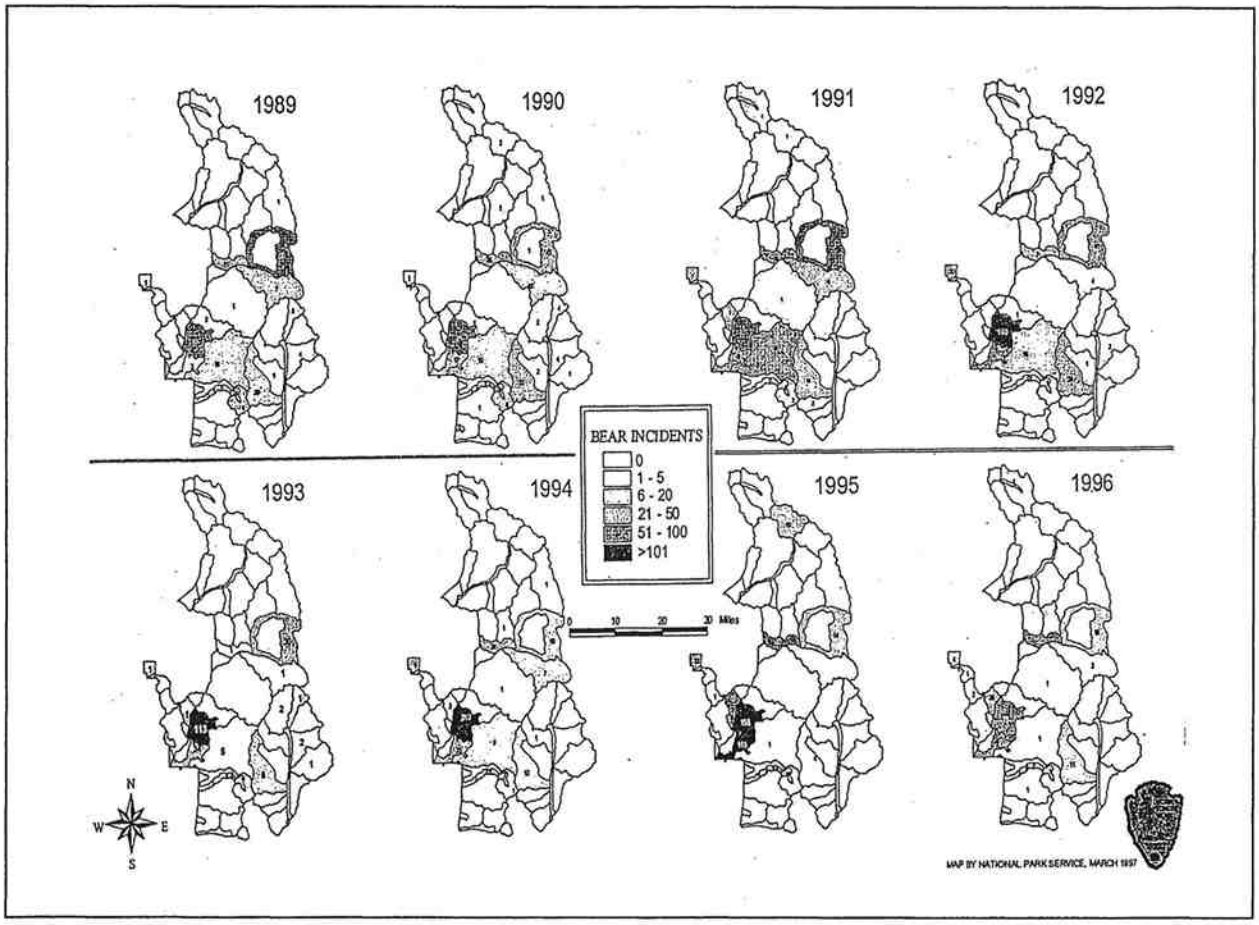

Figure 2. Graphic showing Sequoia and Kings Canyon National Parks bear incident trends, 1989-1996.

locations reporting bear-related property damage in April. Deep snows are thought to have increased the density of bears in lower elevations where there were snow-free foraging opportunities, coinciding geographically with human developments. When residents returned to their seasonal homes in May, some bears had already become conditioned to entering buildings and obtaining food. Incidents peaked park wide in July and August, predictably coinciding with highest visitation numbers. However, high levels of activity continued into December, until the day of the government shutdown. Rather than just a few bears in certain areas of the Parks getting into trouble as in more typical years, there were many such bears parkwide (Figure 2).

In 1995, Resource Management personnel trapped and tagged and/or collared 22 bears compared with seven in 1996 and a five-year average of 12. There were three management kills and another three bears tagged in the park that were killed outside the boundary in 1995. The only reported bear death in 1996 was due to a vehicle. There were three bear-related human injuries in 1995 and none in 1996 (Table 1).

CONCLUSIONS

For decades resource managers have understood the connection between anthropogenic foods and the potential alteration of black bear behavior. Managers have the most control over the human management part of the equation. The solutions may be obvious, but achievement is more difficult. Closures in problem areas are wrought with controversy in light of National Parks' missions to protect resources for future generations, and provide a pleasuring ground for the public. Most public land agencies in black bear habitat, have not been able to provide adequate bear-proof facilities due to lack of funding. Facilities deemed to be bear-proof often prove otherwise due to the learning ability of the intelligent black bear.

Even if funding were available to provide adequate facilities, Sequoia and Kings Canyon

National Parks alone have had 1.7 million annual visitors. Educating every visitor, employee, inholder,

Table 1: Bear Handling and Losses, Sequoia and Kings Canyon National Parks, 1992-1996.

	1996	1995	1994	1993	1992	5-Yr Ave
Bear Handling/ Marking	7	22	10	8	14	12
Intentional Management Kills	0	3	0	1	2	1
Handling Accidents	0	0	0	0	0	0
Legal Kills Outside Parks	0	2*	1*	0	2	1
Illegal Kills in Parks	0	1	0	0	1	<1
Vehicle caused deaths	1	0	0	0	1	<1
Unknown or Natural deaths	0	1	0	0	0	<1
Bear related human injuries	0	3	3	0	1	1

* Depredation permits given after bears were killed.

contractor, and concessionaire about preventing bear problems AND eliminating human error is a daunting task. One mistake involving access to human food can change the life of a bear and even future law-abiding visitors or residents in that area. Reactive management tends to take up most off the managers' time and efforts, and does not treat the symptoms of the problem.

Black bear-human incidents will continue near historic rates unless the following actions are implemented. These recommendations show up annually in bear reports, funding requests and literature on bear management (Thompson, McCurdy, 1995; SEKI annual bear reports 1989-1996). However, funding has not been forthcoming to:

* Explore state of the art bear-proof facilities (buildings, stationary and portable food storage containers, garbage facilities), install them where needed and educate people on how and why to use these facilities.
* Manage human use in areas where bear-human related problems occur.
* Enforce regulations of feeding wildlife and improper food storage.
* Provide adequate staff to educate the public, monitor bear activity, and be proactive in identifying and correcting deficiencies before bear-related problems arise.

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UTAH BLACK BEAR STATUS REPORT – 1997

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DISTRIBUTION AND ABUNDANCE

Utah has approximately 8,712,266 acres (13,612.9 sq. mi) of available black bear habitat. Bears are found throughout their historic range in Utah, which includes areas along the Wasatch Mountain range, throughout the high Uinta Mountains, the Book Cliffs and in other isolated regions in the southeastern areas of the state (Figure 1.). Current population estimates, based on 13,613 square miles of habitat indicate a stable bear population of 800 to 1,200 bears. These estimates are based on .06 to .09 bears per square miles depending on research projects, harvest data, sightings and Animal Damage Control information.

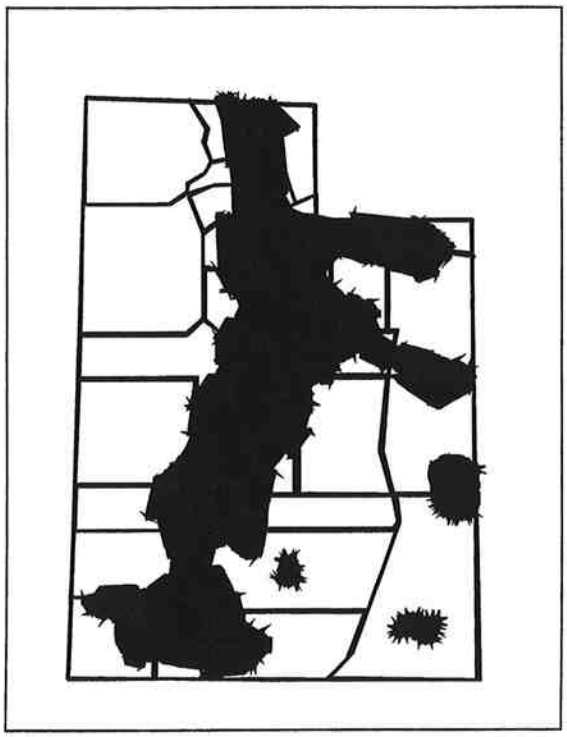
POPULATION MONITORING

Utah has a 48-hour mandatory check in for all bears taken during the sport hunt season. A premolar is taken, sectioned and aged. These data, as well as sex of harvest are used as criteria in monitoring bear populations in Utah (Table 1). The Division also uses the number of hunter days and hunters afield as indices in monitoring the states bear population on a unit management bases. Several research projects have provided the DWR with valuable population information. The DWR will begin a new population monitoring project on the Boulder Mountains in the summer of 1997.

Table 1. Criteria used to monitor black bear harvest and population parameters

Criteria	Overharvest[a]	Desired level[b]
% Female	40%	35%
Male Median Age	2 years	4 years
Female Median Age	4 years	6 years

[a]Reflects an overharvsted population
[b]Reflects a viable population with a diverse age stucture



Black Bear Habitat in Utah (13, 613 square miles).

HUNTING LAWS AND REGULATIONS

In the 1993 the Utah Wildlife Board elected to discontinue the practice of spring bear hunting in Utah. Utah has provided between 169 to 208 limited entry permits for hunting black bear from 1994 to the 1997 hunting seasons. Our season dates have been consistent during that same time and are: 1) August 27, through October 4, and, 2) November 5, through November 30,

Bait may be used after the hunter with a valid bear permit registers the bait station with the Division of Wildlife Resources. Bears may be taken by archery tackle only when hunted over bait. Only one bait station may be used by bait hunters and can only be used during the season dates (no pre-baiting is allowed). Hounds may be used to hunt bear during the regular season dates; hounds cannot be run off of bait stations. A two-year waiting period is required for successful applicants before they may apply again. All bears killed by sportsmen must be taken to a Division office within 48 hours to have a permanent possession tag affixed to the pelt and have a tooth removed for aging.

Any bear is legal game in Utah except cubs and females accompanied by young, with a season limit of one bear. All black bear pursuit and harvest permittees are sent a questionnaire to collect information on pursuit and hunting efforts. All available black bear harvest permits have been sold since the start of a limited entry system.

Table 2. Utah black bear harvest data statewide, 1967 – 1996

Year	# Permits Sold	Total Hunters Afield	Total Sport Harvest	% Males	% Females	Bear per Permit Holder	Dep. Harvest	Total Days for Successful Hunters	Avg Days/Suc Hunter	Pursuit Permits Sold
67			15				12			
68			12				9			
69	43	31	25			0.58	27			
70	155	119	9			0.06	18			
71	59	48	17			0.29	16			
72	96	77	19			0.20	7			
73	125	114	25			0.20	0			
74	134	117	29			0.22	9			
75	161	144	22	59	41	0.14	2			161
76	107	96	10	58	42	0.09	7			48
77	149	127	26	67	33	0.17	6			77
78	222	185	40	67	33	0.18	10			114
79	240	196	26	81	19	0.11	5			91
80	217	177	26	72	28	0.12	6			95
81	263	227	39	70	30	0.15	4			95
82	229	188	38	61	39	0.17	6			93
83	219	176	18	56	44	0.08	9			98
84	217	184	26	69	31	0.12	6			33
85	269	230	29	73	27	0.11	10			86
86	332	302	72	55	45	0.22	6			90
87	326	262	44	65	35	0.14	25			156
88	491	394	69	65	35	0.14	28			173
89	687	556	97	70	30	0.14	10			187
90	142	119	22	82	18	0.15	16			355
91	142	119	35	77	23	0.25	15	220	6.2	364
92	142	124	32	81	19	0.23	25	227	7.1	524
93	162	136	35	49	51	0.22	12	161	4.6	570
94	168	153	42	60	40	0.25	20	124	2.8	552
95	175	156	53	66	34	0.30	34	572	10.8	627
96	181	174	68	57	43	0.38	35	918	9.0	630
Avg.	209.0	176.1	35.5	66.4	33.6	0.2	13.4	370.3	6.8	237.2

LIVESTOCK DEPREDATION

If a bear is harassing, chasing, disturbing, harming, attacking, or killing livestock, or has committed such an act within the past 72 hours the bear may be killed by either: the livestock owner, an immediate family member, or an employee of the owner on a regular payroll, and not hired specifically to take bear, may kill the bear; The livestock owner may notify the division of the depredation who shall authorize a local hunter to take the depredating bear or notify an animal damage control specialist. Depredating bear may be taken at any time by an animal damage control specialist, supervised by the animal damage control program, while acting in the performance of the person's assigned duties and in accordance with procedures approved by the division. A depredating bear may be taken with any weapon authorized for hunting bear. An average of 13 bears are taken per year due to depredation of livestock since 1967, with a maximum of 35 in 1996 and a minimum of 0 in 1973.

CONCLUSIONS

Based on criteria and data collected since 1967 (Tables 1 & 2), the overall black bear population in Utah is classified by the Division as healthy to increasing in most areas of the state.

Public attitudes towards bears and bear hunting continues to change in Utah. There are increased conflicts between the various interest groups concerning bear management. These attitudes have to be addressed and in many cases alternative uses of the resource must be investigated. The Division is currently planning a survey to be taken of Utah residents to poll their opinions on bear hunting and hunting methods in Utah.

WASHINGTON BLACK BEAR STATUS REPORT – 1997

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INTRODUCTION

Washington's black bear management program, is, and will continue to change, over the course of the next several years. Black bear, cougar and furbearer management responsibilities were combined in May of 1993, and as a result we now have a full-time program manager dedicated to these species. The Department of Wildlife is also changing, and in July of this year we will officially be merged with the former Department of Fisheries, creating a "new" Department of Fish and Wildlife. Current, and projected future black bear management strategies are highlighted in the sections below.

DISTRIBUTION AND ABUNDANCE

Black bear reside in 31 of Washington's 37 counties, with bears occupying all forested habitats within Western Washington, the Cascade Mountain Range, the Okanogan Region, the Selkirk and Blue Mountains ranges. Only two island counties within the North Puget Sound area and the arid, shrub-steppe habitat of the Columbia Basin does not support the resident black bear populations.

No current black bear population estimate is available. A five-year black bear research investigation, set to begin this summer, will examine bear densities by habitat type, and annual mortality rates for selected sex, and age cohorts. This information should allow for future population estimation and population modeling.

CURRENT MANAGEMENT AND REPORTING

Black bear management in Washington is currently based on manipulations of the harvest through hunting season length, and hunting technique. Washington has no general spring bear season, and the limit is one bear/hunter/season. Generally, both bait hunting for black bear, and the use of treeing hounds are legal methods of take (there are some local area closures to bait use and hound hunting).

Information on our black bear harvest is obtained from a combination of mandatory hunter report card/bear tooth submittals (successful hunters only), and from post-season questionnaires that sample 10% of our bear tag buyers. Information generated from these activities allows us to determine that total bear kill, including the sex, and age composition of the harvest, the method of take, and the geographic distribution of the kill. Information is collected and analyzed at the Game Management Unit (GMU) level, and at the Regional level. Regions are administrative groupings of Game Management Units that allow efficient biologists and officer deployment.

FUTURE MANAGEMENT AND REPORTING

The Department of Wildlife will begin drafting the state's first black bear management plan later this year. Based of Washington's State Environmental Policy Act (SEPA), and Environmental Impact Statement (EIS) may also be prepared, prior to, or as a complimentary document to the management plan.

The management plan will emphasize a need to refine and enhance the way in which bear harvest data are collected and analyzed. The creation of habitat based Bear Management Units (BMU), guidelines for implementing harvest season changes based on sex, age and kill information, and bear population estimation surveys will be included as future activities.

Changes to hunter reporting and collection of harvest information will center around the initiation of mandatory bear hunter check station, where hunters will be required to bring bear carcasses into checking stations located throughout the state. It is believed that this is the best way to improve the quality of harvest data. Increasing the hunter questionnaire sample of bear hunters from 10% to 30%, or more, may also be used to enhance hunter success, and hunting method information.

DAMAGE AND NUISANCE ACTIVITY

The bulk of black bear property damage in Washington occurs on private industrial timberlands in Western Washington. Black bear peel the bark from conifers, primarily Douglas fir, in order to expose and consume the inner sapwood (phloem). Generally, peeling activity occurs in the spring of the year in stands 15 to 30 years of age. The trees, 8" to 12" DBH, become attractive to bear usually following pre-commercial thinning activity. The thinning stimulates photosynthetic rates and sugar production and makes the trees especially palatable to bear during a time of year when natural foods are not readily available. Historically, the Department of Wildlife has

cooperated with the Washington Forest Protection Association (WFPA) in allowing localized, "hot-spot" hunts on timberlands that are experiencing black bear timber damage. In 1985, WFPA began a black bear supplemental feeding program. The program, designed to alleviate peeling damage, has effectively reduced the number of black bear hot-spot hunts that occur each year.

Other black bear damage activity includes livestock, orchard and apiary depredations. Human population growth and development has also led to increases in black bear urban nuisance complaints. The Department of Wildlife is currently completing a statewide policy on the handling of nuisance black bear and cougar. The policy specifies circumstances in which animals will be monitored, captured and relocated or captured and destroyed. Efforts to increase the reporting rate, and the consistency with which field information on nuisance black bear activity is received, will be made later this year.

POPULATION MONITORING SURVEYS

Currently, the Department of Wildlife has no surveys specifically designed to monitor populations, or population trends for the black bear. This is a priority for the program, and plans are currently being made for a statewide tetracycline-marking project to occur in 1996. The tetracycline effort will provide a statewide population estimate. Long term population trend monitoring will then begin in 1997; with the initiation of black bear bait station index routes.

REGULATION CHANGES

Statewide general hunting seasons are established for all species in three-year increments. In June of 1993, we began the public review and involvement process that will ultimately lead to adoption, by the Wildlife Commission, of the 1994-1996 hunting seasons. Recommendations are currently being finalized to include regulations on the use of bait to hunt black bear. Currently there are no regulations governing this activity, and the Agency, hunters, non-hunters, and anti-hunters share concerns for the practice of unregulated bait hunting. Restrictions on the type of bait, the timing and the placement of baits will allow us to address issues of sanitation, habituation, aesthetics and grizzly bear recovery.

HARVEST SUMMARY

Black Bear harvest information since the last Western Black Bear Workshop is presented in Table 1. Our harvest over the last three-years has increased slightly, with the percentage of females in the harvest, and the hunter success rates remaining stable. In 1993, still hunters (boot hunters) took 28% of the total bear harvested, bait hunters took 48% of the total harvest, and hound hunters accounted for 23% of the total bear kill.

Table 1. Washington bear harvest and hunter information.

	Hunters		Harvest	
Year	Total #	Success	Total	% Female
1991	10,839	13%	1,379	37
1992	11,648	12%	1,442	37
1993	12,179	12%	1,507	35

WYOMING BLACK BEAR STATUS REPORT - 1997

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DAVID S. MOODY, Trophy Game Section Coordinator, 260 Buena Vista, Lander, Wyoming, 82520, USA.

DISTRIBUTION AND ABUNDANCE

Black bears (*Ursus americanus*) occupy most of the major mountain ranges within Wyoming, including the Absaroka, Teton, Wyoming, Wind River, Bighorn, Laramie, Sierra Madre, Snowy, and Uinta ranges. They do not occur in the Black Hills of northeast Wyoming, although their historic range did include this area. The 9 occupied mountain ranges comprise 4 black bear populations that are geographically isolated from each other by high elevation grasslands and sagebrush dominated deserts. The largest population occurs in the northwest corner of the state and is contiguous with bear populations in Yellowstone National Park, Idaho, and Montana. Grizzly bears (*U. horribilis*) are also present in parts of this area. The second largest population occurs in the Bighorn Mountains of north central Wyoming. This population is primarily contained within the state and only extends into Montana for a short distance. The third population, extending northeast from the south central region of the state, is contiguous with black bear populations in Colorado, but exhibits relatively low bear densities in Wyoming. Similarly, the fourth population in the southwest corner of the state has the smallest distribution and lowest densities, existing only in the Uinta Mountains, which originate in Utah.

POPULATION MONITORING

Information collected from harvested bears is the only source of data presently used to monitor black bear populations in Wyoming. A mandatory reporting system has been in place since 1969 that requires all successful hunters to present the skull and pelt of harvested bears to a Wyoming Game and Fish Department (WGFD) employee, who collects 2 teeth for aging and records the location of kill, sex, number of days hunted, and method of take. Skulls must be presented in an unfrozen condition to allow successful removal of teeth, and proof of sex must remain naturally attached to the pelt for accurate identification. A survey conducted in 1992 indicated that 96% of licensed bear hunters comply with these regulations.

A study investigating the use of hair sampling and DNA analysis to monitor population trends is scheduled to begin during the summer of 1997. Theoretically, this technique should provide an estimate of bear abundance using genetic-based identification of individuals through application of mark-recapture techniques. Estimates of population sex ratios can also be derived from genetic analyses. Thus, we are hopeful that an annual application of this technique can be developed to monitor bear populations and guide management in conjunction with harvest data.

MANAGEMENT OBJECTIVES AND STRATEGIES

The legal status of Wyoming black bears was changed from predator to game species in 1911. In 1978 they were reclassified as a trophy game species, making the WGFD fiscally liable for losses to livestock, and in 1996 the WGFD was made liable for bear-related damage to beehives. In 1988 the annual bag limit was changed from 2 to 1, and black bear tags were also removed from the resident elk license. Prior to that, resident elk hunters were entitled to harvest black bear during the fall season
but spring season bear hunters were required to buy a separate license. The state was divided into 31 black bear hunt areas that closely corresponded with elk hunt areas in 1981, but this system was reorganized in 1993 into 29 areas corresponding with known bear distributions.

During the fall of 1994, hunt areas within distinct bear populations were combined to form Bear Management Units (BMU) and assigned annual female quotas, so that once a quota is filled the hunting season in that BMU automatically closes. Initially, harvest from the 1994 fall and 1995 spring seasons were regulated as one annual quota, but this was changed in the spring of 1995 to include separate spring and fall quotas for each calendar year. The fall quotas are increased or decreased if spring quotas are not met or are exceeded. This assures that the annual quota is not exceeded. Annual female quotas are evaluated each winter by comparing the sex and age structure of the harvest during the past 3 years with indicators of potential overharvest (Table 1). If the 3-year trend suggests that overharvest may be occurring, reduced quotas are recommended for the following year, and conversely, increased quotas are recommended if the 3-year trend is above a desired level. This system provides maximum hunter opportunity while guarding against undesirable

Table 1. Wyoming black bear harvest criteria, 1996.

Criteria	Desired	Overharvest	Observed
% Female Harvest	≤ 35%	≥ 40%	34%
% Male Harvest	≥ 60%		66%
% Subadult Female to Total Female Harvest		≥ 35%	30%
Median Age			
Female	≥ 6 years	≤ 4 years	4.8 years
Male	≥ 4 years	≤ 2 years	3.3 years
Total	≥ 5 years	≤ 3 years	3.6 years

population declines. Hunters are responsible for inquiring about season closures by calling a toll free telephone number prior to going into the field. Hunters are also encouraged to be selective and only harvest males, which prevents early closings of seasons. Hunters claimed they could determine sex during the spring season by looking for sexually dimorphic characteristics before they shoot. However, data from harvested bears don't support this contention as seasons have closed early in several BMU's because female quotas were reached. This indicates that hunters cannot determine sex of bears prior to shooting or they are being less selective because of concerns about shortened seasons if quotas are met. An extensive education and information program was initiated by the WGFD when the new quota system went into affect to aid hunters in differentiating sex, age class, and species (grizzly versus black bear).

SPECIES MANAGEMENT PLANS

A black bear management plan was developed in 1993. Almost all recommendations proposed in the plan centered around 4 issues: increasing public involvement, developing an annual female quota system that regulates harvest at the BMU level, implementing new baiting regulations, and reducing illegal take. Since then, these 4 goals have been accomplished to varying degrees. In 1994, a public attitude survey aimed at increasing public involvement in black bear management was conducted by the University of Wyoming Survey Research Center. The new female quota system was introduced in the fall of 1994, and new baiting regulations, controlling the type, amount, location, and density of baits were established in 1992. Thus, the only recommendation proposed in the 1993 plan that has not been addressed is reducing illegal take. The current sentiment among WGFD law enforcement personnel is that illegal take is relatively low. Nevertheless, bills prohibiting the sale of bear parts were introduced in the 1995 and 1996 state legislative sessions, but they did not pass. Current regulations only prohibit the sale of edible bear parts, while the sale of skulls, hides, claws, and gall bladders is permitted.

HUNTING LAWS AND REGULATIONS

Successful black bear hunters must present the skull and pelt from each bear taken to a WGFD employee for inspection within 10 days after harvest. Season dates are generally from 1 May to 15 June during the spring and 1 September to 15 November during the fall, but both seasons are subject to early closure once female quotas are filled. Legal shooting hours are from one-half hour before sunrise to on-half hour after sunset. Cubs and females with cubs at side are protected, and dogs may not be used to hunt, run, or harass bears. The annual bag limit is 1 bear per hunter, and licenses can be purchased over the counter. During 1996, non-resident and resident bear licenses cost $75.00 and $11.00, respectively. These prices were increased to $250.00 and $30.00 in 1997.

During the fall of 1993, the U.S. Forest Service (USFS) prohibited bear baiting on national forest lands within Wyoming because an environmental assessment of the activity was not yet complete. In the spring of 1994, baiting on these lands was reinstated after the final environmental assessment concluded that regulation of bear baiting in Wyoming would be the sole responsibility of the WGFD, regardless of land ownership. In addition to recommendations made in the 1993 Bear Management Plan, this temporary ban on baiting further increased public awareness of the issue. As a result, current baiting regulations include:

(1) Baiting is permitted in all hunt areas except those within the federal grizzly bear recovery area.
(2) Bait is defined as a nontoxic biodegradable substance, not to exceed 200 lbs, enclosed in a rigid container no larger than 8 cubic feet.
(3) The use of game animals, birds, fish, or protected species is prohibited.

(4) Baits cannot be placed more than 7 days prior to the season opening, and must be removed no later than 7 days after the season closes.
(5) Baits cannot be placed within 200 yards of a water source, road, or pack trail; or within one-half mile of a developed campground, picnic ground, or building.
(6) Bait density can not exceed more than 1 per square mile, and 1 hunter can not maintain more than 2 baits at once.
(7) Prior to placing a bait on public land, a written description of the proposed location must be submitted to the USFS district ranger, Bureau of Land Management area manager, or WGFD regional wildlife supervisor.
(8) The hunter's name, address, and phone number must be permanently affixed to the outside of the bait container.

HARVEST SUMMARY

Black bear harvest has averaged 200 bears per year during the last 18 years, but the trend in harvest has varied. In 1979, harvest started increasing an average of 28% annually (SD = 15.9) and continued until 1982, after which it remained constant at 216 bears/year for the next 12 years. Then in 1995, harvest began decreasing at a mean annual rate of 16% (SD = 9.8), dropping from 209 bears in 1994 to 136 bears in 1996, which was the lowest harvest recorded since 1979 (Table 2). This trend in total harvest did not appear to be related to the 1988 change in licensing, when bear tags were removed from the resident elk license, but did appear to be partly related to the new female quota system that was implemented in the fall of 1994. This change in bear management may have discouraged some bear hunters. The largest fluctuation in hunter days (1 hunter for 1 day = 1 hunter day) recorded during the last 15 years occurred between the 1994 and 1995 fall seasons, dropping from 22,966 to 13,422. During the previous 10 years, hunter days were increasing an average of 5% (SD = 9.1) annually (Table 2).

Almost 61% (SD = 9.7, 1979-96) of the annual bear harvest occurs during the spring season. This was somewhat higher during 1985-92 (66%, SD = 6.4), but lower during the last 4 years (56%, SD = 16.0). Hunter success also appears to be higher in the spring than in the fall. While spring hunters account for only 31% of the total hunter days (1982-95), they harvest 61% of the total bears annually, and the number of days/harvested animal is markedly lower for the spring season (spring = 58 ; fall = 202 days/bear). This is likely due to the influence of baiting since 46% of all bears harvested in the spring are killed over bait, compared to 5% in the fall when most successful bear hunters incidentally take a bear while pursuing deer and elk.

Since 1979, spring harvest increased an average of 10% (SD = 17.0) annually until 1992, when spring seasons were shortened to protect late-emerging females with cubs and more stringent baiting regulations were enacted. During the next 3 years, spring hunter days and spring harvest declined, and in 1994 fall harvest exceeded spring harvest for the first time (Table 2). Nevertheless, fall harvest quickly dropped in 1995 and 1996, returning to below spring levels and to the lowest level recorded in the last 20 years. It is unclear why fall harvest and subsequent

Table 2. Wyoming black bear harvest statistics during the last 10 years

	# Bears Harvested			Mean Harvest Date		# Hunter Days			
Year	Spring	Fall	Total	Spring	Fall	Spring	Fall	Total	# Damage Bears Removed
1987	131	61	192	31 May	21 Sep	8,479	14,702	23,181	1
1988	145	81	226	31 May	23 Sep	8,601	19,148	27,749	5
1989	153	64	217	1 June	26 Sep	5,441	19,700	25,141	3
1990	140	82	222	3 June	21 Sep	10,269	15,677	25,946	2
1991	171	67	238	4 June	26 Sep	9,194	17,502	26,696	3
1992	159	61	220	29 May	29 Sep	10,474	16,337	26,811	4
1993	125	112	237	28 May	28 Sep	6,699	21,120	27,819	13
1994	88	88	209	26 May	23 Sep	5,180	22,966	28,146	12
1995	78	78	151	26 May	14 Sep	5,923	13,422	19,345	4
1996	108	108	136	27 May	30 Sep	[b]	[b]	[b]	13
mean	130	75	205	30 May	25 Sep	7,807	17,842	25,648	6
total	1298	750	2048			70,260	160,574	230,834	60

[a] One hunter day is equal to 1 day hunted/hunter.
[b] No data available yet.

total harvest have declined so dramatically in 1996. The mean harvest date for the 1996 spring season was similar to the mean spring harvest date in 1995 (26 May), suggesting that hunter access, which would affect harvest success, was not delayed in 1996 due to late snow melt in high elevation areas (Table 2). Similarly, the mean fall harvest date in 1996 was later than the 1995 date, suggesting that optimal hunting conditions were present longer in 1996. One possible explanation for low harvest during the fall of 1996 is the above average production of natural bear foods observed throughout much of the state that year, but more data will be required to fully understand how hunter effort is affected by changing public attitudes towards bear hunting and the new female quota system. We do not believe that overharvest is occurring since current annual female quotas are relatively conservative when compared to historical harvest levels.

NUISANCE AND DAMAGE ACTIVITY

Wyoming statue allows any black bear damaging private property to be killed by the owner, employee, or lessee of the property. Additionally, owners are reimbursed for confirmed bear-related losses to livestock and beehives. Damage generally occurs in high elevation areas where domestic stocks, particularly sheep, are seasonally permitted to graze. These areas are typically characterized as good bear habitat, and damage payments often reflect recurring localized problems. An average of 6 nuisance bears were removed annually during the last 10 years, but peaks in nuisance removals occurred in 1993, 1994, and 1996 (Table 2).

Bears removed because of nuisance activity do not count towards annual female quotas, and there are no limits on the number of damage bears that can be removed annually. The separation of damage mortality from bear harvest management is intended to prevent a high-nuisance year from influencing annual harvest quotas. That is, a high-nuisance year may necessitate increased harvest if the two were not separated, even though biological data (age and sex characteristics of the harvest) did not justify an increase. Additionally, because most bear hunting in Wyoming occurs in rural areas, it is possible that behaviors which lead to nuisance activity (i.e., attraction to urban areas) decrease a bear's vulnerability to harvest.

PUBLIC ATTITUDES; BEAR MANAGEMENT/ HUNTING

In 1993, the U.S. Forest Service prohibited baiting on national forest lands during the fall hunting season. Baiting was allowed on these lands the following spring; however, the temporary restriction heightened awareness and controversy of the baiting issue, and a public attitude survey was conducted in the winter of 1993. The 3 key findings of this survey were 1) approximately half of the respondents had little or no knowledge of black bear management in Wyoming or the controversy surrounding bear baiting and spring hunting; 2) 16% and 32%, respectively, felt that baiting and spring hunting should continue; and 3) 52% agreed that some form of bear hunting should continue. A similar survey only involving licensed bear hunters was also conducted in 1992, in which, unsurprisingly, only 20% favored elimination of bear baiting. However, a somewhat surprising result of the 1992 survey was that 52% of the respondents (licensed bear hunters) favored shortening spring seasons to reduce female harvest. Presently, no referendums or state legislation banning baiting or spring bear hunting have been proposed in Wyoming, although it is apparent that nationwide approval of these activities is declining.

RECENT RESEARCH AND PUBLICATIONS

Anderson, C.R., M.A. Ternent, D.S. Moody, M.T. Bruscino, and D.F. Miller. 1997. Grizzly bear-cattle interactions on two cattle allotments in northwest Wyoming. Final Report. Wyoming Game and Fish Department, Lander, Wyoming, USA..

Final report of a 3-year study examining bear activity on 2 public land cattle grazing allotment that have experienced high levels of bear depredation. Intensive radio-telemetry and visual monitoring revealed that black bears, although relatively abundant, did not kill cattle, but they did occasionally scavenge dead cattle. Three adult grizzly bears were responsible for 84% of the documented depredations.

Grogan, R.G. and F. Lindzey. 1996. Black bear ecology in southeast Wyoming (Snowy Range). Annual Progress Report. Wyoming Cooperative Fish and Wildlife Research Unit, Laramie, Wyoming, USA.

Progress report of a 2-year study to estimate bear density, reproductive parameters, and habitat use patterns in 3 study areas located in the Snowy Range mountains of southeast Wyoming. Preliminary findings indicate bear density is extremely low in this area (1.2 - 4.6 bears/100 km^2) and first reproduction occurs between the ages of 5 and 6. The authors also discuss using motion-sensing cameras as a mark-recapture technique for estimating black bear abundance.

Holm, G. and F. Lindzey. 1996. Habitat use, spatial distribution, activity patterns, and food habits of sympatric black and grizzly bears in northwestern Wyoming. Annual Progress Report, Wyoming Cooperative Fish and Wildlife Research Unit, Laramie, WY, USA..

Progress report of a 2-year study investigating possible relationships between sympatric black and grizzly bears in northwest Wyoming. The authors report that black and grizzly bear activity was temporally separated, with grizzly activity peaking at night and black bear activity peaking at dusk and dawn; activity was also somewhat spatially separated, with grizzlies tending to use more open habitats.

Lindzey, F. 1996. Estimating black bear abundance using hair sampling and DNA analysis. Project proposal. Wyoming Cooperative. Fish and Wildlife Research Unit, Laramie, Wyoming, USA.

Project proposal for a 2-3 year study examining the usefulness of DNA analysis and hair sampling of free-ranging black bears to estimate bear abundance. If the technique appears accurate, will also investigate if estimated parameters (abundance and sex ratios) corroborate harvest data collected from the same populations.

Wyoming Game and Fish Department. 1996. Effectiveness of attractants to lure black and grizzly bears into hair collection sites for future DNA fingerprinting -the Blackrock/Spread Creek area study: preliminary findings. Annual Progress Report Trophy Game Section, Lander, Wyoming, USA.

Progress report of a 3-week study examining the effectiveness of different lures and lure presentation techniques for attracting bears to hair collection sites. Of the lures tested, cattle blood appeared to be the most cost effective and attractive to bears. Lure volume also appeared to be correlated with visitation rates, but relatively small quantities (<2 liters) were adequate. Adding synthetic lures or dragging lures to sampling sites did not enhance visitation rates.

OTHER RECENT PUBLICATIONS

University of Wyoming. 1994. Public attitude survey on black bear management in Wyoming. Unpublished Report, Research Center, University of Wyoming, Laramie, Wyoming, USA.

Wyoming Game and Fish Department. 1994. Black bear management plan. Trophy Game Section, Lander, Wyoming, USA.

Wyoming Game and Fish Department. 1995. Annual black bear mortality summary. Trophy Game Section, Lander, Wyoming, USA.

Wyoming Game and Fish Department. 1996. Annual black bear mortality summary. Trophy Game Section, Lander, Wyoming, USA.

CONCLUSIONS

Approximately 200 black bears are harvested annually in Wyoming, with 42-79% occurring in the spring season. In 1994, black bear management was dramatically revised in response to a Black Bear Management Plan completed in 1993; distinct bear populations were delineated as Bear Management Units (BMU), and annual female quotas were determined for each BMU that initiate automatic season closure once filled. Annual female quotas are evaluated each year by comparing the 3-year trend in age and sex of harvested bears to predefined criteria and readjusting quotas as needed. Baiting is permitted in both the spring and fall seasons, except within the federal grizzly bear recovery area, however, new regulations were drafted in 1992 governing the type, location, density, and registration of baits in response to increased public criticism. Forty-six-percent of bears harvested in the spring are shot over baits, compared to 5% in the fall. Presently, no anti-baiting legislation has been introduced, although a public attitude survey conducted in 1993 suggests that 84% Wyoming residents do not support the practice.

Total harvest has been declining since 1993, reaching a 5-year low in 1996. It is unclear why such a dramatic decrease has occurred. A decrease in fall harvest between 1994 and 1995 may have been due to implementation of the new quota system. Likewise, a drop in hunter days was observed in 1992 after spring seasons were shortened and baiting regulations were established, but spring harvest increased during 1996, though still below the long-term average. We do not believe that Wyoming black bear populations, and thus harvest, are declining due to overharvest. The current female quota-BMU management system appears to be working well, but there is some concern with basing all management decisions on characteristics of harvest data. Several research projects to better estimate black bear densities and population demographics are currently underway or being proposed.

ORAL PRESENTATIONS

DENNING ECOLOGY OF BLACK BEAR IN THE BLUE MOUNTAINS OF NORTHEAST OREGON

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Abstract: In 1993 the Oregon Department of Fish and Wildlife initiated research on black bear (*Ursus americanus*) in the Blue Mountains of northeast Oregon. In 4 winters 130 dens were located and described. Ground dens were the most common comprising 61% of the dens compared to 39% that were tree dens. Ground dens were defined as excavations, caves and slash piles. Tree dens were internal cavities in standing or downed trees, dead or alive. Our research demonstrated a correlation between ages and sexes of bears and the general den structure, whether tree or ground based. We found significant differences in selection for den type among subadult females (trees), females with yearlings (ground), and adult males (ground). Ninety percent of radio-collared subadult females denned inside trees, and 60% utilized top entry tree dens. Trees utilized for interior denning averaged 110 cm (44") diameter at breast height. By contrast, 95% of females with yearlings and 88% of adult males used either excavations or caves. Den reuse in our study area was 11% overall, 18% for adult males and 7% for adult females. Security, space needs, learned behavior and den type availability may be factors contributing to black bear denning ecology. Forest management prescriptions that emphasize the retention of large diameter trees may have a positive influence on bear populations in the Blue Mountains.

INTRODUCTION

The Oregon Department of Fish and Wildlife collected 4 years of den ecology information for black bear (*Ursus americanus*) in the Blue Mountains of northeast Oregon. This was the first large-scale investigation of den site selection to be conducted in eastern Oregon. We focused our habitat use investigations on the den site and immediate surrounding area. Den habitats are probably the most critical habitats used by individual bears in northeast Oregon. The physiographic situation of our study area is comparable to Idaho where Beecham and Rohlman (1994) reported bears spending half the year asleep in winter dens. Past research in adjacent states; (Lindsey and Meslow 1976) in southwest Washington, (Beecham and Rohlman) in Idaho, and (Jonkel and Cowan 1971) in Montana reported black bear commonly using dens in large hollow trees. The forests of the Blue Mountains have experienced extensive change during the last decade, primarily due to heightened timber harvest resulting from forest insect infestations. Tree mortality and subsequent harvest reduced the retention of large trees with old growth characteristics in the Blue Mountains (Henjum et al. 1994). It was not previously known how this might affect bear denning ecology in northeast Oregon. Our study area also experienced high levels of recreational activity, particularly on public land during fall hunting seasons. We wanted to see how this population dealt with these levels of human activities. Several researchers have reported the sensitivity of black bears to disturbance during the period of den entrance, which in most western states is concurrent with fall deer and elk hunting seasons. In Colorado Beck (1991) speculated that bears denning in areas of high deer and elk hunter densities stood a high chance of disturbance, and therefore tended to select an area within their annual range that minimized their chance of den disturbance.

STUDY AREA

Our study area is situated in the Blue Mountains of northeast Oregon. The area is approximately 450 km^2 in size. Elevations range from 840 to 2640 m with a mean elevation of 1440 m. Approximately 75% of the area is mixed conifer stands of Douglas fir (*Pseudotsuga menziesii*), grand fir (*Abies grandis*), western larch (*Larix occidentalis*), lodgepole pine (*Pinus contorta*), ponderosa pine (*Pinus ponderosa*), and Engleman spruce (*Picea engelmannii*). Douglas fir predominates at mid-elevations, ponderosa pine at low elevations, and lodgepole pine and Engleman spruce at high elevations. Approximately 25% of the area is bunchgrass rangeland. Land ownership is 60% public and 40% private. The U.S. Forest Service manages the public land and the private is a mixture of timber company ownership and cattle ranches. Most of the area has been intensively managed for timber harvest. The study area is within the Starkey Wildlife Management Unit. These bear receive moderate hunting pressure during a 3-month fall hunting season, which usually begins the first of September and goes through November.

METHODS

Radio telemetry provided the primary method for locating winter den sites. Initial locations were

performed from aircraft equipped with a geographic positioning system (GPS). Each year telemetry locations were intensified as the denning season approached. During October, flights were increased from bi-monthly to twice weekly to aid in pinpointing winter den sites. Once dens were located using aircraft, we confirmed the site using ground telemetry and visual identification. Ground confirmation of dens typically involved travel with snowmobiles and snowshoes. Special care was given in the vicinity of dens to avoid disturbance. Precautions taken included wearing soft, quiet clothing and minimizing the field crew to 1 or 2 persons. We also were cautious not to approach too closely to the suspected dens site with snowmobiles. We typically adhered to a 200 m buffer with motorized vehicles, although in 6 instances the dens were inside this distance from well-traveled roads.

We identified 6 different age and sex classifications of bears including: adult females with cubs, adult females with yearlings, adult females without cubs, subadult females, adult males, and subadult males. We designated 4 den types that were used by these bears. Three types were ground based including excavations, caves, and slash piles. The other type was internal tree, which had 2 forms either ground entry or top entry (arboreal). Each den was photographed and pinpointed on a U.S. Geological Survey 7.5-minute quadrangle map. If the site was non-distinguishable from topographic or road features we would use a hand held GPS unit to geographically reference the location. In some cases we marked the den site with flagging to aid in relocation for late winter cub checks and summer habitat plots. Dens were typically located in December and January once hunting season was over and snow cover was present. However, we conducted ground telemetry in late October through November to obtain den entry information on a sample of the population (5 per sex class). We also visited the dens of suspected pregnant female bears in February to listen for newborn cub vocalizations.

During summer months the den sites were revisited to obtain more detailed habitat information. Habitat plots evaluated specific conditions in a 25-meter radius circle around the den. We assessed the management status of a 2-hectare area surrounding the den to describe forest management activities and categorize the stand age. We measured physiographic variables including aspect, slope, and elevation. We also measured tree size, canopy cover, and understory density. Specific den measurements included entrance height, width, and chamber depth, height, and width. The size of the surrounding structure (rock, tree, slash pile) was also measured. For tree dens a diameter at breast height (dbh) measurement was taken, along with a measurement up the tree to the den entrance using either climbing equipment and tape measure, or a clinometer. We measured the distance to the nearest habitat edge and the distance to the nearest traveled road, identified as dirt, gravel, or paved. Other human disturbances were also noted (houses, camps, people, dogs). Den type selection was compared using chi-square analysis, to determine correlation between bear status (age and sex) and general den type selected (ground versus tree). We also compared the bear status with surrounding forest management conditions.

RESULTS

Over 4 winters we located 130 dens from 64 different radio collared individuals (Table 1). More dens of females (n=89) were found than were for males (n=41), due to a greater number of females being collared over the 4-year study period. Numbers of individuals per age and sex classifications included: adult females with cubs (n=31), adult females with yearlings (n=24), adult females without cubs (n=24), subadult females (n=11), adult males (n=24), and subadult males (n=17). The two most common den types were excavations (n=56) and internal tree (n=51). Less common den types identified were caves (n=21) and slash piles (n=2).

Table 1. Annual den type selection.

Year	N	Tree[a]	Excavations	Caves	Slash
93/94	23	13 (7)	7	2	1
94/95	36	10 (3)	17	9	0
95/96	40	17 (8)	22	0	1
96/97	31	11 (7)	10	10	0
Total	130	51 (25)	56	21	2

[a] Arboreal

For our analysis we grouped the 4 specific den types into 2 categories: ground and tree (Table 2). The ground-based dens were excavations, caves, and slash piles. Excavations were usually in soft ash soil and typically dug where the soil had been disturbed by the roots of large bushes or under a decaying stump or log. Rock caves were either chambers within basalt outcrops or naturally occurring pockets within granite boulders. Slash piles were comprised of logging debris and dirt mounds with the den floor at ground level. Some form of bedding material (moss, grass, bush stems, fir boughs) were almost always present in ground dens and less common for internal tree dens. Tree dens were the most structurally variable. Base entry trees were either in live or dead standing trees, or inside hollow downed trees that usually had been sawed down and left in place after logging. Arboreal dens were usually inside live

Table 2. Den type selection by sex and age.

Age / Sex	Base Entry	Arboreal	Excavation	Cave	Slash
Adult Female [a]	13	3	13	0	2
Adult Female [b]	1	0	14	7	0
Adult Female	5	7	10	2	0
Subadult Female [c]	4	7	1	0	0
Adult Male [c]	1	2	16	5	0
Subadult Male	2	6	2	7	0
Total	26	25	56	21	2

[a] With cubs
[b] With yearlings
[c] Use of ground and tree dens were significantly different ($P<0.05$) Chi-square

trees. They were accessed by entry holes at the top or high on the tree side.

Three age and sex classes of black bears id not show a selection preference for either ground or tree dens. Females gave birth to cubs in tree and ground dens at near equal proportions. Natal tree dens were typically base entry compared to the other varieties of tree dens. Natal ground dens were predominantly excavations. Solitary adult females used ground and tree dens equally, with more of their tree dens being top entry. Subadult males were the third age and sex class to use tree and ground dens at near equal proportions. The tree dens used by subadult males were mostly top entry trees and their ground dens were predominantly caves.

Significant selection ($P<0.05$) was determined for 3 age and sex classes of black bear. These were adult females with yearlings, subadult females, and adult males. Adult females with yearlings had the strongest orientation to ground dens, with more being excavations than caves. Subadult females predominantly used tree dens, and most were arboreal. They used top entry trees at a higher proportion than all other classes of bears. Adult males mostly utilized ground dens and favored excavations to caves at a similar proportion as adult females with yearlings. Adult males not only reused their dens (18%) more than the other classes, they also selected excavations for den reuse on all of those occasions.

We documented the elevation, slope, and aspect of each den. The mean elevation of subadult male dens were at the highest elevations (1,717 m). Subadult female dens the next highest at (1,518 m). Adult females tended to den below the subadults at a mean elevation of (1,448 m). Adult males occupied the lowest elevations averaging (1,364 m). Most bears denned close to the mean elevation of the study area (1,440 m). The aspects of the den sites were variable among the age and sex classes. There was a tendency for adult bears of both sexes to use northerly oriented dens, with 44% of their dens having north, northwest, or northeast aspects. There was not a distinguishable aspect orientation detected for subadults. Subadult males denned in the steepest terrain with slopes averaging 33%, also characteristic of the higher elevations in the study area. The next steepest dens were used by adult females at 23%, and subadult females at 21%. The dens occurring in the flattest terrain, typical of lower elevations in the study area, were occupied by adult males.

We compared bear age and sex classifications with the forest management status around the den. Both sexes of adult bears used dens in forest stands that typically had experienced past logging, more than 10 years previous. Adult female bears tended to den in stands with larger trees, as 64% of their den plots had tree sizes characteristic of large commercial stands, with one or more tree being between 21-30" dbh. Adult male bears also used large commercial stands for denning more commonly (44%) than more intensively harvested stands (22%), with small commercial size trees between 11-22" dbh. Both sexes of subadult bears denned in stands characterized as old growth by Thomas' definition (1979) more commonly than adult bears. Seventy-one percent of subadult male dens were located in old growth and 57% of subadult females were also in this stand condition. Elevation is an important factor in making management status comparisons by bear age and sex. For instance, the lower elevations favored by adult males were much more intensively managed than higher elevations used by subadult males.

The chronology of den entrance varied slightly on an annual bases (Table 3). Adult females entered their dens prior to adult males. Information was limited on subadults, but they appear more similar to adult females than adult males. Within the range of adult females entrance dates, we observed that all pregnant females denned earlier than other females. This observation is

consistent with what Beecham and Rohlman (1994) noted in west-central Idaho. Another notable observation is the presence of a localization process for female bears. From den visits in early October, conducted between general deer and elk seasons, we noted a 7-10 day period prior to den entrance where female bears were at or near their den sites, but outside the entrance. We could not determine a similar pattern for adult male bears.

Table 3. Median den entrance date by sex and age [a].

Sex/Age	1993/ 1994	1994/ 1995	1995/ 1996	1996 1997
Female	Oct. 26	Oct. 28	Nov. 06	Oct. 10
Male	Nov. 02	Nov. 02	Nov. 17	Oct. 17
Subadult	Oct.21			

[a] Minimum of 5 adults and 3 subadults were sampled per year

There was a more pronounced timing separation between male and female adult bears for den emergence than observed for entrance (Table 4). During the spring of 1996 we intensively attempted to document emergence through more frequent telemetry flights and ground visits. Adult males were the first bears to become active. Three adult males were documented away from their dens on March 22. Most females gave birth to cubs in 1996, and 6 of 6 females with cubs were still at their dens April 1. By April 11 only 1 of 6 females was away from her den. By contrast, 2 of 2 barren females and 4 of 4 adult males were away from their dens on the same date. Also on April 11, one subadult female was away from her den while 3 of 3 subadult males were still denned. The den sites of subadult male bears were still snow covered at sub-alpine elevations. During 1996 it appears that 2 factors influenced emergence timing: reproductive status in the case of females, and high elevation with regard to subadult males. We also saw a pronounced localization around dens by females with cubs after spring emergence. This was particularly apparent for females with cubs using tree dens. We observed many occurrences of cubs scrambling up these trees to escape potential danger.

Table 4. Median den emergence dates by sex and age [a].

Sex/Age	1994	1995	1996	1997
Female	Apr. 29	Apr. 18	Apr. 13	Apr. 15
Male	Apr. 08	Mar. 22	Mar. 22	Apr. 07
Subadult			Apr. 13	

[a] Minimum of 4 adults and 3 subadults were sampled per year

DISCUSSION

The results of our den research were generally consistent with the findings of studies in other western states that had a comparable latitude and physiographic situation. We found that den type selection was determined by a bear's space and security needs. The largest den chambers we examined were utilized by females with yearlings. Conversely, the smallest chambers were occupied by subadult females inside top entry tree dens. Thermal requirements may also be a factor as suggested by Lentz et al (1983), particularly in the case of natal den sites. We did not specifically measure den temperatures, but we did notice from numerous natal den entries that excavations with narrow tunnel entrances felt warmer than other forms of dens. There are probably many subtle variables, which influence den site selection.

Security at the time of den entrance is a major factor, particularly for females that exhibit a pre-denning localization process. A security need may also be demonstrated through the clustering of dens within a portion of a bear's home range, a situation repeatedly observed with both sexes of adult bears in our study area. Several bears had 3 of 4 dens within a 1 km^2 area over a 4 year period. We found a high instance of adult male den reuse in areas where human disturbance is restricted by limited access on private land. Beck (1991) speculated in Colorado that bears denning in areas of high hunter densities were more vulnerable to disturbance. During fall in the Starkey Wildlife Management Unit there was near constant human activity from the onset of archery season in early fall through the cow elk hunts in early December. It appears that study area bears have adapted to this disturbance through den concealment, from brush, or seeking refuge areas created by private property.

Top-entry trees are the most secure den type, assuming that mid-winter den changes are a barometer of den security. There were no instances of bears moving from tree dens with entrances higher than 5 meters above ground. There were 2 instances of bears being disturbed from dens by coyotes. One such instance involved a subadult female being displaced from a base entry tree den during a low snow year. This bear moved in a straight line manner 400 m to a new base entry tree den, where this time she backfilled her den entrance closed with woody debris. The other instance involved a pregnant female that was in a short, 4 m, top entry tree den. Deep snow allowed coyotes to harass the bear through a side hole in her den tree. She responded by moving 1 km in a straight-line fashion to a hollow log and backfilled the entrance closed with wood debris. Cub vocalizations were heard at her den the next week.

Another aspect of den selection concerns learned behavior. Grizzly bear researchers Serhveen and Klaver (1983) have speculated that young bears learn of dens through visits with their mother. This may also be true of black bears. We observed a large male bear, 300 pounds fall weight, denning in top entry tree dens 2 years in a row. These 2 trees both exceeded 130 centimeters in diameter (53"dbh), and were more than 5 kilometers apart. Hollow trees of these proportions are not common in our study area. This bear may have been shown these trees by his mother, or learned to seek out these rare structures through some other process. Many behavioral questions still remain unanswered in regards to black bear denning ecology.

MANAGEMENT RECOMMENDATIONS

We determined that large diameter hollow trees were an important component of den type selection. Through locating 130 dens used by collared bears we gained insight into relative structural availability. The most common den type we observed were excavations. The soft ash soil types, typical of excavations, are not limited in this study area and protecting structure of this type does not seem necessary at this time. However, we did observe a surprisingly high incidence of tree use, 39% of the total, and an even more unexpected occurrence of arboreal dens. With 75% of the study area forested, trees are not in short supply in this part of the Blue Mountains of northeast Oregon. These forests have undergone extensive harvest over the last decade, mostly in response to tree mortality from a variety of forest insects. Trees of the size class used for denning, 110 cm dbh and larger, are not common in these managed forests, but 39% of dens were in big trees. This size of tree is usually characteristic of forests in late successional stages in eastern Oregon, as pointed out by Henjum et al. (1994) in a recent report by the eastside forest scientific society panel. Our research demonstrated that these trees were used in many conditions: alive, dead, standing, or downed. The primary prerequisite for use is large diameter, and being in some phase of decay creating a hollow interior. Bull et al. (1997) identified the important role that tree decay plays in producing wildlife habitat for a variety of forest birds and mammals.

Logging prescriptions need to be written to retain a collection of large trees for denning, and critical escape security, as in the case of females with cubs. The typical tree used for denning and security can be easily recognized by forest managers. Information from this study was used to produce an identification guide (Parks et al. 1997). Most trees used for denning are grand fir, live standing, approximately 20 m in height and 110 cm dbh or more and have a broken top. The treetop is easily identified with the top taking on a bayonet shape with multiple branches assuming vertical growth. The bayonet top provides weather shelter over the hollow center. Previously used den trees are distinguished by extensive claw marks on the bark from up and down climbing. An increased capability to recognize these unique trees is essential for their retention. The recruitment of trees suitable in size for denning takes many years. To facilitate den tree recruitment we need increased large tree retention. We also need a better understanding of artificially creating these rare and valuable tree habitats, important to black bears in the Blue Mountains of northeast Oregon.

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ARE HUNTER HARVESTED TOOTH AGES AN ACCURATE INDICATOR OF THE AGE STRUCTURE OF A BLACK BEAR POPULATION IN OREGON

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INTRODUCTION

Oregon's black bear (*Ursus americanus*) population is stable or slightly increasing. There is considerable interest in bear hunting in Oregon with an average of over 22,000 bear tags purchased annually from 1983-1994. Hunters in Oregon have been able to enjoy a variety of opportunities with a one to two month controlled spring bear season and a three month general fall bear season. Hunters traditionally have used three methods (hounds, bait and stalking) to harvest black bear. However, a public initiative, Measure 18, in November 1994 outlawed the use of hounds and bait. At this time it is uncertain how this change will affect the accuracy of using hunter harvest tooth samples for assessing the health of a bear population.

Most western states utilize sex ratio, age structure or a combination of this information to determine if black bear populations are being over-harvested in specific wildlife management units (Garshelis, 1990). Oregon's criteria are modeled after that in Idaho's Black Bear Management Plan (Beecham and Zager, 1992). Both have dropped the sex ratio criteria and replaced it with a refinement of the median age criteria (Table 1). Since 1987, successful bear hunters in Oregon were asked to submit harvest information and premolar in an envelope issued with their tag. Between 1987 and 1994, 40% of all bear hunters submitted a tooth, based on telephone surveys of hunters. The hunter compliance on tooth returns has dropped in recent years. Compliance has gone from a high of 58% in 1989 to 29% in 1994, and most recently 18% in 1995. In Oregon's Black Bear Management Plan, 1993 - 1998 (Van Dyke, 1993) it states: "If voluntary compliance drops below 30% of annual harvest, the Department will initiate the mandatory check-in of all bear."

With such heavy dependence on age structure data, the Oregon Department of Fish & Wildlife (ODFW) will be using tooth age data from two Oregon Black Bear studies to help validate the applicability of tooth aging from harvest records. Even though Oregon and Idaho share criteria for evaluating a bear population structure, they differ in collection methods. Idaho requires a check in of all harvested bear while Oregon hunters are asked to submit a premolar tooth on a voluntary basis. All study and hunter harvested bear teeth are sectioned and aged using the cementum annuli method (Willey, 1974) at Matson's Laboratory at Milltown, Montana. Bear hunters within the two study areas have been required for three years to validate their tags prior to hunting and then check in the bear if successful.

Table 1. Oregon's black bear harvest criteria

A Population will be considered overharvested if:
*Median Age of total harvest ≤3 years of age
*Median age of male harvest ≤2 years of age
*Median age of female harvest ≤4 years of age
*=Desired overall median age ≥5 years of age

SITUATION

Black bear hunting in Oregon is diverse and reflects different physical conditions between the west and east sides of the State. Until Measure 18, most of the bear harvest in western Oregon was accomplished primarily with hounds and secondarily with bait. The dense vegetative undercover in western Oregon makes the spot and stalk type of bear hunting very difficult. The open terrain of eastern Oregon is more conducive to spot and stalk hunting. Statewide, from 1990 through 1994, 69% of the bear harvest was done by hound and bait hunting. In western Oregon this proportion is higher and in eastern Oregon it is lower, where at least half of the harvest is done by stalking. Since 1990 approximately 70% of the annual harvest comes from western Oregon. Most of the harvest in eastern Oregon occurs during the fall general season (Table 2).

Bear hunting in the Starkey Wildlife Unit is characteristic of most of eastern Oregon. Hunting is restricted to a three-month general season in the fall. Prior to the 1995 season, the Starkey Unit bear harvest was split between stalking, hounds and bait. During the past two hunting seasons most bears have been taken incidentally while hunters pursued deer and elk. The fall harvest for eastern Oregon during the 1995 and 1996 seasons averaged 55% of the previous five-year

Table 2. Eastern Oregon fall harvest by sex. Portion of harvest with dogs (n).

Year	Males	Females
1996	36	19
1995	44	14
1994	66 (26)	41 (20)
1999	56 (24)	28 (12)
1992	65 (24)	42 (10)
1991	79 (33)	28 (10)
1990	70 (19)	39 (18)

average. This drop directly reflects the absence of hound hunting, accounting for 38% of the harvest and bait hunting which contributed approximately 7% of the annual eastern Oregon harvest (Table 2, Figure 1).

The Wildlife Population Laboratory of ODFW has evaluated the effect of collection method on bear harvest composition across the State. Methods used by bear hunters in Oregon had a significant effect on the sex and age composition of the harvest (Green et al., 1995). Hound hunters took older bears than hunters using bait or stalking (Table 3).

Table 3. Median age of Oregon hunter harvested bears by method. Random samples of 3,811 bears, 1983-1994).

Method	Males	Females
Hounds	4.00	5.19
Bait	3.03	3.61
Stalking	3.01	4.40

Hound hunters generally took older females than males, probably due to hunters selecting the largest bears. All three methods of hunting harvested younger males than females and more than 60% of bears taken were males. Hound and bait hunting had the largest proportion of males in the harvest and accounted for 69% of all bears harvested from 1990 until the banning of these methods after the 1994 hunting season.

Our population laboratory determined different vulnerabilities by age and sex to different harvest methods. Harvest methods affected the sex ratio taken by bear hunters. Hunters using bait harvested more male bears (72% male) than hound hunters (64% male), which harvested more males than stalking (61% male). The median age of bears harvested with hounds was greater for both sexes than for baiting and stalking. This analysis suggests that harvest data has significant bias depending on method used (Kohlmann et al., 1996) (Figure 2).

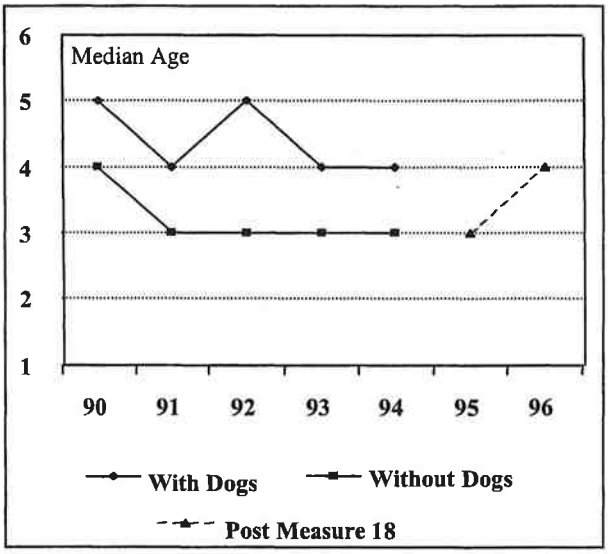

Figure 1. Eastern Oregon fall bear harvest with and without dogs, 1990-1996.

RESULTS AND DISCUSSION

The ban on the use of hounds and bait for bear hunting was imposed in the middle of a population study being conducted in the Starkey Wildlife Unit of northeast Oregon. One of our study objectives was to compare sex and age characteristics between bears contacted through study capture with those harvested during hunting season. We have collected population information two years prior and two years after Measure 18. We selected pursuit dogs as our primary capture method. We feel that using dogs for capture minimizes bias, as dogs will pursue any fresh bear scent regardless of age, sex or size. There have been a total of 103 bears marked during the four-year study (Table 4).

Table 4. Northeast Oregon black bear capture summary, 1993-1996.

Sex / Age	Number
Adult Males	18
Subadult Males	26
Adult Females	24
Subadult Females	8
Cubs	27*

*48 unmarked cubs were documented.

All adult and most sub-adult bears (64 of 76) have been radio-collared. An additional 12 sub-adult males were ear tagged only. All bears encountered greater than one year old were radio collared as they were

encountered, except for sub-adult males during the second half of the study. This includes 27 cubs (marked with microchips) out of 78 cubs that were born to 16 collared females. The male: female sex ratio of collared bears was 1.0 compared with a male: female ratio of 1.375 for all bears encountered during capture efforts (Table 5).

Table 5. Black bear sex ratio comparison in Starkey Wildlife Unit, 1993-1996

	Study	Harvest
Males	44	16
Females	32	11
Total	76	27
M:F Ratio	1.375	1.454

Documented hunter harvest in the Starkey Wildlife Unit has totaled 27 bears over the four-year period, 1993-1996. The overall sex ratio from hunter harvest was 1.454, surprisingly similar to study capture at 1.375; although, sample sizes between study and harvest are unequal. The tendency towards more males can be reflective of heavy hunting pressure. Beecham and Rohlmann (1994) reported from Idaho's studies that a population with fewer adult males than adult females could be experiencing overhunting. The presence of many sub-adult males can also suggest unclaimed space through adult male removal. We do not feel that this is an over exploited population with an annual harvest of less than 10% of the harvestable population. In this case it seems more likely that the male skewed sex ratio is a product of yearling (male) recruitment exceeding mortality (Garshelis, 1993) increasing the proportion of males in the living population, enabling males to dominate in both the study and the harvest sample. Again, it is important to consider collection method bias before determining if an actual population is accurately represented.

We used a chi-square test for homogeneity to compare age distributions between the study population and hunter harvest from the Starkey Unit. The test revealed no significant difference between these age distributions (Figure 2).

There were, however, some noteworthy differences in the two distributions. The first two age categories (1-2 and 3-4) proportionally favor the harvest sample. This could be explained through collection timing. Study capture is conducted from the beginning of May through July, skewing this effort toward spring and early summer. By contrast, hunting occurs from the end of August through November, shifting the harvest sample toward the fall. During late summer-early fall period, we have documented increased movements by sub-adult males, making them much more vulnerable to detection (harvest). The other distribution difference favors the study sample in the older age brackets (5-17). This can be explained by the difficulty of detection of these older, wiser bears that tend to avoid roaded areas. These individuals were more vulnerable to detection through the study due to greater capture effort or more days afield over more months.

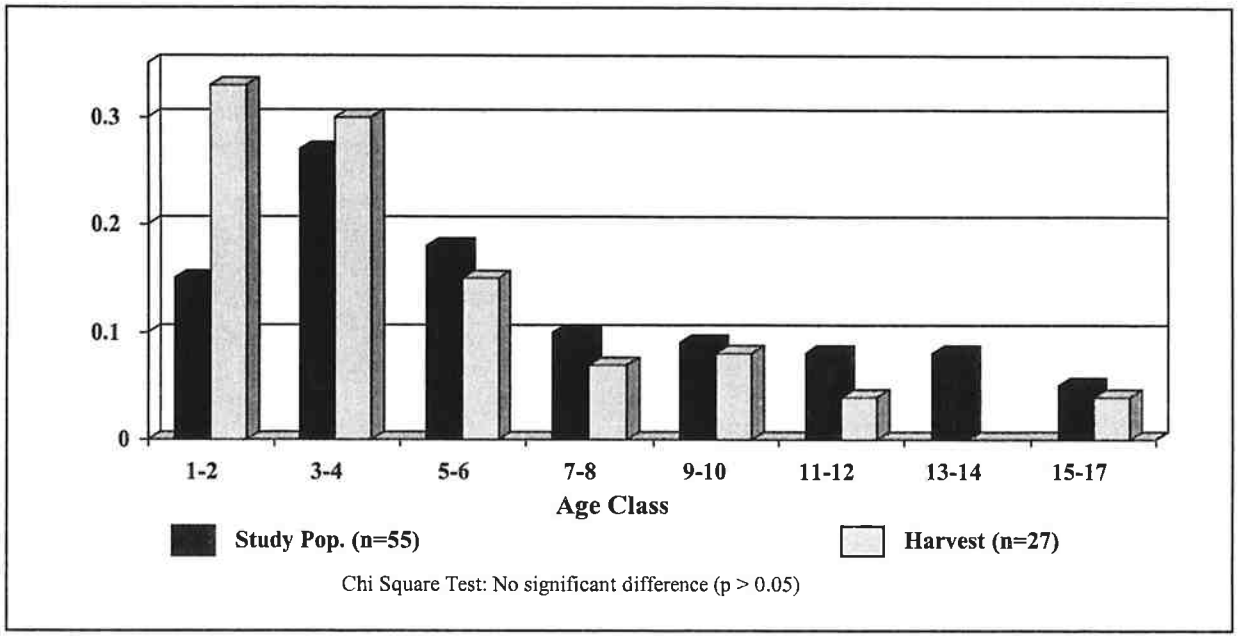

Figure 2. Starkey Unit black bear population and hunter harvest.

CONCLUSIONS

Overall, in this comparison the age distributions of hunter harvested and study bears are reflective of one another (Figure 2). Median ages are also comparable. Hunter harvested bears from the Starkey Unit matched the eastern Oregon ages at 4 years for females and 3 years for males. The Starkey Unit Study ages were the same for females and only slightly different for males at 3.5 years. From a practical management standpoint, it appears that hunter harvested tooth samples can provide an accurate depiction of an actual population. This depiction is confounded by collection methods that can be biased in nature. Bear managers should be aware of these biases, particularly as public initiatives such as Measure 18 play a dominant role in wildlife management in the future. From Oregon's standpoint, compliance by hunters turning in tooth samples is even more essential today, since the statewide harvest appears to be leveling off at half of pre Measure 18 harvest levels. Oregon may be headed toward a mandatory check-in to assure that an adequate number of tooth samples are obtained from hunters to reflect population age structure on a unit-by-unit basis.

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BLACK BEAR MANAGEMENT IN COLORADO FOLLOWING AMENDMENT 10

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Abstract: The passage of Amendment 10 in November 1992 significantly restricted the methods and season of black bear hunting in Colorado. Seasons were restricted to the period 2 Sept.-29 Feb. and use of bait and hounds were prohibited. Kill of black bears by hunters declined in the first 2 years following the change, primarily because of restricted number of licenses in September. The restriction was based on concerns of archers for safety during their ungulate seasons. Hunter kill rates have been about 20% for rifle hunters and 7% for archers during September. Bear hunters afield during Oct.-Nov. deer and elk seasons have had an average kill rate of 3.6%. In comparing the period 1993-1996 to 1989-1992, we have found: 1. Total kill of black bears declined by 10%; 2. Black bear kill in both 1995 and 1996 exceeded the pre-amendment average; 3. Total kill of female bears increased about 6%; 4. Hunter numbers increased 86%; 5. Hunter interest (applicants) increased from 984 to 7,700 during 3 years; 6. Bear license revenue increased over 115%; 7. Geographic distribution of black bear kill has not changed; 8. The change in hunting techniques has not caused a change in size or growth rate of the statewide bear population. Changes in land use and public land policy on toxicants likely have had a greater impact on statewide black bear numbers than has hunting. The Colorado Div. of Wildlife adopted new policies relative to bear-human conflicts in 1994 and began collecting data for the first time on number of incidents. Reported bear-human incidents have varied from 800-1100 annually. The primary policy change was to only translocate nuisance bears one time with subsequent conflicts resulting in the death of the bear. CDOW officers have had to kill from 30-55 bears each year since. Geographic patterns of conflicts differ significantly from patterns of hunter kill. Environmental conditions have significant impact on incident rates in most areas. A management project was initiated to investigate utility of translocation of conflict bears. Damage payments for black bear and puma have increased substantially since 1991. Possible causes include real increases in conflict, changes in CDOW proof-of-loss protocols, economic factors in the domestic sheep industry, greater awareness of the damage claim system, and an environmentally stressful year in 1995. The controversy in 1992 focused public attention to our overall black bear management approach. Significantly more effort has been expended since 1992 on information, education, and preventive techniques for dealing with bears.

A MARK-RESIGHT SYSTEM FOR ESTIMATING BLACK BEAR DENSITY

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Abstract: A mark-resight system for estimating black bear density was evaluated on 2 areas of greatly different bear density and habitat types. A new bear trap was developed; significantly reducing injuries and increasing capture rates. Study areas (466 km^2, 404 km^2) were divided into 10.4 km^2 plots and each plot received one trap for 50-67% of trapping days. On both sites, over 90% of captures (n = 89 & 49) occurred in the first 60 days of activity. Capture efficiency (% of residents captured) was estimated to be 60 and 90+% on the 2 areas. Sex and age composition of the 2 samples was quite similar. Resighting was accomplished in the year following trapping with active infrared-triggered cameras, again placed at 1 camera/10.4 km^2. On the Uncompahgre study area, we obtained 524 pictures of black bears, of which 119 were collared. 89 of the 119 collared bears had pulled their ear tag/streamer combinations out, thus preventing unique identification. This required use of a more general population estimator with consequent wider variance. Estimated density was 36 bears/100 km^2 (93/100 mi^2). On the Middle Park study area, we obtained 108 pictures of bears, of which 77 were collared. A unique marker based on 2 colored dowels affixed to the collar was utilized. All markers remained intact, 90% of collared bears were identified based on these markers. Black bear density was estimated to be 8/100 km^2 (21/100 mi^2). Seasonal ranges and body size also varied between the areas. Time and duration of activity at camera sites indicated a strongly diurnal pattern with most site visits lasting <5 minutes. Recommended protocols involve trapping for a 60-day period followed by 4 14-day photographic resighting periods. Common problems with the camera systems were described.

ESTIMATING BLACK BEAR POPULATION SIZE AND TREND IN WASHINGTON STATE

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Abstract: Population size estimates are useful for population management, planning, and environmental impact assessment. Black bear population size in Washington was estimated from harvest data using a combination of cohort reconstruction and sex- and age-ratio techniques. This methodology produced a minimum population size estimate of ~25,600 black bears for 1988. Projection modeling using known harvests in combination with observed estimates of non-hunting mortality rates and reproductive rates indicated a mean rate of population increase of 2.6% per year from 1988-1996; Washington's black bear population thus increased a minimum of 22% during that period.

Key words: black bear, population size, reconstruction, Washington

Few population estimation techniques have been developed specifically for black bears (*Ursus americanus*), and those that have been (Fraser et al. 1982) tend to be poor models, even for trend analysis (Woolf and Roseberry 1991). Estimates of mortality rates and population size from age and sex ratios are widely used for ungulates, including techniques driven solely by harvest information (Woolf and Roseberry 1991). These techniques have seldom been applied to other game species. The principal reasoning behind the lack of wider application of these ratio techniques seems to be misunderstandings regarding their application. With ungulates, individuals are typically considered recruited at age 1.5. Thus, these techniques are usually used to estimate mortality rates, adult sex ratios, and population sizes of age 1.5 and older individuals. Since this leaves only one age class as subadult, total population estimates are straightforward. Since most/all applications of these techniques involve the proportions of 1.5 year olds, a common assumption is that they apply to only age 1.5 individuals, which are seldom represented proportionally in harvests of species such as bears. However, these techniques are designed to deal with the age of recruitment, or, even more generally, any specified age class, not solely with age 1.5 individuals.

A second assumption has been that these techniques work only with 1 subadult age class, e.g., adults are age 1.5 and older, and thus these individuals must be representative in sampling (harvest) data. This assumption is also incorrect. These methods assume only that the age class used is representative in the data. Thus, for black bears, where recruitment into the adult segment is usually defined as taking place at age 3.5 (occasionally 4.5), adult mortality rates, sex ratios, etc., can be estimated if age 3.5 individuals are proportionately represented in sampling data.

Little population information was available for black bears in Washington State. Available data consisted solely of estimated harvests, estimates of effort, and age structure of the harvest from 1988 on. Further, some of these data (specifically, the age structure data) were known to be biased against younger age classes of bear. I demonstrate the use of harvest driven ratio techniques to estimate black bear mortality rates and population size from historic harvest data in Washington State. My objective was to develop a minimum population estimate for black bears in 1988, and to project this minimum population through 1996 to assess the behavior of Washington's black bear population with respect to known harvest.

METHODS

Mortality Rates

Mortality rates for both male and female bears were estimated using both harvest age-structure and telemetry data. Harvest age class data was available from 1988-1994. Harvest data was biased towards older bear age-classes; 0.5-2.5 year old bears were underrepresented in the harvest data (Table 1).

Due to the lack of a representative harvest among subadults, age ratio methods were used to determine mortality rates for adult age 3.5 and older) bears. Three age ratio methods were used to estimate mortality rates; the Burgoyne (1981), Downing (1980), and Lang and Wood (1976) estimators. The Burgoyne (1981) and Downing (1980) estimators are unbiased; the Lang and Wood (1976) estimator is negatively biased. Additionally, the Burgoyne (1981) and Lang and Wood (1976) methods estimate a mortality rate for all adult (age 3.5 and older) bears; the Downing (1980) method estimates mortality specifically for the recruited class (age 3.5).

I also used a staggered-entry Kaplan-Meier estimator (Pollock et al. 1989) to calculate mortality rates from

Table 1. Washington male bear harvest by age class, 1988-1994.

	Year						
Age	**1988**	**1989**	**1990**	**1991**	**1992**	**1993**	**1994**
0.5	0	0	0	17	0	0	0
1.5	70	217	171	155	135	162	104
2.5	120	79	214	163	189	170	167
3.5	114	122	98	224	114	182	85
4.5	25	101	74	61	192	111	74
5.5	63	53	67	50	46	111	33
6.5	25	85	56	72	36	37	56
7.5	25	32	41	8	61	40	15
8.5	32	26	26	19	18	26	15
9.5	32	32	26	22	25	26	19
10.5	6	53	33	33	18	31	19
11.5	6	16	15	11	29	17	7
12.5	13	5	4	8	11	6	15
13.5	0	16	15	11	7	6	4
14.5	0	11	9	17	0	6	7
15.5	13	11	9	6	11	11	7
16.5	0	5	2	3	4	6	7
17.5	0	5	4	6	4	11	0
18.5	6	5	4	0	4	6	4
19.5	0	0	4	0	0	3	0
20.5	0	0	2	3	4	11	11
21.5	0	0	0	0	4	0	0
22.5	0	0	0	0	4	0	0
23.5	0	0	0	0	0	3	0
24.5	0	0	2	0	0	3	0
25.5	0	0	0	0	4	0	0
>25.5	0	0	2	0	4	3	4
Total	550	873	880	888	921	986	654

preliminary radio telemetry data collected during an ongoing black bear mortality study in Washington (S. Pozzanghera, Washington Department of Fish and Wildlife, personal communication). The capture records indicate that these rates also apply only to adult bears.

POPULATION ESTIMATION

Population reconstruction

Population reconstruction (Fry 1949) allows the determination of a minimum number of individuals in a population by summing harvested animals backwards through time within cohorts. For example, to estimate the minimum number of 0.5 year old bears alive in 1988, the following would be summed: (0.5 year old harvest in 1988) + (1.5 year olds harvested in 1989) + (2.5 yr olds in 1990) + (3.5 yr olds in 1991) + (4.5 yr olds in 1992) + (5.5 yr olds in 1993) +... This method will produce an estimate of the minimum number of individuals alive in any year. The closer harvest mortality gets to accounting for all mortality, the closer this minimum will be to the actual population. Additionally, the estimated population for any year will continue to increase in subsequent years until all cohorts from the evaluation year are dead. This represents a problem for applications involving black bears, which can live 25+ years, and still have significant numbers of 8-15 year olds harvested annually (Table 1). Despite these complications, I used cohort reconstruction to estimate minimum population sizes for adult male bears in Washington. Combined with mortality rates estimated from age-ratios, minimum population estimates

for the total bear population were obtained by: (1) determining the minimum number of adult males known alive in 1988 from cohort reconstruction; (2) correcting this estimate by the maximum estimated harvest rate for adult males in 1988; (3) determining adult female numbers from minimum adult boar: sow ratios in 1988; and (4) determining juvenile numbers from adult female numbers and productivity rates.

RESULTS AND DISCUSSION

Mortality

Ratio based mortality rate estimates pooled over years (1988-1994) were 0.269 (Burgoyne 1981 and Downing 1980) and 0.244 (Lang and Wood 1976) for males; female rates were 0.152 (Burgoyne 1981 and Downing 1980) and 0.083 Lang and Wood (1976). Adult male mortality rates for 1988 were 0.249 for the Burgoyne (1981) and Downing (1980) estimators and 0.201 for the Lang and Wood (1976) method. Adult female mortality rates were 0.168 for the Burgoyne (1981) and Downing (1980) estimators and 0.108 for the Lang and Wood (1976) method for 1988. The Lang and Wood (1976) estimates are negatively biased, and thus likely low. However, subsequent modeling indicates that the bear population in Washington was increasing (not stationary; see the population size and modeling section below). Thus, the Burgoyne (1981) and Downing (1980) estimates are overestimates (Woolf and Roseberry 1991). Corrected for the minimum rate of increase observed in the population (about 2.6%/yr), the Burgoyne (1981) and Downing (1980) rates would be 0.230 for adult males. The Kaplan-Meier estimates, although from small samples, were similar; 0.230 for males, and 0.125 for females where mortality was observed.

These results suggested generalized adult male mortality rates of ~0.25 and adult female rates of ~0.13. With this level of population mortality, at least 25% of newborn boars and 13% of newborn sows must survive until age 3.5 for the population to be stable. This translates into a minimum survival rate of approximately 0.65 for age 0.5, 1.5, and 2.5 males; the comparable rate for females would be ~0.5. Although mortality rates as high as 35% for subadult boars are certainly possible, they are at the high end of observed values (Kolenosky and Strathearn 1987, Gill and Beck 1990). Mortality rates of 50% for all subadult sow age classes are unlikely. The mortality rate analysis thus suggests that the Washington black bear population is not being limited by observed mortality rates, provided productivity is not unusually low (i.e., significantly less than ~2 cubs per adult female every other year).

Population Estimation

A minimum population estimate and projection for black bears in Washington State was developed using the following 7-step process.

1. *Reconstruct the 1988 population from males harvested, 1988-1994:* I used basic reconstruction (Fry 1949) to develop an absolute minimum 1988 male population (Table 2). Since the Washington data starts in 1988, only 6 age-classes were available for the 1988 reconstruction (and subsequently 5 for the 1989, 4 for the 1990, etc.). Therefore, I added to this a projection of harvest from 1995-2004, e.g., 10 years (Table 2). This was done to insure that the reconstructed 1988 cohort contained at least 15 age-classes. Since the 1995-2004 harvests are estimated, not known, I used the mean harvest from 1988-1994 as the projected harvest.

Table 2. The 1988 male cohort reconstruction (uncorrected and corrected) using a 10 yr projection of the average 1988-1994 male harvest.

	Male black bear numbers		
Age	Uncorrected 1988	Adjustment ADD	Corrected ADJ 88
0.5	1016	215	1231
1.5	406	175	581
2.5	457	146	603
3.5	460	123	583
4.5	205	92	297
5.5	271	75	346
6.5	155	69	224
7.5	149	63	212
8.5	132	57	189
9.5	128	46	174
10.5	55	40	95
11.5	60	29	89
12.5	61	23	84
13.5	33	20	53
14.5	37	9	46
15.5	33	9	42
16.5	13	9	22
17.5	16	6	22
18.5	15	3	18
19.5	3	3	6
20.5	4	0	4
21.5	7	0	7
22.5	6	0	6
23.5	0	0	0
24.5	2	0	2
25.5	0	0	0
>25.5	0	0	0
Total	3724		4936
>3.5	1845		2521

2. *Determine maximum harvest levels of adult males in 1988:* The actual harvest of age 3.5 and older males (353) was divided by the numbers of age 3.5 and older males reconstructed for the 1988 population (2521), i.e. 353/2521 = 0.140. Since the

reconstructed 1988 population was a minimum, the estimated harvest rate is a maximum estimate. As more data becomes available for the 1988 reconstruction, this harvest estimate will decrease.

3. *Determining the proportion of the 1988 population accounted for by harvest:* This was done by determining the proportion of total mortality captured in the harvest. The total adult mortality obtained from the Burgoyne (1981) estimator for 1988 (0.249) was divided by the estimated maximum percent harvest (0.140; from 2. above) to determine the ratio of the actual population to that represented only by harvest mortality, i.e. 0.249/0.140 = 1.78. The resulting value was the minimum expansion to convert harvest numbers into total numbers of adult males in 1988.
4. *Estimating the minimum 1988 male population:* This was obtained by multiplying the reconstructed numbers of bears (2521; a minimum estimate) by the minimum estimated expansion (1.78; from 3. above), i.e. 2521*1.78 = 4484. The result is the minimum estimate of the number of age 3.5 and older males in 1988.
5. *Estimating the minimum 1988 adult sow population*: The estimated adult male mortality rate for 1988 (0.249) was divided by the estimated adult female mortality rate (0.168) to obtain an unbiased adult sex ratio (Lang and Wood 1976), i.e. 0.249/0.168 = 1.48. This adult sex ratio assumes that recruitment is equal for both sexes into the 3.5 age class. This assumption is likely wrong; sub-adult male black bears usually show greater mortality rates than do subadult females (Elowe and Dodge 1989). By assuming equal subadult mortality, however, the estimated adult sex ratio is minimized [e.g., if subadult female mortality is less than subadult male, then the estimated adult sex ratio would be corrected for this by a value = (subadult male mortality rate)/(subadult female mortality rate), which would be >1, resulting in an increase in the estimated adult sex ratio]. By assuming equal subadult mortality, the number of adult females in the 1988 population is minimized, which further negatively biases the 1988 estimated population. The minimum adult sex ratio for 1988 (1.48) was then multiplied by the estimated adult male population in 1988 (4484) to obtain a minimum estimate of the numbers of adult females in 1988, i.e. 1.48*4484 = 6636.
6. *Estimate the minimum subadult population in 1988*: All of the age-ratio methods assume an age-stable stationary population (although they can be corrected for a growing or declining population, if necessary). Thus, to estimate the numbers of 0.5 year olds, I took the estimated number of adult females (a minimum estimate) and assumed a reproductive rate of 2 cubs every other year (i.e., a mean of 1 cub per year for age 3.5 and older bears; Washington Department of Fish and Wildlife 1995). Younger females were assumed not to reproduce [although this may be incorrect (Kolenosky and Strathearn 1987); however, it again contributes to a minimum population estimate]. Sex ratio at birth was assumed to be 50:50; numbers of each sex were thus 0.5*(no. adult females)*1.0, or 0.5*6636*1.0 =3318
cubs of either sex.

   Once I determined the number of 0.5 year old males, I divided the minimum estimate of 3.5 (recruited) males by this value to get an average mortality rate for subadults, i.e. 1038/3318 = 0.3. I then multiplied the number of 0.5 year olds by the inverse of this value (survival rate; 0.7) to obtain the number of 1.5 year olds, then multiplied the number of 1.5 year olds by the survival rate to obtain the number of 2.5 year olds, i.e. 3318*0.7 = 2323, and 2323*0.7 = 1626, respectively. Since equal mortality for subadults of both sexes was assumed (a negatively biasing assumption), these numbers are also minimum estimates for female black bears.

   The total population estimate for black bears in 1988 was then obtained by summing the numbers of age 0.5, 1.5, 2.5, and adults of both sexes, i.e. 3318+2323+1626+4484 = 11751 males, and 3318+2323+1626+6636 = 13903 females. The result was a minimum estimated population of 25,654 black bears in Washington State in 1988.
7. *Projecting the 1988 population:* I used Pop-II (Bartholow 1986) for population projections. I entered the 1988 population into POP-II along with the overall mortality and reproductive rates described above. Individual age and sex specific adult natural mortality rates were estimated from the literature, using values which reflected the observed overall rates for Washington bears (Table 3). Thus, projections begin in 1988 with (1) a minimum population estimate and (2) observed, high-end mortality rate estimates for all age and sex classes. The population was projected through 1996 using known harvests (+ an estimated 10% wounding loss).

   Modeling indicates that the Washington black bear population increased a minimum of 22% from 1988-1996 (Table 4). Since the population model was developed to be conservative due to the population minimizing assumptions described above, concerns that the Washington bear population was declining can be dismissed.

MANAGEMENT IMPLICATIONS

Black bear population sizes can be conservatively

Table 3. Initial inputs of the population projection model developed for minimum black bear population estimates in Washington.

	Population Proportions [a]		Preseason Mortality		Postseason Mortality		Young per 100 Sows
Age	M	F	M	F	M	F	
1	100	100	0.15	0.15	0.15	0.15	0
2	70	70	0.12	0.12	0.13	0.13	0
3	49	49	0.12	0.12	0.13	0.13	0
4	34	34	0.04	0.04	0.04	0.04	100
5	26	29	0.04	0.04	0.04	0.04	100
6	19	25	0.04	0.04	0.04	0.04	100
7	14	21	0.04	0.04	0.04	0.04	100
8	11	18	0.04	0.04	0.04	0.04	100
9	8	15	0.04	0.04	0.04	0.04	100
10	6	13	0.04	0.04	0.04	0.04	100
11	5	11	0.04	0.04	0.04	0.04	100
12	4	9	0.04	0.04	0.04	0.04	100
13	3	8	0.04	0.04	0.04	0.04	100
14	2	7	0.04	0.04	0.04	0.04	100
15	2	6	0.04	0.04	0.04	0.04	100
16	1	5	0.04	0.04	0.04	0.04	100
17	1	4	0.04	0.04	0.04	0.04	100
18	1	4	0.04	0.04	0.04	0.04	100
19	1	3	0.04	0.04	0.04	0.04	100
20	1	3	0.04	0.04	0.04	0.04	100
21	0	2	0.04	0.04	0.04	0.04	100
22	0	2	0.04	0.04	0.04	0.04	100
23	0	2	0.04	0.04	0.04	0.04	100
24	0	1	0.04	0.04	0.04	0.04	100
25	0	1	0.04	0.04	1.00	1.00	100

[a] To convert proportions onto actual population, use the following: Proportion * 25600/800

Table 4. Black bear population size and rate of population increase in Washington state, 1988-1996.

Year	Population	% Growth
1988	25,600	---
1989	26,572	3.8
1990	26,895	1.2
1991	27,395	1.9
1992	27,973	2.1
1993	28,559	2.1
1994	29,099	1.9
1995	30,253	4.0
1996	31,390	3.8

estimated from historic harvest data to aid in population management, planning, and impact assessment.

Population size estimation required data on harvest numbers and age structure, and utilized a combination of cohort reconstruction (Fry 1949) and ratio techniques to develop a minimum population estimate. Application of this method to Washington's black bear population resulted in a conservative population estimate of ~25,600 black bears in 1988, which increased by a mean of ~2.6% per year when projected using known harvests and observed mortality rates. This indicated that the Washington bear population was not being limited by harvesting, or overharvested, during the period of 1988-1996, as alleged by certain publics during the development and review of the draft environmental impact statement for the Washington state management plan for black bear (Washington Department of Fish and Wildlife 1995). Since the black

bear harvest in Washington is likely to decline in the future due to the banning of bait and hound hunting for bear and cougar (*Puma concolor*) by public referendum in 1996, the bear population will in all probability continue to increase, possibly at an accelerated rate. Bear-human conflicts are likely to increase in the future in Washington as the growing black bear population clashes with expanding urban and suburban encroachment in historic bear habitats.

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PRELIMINARY ASSESSMENT OF MEASURE 18, PART I: EFFECTS ON HUNTER PARTICIPATION AND SOCIAL IMPLICATIONS

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Abstract: In 1994, an Oregon voter initiative (Measure 18) banned the use of hounds and bait for hunting black bears (*Ursus americanus*) and hounds for hunting cougars (*Felis concolor*). Measure 18 passed 51.8% to 48.2% (1,215,553 votes), with 9 of 36 counties favoring Measure 18. However, the measure was numerically passed by a single county (Multnomah), which contains most of the city of Portland and 20.1% of the Oregon population. In 1996, another initiative attempted to overturn the ban on hounds and bait (Measure 34). Measure 34 failed by a 42.8% to 57.2% margin (1,333,782 votes) and was voted down in 15 counties. Bear tag sales initially dropped in 1995, the first year Measure 18 was in effect, then increased substantially in 1996 (1993, n=18,066; 1994, n=18,204; 1995, n=14,695; 1996, n=22,140). An extension of the tag sale deadline contributed to the increase in tag sales in 1996. In addition, some of the increase was due to hunters buying tags for the first time. Hunters who purchased bear tags and had them validated for hunting in the Indigo and McKenzie Wildlife Management Units (WMU=s) during 1996 (n=766) were surveyed by telephone to determine the effects of Measure 18 on hunters. Of the Indigo and McKenzie WMU bear tag holders, 198 (25.8%) had never hunted bears prior to the passage of Measure 18. These hunters cited seeing more bears or bear sign as a predominant reason for purchasing a bear tag. Some (17.2%) of the surveyed hunters agreed with the ban imposed by Measure 18. The most frequently stated opinions of those hunters that agreed with Measure 18 were that: baiting was an acceptable method but hounding was not, the methods had needed to be more regulated prior to Measure 18, that there was more hunting opportunity since the passage of Measure 18, that bear populations would increase, and that using dogs was an acceptable method for hunting cougars but not bear. Those hunters who disagreed with Measure 18 often stated that Oregon Department of Fish and Wildlife should have sole responsibility for management of wildlife, that bear and cougar populations would increase, and that there should be no restrictions on hunting privileges. Indigo and McKenzie WMU bear tag holders who continued to purchase bear tags after the passage of Measure 18 (n=565) used the following methods to hunt bear after Measure 18: 61.6% incidental, 33.3% stalking/still hunting, and 5.0% other/unknown. These same hunters used the following methods prior to Measure 18: 48.6% incidental, 23.5% stalking/still hunting, 13.8% baiting, 12.6% hounds, and 1.4% other. Between 1990 and 1996, Oregon=s population grew 8.4%, with most growth concentrated in urban areas. These population trends and other social trends (e.g., decreased percentage of the public purchasing hunting licenses and increased use of the ballot initiative as a form of direct government) will likely exacerbate tension between rural and urban areas regarding wildlife issues.

Black bear (*Ursus americanus*) management in Oregon has been determined through the traditional processes of legislation, regulations, and management plans (Table 1). Increasingly, issues surrounding black bear management are sociological rather biological in nature (Beck et al. 1995). Since 1994, there have been 2 voter initiatives dealing with bear management issues in Oregon. In 1994, a voter initiative (Measure 18) banned the use of hounds and bait for hunting bears and the use of hounds for hunting cougars (*Puma concolor*). Measure 18 passed (51.8% to 48.2%; 1,215,553 total votes), with 9 of 36 counties favoring Measure 18. In 1996, another initiative (Measure 34) attempted to overturn the ban on hounds and bait by giving the Oregon Department of Fish and Wildlife (ODFW) and the Oregon Fish and Wildlife Commission sole responsibility for future wildlife-oriented regulations and by canceling all wildlife-oriented regulations created by any authority other than ODFW or the Commission since 1975. Measure 34 failed (42.8% to 57.2%; 1,333,782 total votes) and was rejected in 15 counties. The counties that voted against both measures (voted against the ban and against its repeal) had rejected Measure 18 by relatively narrow margins in 1994. During both initiatives, the debate was emotional and bitter, with extreme statements made by representatives of both sides of the issue.

ODFW biologists tended to personally oppose Measure 18 and support Measure 34 because: (1) the 1993 Oregon Black Bear Management Plan states that ODFW recognizes the proper use of hounds and bait as legitimate methods by which to hunt black bear (ODFW 1993, p. 28); (2) biologists anticipated increased human-animal conflicts resulting from already increasing populations of bear and cougar; (3) ODFW personnel had concerns regarding the use of ballot initiatives for wildlife management; and (4) Measure 18 would be difficult to enforce as written because hunting with bait and with hounds are dispersed activities, using hounds is still a legal method

Table 1. History of bear management in Oregon (ODFW 1993).

Before 1925	Classified as a predator; unrestricted harvest
1925	Classified as game mammal; hunting seasons and bag limits established in some areas
1943	Removed from game mammal status; unrestricted harvest
1961	Classified as game mammal except where damage was expected
1968-69	Bear pursuit season allowed for 2 years
1970	Classified as game mammal statewide
1971	Spring hunting season allowed for 1 year only
1974	Bear tag required of all bear hunters. Tag cost $2.
1975	Cubs and sow with cubs protected; current hunting season established
1978	Bear tag sale deadline established
1979	Price of bear tag increased to $4
1979-87	Bear pursuit season authorized
1981	Price of bear tag increased to $5
1985	Controlled spring hunts authorized for some areas
1987	Black Bear Management Plan developed and adopted by the Oregon Fish and Wildlife Commission
1988	Price of bear tag increased to $10
1993	Management plan revised and adopted
1993	Black bear ecology research projects initiated
1994	Measure 18 passed, banning the use of dogs and bait to hunt bears
1995	First bear season ban in effect
1996	Measure 34 failed to overturn ban

to hunt other species, and violators would have to be caught actually shooting a bear that had been treed by hounds. However, ODFW personnel were limited in their authorization to comment on Measure 18 due to Oregon Regulatory Statute 260.432(2), which states that "no public employee shall solicit any money, influence, service...or otherwise promote or oppose...the gathering of signatures on an initiative, referendum or recall petition, [or] the adoption of a measure...while on the job during working hours." The state Attorney General interpreted the statute as follows, "public bodies may use public funds to inform voters of facts pertinent to a measure, if the information is not used to lead voters to support or oppose a particular position" (memo dated 10/05/93). The Oregon Secretary of State also stated that "(information) prepared or distributed by public employees must be impartial," which was defined as equitable, fair, unbiased, dispassionate, and with a balance of factual information (memo circulated to all Agency Administrators, dated 2/15/94). Thus, ODFW personnel were authorized only to provide biological data; such as harvest levels and the number of bear and cougar damage complaints. Some hunting constituency groups interpreted ODFW's neutral position on Measure 18 as abandoning ODFW's traditional role as an advocate for hunters and hunters' rights.

Both ODFW and the Oregon Legislature attempted to lessen the anticipated impact of Measure 18 on both hunters and harvest rates. In response to Measure 18, ODFW liberalized tag sales for both bear and cougar by extending the sale deadline for bear and cougar tags, by changing the cougar season from a controlled to a general hunt, and by lengthening the cougar season. During the 1995 and 1997 sessions of the Oregon Legislature, lawmakers introduced 14 bills that directly or indirectly dealt with Measure 18, in reaction to concerns about potential human-animal conflicts (property damage and human safety). Three bills passed: one permitting ODFW to refund tag fees to bear and cougar hunters until December 31, 1995 (HB2601, 1995), one dictating that compensation for bear and cougar damage would not be paid with State Wildlife Fund moneys (HB2568, 1995), and one lowering the price of a cougar tag from $50 to $10 (SB403, 1997). Other bills that were introduced, but not passed, included: a full repeal of Measure 18 (HB 2584, 1995), a 2-year suspension of Measure 18 to allow ODFW to study the impacts (HB 2657, 1995), authorization of pursuit seasons for bear and cougar (SB 792, 1995), authorization for individual counties to place ballot measures regarding hunting of bear and cougar (SB 533, 1995), provision for individuals to act as agents of the State in bear and cougar management activities (HB 3338 and 3339, 1995), and authorization for ODFW and law enforcement personnel to advocate a position on initiative measures relating to wildlife resources (HB 2570, 1995).

The methods of hounding and baiting are more efficient methods for harvesting bears than other methods (e.g., stalking, calling, incidental) and provide the hunter with greater opportunity for selection (Litvaitis and Kane 1994). Because ≥25% of the bear hunters hunted with either bait or dogs and these techniques accounted for a significant proportion of the bears harvested prior to Measure 18, the ban was

expected to have effects on bear tag sales, hunter participation, hunter effort, and bear harvest rates. In order to assess the impacts of Measure 18 on bear hunters in Oregon, 2 telephone surveys of bear tag holders were conducted and preliminary data on bear tag sales and bear harvest were analyzed. This assessment was done in conjunction with an ongoing black bear research project in western Oregon.

METHODS

The study area is located on the west slope of the Cascade Mountains approximately 70 kilometers southeast of Eugene, OR and encompasses approximately 1800 km^2. Since 1993, 88 individual black bears have been captured using Aldrich foot snares (Flowers 1977) and instrumented with radio-collars. Standard biological measurements and samples were taken at capture. Bears were monitored from both the ground and air to evaluate survival, reproduction, home range, habitat use, and denning habits. In order to better evaluate hunting pressure and harvest levels, special bear hunting regulations were enacted for the Indigo and McKenzie Wildlife Management Units (WMU's), in which the study area was located. Hunters were required to have their bear tag validated prior to hunting in these WMU's and all bears harvested from these WMU's were required to be checked-in at an ODFW office. Hunter check stations were used to estimate compliance with the regulations. Bear tags were checked for validation, and if the tag was not validated, ODFW personnel validated the tag and gave the hunter information on the research project.

Two telephone surveys were conducted, during which hunters who validated their bear tags were called. In December 1996, an attempt was made to contact all hunters who had their bear tags validated in 1996. Hunters were asked standardized questions on hunting methods, hunting success, and opinions regarding Measure 18. In April 1997, hunters who validated their bear tags in 1993, but not in 1996, were called and asked standardized questions on hunting methods and opinions regarding Measure 18. In the April 1997 survey, an attempt to contact all hunters was not made; rather hunters were called until a predetermined minimum number (n=100) of hunters who no longer validated bear tags were surveyed. A total of 766 hunters were surveyed in the December 1996 survey and 155 were contacted during the April 1997 survey.

RESULTS

Historically, the number of bear tags sold has followed trends in deer tag sales and has been influenced by regulation changes, changes in the tag sale deadline, and increases in tag price. Bear tag sales initially dropped in 1995, the first year Measure 18 was in effect, then increased substantially in 1996 (1993, n=18,066; 1994, n=18,204; 1995, n=14,695; 1996, n=22,140). The increase in tag sales in 1996 was partially due to the extension of the tag sale deadline (Carter In press). Also, some of the increase could be attributed to hunters buying tags for the first time. Of the phone-surveyed Indigo and McKenzie bear tag holders (n=766), 198 (25.8%) had never hunted bears prior to the passage of Measure 18. These hunters cited a variety of reasons for their recent bear tag purchase: seeing more bears or bear sign or seeing bears while scouting or hunting (39.7%), no reason/just in case (12.5%), to have another hunting opportunity (10.6%), friends/relatives had tags (9.5%), hunting a new area (6.5%), and other reasons (12.1%).

As expected, most (79.5%) of the Indigo and McKenzie WMU bear tag holders surveyed disagreed with Measure 18, 17.2% agreed with the measure, 2.2% had no opinion, and 1.1% were undecided (n=766). The fact that a yes vote had opposite consequences for the 2 Measures did not confuse hunters. Hunters surveyed were aware of both measures and were mostly consistent in their opinions. However, 10.6% of the hunters who agreed with the ban (n=132) also agreed with its appeal. These hunters stated that they approved of the ban, but wanted ODFW to make management decisions. Of the 1993 tag holders, 98.6% disagreed with Measure 18.

Hunters were not asked why they agreed or disagreed with Measure 18; however, some hunters volunteered their opinions. The most frequently stated opinions of those hunters that agreed with Measure 18 (n=61) were that: baiting was an acceptable method but hounding was not, the hunting methods had needed to be more regulated, that there was more hunting opportunity since the passage of Measure 18, that bear populations would increase, and that using dogs was acceptable method for hunting cougars but not bear (Figure 1). Those hunters who disagreed with Measure 18 (n=122) often stated that ODFW should have sole responsibility for management of wildlife, that bear and cougar populations would increase, and that there should be no restrictions on hunting privileges (Figure 1).

Of the hunters who continued purchasing bear tags after Measure 18 was enacted (n=565), 30.8% changed hunting methods in response to the Measure. Surveyed bear hunters used the following methods to hunt bear prior to Measure 18 (n=565): 48.6% incidental, 23.5% stalking/still hunting, 13.8% baiting, 12.6% hounds, and 1.4% other. After Measure 18, these hunters used: 61.6% incidental, 33.3% stalking/still hunting, and 5.0% other/unknown.

Of the surveyed hunters that had validated their bear tags in 1993 but not 1996 (n=155), 37 hunters had purchased a bear tag, but had decided not to validate the

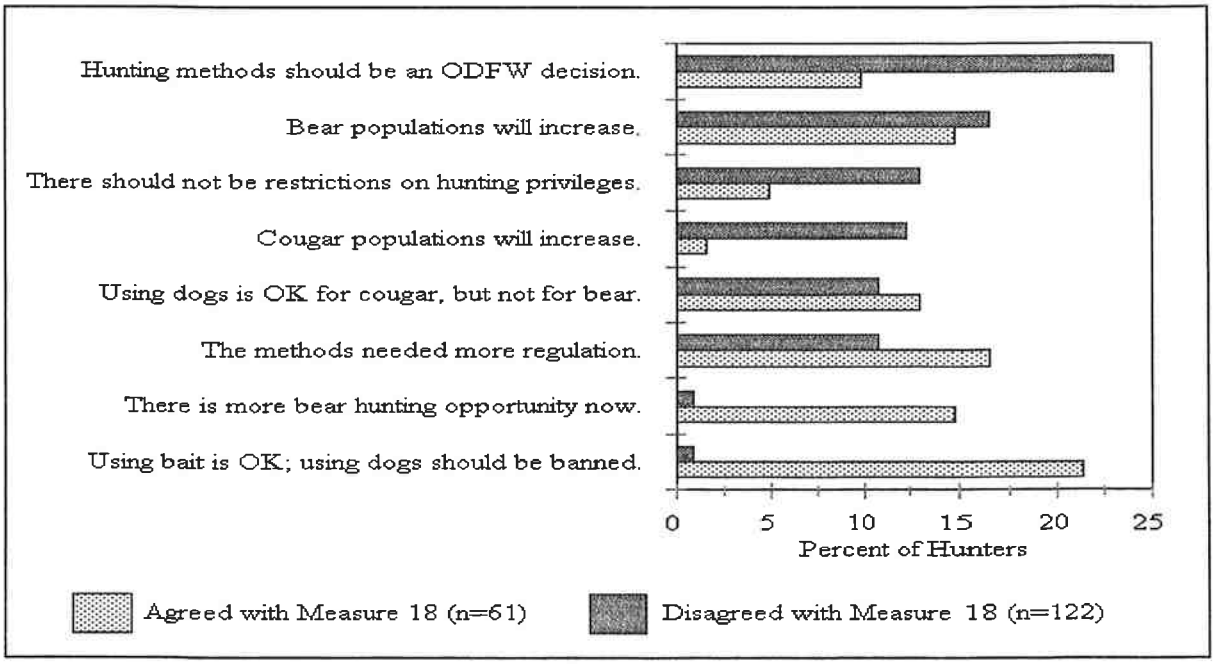

Figure 1. Volunteered opinions of bear hunters surveyed in 1996. Bars represent percent of hunters in each group (Disagreed with Measure 18 and Agreed with Measure 18) who made the statement. Hunters may have made more than one statement.

tag. Approximately half of these hunters (n=18) had previously used either dogs or bait to hunt bear and had since changed hunting method in response to Measure 18. Of the hunters who did not purchase bear tags (n=128), most (64.4%), had previously used dogs to hunt bear. The reasons cited by hunters for not purchasing bear tags in 1996 included: directly because of Measure 18 (71.2%), no time (8.5%), lost interest in bear hunting (6.8%), and other reasons (13.6%). The hunters who did not purchase bear tags directly because of Measure 18 had stopped hunting bears altogether.

DISCUSSION

Twenty-six states and hundreds of localities have some form of direct legislation, in which voters approve or reject legislation (Cronin 1989). Direct Legislation has been part of the Oregon political process since 1902. There are 3 methods of direct legislation in Oregon: referral (refers new law to voters, initiated by the Oregon Legislature), referendum (refers law enacted by Legislature to voters, initiated by voter petition), and initiative (refers new law to voters, initiated by voter petition). Since the voter initiative was introduced in Oregon, there has been 288 initiatives, of which 34% have passed (Keisling 1997). Use of the initiative was highest early in this century; however, interest seems to be increasing in the use of the initiative as a means of bypassing the regulatory and legislative processes to enact new laws. From 1980-92, there was an average of 7 (SD=3.1) voter initiatives and referenda on the November ballot in Oregon. In the 1994 election, there were 18 ballot measures, of which 16 were voter initiatives. In the 1996 election, there were 23 ballot measures, of which 16 were voter initiatives. Direct legislation is popular with voters, and there is increasing use of the initiative process in states that have it (Cronin 1989). This increased use of initiatives has created an enormous amount of information for the voters to evaluate, which could limit the amount of attention voters will devote to any one issue. A high number of initiatives could also increase voter reliance on the media for information, increasing the influence of well-choreographed campaigns.

There have been only 3 initiatives concerning the management of wildlife since 1902: Measure 5 in 1980 (failed, would have banned the sale and use of snare and leghold traps for most purposes), Measure 18 in 1994, and Measure 34 in 1996. When interested citizens feel disenfranchised from the normal process of developing public policy, they may seek alternative avenues of influence (Schmidt 1990, Race et al. 1991). Also, initiatives are an effective tool for special interest/single interest groups, and offer the opportunity for less represented interests to bring their message and legislation to the public (Cronin 1989). As a group, hunters are vulnerable to majority rule in the initiative process since they represent a decreasing minority of the Oregon population. Traditionally, approximately 15% of Oregon citizens purchased either hunting or combination hunting/fishing licenses (Figure 2). However, the number of hunters has declined while the Oregon population has grown, resulting in hunters only

representing 9.3% of the Oregon population in 1994 (Figure 2). This pattern mirrors nationwide trends (Schmidt 1996). Given the increased use of the ballot initiative, particularly by animal welfare and animal rights groups, wildlife managers in Oregon are likely to face more voter mandates, or at least more public debate on wildlife issues in the future.

The vote on Measure 18 was in part representative of a clash between urban and rural values. Measure 18 was passed by voters in Oregon's urban centers; it was carried by a single county (Multnomah), which contains most of the city of Portland and 20.1% of the Oregon population. Oregon's economy has been changing from one dominated by a resource-based economy, principally forest products, to a more diverse economy with economic growth occurring mostly in the high technology and service industry sectors (Keisling 1997). Economic factors in both Oregon and California have contributed to an influx of people into Oregon. Oregon=s population grew 8.4% between 1990 and 1996, with most growth concentrated in urban areas (Keisling 1997). Seventy percent of the population growth was due to people moving into the state (Keisling 1997), which may influence the opinions and values of the voting public. These population trends will likely exacerbate tension between rural and urban areas regarding wildlife issues.

Opponents of the ban on baiting and hounding lost voter support during the Measure 34 campaign. Whereas the ban (Measure 18) was approved by 9 of 36 counties with a margin of 3.6%, the repeal of the ban (Measure 34) was rejected by 15 counties and a margin of 14.4%. The broad, indirect approach of Measure 34 did not seem to appeal to voters and may have been its major weakness. The first provision would have prevented any future voter initiatives dealing with wildlife management issues and prevented other Oregon State Departments, such as Parks and Recreation, Forestry, and Environmental Quality, from implementing regulations regarding wildlife. The second provision would have repealed all regulations implemented by agencies other than ODFW, as well as repealing Measure 18. Most newspapers and voting guides recommended voters to vote against Measure 34.

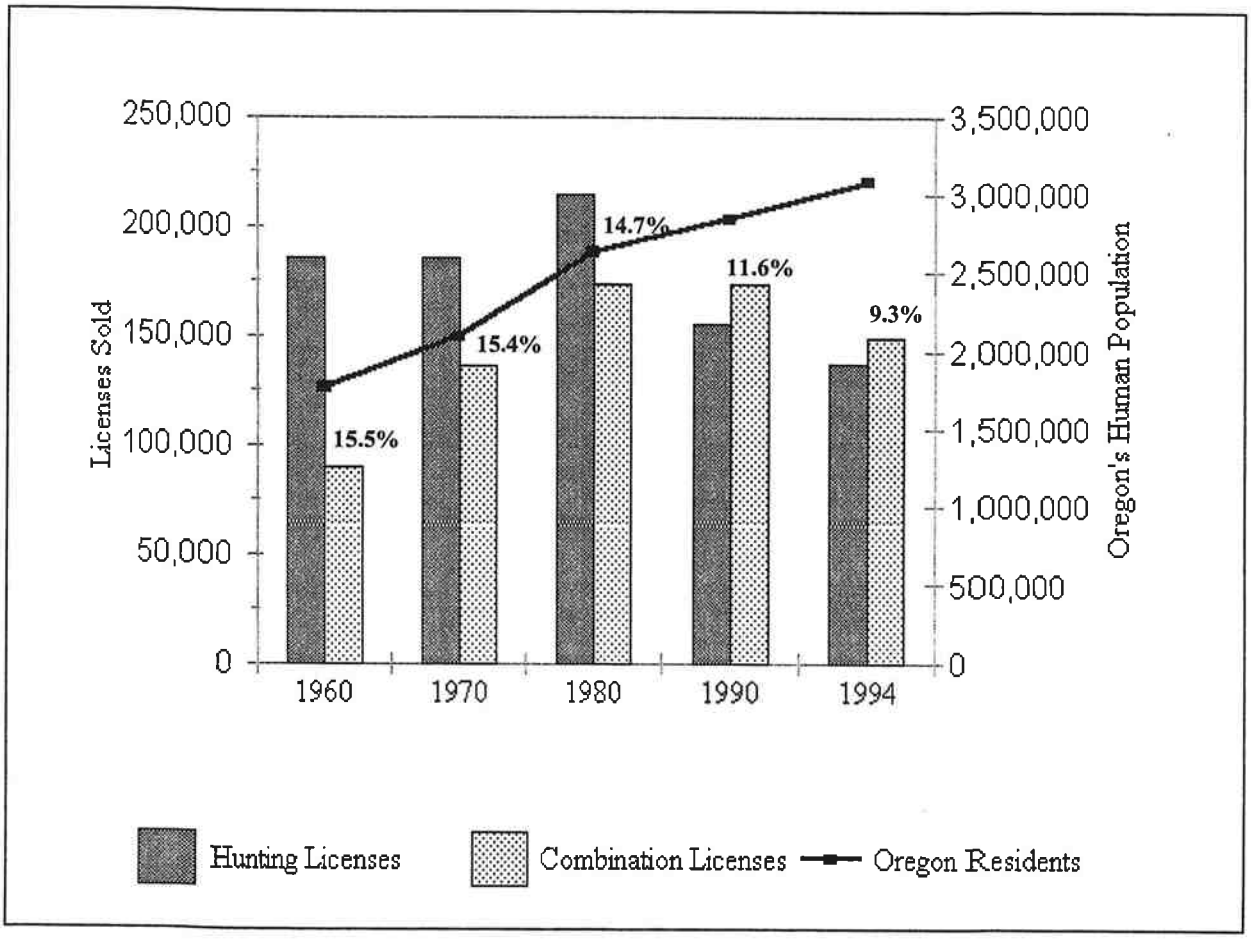

Figure 2. Number of resident hunting and combination (hunting and angling) licenses sold relative to number of Oregon residents. Numbers indicate the percent of the Oregon public purchasing either a hunting or combination license.

As an example, the Eugene Register Guard compared Measure 34 to the Mississippi River, broad and murky, and stated that it was a dishonest approach to overturning Measure 18 (editorial dated 10/14/96). Other factors may have also contributed to Measure 34's overwhelming defeat, including the Halo Effect, in which laws gain public support when enacted (B. Lunch, personal communication). The success of a Measure--as indicated by approval of a majority of voters--is taken as a sign of legitimacy, thus voters are less likely to overturn a law once passed by initiative (B. Lunch, personal communication). Lastly, dramatic commercials sponsored by proponents for the ban on hounding and baiting may have further influenced voter opinions. Commercials sponsored by the "No on 34 Committee" showed a video of a yearling bear being attacked by several hounds. The increased publicity regarding the issue, with persuasive commercials, may have convinced some voters to change their opinions.

Measure 18 has made bear hunting more attractive to some hunters who traditionally did not purchase bear tags. Bear tag sales decreased after Measure 18, then dramatically increased. Extending the deadline for bear tag sales by one month contributed to the increase in tag sales (Carter, *In press*). The increase was also due in part to hunters purchasing a bear tag for the first time. Over a quarter of surveyed bear tag holders had never purchased a tag prior to Measure 18. The most common reason these hunters stated for purchasing tags was because they were seeing more bears or bear sign. They believed they had a greater chance to harvest a bear because of Measure 18 due either to a perceived increase in bear populations (as a result of decreased hunting pressure) or to increased bear activity (as a result of bears not being chased by hounds). Because bears have slow reproductive rates, population size would not be expected to change drastically in the 2 years Measure 18 has been in effect. Bears have been documented to alter movements in response to disturbance, particularly as related to road density and vehicular traffic (Brody and Pelton 1989). Bears may increase mobility and daytime activity with less disturbance, yet bear mobility and activity will also be influenced by annual variation in food availability (quantity, quality, and patchiness) and denning chronology (Lindzey 1981). Nonetheless, whether or not there has been any change in bear populations or behavior, the perception of these changes is motivating some hunters to purchase bear tags. Since Measure 18 was enacted, most (62%) hunters who purchase bear tags do not hunt specifically for bear, but rather have a bear tag in case they happen to see a bear while hunting deer or elk. The current price of a bear tag is not prohibitive ($10), so hunters would be expected to purchase tags as long as they perceive their chances of harvesting a bear to be great enough to justify purchasing a tag. Tags sales may eventually decrease, depending on hunter success rates, but would be expected to remain within historic variation.

The majority of bear hunters continued to purchase bear tags after Measure 18, although approximately a third of surveyed bear hunters were forced to change their hunting methods. Measure 18 caused some hunters to discontinue hunting bears completely, particularly those who have traditionally used dogs. Hunters who use dogs often cite the satisfaction of working with the dogs and hearing the chase as the primary reason they enjoy the sport, rather than killing a bear (Elowe 1990). Thus many houndsmen in Oregon may have chosen to either leave the sport altogether or to hunt bears in other states where hounding is still legal, rather than hunt bears in Oregon using different methods. It is still legal in Oregon to hunt other species, such as bobcat, coyote, and raccoons with dogs, so some hunters who use dogs may choose to switch to other species.

Hunters who purchased bear tags had diverse opinions regarding Measure 18. A surprising number of bear hunters agreed with Measure 18. Hunters who agreed with Measure 18 tended to either have used stalking as their method to hunt bears prior to Measure 18 or did not hunt bears prior to Measure 18. This may reflect differences within the hunting community and historical tension between some hunter groups (e.g., bow hunters who object to perceived disturbance of game by dogs). Such user-group differences have been documented among bear hunters in other states (DuBrock et al. 1978, Peyton 1989). Hunters who disagreed with Measure 18 expressed concerns that hunting issues should be decided by ODFW, not by voters, and that there should not be additional restrictions on hunting privileges. These concerns were cited by surveyed opponents of a similar ban on baiting and hounding in Colorado (Loker and Decker 1995). Surveyed supporters of Colorado's Amendment 10, who were mostly non-hunters, cited concerns regarding the well being of the bears (either at the individual animal welfare level or the population level) and the ethical aspects of hunting (i.e., sportsmanship) (Loker and Decker 1995). In contrast, Oregon bear hunters who agreed with Measure 18 thought using bait was a more acceptable method than using dogs; that baiting and hounding should have been regulated more stringently previously; and that there is more bear hunting opportunity for other hunters since the ban took effect. Most hunters surveyed believed that bear populations would increase as a result of the Measure. However, those who agreed with Measure 18 tended to think that increased bear populations would be positive due to increased hunting opportunity, while those who disagreed with Measure 18 thought that increased bear populations would be negative due to increased damage

to property and other human-bear conflicts. It will be difficult to obtain the support of the non-hunting public for hunting with dogs and bait given these diverse views and lack of consistent support by individuals in Oregon's bear hunting community.

Voter initiatives have the potential to limit ODFW's ability to manage populations of wildlife and to provide for wildlife-based recreation. Once an issue reaches the initiative stage, Oregon public employees are limited in the type of information they may provide to the public. Once an initiative becomes law, it is more difficult to overturn (B. Lunch, personal communication). A proactive approach that combines public outreach and education with efforts to determine people's attitudes towards hunting, ethics, and specific issues may help agencies predict and address issues before they reach the initiative stage.

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PLANNING FOR WILDLIFE VIEWING AMONG A HOST OF CONFOUNDING ECOLOGICAL VARIABLES: AN ADAPTIVE MANAGEMENT APPROACH

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Abstract: Striking a balance between wildlife impacts and visitor access at viewing sites is complicated by all the variability characteristic of single site field studies. In 1993, the USDA Forest Service initiated a cooperative study with Utah State University on the effects of rapidly increasing visitation on bears at Anan Creek, Tongass National Forest. This behavioral study on black bears (*Ursus americanus*) provides 4 years of data on a range of observed measures correlated with visitor numbers. Clear interpretation was confounded by annual variation in a number of ecological factors including increasing brown bear (*Ursus arctos*) activity, berry availability and salmon abundance. An adaptive management approach provided the experimental structure to unravel some of the system s complexity. Serial monitoring over 4 years identified subtle human and other biotic impacts on black bear activity.

Key words: adaptive management, black bear, brown bear, human-bear interactions, Southeast Alaska, wildlife viewing, *Ursus americanus, Ursus arctos.*

Wildlife-viewing programs have gained wide acceptance and have increased in popularity in recent years (Edington and Edington 1986). In particular, opportunities to observe charismatic megafauna such as bears in their natural environment have captured a great deal of attention (Swanson et al. 1992). Currently, most of the well-known bear-viewing sites are found in Alaska on or near salmon streams where bears concentrate in large numbers during the summer months to feed on migrating and spawning fish. During the past 10 years, these sites have experienced escalating application and visitation rates, some doubling each year (Chi and Gilbert 1996, Fagen and Fagen 1994, Olson and Gilbert 1994). While some programs, such as the McNeil River State Game Sanctuary, have long capped visitor numbers (Aumiller and Matt 1994), others lack such a mechanism to manage for increasing visitation (Neary 1995).

As the popularity of bear-viewing has increased, research on human-bear interactions has expanded, examining how viewing activities affect the behavior and population trends of bears. These investigations indicate that while some bears habituate to the presence of human observers, others appear to actively avoid areas of high human use (Braaten 1988, Fagen and Fagen 1994, Rogers 1989, Olson 1993, Olson and Gilbert 1994, Warner 1983). Because overwinter survival of these large omnivores is dependent on their ability to build up fat for hibernation, displacement of non-habituated bears from critical foraging areas due to the presence of people may affect their fitness if alternative sources of food are unavailable (Archibald et al. 1987, Gilbert 1989). Thus, a current concern to biologists and wildlife managers is the effect that unprecedented expansion of viewing programs is having on bears. Managers and planners need a basis for predicting impact thresholds on habituated and non-habituated individuals to find a balance between resource protection and public access.

Determining such thresholds, however, can be problematic due to the complexity and natural variation inherent to most ecological systems, salmon streams being no exception. On any given day, a bears foraging choices could be influenced by a number of variables in addition to human activity. These include availability and productivity of primary and alternative food sources, inter-and intra-specific competition, ambient temperature, etc. Furthermore, annual variation in these variables could mask the effects of anthropogenic exploitation resulting in a misinterpretation of human impacts on a resource (Gutzwiller 1993, Krausman and Bolen 1996). In the end, sound management may be obstructed by a lack of understanding of cause and effect relationships (Gutzwiller 1993, page 528). While controlled experimental studies might disassemble some of the complexity associated with biological systems, field biologists typically do not have the luxury of manipulating variables due to logistical, political or economic constraints. More to the point, this type of ecological research frequently is being conducted for urgent management purposes, which does not permit a study of temporal variation (Krausman and Bolen 1996). These constraints to ecological understanding lead one to question how science can be utilized to obtain answers in complex, highly variable systems when time is limited.

Walters (1986) has proposed adaptive management to address some of the limitations associated with management- oriented field research (Ringold et al. 1996). Adaptive management facilitates

hypothetico-deductive inferencing through use of management strategies as experimental manipulations in the presence of a consistent monitoring protocol (Irwin and Wigley 1993, Lee 1993). This approach may be especially suitable for the development and evaluation of viewing programs for several reasons. First, it acknowledges that our knowledge and understanding of most ecological systems is imperfect and anticipates that results may differ dramatically from those expected (Lee 1993, Ringold et al. 1996, Williams et al. 1996). Second, it functions as a feedback system such that information gained through experimentation can be used to update the existing knowledge and to refine current management strategies (Gutzwiller 1993, Ringold et al. 1996). Lastly, it provides choices to managers because it takes into account uncertainty, and offers flexibility in implementing management decisions (Lee 1993).

This paper examined the impacts of human activity on black bear behavior at Anan Creek, a wildlife-viewing site in Southeast Alaska, within an adaptive management framework. Visitor numbers at this site have been rapidly escalating for the past decade from 1400 in 1991 to almost 4000 in 1995 (USFS 1996). In 1993 Utah State University, in cooperation with the U.S. Forest Service, commenced a 3-year study on human-bear interactions and black bear ecology at Anan Creek. Results of this study indicated tolerance thresholds of bears to people at a viewing observatory and the potential for displacement of non-habituated individuals further upstream where human activity has been limited (Chi and Gilbert 1996). In 1996, the U.S. Forest implemented management changes under the premise that potential effects of these changes would be examined and evaluated. Our objectives were 1) to determine the efficacy of these changes in meeting management goals and 2) to test hypotheses concerning black bear responses to people based on prior monitoring.

STUDY AREA

Anan Creek is located approximately 40 km southeast of Wrangell on the Tongass National Forest. It is accessible only by float-plane or boat. The region is characterized by coastal forests of Sitka spruce (*Picea sitchensis*) and western hemlock (*Thuga plicata*), interspersed with alder (*Alnus spp.*) and black cottonwood (Populus trichocarpa) along riparian zones. The left fork of Anan Creek is wide and flat providing suitable spawning habitat for pink salmon (*Oncorhynchus gorbuscha*). Both black bears and brown bears come to Anan Creek to feed on abundant salmon from early July to mid-September. Two sets of falls impede movement of salmon making them particularly vulnerable to capture by bears. The lower falls, accessible by a boardwalk and trail, is located about 0.8 km from the trailhead at the mouth of the lagoon. A bear-viewing observatory was constructed on a cliff approximately 12 meters above the lower falls for public use. The upper falls area, 0.40 km from the lower falls, has been closed to the public since 1992 Restrictions and changes implemented by U.S. Forest Service in 1996

Prior to 1996, there were few restrictions on visitation to the lower falls observatory other than on the size of guided groups (< 12 people including the guide). In 1996, the U.S. Forest Service imposed limits on the number and size of guided groups as they have been the largest growing faction of visitor clientele over the past 4 years (USFS 1996). Their goal was to maintain visitor numbers on the observatory to less than twenty at one time in order to reduce disturbance to bears fishing at this site. In addition, access to the upper falls was permitted to visitor groups no larger than 6 people using a lottery system each day to determine participants. Groups were guided to the upper falls by a Forest Service interpreter between 1200 and 1400 hours.

BASELINE PATTERNS AND HYPOTHESIZED INTERACTIONS

Between 1993 and 1995, we documented patterns in black bear behavior and activity that seemed related to human disturbance (Chi and Gilbert 1996). First, there appeared to be a relationship between visitor numbers on the observatory and bear activity at the lower falls indicating a threshold effect. Second, data suggested subtle diel shifts in bout lengths at the lower falls in response to high human activity between 1000 and 1400 hours. Lastly, black bear activity was consistently higher at the upper falls throughout all three years of the study. Although this pattern can be attributed in part to superior fishing opportunities and increased cover in the form of rock caves at this site, we believe that some bears (large males in particular) frequented the upper falls to avoid visitor disturbance near the lower falls. This conclusion was based on a statistical analysis of the effect of researcher arrival on bears present at this site.

Based on these results, we hypothesized the following causal relationships:

a. Restricted visitor numbers will be accompanied by increased bout lengths compared to previous years;
b. Limitations on guided groups should result in fewer people on the observatory at one time; and
c. Bear activity at the upper falls will be lower when guided groups are present than when no visitors are on site.

METHODS

Data was collected between 6 July and 27 August 1996. Observations were made at the lower falls from the observatory. At the upper falls data was collected either from an elevated tree platform/blind (1.5 m x 2.5 m, 12 m high) located on the north bank of the creek or from the old ground platform.

Each day was divided into seven 2-hour observation periods between 0600 and 2000 hours. At the lower falls, one or two observation sessions were randomly assigned (without replacement) each day. Guided groups to the upper falls were scheduled between 1200-1400 hours; data on black bear activity were collected during this time period regardless of whether a group was present (monitoring) or not (no monitoring). Observations were made during a second 2-hour block randomly selected from the remaining time sessions between 0800 and 1800 hours each day.

Seasonal trends in fish abundance at the lower and upper falls were estimated using a qualitative measure of fish accessibility; this measure was based on density estimates of salmon (percent coverage) across the mainstream and sidepools of the creek. This measure was validated by Chi and Gilbert (1996).

Relative changes in water level of the stream were determined by recording the water level from a graduated staff secured to the fish pass.

We identified individual bears using binoculars and spotting scopes. Photographs of bears (front view and profiles) were taken and distinguishing physical characteristics were sketched in detail. The sex of individuals was determined by direct observation of genitals, urination posture or the presence of cubs.

Prior to beginning each observation session, the following information was recorded: date and time of session; site (LF or UF); observer identification; weather conditions (visibility and wind conditions); fish accessibility; water level; number of bears present upon arrival; identification or description of individuals present; immediate response of individuals present upon arrival of researchers.

Instantaneous scan sampling was used to monitor visitor use and bear activity at both the lower and upper falls. A timer was scheduled to go off every ten minutes. Upon the sound of the timer, the observer visually scanned the designated zone and recorded the following: identification or description of all bears in view; the side of the river each bear was on; the behavior of each bear; the number of people on the observatory.

From 1993-1995, the following information was recorded for all bears that came into view: identification (species, sex-age class and individual); side of river bear arrived on; the time each bear arrived and departed from view (to nearest second); whether fishing attempt was made or not; the number of fish caught while in view; eating location for each fish caught or scavenged.

During the latter part of the 1996 field season, this procedure was simplified due to the limited availability of monitoring personnel. Instead of recording the time individuals arrived and departed from view, the observer recorded the number of visits each individual made in and out of view and noted any response to the visitors.

ANALYSIS

Rates of human activity at the lower falls observatory were determined using counts every 10 minutes (scan data). The mean number of people per scan was calculated by dividing the total number of visitors counted for all scans conducted during an observation session by the number of instantaneous scans taken.

Data on the following three measures of black bear activity were collected:

1) Bears per scan: calculated by dividing the total number of bears counted for all scans throughout that session by the number of instantaneous scans taken.

2) Number of bear visits: refers to the number of trips bears made to and from the site or in and out of view (as going in a cave) during the observation session regardless of the amount of time spent during any given visit.

3) Different individuals: number of different bears observed per 2-hour observation period.

The following two indices were estimated (Chi and Gilbert 1996):

4) Bear minutes (y): calculated as: $y = 107.541x + -.894$, where x = bears/scan.

5) Bout length: the mean length of time each bear was in view during any given visit per observation session, calculated as: estimated bout length = estimated bear minutes/ total number of visits.

Seasonal patterns were determined using 7-day blocks to insure that all time periods were represented from both sites in each block. Daily activity patterns were examined using the designated 2-hour observation periods from 0600-2000 hours.

RESULTS

Diel and seasonal patterns of human activity

The diel pattern of human activity in 1996 was identical to that observed 1993 - 1995 with visitation being highest between 1200 and 1400 hours (Figure 1). However, based on our index of human use (mean people per scan), visitor numbers were lower at the lower falls in 1996 compared to previous years and were spread out more evenly throughout the season (Figure 2).

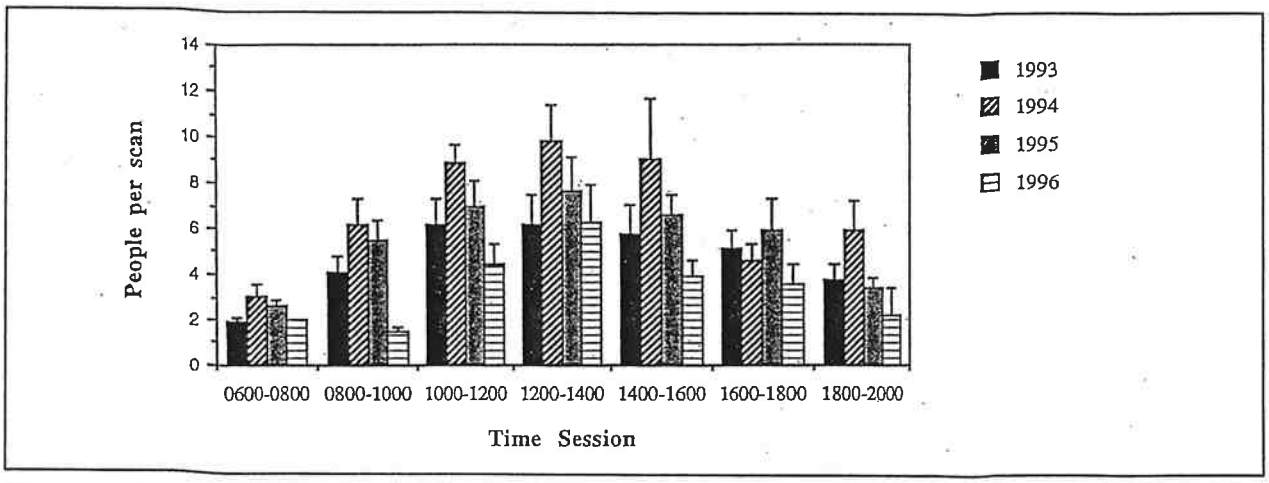

Figure 2. Human activity at the lower falls throughout the season, 1993-1996. Missing values indicate data was not collected during that week.

Black bear bout lengths at the lower falls

In contrast to 1994 and 1995, black bears exhibited the longest bout lengths between 1000 and 1200 hours I 1996 (M = 15.95) (Figure 3). We attribute this to the decrease in visitor numbers at the lower falls at this time. Data indicated that 20 people on the observatory at one time were rarely exceeded (Figure 4). Black bear responses to guided groups at the upper falls

Between 17 July and 23 of August, a total of 19 visitor groups were led to the upper falls between 1200 and 1400 hours. To assess the potential impacts of these groups on black bear activity at this site, we compared all indices of black bear activity during the 1200-1400 hour sessions with visitors (People) to those in which researchers observed from the tree blind (Blind / number of people). Data collected prior to 17 July and following 23 August under the Blind / number of people condition were left out of the analysis to avoid confounding the effects of early and late fishing conditions with human impacts on black bear activity. For all four indices black bear activity, there were no significant differences between 1200-1400 hour sessions with visitors present and those without (Table 1).

DISCUSSION

Reduced human activity in 1996

The relatively low visitor numbers observed at Anan Creek in 1996 were likely due to several interacting factors. First, the U.S. Forest Service imposed limitations on the size and scheduling of guided groups during the summer of 1996. The objective was to minimize crowding on the observatory (greater than 20 people) in order to improve people management by interpreters, maintain quality of visitor experience, and, most importantly, reduce impact on

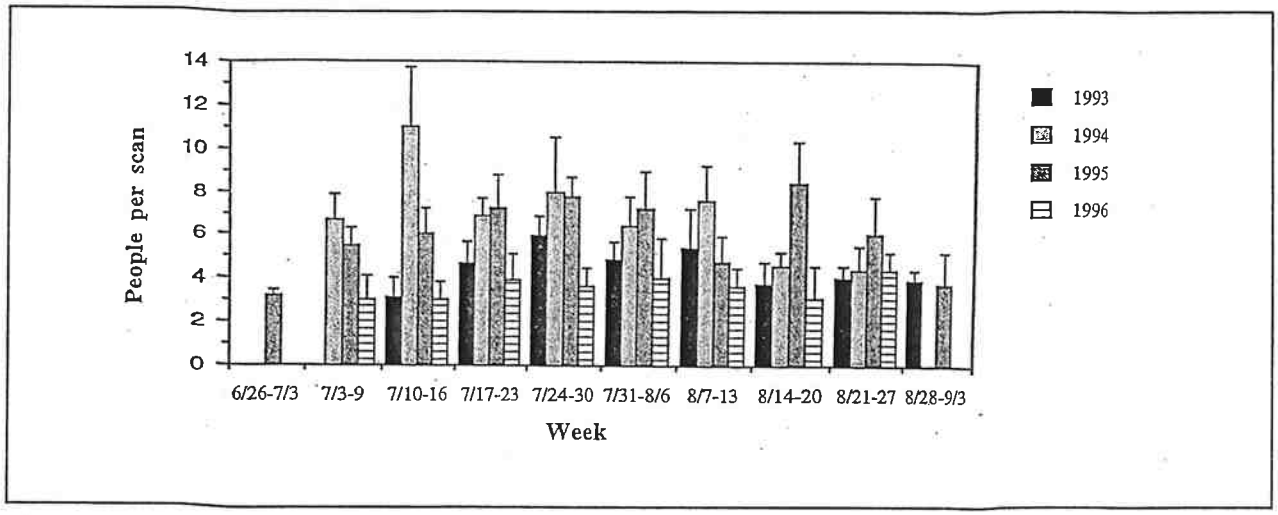

Figure 1. Human activity at the lower falls throughout the day, 1993-1996.

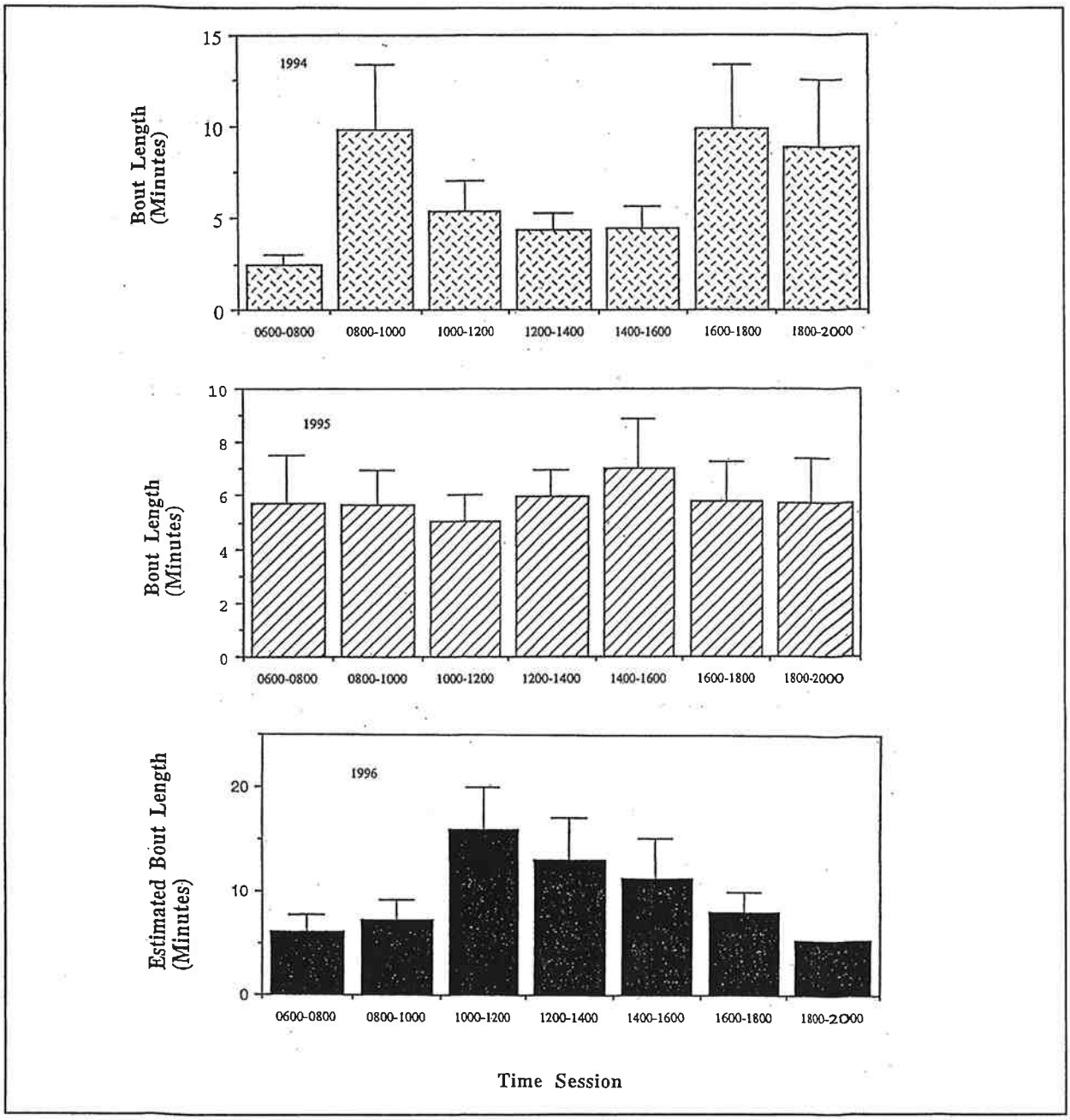

Figure 3. Black bear activity at the lower falls throughout the day, 1994, 1995, and 1996.

black bears fishing at the lower falls (Chi and Gilbert 1996). These management actions reduced total visitation and distributed human use more evenly across the season. Furthermore, relatively high black bear activity observed in 1996 resulted in visitors not remaining on the observatory for long periods of time to witness a black bear capture a salmon. An average of 5 different individuals frequented the lower falls per 2-hour observation session (Chi 1997).

Black Bear Responses to Reduction of Human Use at the Lower Falls

Black bear activity at Anan Creek was higher in 1996 than in the previous 3 years. This was especially apparent at the lower falls where 3 of 4 indices of bear activity surpassed values observed from 1993 - 1995 by approximately 80 percent (Chi 1997). Several factors acting independently or in concert could be responsible for such an influx of black bears to Anan Creek during

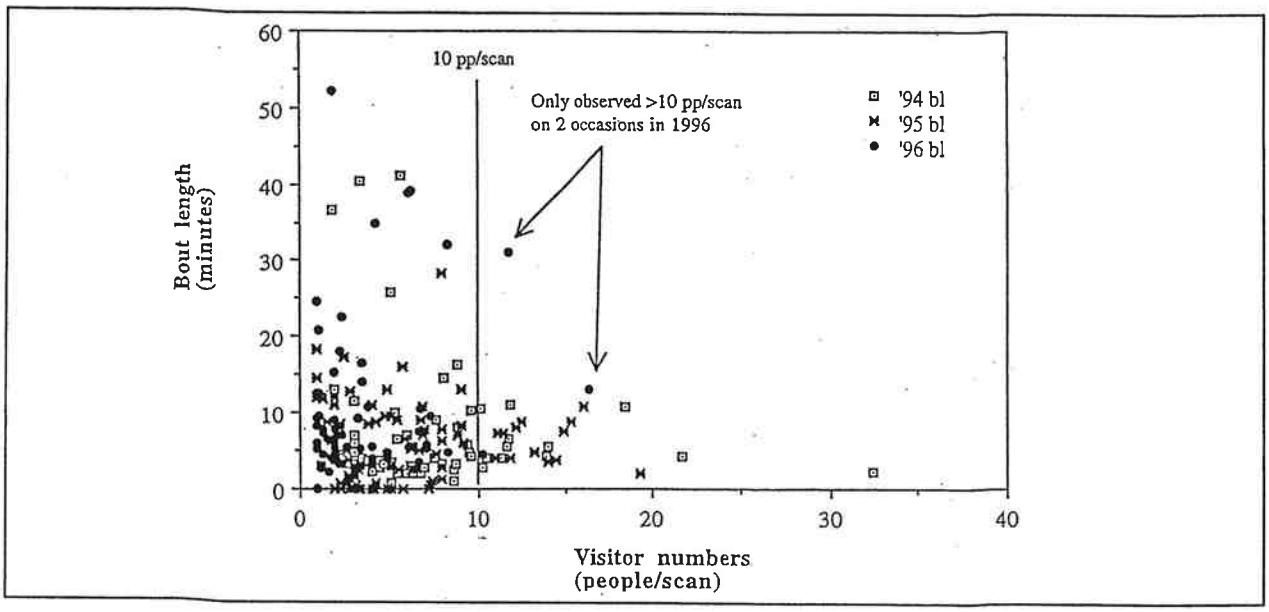

Figure 4. Relationship between bout length and visitor numbers at the lower falls, 1994-1996

this season including low berry productivity (Garshelis 1989, Rogers 1989) and a superior salmon run (Barnes 1990, Egbert and Stokes 1976).

While the possible influence of natural forage conditions and alternative food sources cannot be dismissed, results suggest that limitations on visitation implemented in 1996 by management appears to have contributed to subtle behavioral changes in black bear fishing behavior at the lower falls. Chi and Gilbert (1996) found that bout length was the most sensitive to human disturbance of four indices of black bear activity. More specifically, bout length decreased substantially when a threshold of 10 people per scan was exceeded. In 1994, mean people per scan approached this threshold frequently 6 hours of the day (between 1000 and 1600 hours). Bout lengths during this period were shortest in comparison to the rest of the day. In 1995, human activity throughout the day was approximately 20% lower than that observed in 1994: no midday depression in bout length was observed in 1994. In 1996, visitation (as measured by people per scan) was the lowest in 4 years; bout lengths were longest in the middle of the day despite the fact that counts of people during this time were the greatest. With a decrease in the number of people typically on the observatory at one time, bears appeared more willing to spend greater amounts of time fishing at the lower falls.

Although management restrictions appear to have contributed to increased black bear activity at the lower falls, several other potentially influential variables should be mentioned. First, bears at Anan Creek may be becoming more habituated to people as human behavior becomes more consistent and predictable (Gilbert 1989, Aumiller and Matt 1994). Wary bears become more willing to fish in the presence of people if disturbance is kept to a minimum and habituated bears learn to tolerate even greater ranges of human numbers and behaviors. This process could be facilitated if management is able to continue to limit visitor numbers, control human behavior, and maintain innocuous contact between people and bears. Second, changes in black bear foraging behavior may be related to expanding brown bear numbers observed at Anan Creek over the past few seasons (Chi and Gilbert 1996, USFS 1996). Black bears adjust to the activity patterns of brown bears (MacHutchon et al. in press, Chi and Gilbert 1996, Reinhart and Mattson 1990, Kasworm and Manley 1990, Miller 1985). Brown bears at Anan Creek were sighted most frequently during the early morning and evening hours: black bears may be concentrating their fishing efforts more during the midday hours to avoid their larger congeners.

Black Bear Responses to Visitor Groups at the Upper Falls

At the upper falls, changes in management regulations included limiting access to small guided groups between 1200 and 1400 hours. This was the first season since 1992 that the upper falls area was open to the public. No detectable impacts on black bear activity resulting from the presence of small visitor groups were measured at this site. This was surprising as several studies on bear-human interactions indicate

Table 1. A comparison between black bear activity (4 indices) at the upper falls during the 1200-1400 time sessions with and without visitors, 1996.

Index	Condition	Mean	U[a]	p
Black bear activity (estimated Bm/om	Blind/no people	3.76	126	.9233
	People	3.94		
Black bear visits	Blind/no people	40.86	142.5	.5304
	People	43.17		
Mean bout length (estimated)	Blind/no people	10.41	124	.7793
	People	10.46		
Different black bears	Blind/no people	17.5	142	.5406
	People	18.11		

[a]Mann-Whitney U

bears are more reactive to people in areas where encounters are unexpected (Herrero 1983, Jope 1985, Rogers and Wilkers 1990). However, the past 3 years of researcher presence at the upper falls and occasional use by the public prior to 1993 may have desensitized bears at this site to small groups of people. It is also possible that on such a small spatial scale (within 1 km of a high human use area), tolerance of people may be generalized.

CONCLUSIONS

Three years of data collected between 1993 and 1995 indicated a tolerance threshold of black bears at Anan Creek to visitor numbers as well as diel shifts in bout length in response to periods of high human activity. However, clear resolution of these effects was hindered by changes in other environmental variables and our inability to manipulate human use. Although the results presented in this paper are preliminary, we believe the experimental management regime reported here helped define subtle effects of people on bear behavior particularly for those animals somewhat habituated to people. Continued monitoring with the current restrictions kept in place is recommended to further assess the effects of these management changes.

Exploding interest in nonconsumptive uses of natural resources suggests that demand for wildlife viewing opportunities will continue to increase. If wildlife viewing programs are to expand without serious degradation of sensitive native flora and fauna, science-based management is essential. First, there is a need for sanctuaries where wildlife and key habitat are protected from harvest, environmental degradation, and land development (Mattson
1990). Second, careful monitoring of visitor effects on wildlife, including behavioral adaptation, to determine thresholds for the number of viewers is needed. Where long-term experimental studies are not possible, adaptive management may provide an experimental structure useful to determining tolerance thresholds of both habituated and non-habituated individuals and contribute to a better ecological understanding of the system as a whole.

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MANAGING NEGATIVE HUMAN-BLACK BEAR INTERACTIONS: LIARD RIVER HOTSPRINGS PROVINCIAL PARK, BRITISH COLUMBIA

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Abstract: A radio-telemetry and management study of the black bear (*Ursus americanus*) in Liard River Hotsprings Provincial Park and surrounding area was conducted. Emphasis was placed on the developed portions of the park. Information was collected on: human-bear interactions, landfill site, private holdings, black bear food habits, food conditioned and non-food conditioned bear habitat use, and visitor use patterns. Three main factors were identified that contributed to negative human-black bear interactions in the Liard River study area. These factors were: (1) the availability of unnatural foods within the park and surrounding area which resulted in the food conditioning and human habituation of several bears that used the park; (2) the availability of natural bear foods adjacent to areas of high human use; and (3) the lack of visitor education and information regarding basic bear biology and the ethics of camping in bear country. The combination of unnatural food availability in an eco-unit (SH) that was naturally selected for by bears, made the human use areas of Liard River an extremely attractive and unsafe environment for black bears. Management recommendations focused on restoring the natural behaviour and distribution of the Liard River black bear and enhancing visitor safety. Primary recommendations included the restriction of unnatural foods in the Liard River area, the management of humans and their activities through enforcement and education, and the improvement of park design to enhance visitor safety. Recommendations on adaptive management emphasized future research and monitoring in the park and surrounding area. The management plan was considered proactive in that the recommendations addressed the root causes of the problems.

Keywords: black bear *(Ursus americanus)*, Liard River Hotsprings Provincial Park, radio-telemetry, food conditioned, human habituated, defensive bear behaviour, offensive bear behaviour, ecosystem unit (eco-unit), bear ecological seasons, proactive management.

INTRODUCTION

Liard River Hotsprings Provincial Park and surrounding area has had a history of human-bear conflicts. Every year a number of bears are translocated or destroyed within the park boundaries and larger study area. Bear research for the Liard River area was proposed from on-going concerns raised by park managers and rangers as a result of the high number of aggressive human-bear encounters and sightings over the last few years (Table 1). There has been one grizzly *(Ursus arctos)* bear-inflicted human death in the park (August 17, 1981) and three black *(U. americanus)* bear-inflicted injuries on the highway to and from the park (May 19, 1992 and two on June 27, 1994). The number of human-bear encounters in Liard River Hotsprings Provincial Park is high when compared with other parks (Tetsa River Park, Stone Mountain Park and Muncho Lake Park) in the Toad River area.

STUDY AREA

Liard River Hotsprings Provincial Park

Liard River Hotsprings Provincial Park is located at mile 497 (kilometre 800) of the Alaska Highway, in northern British Columbia. The Park was established as a Class A Provincial Park in April 1957 to protect and preserve the hot springs ecosystem. In 1992, the park boundaries were extended down to the Liard River, encompassing two privately owned commercial lodges. The major recreational activity in the park is bathing in the hot springs. Back country hiking is not offered and no trails exist within the park, with the exception of a 750 metre boardwalk to the hot springs. The Park offers 53 sites for recreational vehicle and tent camping, a day-use area with 22 picnic tables and fire pits, a children's play area, and a 60 unit day-use parking.

Two developed hot springs, Alpha pool and Beta pool, are open to visitors year round. Alpha hot spring is shallow with an average temperature of 54°C at source. Cold water is diverted from Psi Spring into Alpha pool for visitor enjoyment. Beta hot spring is 3 meters deep resulting in an average temperature of 42° C. Two undeveloped hot springs (Epsilon and Tau) also occur within the park boundaries (Reid 1978). Most hot springs in Canada flow directly into a creek or river (Peepre et al. 1990). However, the hot spring's water in Liard River Hotsprings Park runs off into an intricate series of warm swamps. Although shallow, these swamps do not freeze in the winter. A number of thermally influenced plant species occur this far north because of the hot spring environment (Reid 1978). Alpha and Beta hot springs are the second largest in Canada and are ranked among the top five according to a range of ecological criteria, affording them national ecological significance (Peepre et al. 1990).

The study area is bisected by the Alaska highway and encompasses the 900 hectare (ha) park with a 48,000 ha buffer zone. Focus was placed on the

Table 1. Total Number of Problem Bears Reported, Translocated and Destroyed for 1993 and 1994 in the Liard River Hotsprings Study Area.

NUISANCE BEARS	1993	1994
No. of Nuisance Bears Reported	12	25
TRANSLOCATIONS		
No. of Bears Translocated from the Park	3[a]	5
No. of Bears Translocated from Holding 1	0	1
No. of Bears Translocated from Holding 2	8	1
No. of Bears Translocated from a Private Resident	0	2
Total No. of Bears Translocated	11	9
DESTRUCTION		
No. of Bears Destroyed in the Park	0	3[b]
No. of Bears Destroyed on the Highway	0	1
No. of Bears Destroyed at Holding 1	0	0
No. of Bears Destroyed at Holding 2	3[c]	1
No. of Bears Destroyed by a Private Resident	3	2
Total No. of Bears Destroyed	6	7

[a] One sow with two cubs of the year was darted while free-ranging and relocated to the McDonald River area.
[b] Includes on bear that was shot and wounded in the campground. This bear is believed deceased.
[c] Includes collared bear BBM 15.

developed portions of the park, approximately 300 ha. The buffer zone was delineated by the locations of radio-collared bears and open-pit landfill.

The study area is located at the southern end of the Liard-Rabbit Plateau in the Liard River Valley within the Northern Boreal Mountains ecoprovince. The majority of the study area is located within the boreal white and black spruce (BWBSdk2) biogeoclimatic zone with some outlying and high elevation areas being within the spruce/willow/birch (SWBmk) zone. Dominant tree species include *Picea glauca* (white spruce), *Picea mariana* (black spruce), and *Betula papyrifera* (paper birch). Also common throughout the study area are *Populus tremuloides* (trembling aspen), *Populus balsamifera* ssp. *balsamifera* (balsam poplar), and *Populus balsamifera* ssp. *trichocarpa* (black cottonwood).

The study area is characterized by large expanses of burned over habitats of different ages. The park boundaries were protected from fire and as a result the park is young, mature or decadent forest, which is rare in the larger study area. Within the park, the thermal effects of the hot springs causes the surrounding vegetation associations to be generally more lush and rich than other areas, providing a variety of common and rare plant foods for bears. Bear use around the hot springs and campground favours black bears over grizzly bears.

An open pit (10 m x 20 m) landfill is located 3 km south of the park boundaries across the Liard River. The landfill was established in 1986 to service the park, lodges, outfitters and private residences.

METHODS

Eleven black bears were tranquilized and radio-collared in the spring of 1993. The sample consisted of 6 'wild' bears, defined as bears that did not feed on human food and garbage, and 5 food conditioned bears. On-site ground and aerial telemetry locations were used to establish the home range of collared bears in 1993 and 1994. In 1994, ground searches were conducted in an attempt to "home in" (White and Garrott 1990) on the bear for later habitat analysis. Site investigations on radio-collared bear locations were performed to identify areas of seasonal concentration and use, and relate these areas to food availability and other seasonally important needs. Food habits were verified using visual observations of collared and uncollared bears, site investigations on feeding sign, and in-field scat analysis. Habitat was analyzed on the frequency of polygon occurrence and the structural stage of the forest in which the bear was located (Ketcheson and Riddell 1995). Twin plots were performed in an attempt to compare plant phenology in areas that bears were using within the park with those that displayed similar characteristics outside the park.

A visitor encounter questionnaire was designed using a combination of both open-ended and structured questions in order to gather information on both aggressive and non-aggressive human-bear encounters.

Bear encounters and sightings, and garbage storage and removal methods for both private holdings were monitored. Furthermore, I attempted to identify all bears using the landfill and noted their behavioural characteristics.

Estimates of the total number of park visitors was obtained through the installation of two Traffic Talley #3 (TT3) trail counters with TT3 infrared sensors (Diamond Traffic Products). The number of people registered in the Liard River Hotsprings campground and average length of stay information was obtained through the Park Facility Operator's Park User Collection Forms.

Limitations

Food conditioned and human habituated bears had a high human induced death rate and as such it was difficult to achieve the desired cohort representation to match the research objectives. Specifically, a number of the remaining collared bears in August 1994 did not utilize the human use areas of the park, landfill, or immediately adjacent areas. Furthermore, the inaccessibility of the study area terrain made locations and habitat work biased towards roads or places of easy access. However, the high death rate of food conditioned and human habituated bears was useful for understanding causes of 'problem' bear mortality and in the development of the management plan.

Definition of Terms

A food conditioned bear was defined as one who feeds on human food or garbage. 'Problem' bear behaviour was characterized by bears seeking human food or garbage an/or displaying little to no fear of humans. 'Problem' bears were those that acted on this behaviour to such an extent that they threatened human safety. Human habituated bears were those that tolerated human presence. Tolerance normally results from bears learning that humans are not posing a threat, reducing
the frequency of a fleeing response by the bear (McCullough 1982; Herrero 1985; Gilbert 1989). These two behaviours were considered separate in that a food reward was not a necessary condition for habituation (Aumiller and Matt 1994; Herrero 1985; Gilbert 1989).

RESULTS AND DISCUSSION

Interactions were classified into two categories: sightings and encounters. A sighting was recorded if the bear's reaction to the human(s) was non-aggressive. Sightings normally resulted from the visitor simply viewing the bear. However, the interaction would be classified as a sighting even if the visitor approached the bear for a picture, attempted to pat or to follow the bear, so long as the bear's reaction remained non-aggressive. Aggressive encounters were then assessed to determine if they had been provoked (bear displaying defensive behaviour towards a human's actions) or unprovoked (bear displaying offensive behaviour).

For June, July and August 1994, a total of 150 sightings and encounters with bears were recorded in the Liard River Hotsprings Study Area, excluding private holdings and the landfill (Table 2). The human use areas of the park accounted for 148 of the 150 sightings and encounters recorded. The remaining two encounters occurred on the highway north and south of the park boundaries and both involved human injury. The number of bears reported sighted or encountered by visitors was independent of the number of campers registered in the campground.

The totals provided in Table 2 are cumulative in that individual bears were counted each time they were seen or reported. However, if a bear was followed from the campground into the day-use area it was only recorded as being in the campground, unless it was seen at another time in the day-use area. The column on provoked encounters refers to that percent of the encounters that have been classified as defensive behaviour on the part of the bear.

In an attempt to gain an understanding of why bears were using the park, the actions of the bear at the time of initial sighting were put into five categories: (1) natural feed; (2) unnatural feed; (3) unnatural feed not obtained (unsuccessful attempt to unnatural feed); (4) travel; and (5) neutral. Neutral behaviour was defined as not feeding or seeking natural or unnatural food, not

Table 2. Total Number of Bear Encounters and Sightings Recorded for the 1994 Field Season.

MONTH	SIGHTINGS	ENCOUNTERS	PROVOKED ENCOUNTERS	TOTAL
June[a]	3	2	2 (100%)	5
July	16	8	2 (25%)	24
August	107	14	6 (43%)	121
September	0	0	0	0
Total	126	24	10 (42%)	150

[a] includes the 2 highway maulings

traveling and not displaying aggression. The total frequency of the bears' behaviour is shown in Table 3. The number of encounters involved with each activity is provided in brackets.

Bear sightings and encounters in the park occurred on a seasonal basis, peaking during the month of August. During August, bear sighting and encounter

reports from visitors in the campground, at the hot springs and in the day-use area were received throughout the day and night. The distribution of the total bear sightings and encounters by day allowed me to identify exactly when peak reporting occurred (Figure 1). There were no reported bear sightings in the park after September 2, 1993 and August 29th, 1994. Being able to identify trends in bear use of the park was useful when assessing the effectiveness of options, such as seasonal closure of the campground.

The locations of all bear sightings and encounters were also recorded. Bears sightings and encounters in order of commonalty for the park were: the campground (53%), boardwalk (12%), day use area (excluding the children's play area) (11%), service yard (8%)-

, Beta pool (5%), Alpha pool (4%), children's play area (3%), Cobbett's road (2%) and the hanging gardens (2%). Identifying the location of bear sightings and encounters allowed me to concentrate the recommendations on prime human-bear encounter areas, such as the campground.

The majority of bears involved in negative human-bear interactions was the cohort of subadult males. The average age of bear mortalities for the 1994 field season was 4.25 years (n=4), and all bears destroyed were male. Herrero and Higgins (1995) state that in developed areas, the majority of fatal attacks on people were attributed to subadult male black bears. In my research I found that the most serious problems occurred with subadult male bears that were both food conditioned and human habituated. I identified two main reasons for this finding: (1) the bear appears tame to humans who in turn approach the bear; or (2) the bear searches out human food and garbage with little or no fear of humans. When the bear appears tame to humans, a provoked encounter normally results. Provoked encounters account for 42% of the encounters in Liard River Hotsprings Provincial Park. It is worth noting that visitors approached bears on a number of occasions but the bears' reactions remained non-aggressive and were recorded as sightings; in the majority of human-bear interactions within the park the bears were very "tolerant" (Herrero 1985) towards visitors who had little or no bear awareness or ethics.

I attempted to identify the effect recreationalists in Liard River Hotsprings were having on bears. I focused on direct mortality (death or removal of bears on site), indirect mortality (premature death by an event or agent), displacement (bears displaced to lower quality habitat due to visitor use) and aggressive behaviour or stress (demonstrating abnormal behaviour or showing signs of stress). I discovered that an extremely high direct mortality of bears was linked to the lack of knowledge regarding bears, and bear ethics, on the part of the recreational users. In most instances, strong food conditioning as a result of bears obtaining improperly stored food or garbage accounted for aggressive behaviour displays in bears. The two highway maulings that occurred in June 1994, were also considered provoked in that both bears had been fed by tourists during or prior to the encounter. The highway mauling in 1992 that occurred 25 km from park boundary also involved a bear that had been fed from a vehicle before the victim encountered the bear. Furthermore, the 1981 fatality of a researcher within the park was believed to be attributed to a grizzly bear that may have ransacked a tent containing improperly stored food sometime before the fatality (McCrory and Mallam 1994). Negligence on the part of the visitor, whether it be the current visitor or a previous visitor, was a significant factor that contributed to negative human-bear conflicts in Liard River Hotsprings. Of the 7 bears destroyed in the 1994 field season, 4 were known to have fed extensively on human food and/or garbage.

The landfill at Liard River was known to attract bears, therefore it became a tourist attraction. This

Table 3. Frequency of Bear Behaviour Recorded For the 1994 Field Season.

MONTH	NATURAL FEED	UNNATURAL FEED OBTAINED	UNNATURAL FEED NOT OBTAINED	TRAVEL	NEUTRAL
June	1	2 (2)	0	1	1
July	5 (1)	2 (1)	5 (2)	6	2
August	88 (8)[a]	10 (1)	20 (3)[b]	7	0
Total	94 (9)	14 (4)	25 (5)	14	3

[a] Five out of the eight encounters were considered provoked.
[b] Two out of the three encounters were considered provoked.

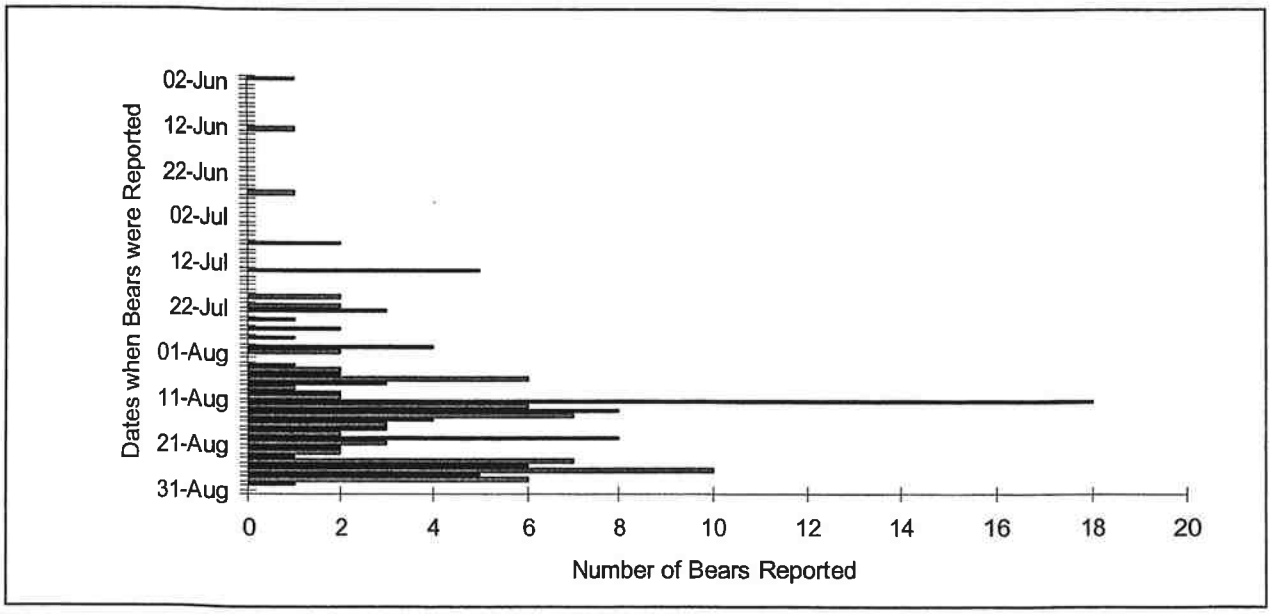

Figure 1. Total bear sightings and encounters by day in Liard River Hotsprings Provincial Park from June 1st to September 12th, 1994.

produced human habituated and food conditioned bears. Black bears were the only species identified to feed at the landfill. In monitoring the landfill, I was able to document a direct link between bear use of the landfill and bear use of the park. For example, BBM 01 was located in the park campground on the morning of July 22, at the landfill in the afternoon, and back in the park boundaries that evening. Ten of the 19 bears identified as landfill feeders were sighted within the human use areas of the park. A number of these bears were classified as 'problem,' and two were destroyed. The high level of food conditioning and human habituation appeared to allow these bears to feed undisturbed at close proximity to high human use areas, such as the campground, children's play area and hot springs.

The use of habitats by bears has been shown to vary "with the availability, distribution and abundance of preferred foods" (Hatler 1967, Jonkel and Cowan 1971 in MacHutchon 1989:116). Bear foods appeared to be exceptionally good within the park. To determine patterns of habitat selection, habitat use was ranked according to the frequency of use of eco-units and structural stages.

Three general seasons of feeding activity were identified: 1. pre-berry; 2. early berry; and 3. late berry. The Pre-berry season occurred from Late May to early July and was characterized by low elevation feeding on herbaceous green vegetation with an increase in sightings of highway feeding. The early berry season occurred from early July to Late July and was characterized by low to mid-elevation feeding with a shift to disturbed habitats. The dominant berry for early July was *Shepherdia canadensis* with an increase in *Rubus idaeus* feeding in mid to late July. There was an increase in sightings of highway feeding and an increase in overall use of the landfill. There was also a shift to lower elevations for the 'wild' bears. The late berry season occurred from late July to Mid-September. For the first part of season three the dominant berry species consumed included *Cornus stolonifera* and *Viburnum edule*. This season was characterized by an increase in use of the park for a majority of the 'conditioned' bears. Radio-collared bears that did not use the park during this season generally remained at low elevations. The majority of the 'wild' bears appeared to shift to high elevation habitats by mid-August. However, the majority of 'conditioned' bears remained in the park and study area feeding on these berries until late August. Feeding in the later part of August to mid-September (season 3b) was characterized by a general shift to high elevation burned-over habitat. Dominant berries consumed for this period included *Vaccinium membranaceum* (black huckleberry), *V. caespitosum* (dwarf blueberry), *V. vitis-idaea* (ligonberry) and *Empetrum nigrum* (crowberry).

Bears appeared to be selecting for SH (Current - Horsetail) and SW (Fuzzy-spiked wildrye - Toadflax) eco-units because the percent of bear use was higher than the eco-units availability (Figure 2). Liard River Hotsprings Park is comprised of approximately 60% SW eco-unit and 20% SH eco-unit, as compared to 16.5% SW and 9% SH for the entire larger study area.

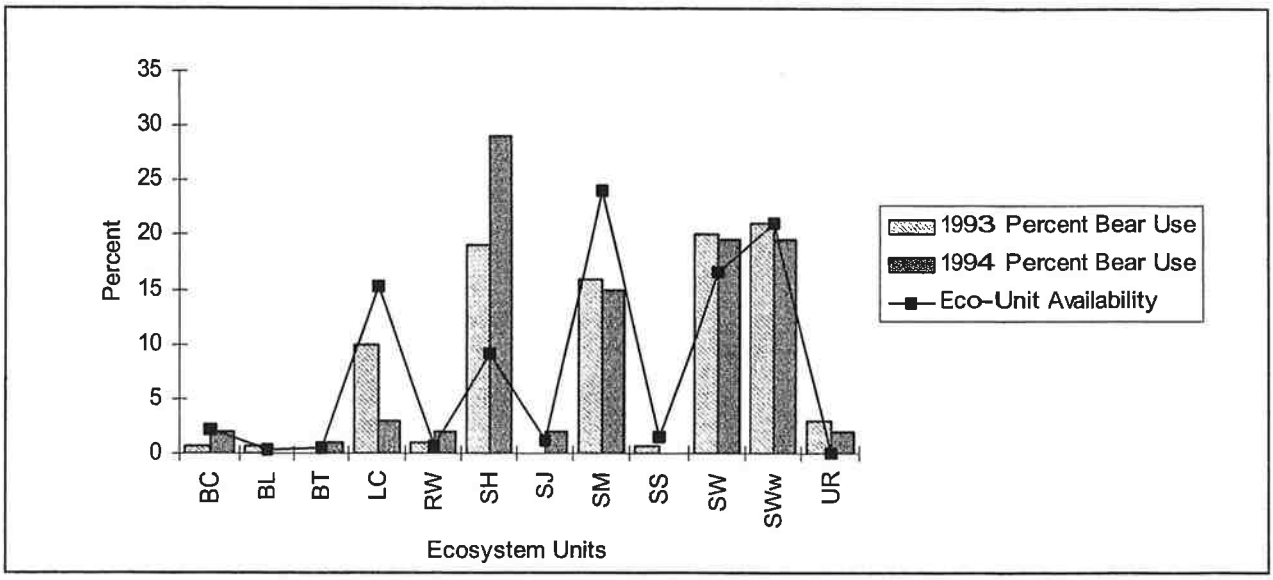

Figure 2. Ecosystem Unit Availability and Bear Use

The human use areas of the park were placed in approximately 80% SH habitat (polygons #57 and 58; Ketcheson and Riddell 1995). Furthermore, the thermal influence of the hot springs appeared to maintain herbaceous vegetation in a prolonged lush stage, this being easier for bears to digest. Consequently, the park, and particularly those areas adjacent to human activity, is largely comprised of habitats bears are selecting.

Foods important to bears occur in different concentrations depending on the structural stage of the forest. Thus, the use of structural stages by bears was compared to the structural stages availability within the study area (Figure 3).

Bears appeared to be selecting for structural stage 6 because the percent of bear use was higher than the structural stages availability. Approximately 60% of Liard River Hotsprings Provincial Park is in structural stage 6, as compared to approximately 16.5% for the entire study area. The next highest structural stage in the park is 5, at approximately 16%. The forest surrounding the human use areas of the park is approximately 80% SH habitat, of which 75% is in structural stage 6 (polygons #57 and 58; Ketcheson and Riddell 21995). Structural stage 4 was also a highly used structural stage by bears. However, structural stage 4 has the greatest availability within the study area (approximately 55%).

As mentioned, the majority (53%) of bears reported were sighted or encountered in the campground area.

The campground also contains an abundance of seasonally important feeding habitat for black bears, especially in those areas that have had the overall forest cover reduced. The majority of bear behaviour involved natural feeding on wild berries in and around the campground. However, the abundance of unattended food and garbage made food conditioning a serious concern for all bears using habitats adjacent to human use areas of the park.

CONCLUSIONS

I identified three main factors as contributing to negative human-black bear interactions in the Liard River study area.
These were:

(1) The availability of unnatural foods within the park and surrounding area which resulted in the food conditioning and human habituation of several bears that used the park;

(2) The availability of natural foods adjacent to areas of high human use; and

(3) The lack of visitor education and information regarding bears.

At Liard River Hotsprings I found that a number of campsites contained unnatural bear attractants in the absence of a visitor. I issued warnings to occupants of these sites. However, the majority of visitors (54%) did not store their food in a bear-resistant location after being warned. The high number of people not complying with proper food and garbage storage was primarily attributed to the lack of bear resistant food storage facilities within the park and a general lack of

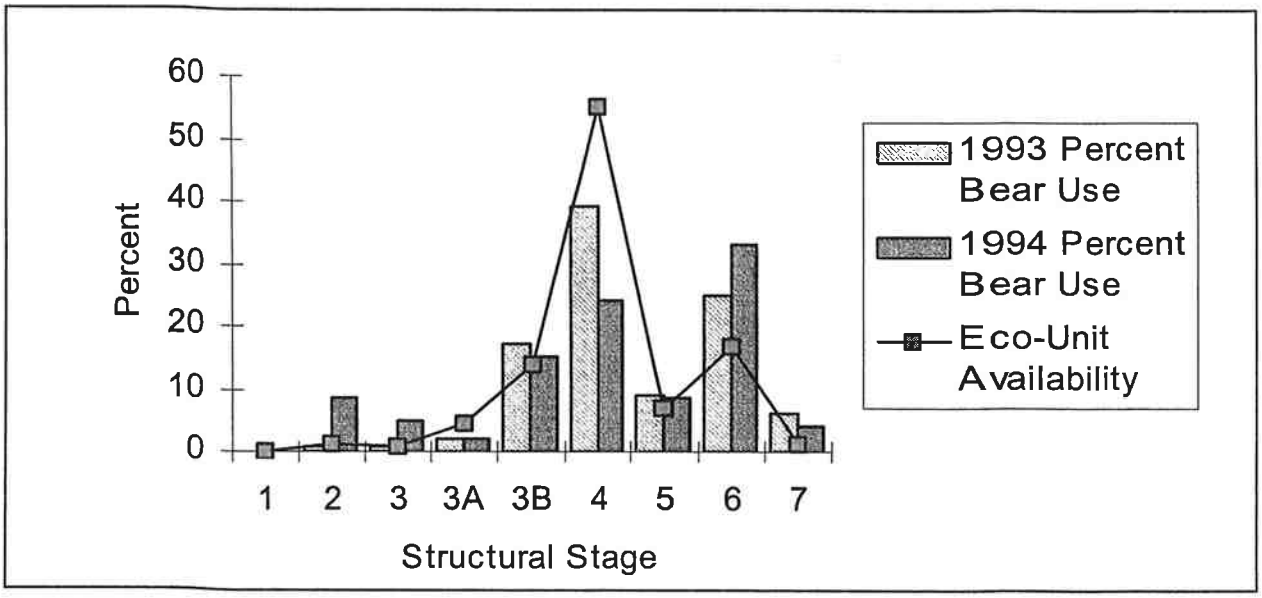

Figure 3. Structural Stage Availability and Bear Use

visitor knowledge regarding bears and the ethics of camping in bear country.

The removal of all potential unnatural attractants is an essential first step to minimizing negative human-bear conflicts. In Liard River Hotsprings Provincial Park the majority of negative human-bear interactions occurred with the cohort of food conditioned and habituated subadult males. Past management actions implemented in the park were very reactive towards the bear; the bear was termed a 'problem' and either destroyed or translocated. In Liard Hotsprings, park visitors were rarely warned, fined or evicted for inappropriate behaviour while in bear country.

Augmenting the problem of easily accessible human food and garbage within the park is the open pit landfill located 3 km south of the park boundaries. Through monitoring of the landfill, I was able to document a direct link between bears using the landfill and problem bears within the park. The landfill was found to condition a number of black bears to humans and their food. When in the park, some of these bears were found to feed undisturbed in extremely close proximity to visitors.

In Liard River Hotsprings, conditioned bear behaviour resulted in human-bear conflicts with people approaching seemingly tame bears or bold bears approaching people. Visitors were often witnessed approaching
bears to dangerously close distances. In some cases, visitors attempted to pat bears, successfully and unsuccessfully feed bears, while others hit bears with branches or other objects. The influx of day-users, high turn-over rate, and apparent disregard of bear warnings makes the education of Liard Hotsprings visitors a formidable task.

Analysis of the research gathered on bear use of Liard River Hotsprings Park identified that food conditioned and human habituated bears altered their natural movements between habitat types in order to utilize areas with poor garbage management. However, the results of the research also showed that alteration of natural habitat patterns by bears using the park mainly occur on a seasonal basis, with regular reporting of bear sightings beginning around mid-July and peaking during the last two weeks of August. Furthermore, bear use of the landfill decreased when natural food availability within the park and adjacent areas increased.

When comparing the seasonal use of vegetation by bears, I found a strong correlation between the number of bears reported within the park and the availability of natural bear foods. Similar to this, Holcroft (1986:36) found that black bear incidents and sightings were higher "than expected in campgrounds where the plant food rating was excellent in the immediate area and surrounding area." The majority of the human use areas of the park are classified as SH eco-unit (Ketcheson and Riddell 1995). For both 1993 and 1994, SH eco-unit was identified as the primary habitat type utilized by bears in season one (pre-berry). Furthermore, SH was identified as important in the beginning of season three (late berry season). A significant increase in bear use of the park occurred during season three. The dominant berry species consumed in this season were *Cornuss stolonifera* and *Viburnum edule,* both of which occur in

concentration throughout the human use areas of the park. A plot and twin plot method revealed that plots established within the park contained more major berry foods during August than areas outside the park, and of the berry species that were there the park species fruited more. The abundance of berry producing species within prime bear use of the park means that bears and people will be occupying the same habitat, even after the removal of human food and garbage. Bears naturally feeding in or adjacent to human use areas within the park is a concern because of the availability of unnatural attractants. If the availability of unnatural attractants is not addressed, these bears have a high probability of becoming future 'problem' bears.

MANAGEMENT PLAN

The Liard River Hotsprings Provincial Park Master Plan (Peepre et al. 1990:11) states that "the strategy on bear management will be to educate visitors and to minimize potential human-wildlife conflicts through the provision of information and the proper storage and removal of garbage." As of yet, this strategy has not been fully implemented.

The management plan is separated into major and minor recommendations, and provides tentative stages for each recommendation's implementation by addressing the results of the research conducted through five key issues:

Issues One through Three (Removing the Attractants, Managing Humans, and Park Safety and Design) deal with proactive/preventative management by identifying and addressing the root causes of the problems as opposed to the symptoms. The focus of these sections is on eliminating the accessibility to human food and garbage, the management of visitors and their activities, and modifying park design to enhance visitor safety. The sections on proactive management are considered to hold the most important recommendations of the Plan.

Issue Four is classified as reactive or responsive management in that it specifically deals with how to react should a problem situation arise. As responsive management issues for British Columbia Parks have been outlined in the *Bear-People Prevention Plan* (Conservation Services 1995), this section merely evaluates their applicability to Liard River Hotsprings Provincial Park. Only those sections that require clarification are addressed. Specifically, these sections deal with how to respond to 'problem' bear situations by outlining the criteria for aversive conditioning, translocation and destruction.

Issue Five outlines recommendations that have an emphasis on future research and monitoring in the park and surrounding area by applying an adaptive management approach. In an adaptive management approach, the effectiveness of the implemented management recommendations would be monitored and viable solutions offered as required by the specific situation. For example, an emphasis on the campground may not be appropriate for a low berry production year. Monitoring would allow factors such as this to be identified and the Plan adapted to suit years of low berry production. In addition, the monitoring program will allow Liard Hotsprings to update its bear management plan during and after sanitation (i.e., closure of the landfill, installation of food storage lockers and bear-resistant garbage receptacles, etc.), or whenever new problems arise. The management plan should always be modified to address the result of the monitoring.

The combination of unnatural food availability in a highly selected and naturally used eco-unit (SH), makes the Liard River area an extremely attractive and unsafe environment for black bears. The challenge in formulating the management plan came when trying to assess options that would maintain or attempt to restore the natural habitat movements of black bears while also maximizing visitor safety and enjoyment.

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NOCTURNAL ACTIVITIES OF BLACK BEARS IN NORTHCENTRAL WASHINGTON CASCADES

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Abstract: The nocturnal activities of 10 (4 female: 6 male) radio-collared black bears (*Ursus americanus*) were monitored from den emergence through den entrance during 1996 as part of a habitat use study. Ground based aerial telemetry was used to determine if bears were active at two hour time intervals beginning at dusk and ending about two hours after dawn. Preliminary results showed that bear activity decreased steadily throughout the night, reaching a low between 0201-0400. Bear activity increased dramatically between the 0601-0800 time periods. When analyzed on a seasonal basis (den emergence-31 July = early season, 1 August-den entrance = late season) there was no significant difference in black bear activity during the 2000-2200, 2201-2400, and 0201-0400 time periods. There was a significant difference in black bear activity during the 0001-0200 and 0401-0600 time periods. Black bears were more active during the late season during this time period. Bear activity was the lowest during the 0201-0400 time periods during both seasons. We plan to conduct one more year of monitoring to increase sample sizes so more detailed analysis of nocturnal bear activities can be completed.

NEW MEXICO BLACK BEAR PELT DATA INTERPRETATION WITH MODEL SIMULATIONS

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Abstract: An unusually large number of bear pelts was tagged in the Gila region of New Mexico during the 1994 hunt and raised the question of possible over harvesting. The large harvest occurred during poor environmental conditions and followed 2 years of depressed hunting effort and 6 years of apparent variation in cohort size. Natality and mortality rate variations to express hypotheses about bear population dynamics were simulated to explore possible explanations of the 1994 event. Observed and predicted pelt tag numbers and composition were compared. A scenario was developed, without over harvesting, that combined cohort variation from 1988-93, lower hunt mortality in 1992 and 1993, and higher hunt mortality in 1994. This scenario simulated a pelt tag harvest that approximated pelt tag observations.

USING PURSUIT HOUNDS TO FACILITATE BLACK BEAR POPULATION RESEARCH

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Abstract: The Oregon Department of Fish and Wildlife has been utilizing volunteer houndsman and trained pursuit dogs for conducting black bear (*Ursus americanus*) capture for the last 4 years. This method has accounted for over 200 captures. These captures have included immobilization and instrumentation, checking for cubs, and conducting population transects with strike dogs and mark and recapture methods. Most treed bears were immobilized and caught in a safety net. Other bears were allowed to descend the tree and were darted on the ground. Use of dogs to facilitate black bear research takes special equipment, trained personnel, and good judgment. Specific strategies have been developed to safely remove bears from trees following dog pursuit. Trained hounds can be a very efficient tool to aid researchers conducting black bear population studies.

THE USE OF FECAL DNA AS A MANAGEMENT TOOL AND ITS APPLICATION TO BLACK BEAR BARK-STRIPPING BEHAVIOR

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Abstract: American black bears (*Ursus americanus*) engage in seasonal bark-stripping behavior that potentially results in thousands of dollars of damage annually to harvestable timber in the Pacific Northwest. This far, management practices using supplemental feeding stations and site-specific hunting have not led to an effective decline in this behavior. While a majority of the harvested bears from these selective hunts are males, observations of differing scat sizes and radio telemetry studies suggest that females may be responsible for tree girdling while male monopolize the feeders. We are using fecal DNA material to test these observations and hence, the effectiveness of these management practices. We have collected and isolated DNA from 101 scat samples left at peeled tree sites and an additional 104 fecal samples from 6 different individuals within the study site, have been analyzed using sex determining genes and microsatellite DNA primers. These data are being used to determine the sex and number of different individuals stripping bark from trees as well as visiting feeder stations. Genetic differences observed in this study suggest new management directives beneficial to both bears and industry.

PROPOSED MECHANISMS FOR THE OBSERVED DOUGLAS-FIR VASCULAR TISSUE PREFERENCES OF BLACK BEAR

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Abstract: Douglas-fir *(Pseudotsuga menziesii)* vascular tissue provides an excellent source of high-energy carbohydrates to foraging black bear *(Ursus americanus)* when other forage items are scarce. However, foraging may be deterred by secondary metabolites that induce toxic effects. We propose that foraging preferences of black bear are mediated by the nutrient/toxin ratio of the vascular tissue on which they are feeding. Bioassays used to assess free ranging bears response to diets with varying carbohydrate and terpene concentrations demonstrated that these phytochemicals play a role in black bear foraging. The results indicate that bears selected for low terpene and high carbohydrate containing test diets. This may explain why bears prefer to forage on trees in thinned stands rather than unthinned stands. Trees within thinned stands have a lower ratio of terpene to carbohydrates than trees among higher density stands.

Key Words: black bear, carbohydrates, detoxification, diet selection, Douglas-fir, *Pseudotsuga menziesii,* silviculture, terpene, *Ursus americanus*

BACKGROUND

Black Bears (*Ursus americanus*) strip the bark of Douglas-fir (*Pseudotsuga menziesii*) to feed on newly forming vascular tissue during the spring, presumably because of the relatively high carbohydrate content (Radwan, 1969). Why some trees are peeled while others are ignored is unknown. Bears exhibit preferences for certain tree species (Barnes and Engemen, 1995) as well as preferring to forage within thinned stands (Mason and Adams, 1989; Kanaskie et al., 1990; Schmidt and Gourley, 1992). Kimball and colleagues (in press) have demonstrated that these foraging preferences are at least in part related to the carbohydrate and terpene content of vascular tissue.

Three mechanistic views have been proposed to explain foraging preference (Van Wieren, 1996). Schoener (1987) suggested that animals maximize their rate of intake. Optimal foraging theory predicts that energy is the currency maximized while foraging. An alternative explanation is that animals eat a varied diet to avoid the negative aspects of plant defenses (Freeland and Janzen, 1974). The third mechanistic explanation combines nutrient selection with toxin avoidance (Wang and Provenza, 1996). The latter view has been frequently implied but rarely tested (Van Wieren, 1996).

We offered free ranging black bears diets varying in carbohydrate and terpene content to ascertain if their diet selection reflected nutrient maximization and/or toxin avoidance. Subsequently, we examined bear preference of thinned to unthinned timber stands relative to the chemical constituents of trees within these stands.

METHODS

Field Bioassay:

Pelleted test diets were formulated with 56% meat and bone meal and 43% sugar beet pulp. The remainder of the base diet consisted of sodium chloride, magnesium sulfate and swine mineral vitamins. Cane sugar was added to two of the test foods to increase their carbohydrate concentration while sugar beet pulp was the only source of carbohydrates in the two low carbohydrate foods. A mixture of 17 terpene compounds was also added to the diets in varying amounts; 2.2 L per 900 Kg to the high terpene diets and 01 L per 900 Kg to the low terpene diets. Terpene compounds and respective concentrations included in the terpene mixture reflected those normally found in Douglas-fir vascular tissue (Kimball, et al., 1995). The isomeric composition of the hydrocarbon monoterpenes, oxygenated monoterpenes and sesquiterpenes matched that of Douglas-fir vascular tissue.

Terpene compounds and their sources included: (1S)-(-)-α-pinene, (-)-camphene, (1S)-(-)-β-pinene, myrcene, α-terpinene, p-cymene, (S)-(-)-limonene, γ-terpinene, (±)-linalool, terpinen-4-ol, α-terpineol, (-)-bornyl acetate and (+)-longifolene which were obtained from Aldrich Chemical Co. (Milwaukee, WI) and terpinolene, (+)-3-carene, β-caryophyllene, and citronellyl acetate from TCI America (Portland, OR).

Choice tests with four test diets were conducted with free roaming bears by implementing an approach similar to that used in the supplemental deeding program of the Washington Forest Protection Association (WFPA) (Ziegltrum, 1994). Feeders were

constructed from 55-gallon drums with an oblong opening cut at the lower end of one side. A diagonally placed metal sheet inside the barrel supported the bulk of the test diets and allowed for continuous replacement of pellets through a narrow gap at the back of the drum. Feeders were set on wood bases approximately 25 cm off the ground and securely fastened to a tree to prevent displacement by bears.

Choice tests were implemented at ten sites with a history of past bear activity (Figure 1). Four feeders were established at each experimental site in close proximity (10m) to each other with their openings oriented toward a central focus. Experimental sites were spaced such that it was unlikely a bear would visit more than one of the test sites. It is unknown, however, whether a single bear or multiple bears fed at a site during the test. Feeders were initially filled with the standard WFPA supplemental feed and a beaver carcass hung nearby to attract bears. Sites were monitored for bear activity every third or fourth day and food intake was recorded. Choice tests were initiated after an experimental site had been active for two weeks. Two of the ten experimental sites were not consistently active for the mandated two weeks prior to test, thus these sites were not included in the choice tests. At the other eight experimental sites the WFPA feed was replaced with test foods randomly located among the feeders. Intake was indirectly measured as the amount removed between monitoring intervals.

Sites were monitored every three or four days for a total of seven monitoring intervals. Mean daily intake was calculated for each interval. Intake data were analyzed as a three-factor experiment where sites were blocked and the factors were: carbohydrate content, terpene content and sampling interval. The response variable was mean daily intake. Two linear contrasts were performed to test whether test diet intake was reduced as a result of increased terpene concentration at the high carbohydrate level and if intake was increased as a result of increased carbohydrate concentration at the high terpene level.

CHEMICAL CONSTITUENTS AS RELATED TO STAND DENSITIES:

Vascular tissue samples were collected from trees in Douglas-fir stands of varying tree density using the methods of Kimball, et al., (1995). Briefly, vascular tissue was collected by removing an 80 x 10 cm patch of bark at 1.5 m above ground level and scraping the vascular tissue (phloem tissue and xylem oleoresin located immediately underneath the cork cambium) into a plastic freezer bag.

The bags were immediately immersed in liquid nitrogen for two to five minutes. After complete freezing the samples were maintained on Dry Ice until placed in a laboratory freezer at -24°C. The mass of available forage material was determined as the mass of vascular tissue in the 800 cm^2 sample area. Samples were kept frozen until homogenized and divided into tow equal portions. One portion was maintained frozen until analyzed for terpenes, while the other was lyophilized and analyzed for carbohydrates.

Vascular tissue was collected from eight trees in each of three plots replicated at nine sites throughout Western Washington and Oregon. Each plot was assigned to one of three tree density levels: high (ca. 500 trees per acre), medium (ca. 300 trees per acre) and low (ca. 180 trees per acre).

Terpene analyses were performed by capillary gas chromatography with mass selective detection according to the same method. Carbohydrate analyses were performed by extracting approximately 0.5 g of freeze-dried vascular tissue 25 mL of 50% aqueous ethanol. Extracts were analyzed by anion exchange chromatography with electrochemical detection (Rocklin and Pohle, 1983). Carbohydrates were quantified versus external standards.

Tree chemical data were statistically analyzed as a randomized complete block with density level as the lone factor and sites blocked. The responses were mass of vascular tissue, total carbohydrates and total terpenes.

RESULTS

A significant model ($p<0.0001$) resulted from the analysis of the bioassay data (figure1). Carbohydrates had a positive effect o mean daily intake ($p<0.0001$) while intake was decreased by the terpenes ($p = 0.011$). Effects due to sampling interval ($p = 0.73$), interval*carbohydrate ($p = 0.72$), interval*terpenes ($p=0.72$), and interval*carbohydrate*terpenes ($p + 0.80$) were not significant. Similarly, there was no significant carbohydrate*terpenes interaction ($p=0.12$). Results of the preplanned comparisons demonstrated terpene avoidance at the high carbohydrate level ($p=0.006$). Furthermore, carbohydrates preference was observed at the high terpene level ($p < 0.0001$).

There was a significant model from analysis of the tree chemical data ($p<0.0001$). Carbohydrates ($p= 0.0038$) and vascular tissue mass ($P< 0.0001$) were significantly impacted by tree density with both vascular tissue mass and carbohydrate concentration increasing as tree density decreased. Terpene concentration was not affected by tree density ($p = 0.12$).

DISCUSSION

Nutrient selection and toxin avoidance are important mechanisms in forage preference. When considered independently, the complimentary component is usually considered to be a constraint on the system. Our evidence suggests that the interplay

between nutrients and toxins should be considered when investigating foraging preferences. Within this paradigm, the nutritional state of the foraging animal, the postingestive feedbacks resulting from nutrients and toxins, and the learned associations of forage with nutrients and toxins are key mechanisms (Villalba and Provenza, 1997).

Animals will select forage to obtain those nutrients which they lack, Provenza, et al. (1996) demonstrated that lambs switched preferences among diet choices in a manner, which maintained constant energy/protein ratios. Similarly, preloads of protein or sugar caused rats to select the component they lacked (Perez et al., 1996). Since Douglas-fir vascular tissue is rich in carbohydrates but nitrogen poor (Radwan, 1969), it is probable that black bear foraging preferences of vascular tissue result from toxin avoidance and energy acquisition.

These preferences are mediated by postingestive feedbacks. Forage preferences of rats are frequently explained by energetic value (see Sclafani, 1990). However, preferences for isocaloric solutions have also been observed (Ackroff and Sclafani, 1991). Preference for glucose over fructose may be explained in part by the faster physiological absorption rate of glucose. These differences cause the postingestive feedbacks of glucose to be more reinforcing that the feedbacks of fructose (Ackroff and Sclafani, 1991).

Avoidance is similarly mediated by the negative postingestive feedbacks of toxins (Wang and Provenza, 1996). Mammals have evolved complex mechanisms to detoxify secondary metabolites, which they routinely encounter (Lindroth, 1988). Because these detoxify mechanisms are well known, the physiological impacts of ingesting secondary metabolites such as terpenes have largely been dismissed. However, recent work indicates that ingestion of secondary metabolites, such as the terpenes that are pervasive in forest ecosystems, caused malaise associated with the cost of detoxification.

Mammalian detoxification involves three steps: primary metabolism (typically oxidation), conjugation and elimination. During the oxidation process, secondary metabolites are transformed into more polar compounds which themselves are considered a metabolically produced organic acid load (Foley, et al., 1995). In addition to elimination of the organic anion, excess protons must be buffered. Because maintenance of acid-based balance is of primary importance, bicarbonate must be produced. The cost of increased bicarbonate production is increased protein metabolism (Foley, et al., 1995). One major consequence of disruption of acid-based homeostasis by ingestion of plant secondary metabolites is academia (Foley, et al., 1995). Conjugation also has its costs. Amino acid catabolism and glucose depletion are major consequences of glucuronidation. Modeling has suggested that the amino acid cost during conjugation far exceeds that of maintaining acid-based homeostasis (Illius and Jessop, 1995). Furthermore, depletion of the glucose pool comes at the expense of daily energy requirements. Therefore, nutrient selection is not only important for maintaining basal metabolism, but also for supplying the substrates for terpene conjugation. Maximum tolerance of secondary metabolites occurs when nutrient intake approached two times maintenance requirements (Illius and Jessop, 1995).

The field bioassay demonstrated that following winter activity, black bears selectively forage by minimizing intake of terpenes (toxins) while maximizing energy intake (nutrients). Bears would be expected to evaluate the detoxification costs and energy benefits of forage while accounting for their own nutritional states. Thus, forage with a given costs/benefit (or toxin/nutrient) ratio may be tolerated by one individual while rejected by another. For example, a mature male with a large home range may have access to forage items that a female may not. This advantage may provide the male with glucose reserves, which minimize the detoxification costs of a forage that the female could not tolerate.

Two learning processes allow foraging animals to associate nutritional costs and benefits with a forage item (Provenza, et al., 1992). Affective processes associate the flavor of a diet with the postingestive feedbacks. Cognitive processes associate the sight of forage with the flavor. In the bioassay, foraging bears may have associated the flavor with the energy benefits and detoxification costs of each test diet. Evolutionary learning may have also played a role. Avoidance of bitter tasting forage may be a function of toxin avoidance (Harborne, 1991). However, rejection of forage on bitter taste alone may not be practical for animals that encounter bitter substances on a regular basis (Nolte, et al., 1994; Glendinning, 1994).

OBSERVED PREFERENCES

Black bears prefer to forage Douglas-fir vascular tissue in thinned stands (Mason and Adams, 1989; Kanaskie et al., 1990; Schmidt and Gourley, 1992). Analysis of Douglas-fir from stands varying in tree density demonstrated that both the mass of available vascular tissue and its carbohydrate concentration increase as tree density decreases. Conversely, the terpene concentration does not significantly change due to thinning. The net result is that the potential terpene consumption differs only as a function of changing vascular tissue mass between trees in stands of varying tree density. However, potential carbohydrate consumption between trees in different stands is a function of both the mass of forage material available and changing carbohydrate concentration.

Assume a forage bear has the choice of foraging in either the high; medium or low tree density stands examined in this study. Further, assume that the bear can remove 2500 cm^2 area of bark (medium damage from previous work) and be 25% efficient in scraping the vascular tissue from the tree when foraging. The quantity of terpenes consumed increases 31% by choosing a single tree in the low-density stand over a single tree in the high-density stand, while the amount of consumed carbohydrates increase 72% (Table1). Therefore the observation that bears prefer to forage trees in thinned stands may be explained by the cost/benefit ratio of ingesting vascular tissue. Foraging black bears may prefer vascular tissue in low-density stands because the toxin (terpene) to nutrient (Carbohydrate) ratio is lower than in high density stands (Table1).

Cognitive processes would allow foraging animals to recognize preferred diets without having to taste them (Provenza, et al., 1992). Low-density stands are visually different from high-density stands. The flavor and feedbacks of foraging in low-density stands can be associated with the visual properties of the stand. Therefore, black bear preference of vascular tissue in low-density stands may be mediated by the chemical constituents of the forage and discerned by sight association.

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DNA MARK-RECAPTURE ESTIMATOR OF BLACK BEAR NUMBERS: IS THE HAIR BALL TECHNIQUE A HAIR BRAIN ESTIMATOR?

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Abstract: As part of a 5 year investigation into black bear (*Ursus americanus*) ecology and demography in Washington we are developing a mark-recapture population estimation technique based on DNA analysis of bear hairs collected from hair snags. The objective is to develop a non-invasive cost-effective reliable population estimator that can be applied statewide in a variety of habitats. During 1996 in the Snoqualmie study area in western Washington we selected a 64 km^2 area occupied by 10 radio transmitter marked females and 8 transmitter marked males where we placed, in a trapping grid, 35 hair snags stations spaced at 1.6 km intervals. Each station consisted of an attractant of commercial fish fertilizer centered within a 30 m perimeter barbed wire fence, which is placed 50 cm above ground. Hairs left on fence barbs and on scent tree by bears investigating the scent were collected weekly and additional scent was added. Hair snags were monitored for 9 weeks from 22 July to 16 September. Presence of hair and other sign indicated bears visited stations on 81 occasions of a possible 315 stations visits (35 stations x 9 weeks) for a visitation rate of 25.7%. 8.6% (7 visits) resulted in no hair left by bears, 17.2% (14 visits) resulted in hair left on the scent tree only and 74% (60 visits) resulted hair left on the fence. Hairs are presently being analyzed for DNA to identify bears and to compare to DNA identities of the 18 transmitter-marked bears occupying the area. Estimates of abundance will be determined by adding the number of known bears (transmitter marked bears) with the number of unmarked bears (estimated from hair snag samples). The total number of unmarked bears on the study area will be estimated by adjusting the number of sampled unmarked bears by their probability of detection; determined from the number of hair samples collected from marked bears. Cost for conducting the DNA hair snag technique totals $13,562 ($762 for materials and supplies, $7,800 for salaries and $5,000 for DNA analysis). This compares to $37,440 for a telemetry estimate of bear numbers ($31,500 to capture and mark the 18 bears and $5,940 for aircraft rental and salary for monitoring flights for 9 weeks).

REVELSTROKE, BRITISH COLUMBIA DNA WORKSHOP UPDATE / SUMMARY

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Abstract: The ability to identify the species, sex, specific individual, and degree of relatedness among individuals from as little tissue as the root of a hair has enormous potential in ecological research. In 1995, the Westslopes Bear Project began developing methods of collecting bear hair using a variety of methods but found using barbed wire strung around a central attractant was the most successful. In 1996, methods were expanded primarily to investigate the potential of hair collection and DNA identification to census brown bears. A 64 by 64 kilometer area (4096 km^2) was divided into 64, 8 by 8 kilometer cells and 4 sessions of hair collection occurred in each cell. Based on the results of the 1996 collections, analytical methods and future hair collection are currently being reviewed.

OBSERVATIONS OF DIFFERING PREDATION OF CALF ELK BY BLACK BEARS AND COUGARS IN SOUTHEAST WASHINGTON: OR WHO EATS THE MOST WHEN?

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Abstract: Between 1993-1996, we documented the fates of 180 radio-marked calf elk (*Cervus elaphus nelsoni*). We observed predation by black bears (*Ursus americanus*) and mountain lion (*Puma concolor*) to be the most common cause of death of calf elk during their first 3 months of life. Survival rates of calk elk varied between years, as did the amount of predation by black bears and mountain lions. We explore causes for these variations and present correlations between survival rates, predation levels, and weather patterns.

A BIOGEOGRAPHIC APPROACH TO GENETIC ANALYSIS OF MONTANA BLACK BEARS

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Abstract: Geographic isolation on the regional scale may affect the genetic structure of black bear populations in Montana. Of particular interest are populations from mountain ranges in the central part of the state, and the potential for these populations to support tenants of island biogeography. We hypothesized that black bears occupying mountain ranges in central Montana would have low microsatellite allele heterozygosity in response to degree of isolation. Six microsatellite DNA loci from 90 hunter killed Montana black bears are being analyzed to investigate genetic population structure with respect to geographic isolation. Analyses include allele frequency and deviations from expected Hardy-Weinberg equilibrium, percentages of heterozygosity, and genetic distance between populations. Results to date show the presence of an undocumented allele, allow identification of related bears, and demonstrate frequency dominance of certain alleles.

PLAYING BIOLOGIST AT THE BALOT BOX: A MANAGERS PERSPECTIVE ON WASHINGTON'S INITIATIVE 655

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Abstract: Initiative 655, which prohibited use of bait for hunting of black bear, and banned recreational use of hounds for hunting black bear, cougar, bobcat, and lynx was certified by the Washington Secretary of State's Office approximately 6 weeks prior to being placed on the November 1996 ballot. It was approved by a 63% to 37% margin (1,387, 577 votes to 815, 385) and passed in 31 of Washington's 39 counties. Direct cash contributions to the group supporting the campaign (Washington Wildlife Alliance) totaled $600,065 or .20 cents per registered voter. The opposition campaign organization (Washingtonians for Wildlife Conservation) received $197,795 in cash contributions, totaling .06 cents per voter. In Michigan, where Proposal D, a measure similar to Initiative 655 failed, total campaign dollars were significantly higher than those spent in Washington, totaling more than 1.5 million dollars. Additionally, State statute prevented Washington Department of Fish and Wildlife (WDFW) from using State resources to take a position in support or in opposition to this initiative. Thus, with a lack of significant total campaign committee funds spent on Initiative 655, and minimal information provided by the WDFW, voters were asked to, and subsequently made, significant changes to harvest management programs and hunting methods for black bear, cougar, and bobcat.

THE USE OF DOGS TO STUDY BLACK BEAR HABITAT UTILIZATION, MOVEMENT PATTERNS AND FORAGING BEHAVIOR

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Abstract: A method to study black bear habitat utilization using hound dogs was developed on the East Tavaputs Plateau of east-central Utah. Dogs on lease were used to track bears and help locate bear sign and identify behaviors. Bear tracks were initially located for the dogs to track in four ways: by sighting them on roads from vehicles, by dogs striking a fresh track from the back of a truck, by approaching a radio-transmitted bear, and by following a bear after release from a live trap. A guide string was laid down to approximate the bear's path through the forest. Our preliminary results have been satisfying allowing us to acquire a large sample size of different age bears of both sexes. Both habitats used by bears and bear behaviors have been documented and quantified using this technique. Typical transects contain ant mounds excavated by bears, carrion fed upon by bears, rocks turned over in search of ants, bed sites establish by bears, deer kills and bear scat.

MICHIGAN BEAR REFERENDUM

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During 1996, Michigan joined the list of states in which traditional wildlife management decision-making was challenged at the polls. A measure was put on the November ballot that, if passed, would have put wildlife management in the hands of voters and taken it away from the professionals in the Department of Natural Resources who are most qualified to make such decisions. The measure was labeled proposal D. It would have eliminated the use of bait and dogs for bear hunting and shortened bear season.

Similar proposals have passed in a number of other states, but Proposal D did not pass in Michigan. The reason I'm here today is to provide some insight into why this happened, and I can tell you in one sentence. Lots of money, being proactive, thousands of hours of volunteer effort by non-agency personnel and giving voters a choice.

Proposal G also appeared on Michigan's ballot, which vested the authority for making wildlife management decisions in the hands of the Natural Resources Commission. This commission is the policy setting body for the state DNR, with members appointed by the Governor.

Proposal G gave the authority to the Natural Resources Commission to make wildlife management decisions, with advice from DNR professionals. Specific wording requires that principals of sound wildlife management be used in making decisions. This measure also clearly provided for the opportunity for public input on wildlife issues before being acted on by the commission. Public input has been possible on wildlife management issues in Michigan for a long time, but many members of the public weren't aware of that opportunity.

It would have been possible for both proposals to be approved, but that did not happen. It appeared as though most voters clearly understood what they were voting for. Sixty-two percent of the people who went to the polls voted against D and G was approved by a 69 percent margin. D was defeated in every county in the state and G was approved in every county.

If both measures would have passed, the one that had the widest margin of votes was supposed to take precedence.

I'm pleased to have played a role in the defeat of D and passage of G. The fact that there are thousands of others like me in Michigan who are concerned about the proper management of wildlife such as bear, and were willing to get involved, is why it happened. A tremendous team effort on the part of sportsmen and women across the state was responsible for educating voters about the best choices to make on their ballots.

The fact that Michigan has a strong contingent of outdoor organizations was important. The understanding among residents of the state that proposal D was not just about bear hunting was also important. The passage of D would have set a dangerous precedent that could eventually impact any and all forms of hunting, trapping, fishing and other methods of management. This realization mobilized a lot of people who otherwise might not have gotten involved.

Wildlife research by state or federal agencies and universities can also be negatively impacted by ballot initiatives as Massachusetts found out last fall. A proposal
on that state's ballot that outlawed the use of hounds and snares for hunting and trapping also eliminated their use for research purposes. Bear dogs used to play an important role in bear research in that state, but that's no longer possible.

Michigan residents who are concerned about wildlife management also learned valuable lessons from what happened in Colorado and Oregon. Many hunters in those states did not believe that bear hunting proposals would make it on the ballot, much less be approved by voters. The threat wasn't taken seriously, if at all, until too late in those states.

That did not happen in Michigan. Our state's referendum was anticipated by at least two years by those of us who were paying attention. On a personal level, I had been planning on writing a book about Michigan black bear and the pending referendum gave me the incentive to do it, with the idea of using it as an educational tool. I had been closely following bear research and management in the state for many years as a hunter, writer and photographer, spending a lot of time with state researchers.

My wife and I published *Understanding Michigan Black Bear* in the fall of 1995. We crammed as much information as possible about bears in the book, which ended up being 190 pages. I happen to have copies of the book with me today for anyone interested in looking at one. For those of you interested in buying one, we're offering a special price of $10 per copy.

Before the book was published, a coalition of hunting organizations formed the Citizens for Professional Wildlife Management, which was the main group that campaigned against D and for G. One of the

most important members of CPWM was the Michigan United Conservation Clubs. This conglomeration of sporting groups that already existed provided staff members and their office for fundraising and educational efforts. Michigan Chapters of Safari Club International also played a prominent role, as did two active bear hunting organizations in the state.

Fund raising was the backbone for the successful campaign for G and against D. Like any political campaign, and that's what this was, the amount of money in the war chest often separates winners from losers. The Upper Peninsula Sportsmen's Alliance, one of the member groups of CPWM, came up with the best fund raising idea that helped lead to victory.

The alliance conducted a raffle that raised over $1 million. The grand prize is what set this raffle apart from others. Forty acres of recreational land with a log cabin kit to put on it, was the grand prize. Tickets sold extremely well.

The money raised in the raffle, auctions, and banquets and from pledges made it possible to buy critical television time and ad space in newspapers to get the message to voters before the election. Long before proposal D was officially on the ballot, bear hunting organizations were collecting pledges. A total of $1.8 million dollars was collected and most of it was used in the fight to protect professional wildlife management.

Reserving television time early is critical during an election year. If CPWM had waited until signatures were certified, it might have been too late to purchase the necessary TV time. Successful fund raising efforts made it possible to get the necessary time.

Besides ad time and space, proposals D and G generated a lot of news coverage. Members of CPWM met with the editorial boards of many major newspapers in the state and got the support of all but one of them. To the credit of the Detroit News, one of Michigan's largest newspapers, their editorial writer took the time to go on bear hunts with bait and dogs, to find out for herself what they were like.

A Seattle, Washington based crew from CNN (the Cable News Network) did the same thing. I took the editorial writer and CNN crew on bait hunts and the Michigan Bear Hunters Assoc. hosted them on hound hunts.

Michigan has its share of outdoor writers and outdoor television shows, most of which devoted space and time to the ballot proposals. On a personal note, I wrote more newspaper and magazine articles about black bear during 1996 than ever before, in an effort to get the truth out about bear hunting and management. I actually spent a lot of time countering false information distributed by the proponents of D.

Most of the campaign by the proponents of D was designed to deceive the public and we didn't let them get away with it. They maintained that eliminating bear hunting with bait and dogs would protect cubs. Cubs have been protected in Michigan since 1948. Sows in the company of cubs are also protected.

They claimed that both hunting methods are unsporting, unethical and inhumane. Both hunting methods that were being challenged increase the opportunity for humane kills rather than decrease it. They also offer hunters the best means of clearly identifying protected versus unprotected bears. I've always understood that two of the most important responsibilities of an ethical hunter are to identify their target and make clean kills. I've also been told that non-hunters support hunting that meets those criteria.

In terms of rates of success, approximately 25 percent of bait and dog hunters in Michigan manage to shoot a bear. Any method that only results in one out of four hunters filling a tag does not qualify as unsporting.

Proponents of D also claimed that bait and dog hunting was hurting the state's bear population, another falsehood. The bear population has been increasing annually under a permit system started in 1990. Our permit system is similar to those in Minnesota and Wisconsin, limiting hunter numbers in specific management units, offering the best protection for bear numbers. Passage of D would have eliminated Michigan's very successful bear management system.

Those who supported D also told voters they weren't against bear hunting, just the use of bait and dogs. Then the Make A Wish Foundation sent a youngster from Minnesota, who had a brain tumor, on an Alaskan brown bear hunt. That hunt, which involved neither bait nor dogs, was strongly opposed by The Fund For Animals, one of the groups seeking passage of D in Michigan.

The support of Governor John Engler and DNR Director K. L. Cool, who accepted the directorship about the time the referendum, was heating up, also played a role in the defeat of D and passage of G. Director Cool appeared in commercials supporting proposal G and he was able to do that because he is not classified as a civil servant. And no public funds were used to make the commercials.

As far as advice for other states who may face a referendum on wildlife management in the future, I would suggest the formation of fund raising efforts by coalitions of sporting groups like CPWM as soon as possible. The more time they have to raise as much money as possible, the better. I would also suggest making an attempt to have measures like proposal G passed in states before other hunting measures make it on the ballot.

I didn't mention that Michigan's proposal G was passed by the state legislature. Proposal D got on the ballot through the collection of voter signatures. People who circulated petitions to get D on the ballot were paid up to $2 per signature. And there's no requirement that petition language be accurate to get a measure on the ballot. Wording on the Michigan petitions claimed that a ban on bear hunting with bait and dogs would protect cubs, which is false, but it helped them get the signatures they needed. The petition language could only have been challenged after the election.

Another thing I think may help in the effort to protect professional wildlife management is solid research on the hunting methods that are being questioned. To my knowledge, little research effort has been spent gathering solid data on bear hunting with bait and dogs. In my opinion, it's time for that to change.

The Michigan United Conservation Clubs can provide additional advice for anyone who may face a similar referendum in the future. Rick Jameson is the Executive Director and Dennis Knapp was also actively involved in CPWM. The telephone number for MUCC is 517-371-1041. The address is P.O. Box 30235, Lansing, MI 48909. I would also be willing to help out in any way I can.

MONITORING BLACK BEAR (*URSUS AMERICANUS*) POPULATIONS IN CALIFORNIA

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Abstract: Standard techniques for monitoring large mammal populations cannot be applied to black bears due to their habitat requirements and solitary nature. Instead, black bear populations in California are monitored by using a matrix composed of population indices including age and sex ratios of hunter killed bears, kill per unit effort, total harvest, and population estimates. The use of this matrix is expected to lessen the effects of biases inherent in each individual monitoring technique. These data have been proven to be valuable for detecting impacts to bear populations and were instrumental in making regulatory changes in the early 1980s aimed at reducing bear poaching. We will present the data from our management programs and will also present the idea of including bait station data as a component of the matrix. New monitoring methods may be utilized as they become available.

BLACK BEAR DAMAGE TO FOREST STANDS IN WESTERN WASHINGTON

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Abstract: Cambium-feeding behavior by black bears (*Ursus americanus*) is a major reforestation problem in the Pacific Northwest. Historically, studies have measured the cumulative effects of damage over time, but few have viewed damage in the frame of one season. Black bear damage that occurred in 1996 was surveyed in areas of radio marked bears. Fresh damage occurred on 48% of bear location plots. Douglas-fir (*Pseudotsuga menziesii*) (69%), western hemlock (*Tsuga heterophylla*) (19.2%), and Pacific Silver fir (*Abies amabilis*) (9.6%) were most frequently damaged, with a mean dbh of 25.1 cm (9.9 in.), 29.5 cm (11.6 in.), and 30.7 cm (12.1 in.), respectively. Random plots were surveyed from mid-July to mid-August to measure habitat availability. Site and stand variables were measured on freshly damaged bear location plots, random plots and non-damaged bear location plots. This study identified several variables that make forest stands vulnerable to bear damage: conifer dbh, conifer density, stand age, and canopy cover. Awareness of such stand characteristics can assist foresters with animal damage prevention and control programs.

Key Words: animal damage, black bear, cambium-feeding behavior, *Ursus americanus*, wildlife management.

Black bear (*Ursus americanus*) damage to conifers, in the form of cambium-feeding behavior, is a major concern to forest managers in the Pacific Northwest. Damage occurs during the spring and early summer, then ends, abruptly, coincident with the ripening of fruits and berries (Flowers 1987). Tree species preferred by black bears varies not only by region, but also with elevation. Douglas-fir (*Pseudotsuga menziesii*) is the preferred species in western Washington at low and intermediate elevations. Pacific silver fir (*Abies amabilis*) is the main species damaged on the upper slopes of the Olympic and Cascade Mountains (Pierson 1966, Schreuder 1976).

Black bears feed on trees from a variety of age classes, although damage tends to be concentrated on younger, faster growing trees. Heavy damage often occurs on very productive sites, to the fastest growing trees (Noble 1993). Damage levels have been observed to be higher in thinned stands (Mason and Adams 1989, Kanaskie et al. 1990), negating the economic returns of thinning practices (Schreuder 1976).

Damage was recognized as a serious problem in western Washington by 1951, when a solution was sought (Lutz 1951). In 1971, a serious bear damage problem developed on the North Fork of the Snoqualmie River where the current study occurred (Poelker and Hartwell 1973). Spring bear hunts, where suspected problem bears are harvested, and a supplemental feeding program, providing commercially processed alternative food to bears, have since been initiated in that area, yet damage levels continue to be high. The objectives of this study were to better define the timing and extent of black bear damage to forest stands in western Washington and to identify habitat attributes associated with bear damage. Use was defined as trees exhibiting cambium-feeding behavior (fresh damage) during the 1996 season, evident from the presence of incisor grooves on the sapwood. We report preliminary results here. For a more complete presentation of study results, including bear food habits and the sex of bears causing the damage, readers are referred to Stewart (1997).

STUDY AREA

This study was conducted on the west slope of the Cascade Mountains from May to August, 1996, in the South Fork Tolt River watershed, King County, Washington. This study was a cooperative effort between USDA/APHIS National Wildlife Research Center (NWRC), Washington Department of Fish and Wildlife (WDFW), and Washington State University. The study area is managed primarily for timber production.

Elevations ranged from 91 m (300 ft) to 1160 m (3800 ft). High levels of precipitation occur between October and May, primarily as rain, and varies with elevation. Mean annual precipitation is 131.3 cm (51.7 in.) at 235.0 m (771 ft). Average temperature in January is 3.5° C (38.3° F), and in July is 17.4° C (63.4° F).

Coniferous forests dominate the Tolt River watershed landscape, which can be divided into two vegetative zones: the western hemlock (*Tsuga heterophylla*) and Pacific silver fir zones. The western hemlock zone extends from the lowlands to 610 m (2,000 ft) elevation where Douglas-fir is the dominant

seral species. The Pacific silver fir zone extends from 610 m (2,000 ft) to 1311 m (4,300 ft) where the dominant climax species is Pacific silver fir. Common understory plants include sword fern (*Polystichum munitum*), salal (*Gaultheria shallon*), Alaska huckleberry (*Vaccinium alaskaense*), rosey twisted stalk (*Streptopus roseus*) and devil's club (*Oplopanax horridum*).

METHODS

Efforts were concentrated on radio-monitored black bears that inhabited stands exhibiting the age class most vulnerable to damage. This was defined by past studies in western Washington to be stands greater than 20 years old (Pierson 1966, Poelker and Hartwell 1973). Ten females and ten males were intensively monitored. Damage searches occurred in an area of approximately 8.0 ha (19.8 acres), encompassing a bear's location. A 0.0936 ha (0.2314 acre) circular plot was used to assess freshly damaged trees. Within the 0.0936 ha plot, stand inventory was subsampled in a 0.0234 ha (0.0579 acre) plot. All trees greater than or equal to 10.2 cm (4 in.) dbh were identified and measured.

Random plots were surveyed mid-July to mid-August to determine habitat availability within the study area. Stand characteristics were inventoried in a 0.0234 ha (0.0579 acre) plot. Comparisons (t-tests) of freshly damaged bear location plots with non-damaged bear location plots and random plots were performed to test for differences between the values of site and stand variables, averaged per plot type. Multivariate logistic regression analyses were also performed to identify, in combination, the variables most important for black bear selection of freshly damaged sites.

RESULTS

Study Plots

A total of 96 bear location plots were measured. Fresh damage was found on 48% (n=46) of plots. Stands, on average, consisted primarily of western hemlock (48.8%) and Douglas-fir (31.6%). Average conifer density (≥10.2 cm dbh [4 in.]) was 478.9 stems per ha (193.8 stem/acre).

Two hundred thirty-nine freshly damaged trees were examined: 69% Douglas-fir (n=165), 19.2% western hemlock (n=46), 9.6% Pacific silver fir (n=23), and 2.2% other conifers (n=5). Average stem dbh of freshly damaged trees varied per species and was 25.1 cm (9.9 in.) for Douglas-fir, 29.5 cm (11.6 in.) for western hemlock, and 30.7 cm (12.1 in.) for Pacific silver fir. On average, freshly damaged sites had 14% (55.5 stems/ha [22.4 stems/acre]) of trees damaged during the 1996 season with one stand sustaining 59% of trees freshly peeled (202.9 freshly damaged trees per ha [82.1 trees/acre]).

One hundred four random plots were assessed between mid-July and mid-August. Random plots had an average conifer density
of 649.4 stems per ha (262.8 stems/acre).
Stands were comprised primarily of western hemlock (56.1%) and Douglas-fir (23.6%).

Use and Availability

A use and availability analysis was performed by comparing freshly damaged bear location plots (n=46) with random plots (n=104). It was assumed that random plots were representative of the study area. Significant differences were found in the means of both site and stand characteristics (Table 1). Stand characteristics that differed were average conifer density (P<0.0001), average density of western hemlock (P=0.0036), and stand age (P=0.0006). Site index (P=0.0197) was the only site variable to differ between the two groups of plots. A multivariate logistic regression model revealed that average conifer dbh (P=0.0002), average conifer density (P<0.0001), site index (P=0.0002), and canopy cover (P=0.0166) were all good predictors of freshly damaged bear location plots.

Inter-site Selection

An additional analysis was performed to look specifically at areas inhabited by radio-monitored bears to see if inter-site selection occurred. Bear-occupied areas were tested to see if the study animals selected for particular stand and site characteristics for cambium feeding within their home ranges. Freshly damaged plots (n=46) were compared with non-damaged plots (n=50) to test the hypothesis of no difference in the means of stand and site characteristics.

Stand characteristics that differed significantly included average conifer dbh (P=0.0003), average conifer density (P=0.0336), average density of western hemlock (P=0.0100), stand age (P<0.0001), and canopy cover (P=0.0264) (Table 2). Site characteristics that differed significantly included site index (P=0.0099) and elevation (P=0.0042). Average conifer dbh (P<0.0001), average conifer density (P=0.0004), stand age (P<0.0001), canopy cover (P=0.0349), and site index (P=0.0073) were all good predictors of freshly damaged sites within bear occupied areas in the multivariate logistic regression model.

DISCUSSION AND CONCLUSIONS

This study is unique because efforts concentrated on freshly damaged trees, measured within two weeks of feeding. Fresh damage was observed the first week in May and into the third week of July. A late green-up resulted in 1996 due to heavy snow loads at higher elevations and below average temperatures in May and June (NOAA 1996). This probably resulted in an

Table 1. Summary statistics for site and stand variables of random plots (n=104) and freshly damaged bear location plots (n=46), King County, Washington, 1996.

Variables	Random plots		Freshly damaged plots			
	Mean	SE	Mean	SE	Z[a]	Prob.>Z
Stand variables						
Average conifer dbh (cm)[b]	28.2	6.9	25.9	5.3	-1.8660	0.0640
Conifer density (stems/ha)	649.4	363.1	401.6	158.1	-4.4641	<0.0001
W. Hemlock (stems/ha)	384.5	414.4	179.4	166.6	-2.9334	0.0036
Stand age	39.8	13.1	32.2	7.6	-3.4292	0.0006
Canopy cover (%)[c]	86.1	10.7	82.8	11.4	-1.9032	0.0570
Site variables						
Site index (m/50yrs)[d]	30.5	6.0	27.9	4.8	-2.3327	0.0197
Elevation (m)	577.7	303.2	664.2	250.8	1.7773	0.0755

[a] Test statistic based on Mann-Whitney test
[b] Test statistic based parametric t-test
[c] Based on arcsine transformed variables
[d] Based on Douglas-fir

extension of the spring period in which forages are restricted by delaying, and possibly diminishing, the fruit and berry crops that are essential for black bear nutrition and survival.

Although the results were strikingly similar, the inter-site selection analysis revealed more variables (7 vs. 4) that were significantly different, as well as more variables (5 vs. 4) that were good predictors of black bear damaged sites, than the use and availability comparison. The inter-site selection analysis was a finer look at selection criteria because black bears were present in the areas of all plots. Of the two statistical methods utilized, the results from the predictive model are probably a better representation of selection criteria for freshly damaged sites because it accounts for interactions among variables.

Douglas-fir was most frequently damaged on the Snoqualmie study area, even though western hemlock was the most abundant conifer species. Freshly damaged areas were younger, overall, and had a smaller average conifer dbh than random plots and non-damaged bear location plots. Freshly damaged bear location plots also had a significantly lower density of conifers and a more open canopy. Bear damage is typically in more open grown stands (Nelson 1989). More open sites provide faster growing trees, with higher sap flow, and more understory vegetation, thereby increasing forage availability.

Elevations of freshly damaged bear location plots tended to be higher than random plots and non-damaged bear location plots. This is probably a function of the distribution of stand age throughout the study site. Stands most vulnerable to bear damage (21-40 years old) tended to be concentrated in higher elevations as the lower elevations had been harvested earlier in the century. Therefore, past logging activities and time of plantings dictate which areas will become vulnerable to bear damage at future dates. Also, the delay in the phenological development of trees with increasing elevation may have resulted, theoretically, in a delay in tree peeling (Schmidt and Gourley 1992). This relationship could result in more severe bear damage occurring, overall, at higher elevations, most notably in years (1996) when a late green-up occurs and foraging options are very limited.

Freshly damaged bear location plots had significantly lower site indices than random plots and non-damaged bear location plots. This is a contradiction to Mason and Adams (1989) and Nelson (1989) who found that bears tended to damage more productive sites. This can be explained by the fact that freshly damaged bear location plots were at high elevations because site productivity decreases with increasing elevation due to the shorter growing season. Steinbrenner (1979) found elevation to be the most important variable that expresses climatic change, directly influencing site index.

The Snoqualmie study area has traditionally relied on spring bear hunts and a supplemental feeding program to reduce bear depredation on trees. Despite these efforts, heavy levels of damage occurred on over 75% of freshly damaged sites examined in 1996, with damage concentrated in areas. It would appear from this study that the current methods to reduce black bear

Table 2. Summary statistics for site and stand characteristics of non-damaged (n=50) and freshly damaged (n=46) bear location plots, King County, Washington, 1996.

Variables	Non-damaged plots Mean	SE	Freshly damaged plots Mean	SE	Z[a]	Prob.>Z
Stand variables						
Average conifer dbh (cm)	31.8	9.4	25.9	5.3	-3.5948	0.0003
Conifer density (stems/ha)	551.1	286.2	401.6	158.1	-2.1243	0.0336
W. Hemlock (stems/ha)	320.4	277.7	179.4	166.6	-2.5766	0.0100
Stand age	44.0	12.3	32.2	7.6	4.7196	< 0.0001
Canopy cover (%)[b]	85.0	11.2	82.8	11.4	-2.2203	0.0264
Site variables						
Site index (m/50yrs)[c]	31.4	6.4	27.9	4.8	2.5747	0.0099
Elevation (m)	503.5	300.9	664.2	250.8	2.8610	0.0042

[a] Test statistic based on Mann-Whitney test.
[b] Based on arcsine transformed variables.
[c] Based on Douglas-fir.

damage are only marginally successful.

It is important to keep in mind that the bear location plot method selected for areas more likely to receive heavy damage. Therefore, the high damage levels observed in some areas were not representative of overall damage levels, but nonetheless warrant concern by foresters. High levels of bear damage have also been reported by Schmidt (1987), who observed cumulative damage of up to 70% of a stand. Forest managers are concerned about losing a substantial portion of wood fiber production because stands remain vulnerable to bear depredation for several years. Additionally, black bear populations in western Washington and Oregon continue to grow, which further compounds the problem.

Several silvicultural practices may help reduce bear damage. These include: managing for greater species diversity, pruning of lower branches, delaying thinning, and thinning to higher densities (S. Ferguson, Oregon Department of Forestry, personal communication). Not only are these indirect damage control methods pro-active, but they are also non-invasive. We suggest efforts be concentrated in areas that have historically sustained black bear damage as well as those stands that show a potential vulnerability to bear depredation, based on an assessment of key habitat variables. This will provide more efficient integrated forest and wildlife management.

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BLACK BEAR HABITAT USE AND HOME RANGE ECOLOGY

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Abstract: Black bear (*ursus americanus*) reproductive capability is directly influenced by habitat quality and quantity. Therefore it is necessary to study the female cohort's use of habitat to project population growth rates and formulate black bear management plans. A total of 14 adult female black bears were radio - tracked from June of 1993 to December of 1995 in the central Cascades of Oregon. Several locations classified to habitat type were obtained per bear each week and entered into a Geographic Information System. Habitats were characterized by stand structure and mapped using a LANDSAT Thematic Mapper scene of the study area. Statistical techniques were used to determine variables significantly associated with bear locations, including habitat type, patch size, slope, and distance to roads and streams. Habitat selection was assessed at both the landscape and home range scales. When analyzed in conjunction with demographic data, this study will aid in determining black bear population viability in the central Oregon Cascades.

THE WASHINGTON ADCP - A COLLABORATIVE EFFORT TO ADDRESS CONSTRAINTS TO REDUCE BLACK BEAR AND OTHER ANIMAL DAMAGE

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Abstract: The Animal Damage Control Program (ADCP) is a joint effort of private, government and tribal forestland managers to protect forest resources from animal damage. The collaborative effort among large and small timber landowners provides a feasible means to address the biological, economical and social constraints of operating a program to reduce wildlife damage. The principle objective of the program is to limit the extent of black bear (*Ursus americanus*) damage to forest resources during the spring. Black bears foraging on trees can be extremely detrimental to the health and economic value of a timber stand. A brief overview of the Washington Forest Protection Association's Animal Damage Control Program (ADCP) is provided along with a description of bear damage and means to reduce the damage. The paper is an updated compilation of information presented at prior conferences (Ziegltrum and Nolte 1996, Ziegltrum and Nolte 1997). Emphasis is placed on the supplemental feeding program. Timber producers in Washington and Oregon placed over 545 thousand pounds of pellets into 850 feeding stations during 1996.

Key Words: black bear, timber damage, supplemental feeding, WFPA-ADCP

INTRODUCTION

The Washington Forest Protection association (WFPA) was founded in 1908, originally as an organization to protect private forest from fires. At present, The WFPA works with and represents the interest of private landowners in the areas of forest taxation and economics, land use, environmental affairs, communication, educational activities, and forest policy. WFPA members represent a combined land base of nearly 5 million acres. An increasing need to protect forest resources from animal damage led to the formation of the Washington Animal Damage control Program (WADCP) within the general structure of the WFPA in 1959. The principal objective of the WADCP is to work with participating landowners to reduce spring black bear (*Ursus americanus*) damage to timber stands of Douglas-fir (*Pseudotsuga menziesii*), western hemlock (*Tsuga heterophylla*), and western red cedar (*Thuja plicata*). The WADCP, however, also provides expertise and technical assistance in damage management for a broad range of wildlife species including beaver (*Castor canadensis*), mountain beaver (*Aplodontia rufa*), porcupine (*Erethizon dorsatum*), ungulates (*Cervus* and *Odocoileus spp.*) and other wildlife species.

The general goal of the WADCP is to resolve animal damage issues in an economically feasible and socially acceptable manner. The program had 34 members during 1996, with a total land base of more than 3.4 million acres of forestland of which 1.3 million acres are considered to be vulnerable to black bear damage (Figure 1). Participants in the program range from small private landowners to large forest management companies, an Indian Nation, forestry consulting firms, city watersheds, and land managers in the neighboring state of Oregon.

BLACK BEAR DAMAGE TO TIMBER STANDS

Black bears strip the bark of trees to feed on the newly forming vascular tissue during the spring. Damage inflicted through this behavior can be extremely detrimental to the health and economic value of a timber stand. Complete girdling is lethal, while partial girdling reduces growth rates and provides avenues for subsequent insect and disease infestations (Kanaskie et al. 1990). The severity to timber loss is compounded because bears tend to select for the most vigorous trees with the most productive stands or where stand improvements (e.g., thinning) have been implemented (Mason and Adams 1989, Kanaskie et al. 1990, Schmidt and Gourley 1992).

Bear foraging on the vascular tissue occurs almost exclusively in the spring. Presumably, because alternative forages are limited and spring sapwood provides a source of carbohydrates (Radwan 1969, Kimball et al. 1997). Damage generally starts with bud burst as the relative abundance of carbohydrates increases. Relative preference of bears for a particular tree or tree species may change with the phenological stage of the tree (Kimball et al. 1997). Hemlocks are generally damaged earlier in the spring than Douglas-fir because of an earlier bud burst (Flowers personal communication). Damage generally declines during early July as berries and other alternative foods become more readily available.

Bears feed on the vascular tissue by removing the bark with their claws and scraping the sapwood from the heartwood with their incisors. Bears generally feed on the lower bole of trees in stands between 15 and 30

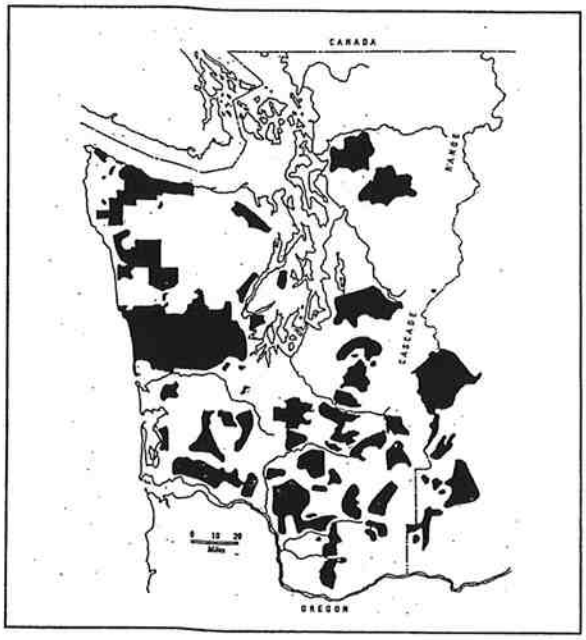

Figure 1. Black bear damage locations in eastern Washington

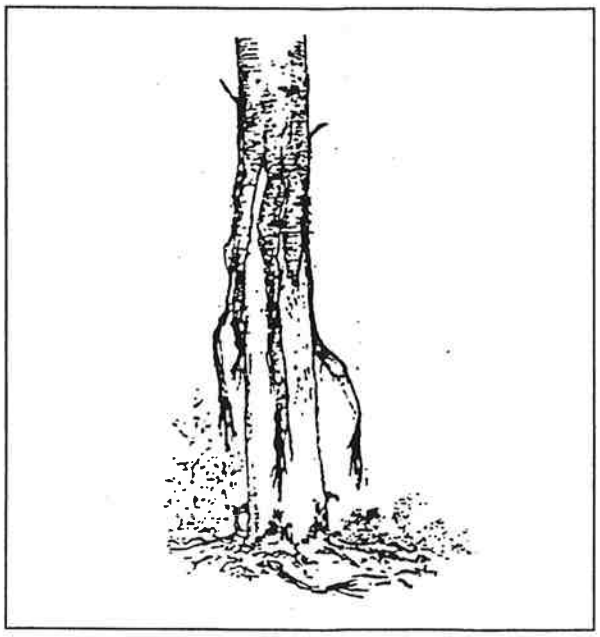

Figure 2. Tree peeled by a black bear foraging for vascular tissue

years of age. Any age tree, however, is vulnerable and bears occasionally strip an entire tree. Damage within a stand can be extensive as a single foraging bear may peel bark from as many as 50 to 70 trees per day (Schmidt and Gourley 1992).

Timber stands with girdled trees are readily identified through aerial surveys in the spring. Trees completely girdled the previous year appear red as their vigor declines and their needles become discolored. Partially girdled trees are generally physiologically stressed and their needles will appear light green to yellow. Gray trees are dead. Areas suspected to contain bear damaged trees are mapped from the air and later verified by ground proofing. A greater number of damaged trees are generally revealed during ground proofing than originally detected in the air.

Damage inflicted by bears to trees is easily identifiable (Figure 2). Stripped bark is on the ground around the base of the tree and vertical tooth and claw marks are generally visible on the bole. Beaver and mountain beaver also girdle the bore of similar age trees near the ground though damage inflicted by these species is usually easily distinguishable from bear damage. For example, conical shaped stumps and large wood chips are good indicators of beaver activity. Mountain beaver girdling on a tree bore generally occurs within 50 cm of the ground and tooth marks are smaller and are horizontal with irregular claw marks rather than vertical. Porcupine damage generally occurs higher in the tree canopy and indicators, such as small bark chips, clipped needles, quills, and fecal material, are often at the base of the tree.

SUPPLEMENTAL BEAR FEEDING PROGRAM

A primary objective of the ADCP is a socially acceptable means to reduce bear damage to forest resources. Historically, lethal removal was the available means to eliminate bears that damaged timber. Professional agents were hired to identify and remove problem animals. The WADCP began investigating non-lethal approaches during the early 1980s (Flowers 1983). The first operational supplemental feeding of bears to reduce timber damage included 10 feeders established during the spring of 1985.

The supplemental feeding program proved to be an effective tool to reduce bear damage to timber. Damage on timber stands that had been extensive in previous years was reduced to an acceptable level. Interest and participation in the program has increased dramatically over the past dozen years (Table 1). Participants in the supplemental feeding program, during 1996, placed over 535 thousand pounds of pellets in 840 feeding stations established across western Washington and Oregon. More than 600 thousand pounds of pellets have already been purchased for use during the spring of 1997.

Supplemental feed is provided only in the spring and early summer when bears are actively foraging on trees. Feeding stations are installed as close as possible to current or anticipated damage. Preferred feeder

Table 1. Number of feeding stations and pounds of pellets used in the supplemental feeding program from it's inception in 1985 until the present.

Year	Washington		Oregon	
	Stations	Pellets (pounds)	Stations	Pellets (pounds)
1985	10	5,000	--	--
1986	22	10,000	--	--
1987	52	20,000	--	--
1988	152	50,000	--	--
1989	260	80,000	--	--
1990	280	99,000	--	--
1991	320	159,000	--	--
1992	350	210,250	20	21,000
1993	500	308,000	70	45,000
1994	600	310,000	90	60,850
1995	610	357,150	90	60,850
1996	750	450,040	90	87,500
1997*	>850	600,000		

*Known number of feeding and pounds of pellets in Washington and Oregon prior to the damage season

locations are close to roads to facilitate the stocking of feeders with pellets, but hidden from public view to avoid poaching and away from high public use areas to avoid bear-human conflicts.

The Washington Forest Protection Association produces the supplemental pellets. Sugars are considered the most important ingredients to alleviate damage to trees. Carbohydrate content of the pellets is approximately 3 times that found in the vascular tissue of Douglas-fir (Kimball, personal communication). Pellets also contain fats, proteins, vitamins and minerals to provide a nutritional balanced diet for bears. A low-moisture content, less than 10%, enhances bear acceptance and increases the viable shelf life of pellets. Individual pellets resemble a greenish colored dry dog food and are .25 inches in diameter and about .5 inches long.

Self-feeders are constructed from either plastic or metal 55-gallon barrel (Figure 3). Bears can obtain pellets from an oblong opening cut in the lower front portion of the barrel. The feeding plate is separated from the storage compartment by a metal or plywood sheet inserted diagonally within the barrel. Pellets taken from the feeding plate are automatically replaced as pellets fall through a narrow gap beneath this sheet. The self-feeding mechanism permits a continuous supply of pellets, but prohibits bears from spilling or playing with the food. A heavy roof insulated with foam keeps the pellets dry and restricts bears to feeding from the front entrance.

Bear feeders are securely fastened to a tree approximately 10 inches off the ground to avoid contamination by water or rodents. Bait (e.g., beaver carcasses) may be used to initially attract bears to stations, but is nor necessary once bears begin feeding. Generally feeders established in the same location over a series of springs are readily located by bears in subsequent years. Each station holds approximately 200 of pellets and active stations need to be restocked once a week. Wet or powdery pellets are removed before a station is restocked with new pellets. At the end of the damage season all feeding stations are removed from the forest.

Overall the supplemental feeding program is an effective means to reduce bear damage to timber stands. Bears generally stop peeling trees once they begin eating pellets. Some evidence suggests that the success of the feeding program declines as population densities increase. This may be because of competition among bears or through efforts by bears to avoid antagonistic encounters, particularly females with cubs. Large bears may interfere with smaller bear access to feeders and they may resort to foraging on trees. A second feeder or possibly a third placed several hundred yards down the road often alleviates this problem. Initial concerns that bears might become dependent of the feeders for food have been unfounded. Bears wean themselves from the supplemental feed as natural forages (e.g., berries) become available.

Occasionally, a bear fails to adjust to feeding from the supplemental feeding station and continues to strip trees. These animals are generally removed to another location or euthanized if necessary. An established working relationship with the Washington State Department of Fish & Wildlife (WDFW) enables the WADCP to obtain appropriate permits and to quickly respond to problem animals. In the past, bear population management was accomplished by sport hunters during the regular hunting seasons and forest management efforts focused only on the behavior of individual animals. A combination of techniques led to the removal of 84 bears in response to bear damage complaints during 1996 (Table 2).

ASSOCIATED RESEARCH

The WADCP recognizes that new alternative wildlife management strategies need to be developed and existing approaches continually improved. The WADCP actively supports black bear research in cooperation with federal and state agencies, as well as universities. The WADCP has collaborated with the WDFW to develop indirect population measures to assess bear densities on a game management unit in the Cascade Mountains. The WADCP also has cooperated with the WDFW to investigate black bear habitat requirements in managed forests. University students interested in wildlife damage management have received either direct or indirect support from the WADCP. Currently, the WADCP is working in

Table 2. Number of attempts by technique and the numbers of bears lethally removed during 1996 in the State of Washington to prevent timber damage.

	Hot Spot		Prof. Hunt		Foot Snares		Bait Hunts	
Region	Number	Kills	Number	Kills	Number	Kills	Number	Kills
4	18	19	4	5	2	2	0	0
5	10	9	5	5	5	4	4	3
6	8	12	11	11	17	14	0	0
Total	36	40	20	21	24	20	4	3

collaboration with the USDA/APHIS/ADC/National Wildlife Research Center (NWRC) to improve the understanding of bear damage management in timber stands. Initially efforts have been directed at determining the forage selection criteria used by bears to select trees. A subsequent study will assess the impacts and limitations of the supplemental feeding program.

The WADCP also has assisted in developing mechanisms for private timber interests to have an ongoing dialogue with other producers and researchers. The Collaborative Research Team (CRT) is a group of interested persons that meets to informally assess research needs among a diverse array of federal, state and private managers in Washington and Oregon. The CRT works closely with the National Wildlife Research Center's project to develop means to alleviate damage to forest resources.

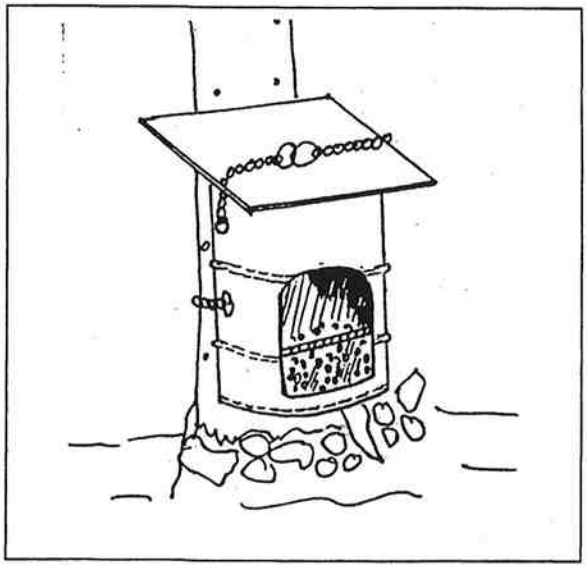

Figure 3. Feeding station implemented to provide bears an alternative to peeling trees during the spring.

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WORKSHOP SESSIONS

SESSION ONE: POPULATION MONITORING

Session Lead: Steve Pozzanghera, Washington Department of Fish and Wildlife

MONITORING BLACK BEAR POPULATIONS IN CALIFORNIA

Robert Stafford, California Department of Fish and Game

Question: (Hal Black) - Have there been any years when there have been any areas of big failures in cub production?

> *Answer:(Robert Stafford)* - Going back to 1982, there have not been any years when there has been cub failure. There are roughly 52,000 square miles of occupied bear habitat in the state, so any particular crop failures don't seem to occur at a statewide level.

Question: (Steve Pozzanghera) - Of the 85-95 percent return of total report cards, what is the bias of successful to unsuccessful?

> *Answer: (Robert Stafford)* - Hardly any (maybe 10); teeth are turned in without a card being returned. If the tags are not returned, a tag is not given the next year.

Question: (Steve Pozzanghera) - Why run a bait station in poor habitat?

> *Answer: (Robert Stafford)* - The station is done on the "fringe of the range", while at the same time trying to see if there are other problems.

ARE HUNTER HARVESTED TOOTH AGES AN ACCURATE INDICATOR OF THE AGE STRUCTURE OF A BLACK BEAR POPULATION IN OREGON?

James Akenson, Oregon Department of Fish and Wildlife

Question: (Sam Wasser) - Can hounds tell the difference in bear scents; (i.e. when females are in estrus is there an increase in contact with females)?

> *Answer: (James Akenson)* - Hounds apparently cannot tell the difference in sexes, even if a female is in estrus.

Question: (Steve Pozzanghera) - Do you have any ideas relative to the lack of subadult females in the capture?

> *Answer: (James Akenson)* - That is where the sampling bias is in our method. Subadult females tend to expose themselves less to detection since they travel less than subadult males.

ESTIMATING BLACK BEAR POPULATION SIZE AND TREND IN WASHINGTON STATE

Louis Bender, Washington Department of Fish and Wildlife

Question: (Richard Smith) - How much is the population going to increase with the elimination of bait and dogs?

> *Answer: (Louis Bender)* - Simulations can be made from the model given above (which was a minimum model, i.e. everything was estimated on minimum populations). We also have a population model using an average model with confidence intervals that is considerably higher than the model presented. We do know the population will continue to increase but we don't know for how long.

Iechtel) - How soli d are your estimates of adults, age 3.5, having cubs every-other year? Since ifference in eastern and western Washington, Montana, and Alaska, wouldn't that make a big nodel?

(Louis Bender) - Yes, it would make a difference. Again, the productivity rates came from g what little literat ure was available for Wahington and what information is out there in general. currently ongoing research, which will certainly shed new light on this. Right now, it is just a esstimate".

CO BLACK BE AR PELT TAG DAT INTERPRETATION USING MODEL

en, New Mexico Ga me and Fish

SESSION TWO: DENSITY ESTIMATION AND DNA TECHNOLOGY

Session Lead: Boyd Blackwell, Utah Division of Wildlife

A MARK-RESIGHT SYSTEM FOR ESTIMATING BLACK BEAR DENSITY

Thomas Beck, Colorado Division of Wildlife

Question: (Steve Pozzanghera) - On the streamers with the ear tag loss in year 1, going back to the drawing board and putting on wooden dowels, it didn't seem as though your estimation of plus or minus 20 percent had changed in your conclusion.

> *Answer: (Tom Beck)* No, it did not change. It was more because of a sample size problem.

DNA CENSUS METHODS, A CONTINUATION OF THOUGHTS FROM REVELSTOKE, BC

Bruce McLellan and John Woods, British Columbia Forest Service, Research Branch

Comment: (Sam Wasser) - Some of your concerns in setting up grid size for females vs. males will be tested. One of the powers of DNA is that you can tell if the same female visited two different sites over a given interval. Nuclear DNA can be retrieved from scats.

> *Response:* Thank you for the encouragement.

Question: (Cliff Rice) - What is the cost associated with this analysis?

> *Answer:* All the money is in the helicopter. The actual analysis of the DNA samples is being done in a university research-type environment right now, so it's difficult to get a cost estimate. We feel that it's in the neighborhood of $50 Canadian.

DNA MARK-RECAPTURE ESTIMATOR OF BLACK BEAR NUMBERS: IS THE HAIR BALL TECHNIQUE A HAIR BRAIN ESTIMATOR?

Gary Koehler, Washington Department of Fish and Wildlife; Sam Wasser and Christine Houston, Center for Wildlife Conservation; D. John Pierce, Washington Department of Fish and Wildlife and John Skalski; Center for Quantitative Science

Question: (Hal Black) - How do we maintain our scat samples for future use?

> *Answer: (Gary Koehler)* - Part of it depends on where you are going to be transferring it. The easiest way is to use silica gel at a ratio of 4 grams of silica to 1 gram of feces. Put it in a tightly sealed container with a little filter paper on it.

Question: (Cecily Costello) - What type of sample size of known bears have you collected hair from? What confidence do you have in actually identifying the individuals?

> *Answer: (Gary Koehler)* - Don't know if there is a good handle on that right now. So far, for determining probability of identity, only three loci have been looked at with the hair. The level of variation in two of the loci wasn't very diverse. Can't really say right now with a high degree of probability that there will be matches. There is a high degree of confidence in individuals. For the sib-sib relationship, .05 is used.

A BIOGEOGRAPHIC APPROACH TO GENETIC ANALYSIS OF MONTANA BLACK BEARS

Bill Ostheimer, Montana State University

Question: (speaker not identified) This is based on one genetics course in college and an evolution course; I was always under the impression that genetic diversities and the level of heterozygote were not the same thing. I thought that genetic diversity was looking at the number of alleles that are possible at a certain loci. I was wondering what the relationship between those two are looking at your different populations.

> *Answer: (Bill Ostheimer)* - The heterozygote index comes from allele frequencies at those six different loci. Each loci has a number of alleles possible, and they are distributed on a frequency based on population. Those frequencies are used to determine the heterozygote of those populations. The more alleles present, the higher the heterozygotes of a group.

Question: (Rob Serrouya) - You pointed out that it's important to try to figure out the underlying management as to what is going on in a location. Was it 72 percent in the Banff area?

> *Answer: (Bill Ostheimer)* - Yes. It was based on 4 loci at .8 for the heterozygote in the Banff population.

Question: (Rob Serrouya) - Many people think that tends to be a mortality thing, so a lot more bears are dying than are being produced. What I suspect is that many bears from the outside are moving in, so an out-breeding kind of thing is happening. Do you agree?

> *Answer: (Bill Ostheimer)* - I can see that situation where subsequent recolonization from an outside area having escalated heterozygotes.

Question: (Rob Serrouya) - Are you suggesting that some form of hunting could improve heterozygotes?

> *Answer: (Bill Ostheimer)* - Only if you have enough bears around and have a specific heavy harvest and getting could recolonization from outside.

Question: (Rob Serrouya) - If males move to another area and establish a home range, do they live to be old? After 4 years in a new home range, he is going to be breeding with his daughters. Shouldn't they be removed after a certain age to reduce inbreeding?

> *Answer: (Bill Ostheimer)* - The problem with taking out the males is protection of the genes they have already passed on because immigrant males are not going to look as kindly at the young as the parent would.

Comment: (Sam Wasser) - If you are taking out the creme-de-la-creme of the males, the genetic diversity that you are infusing into the population could be of lesser quality. What you are saying is not necessarily clear. Concerning inbreeding: there have been millions of years of evolution to prevent that from happening - nature can do it better than we can.

SESSION THREE: MANAGEMENT BY INITIATIVE

Session Lead: Mark Henjum, Oregon Department of Fish and Wildlife

BLACK BEAR MANAGEMENT IN COLORADO FOLLOWING AMENDMENT 10

Thomas Beck, Colorado Division of Wildlife

Question and Answer Session not recorded

THE MICHIGAN BEAR REFERENDUM

Richard Smith, Marquette, Michigan

Question and Answer Session not recorded

PRELIMINARY ASSESSMENT OF MEASURE 18: SOCIAL IMPLICATIONS AND EFFECTS ON HUNTER PARTICIPATION AND BEAR HARVEST

Margaret Boulay, Oregon Department of Fish and Wildlife

No questions

PLAYING BIOLOGIST AT THE BALLOT BOX: A MANAGER'S PERSPECTIVE ON WASHINGTON'S INITIATIVE 655

Steve Pozzanghera, Washington Department of Fish and Wildlife

Question: (Lisa Wathne) - You said that the Washington Wildlife Alliance spent $600,000?

> *Answer: (Steve Pozzanghera)* - The summary received from the Secretary of State's Office, which did not include in-kind services, showed $600,065.

Question: (Lisa Wathne) - That is incorrect. The amount was $389,000.

> *Answer: (Steve Pozzanghera)* - That supports my point that on both sides of the issue, generally, the voter does not receive good information. That was one of the frustrations of the campaign.

Question: (Jack Smith) - Please comment on discussions that the agencies had with the treaty tribes in western Washington in relationship to Initiative 655.

> *Answer: (Steve Pozzanghera)* - I was not directly involved in those discussions, but I'll touch on the tribal issue. In Washington we have a number of tribes and tribal interests in the state, with a combination of both formal reservation territory and ceded properties as well. The interpretation of the State law is that the tribes on reservation activity is not included in state initiatives, and that tribes could continue to use bait and hounds recreationally.

Comment: (Katherine Bragdon - Worked on Initiative 655). The numbers from the Secretary of State's office were $389,000, which included the signature gathering drive where we had to pay for overhead. Ad expenses were $225,000; for the opponents it was $150,000. We outspent the opponents by $75,000 not $300,000.

Question: (David Anderson) - Were you contacted to put information into the voters' pamphlet? Could you do that by statute or not?

Answer: (Steve Pozzanghera) - No, we would not have been able to provide the write-up for the voters' pamphlet. The Washington Wildlife Alliance and the Washingtonians for Wildlife Conservation were the two political parties involved, so they would have provided any information for the pamphlet. There would have been a conflict of interest if the state had provided a pro or con write-up for the voters' pamphlet.

PANEL DISCUSSION: BLACK BEAR MANAGEMENT/WILDLIFE MANAGEMENT BY BALLOT

Thomas Beck, Colorado Division of Wildlife; Richard Smith, Marquette, Michigan; Don Whittaker, Oregon Department of Fish and Wildlife; Steve Pozzanghera, Washington Department of Fish and Wildlife; Wayne Buchanan, Great Bear Foundation; John Beecham, Idaho Fish and Game; Dan Lay, 150 Mile House, British Columbia; Don Koch, California Department of Fish and Game

Comment: (Don Koch) - California has been involved in the initiative process twice in the last few years. Our process really started in 1975 where Wildlife Alive sued the Department of Fish and Game regarding black bears, and that lawsuit was ultimately decided in our Supreme Court. The court determined that black bear hunting did cause significant impact; it has the *potential* to cause significant impact to the population. We dealt with that issue. There was no stoppage or anything of hunting. At the same time, the legislature had fully protected mountain lion in the state, and that legislation would sunset every few years. So, in 1987 a couple of things happened simultaneously. Our legislation which protected cougars sunsetted, and they were once again a game mammal. Our Commission, the following year proposed to issue 190 permits to shoot cougars in a portion of our state. We were promptly sued by a number of organizations for failure to comply with our California Environmental Quality Act. The following year we also proposed a cougar hunt and a two-year elk hunt for the first time. Again we were sued and lost both times. In 1989 we were sued, this time, for black bears. The important thing to remember here is that in California all these lawsuits were procedural in nature. We hadn't dotted our "i's" or crossed our "t's" or fully disclosed, to the satisfaction of the court, potential impacts or views of opposing factions. So, while in the news media and in the dialogues from both hunters and anti-hunters (or people opposed to the hunting season), everything was seasonal. Were dogs ethical in pursuing bears? All the lawsuits were procedural. When we finally cleaned up our procedural act, we had spent probably $1 million defending six different lawsuits. Hunting seasons went on with the exception of mountain lion. That was our first experience with the ballot Initiative 117, called the "Wildlife Protection Act". In California it prohibited all hunting of mountain lions, and also allowed that the only way to change that Act would be by another vote of the people. That Act passed with 52 percent versus 48 percent, and in 1996 a consortium of hunting groups tried to amend that Act through the ballot process dealing only with mountain lion hunting. They lost that with 42 percent yes vs. 58 percent no. Just recently, we expect the process to start again. The first step was taken in our legislature where Senator Shear introduced a bill that would have outlawed the pursuit of several mammal species (bobcat, raccoon, opossum, bear) with the use of manufactured traps and several other things. That bill was amended several times in committee and finally went to our Senate Natural Resource Committee; it then just outlawed the pursuit of bears and bobcats with dogs. It failed to get out of committee, but Senator Shear has the ability to take that back and get another vote. We assume, that based on this bill and the interest shown in the use of dogs in California, it will be put out as an initiative in 1998.

Comment: (John Beecham) - Idaho had a similar experience to Michigan's in this last election process, 1996. We had a challenge to, not only our rules regarding the use of bait to hunt bears, but also hounds in the spring hunt. The initiative lost by a 60 to 40 percent vote. I really can't add a whole lot to what Richard had to say this morning in terms of tactics. The Sportsmen's Heritage Defense Fund, which was the political action committee that led the charge against the initiative process, used pretty much the same strategy that Richard outlined this morning. But what I would like to see come out of this discussion is a little more focus, not so much on how to defeat an initiative in the future but what can we do to move forward in terms of trying to prevent them from reaching the ballot box. I think there are some things we can do as professionals to facilitate that process.

Comment: (Don Whittaker) - I think that Peg did an excellent job of explaining the situations specific to initiatives. In the state of Oregon, we had one in 1994, which made it illegal to use hounds and bait for lions and bears. The 1994 one was driven primarily by, and at the risk of offending people, animal rights or environmentalists or whatever labels those organizations have. Sportsmen drove the 1996 initiative. It was an effort to repeal Measure

18 as Peg detailed it and it failed. The response to both of those was legislative immediately after. In 1994 there was the whole gamut. We saw the same thing again this year. Our legislature is still in session. We have a number of bills hit the floor relating to tag fees, human safety, protection areas, year-round season, and one that was introduced that would make it against the law for the Department to close mountain lion seasons statewide until 2004. The implications of these initiatives are immense. There are legal implications, fiscal implications, and social implications. I echo the comments of most of the people who spoke this morning, Jones in particular. There is a lot of room for proactiveness in dealing with wildlife management in general. We know most of the biology we need to know in a lot of situations; however, we are all biologists, we are not social scientists. That is one of my big reasons for trying to get a symposium at the national level to look at some of the experience and issues and how this stuff works. I do also want to mention that we are all here because we are frustrated. We are losing management tools. We are losing money. We are dealing with situations that we are not prepared to deal with. However, there are additionally some positive initiatives, and we shouldn't forget those. Anybody in this room who is familiar with Missouri Department of Conservation, if you told them initiatives were bad they would say "wrong" because that one-eighth percent tax levy was an initiative. They have one of the strongest budgets in the country. Arizona just got two initiatives that put $20 million into resource management in the state of Arizona; those were initiative based. There is good and bad on both sides of these, and from a proactive standpoint, I want to emphasize that we need to get out in front of it and be honest, accurate, and get rid of our frustrations and go forward and learn from our mistakes.

Comment: (Dan Lay) - Being from British Columbia we are probably a couple of years behind the rest of you in that we are starting to notice there is a move towards the closing of black bear hunting to different degrees. Our politicians work a little different than yours do, but we are starting to see some move towards the closure of bear in some degree. Our bear closure is probably, because of the way they do things in attacking and/or killing people, not going to come as easily as what it has been in some of the states. We may change our opinion up there as to what people think of bears or how we look at a black bear. What we have to remember is that the black bear is still a predator, and with the number of bears we have, they continue to do themselves more harm than what we can do them good. We are probably headed down the same road you people are, but we are just a little bit further behind you.

Comment: (Wayne Buchanan) - I would like to begin by suggesting that we are looking at only half the issue if we focus too much on initiatives. For example, the Washington State legislature dropped it and passed the bill that prohibits our Department of Wildlife from participating in augmentation of the North Cascades grizzly bear population, probably the most endangered mammal in the State. The initiative process is just the citizens' avenue of checks and balances within a political arena. I would suggest that what we are really talking about could more accurately be described as legislative mandates making wildlife management decisions versus professional management people. The initiative process tends to come about, in my experience, because of a real or perceived lack of action by Departments, and I would agree very much with what Steve was saying this morning that both sides of these issues seem to be, let's see, mediocrity would be the key word in their information level. Some of it good, a lot of very emotional-based. For me personally, it began in 1988 with my involvement with grizzly bear recovery in the North Cascades. I began dealing with our Wildlife Commission on the issue of bait and hounds and pointing out to them what I felt was very clear conflict with the Endangered Species Act by continuation of these practices in the recovery area. I told them outright on several occasions that they were the best people to deal with this. But if they didn't, that on the horizon it would be inevitable that either a federal judge would, or they would, be taken to the ballot box and it would be decided there. In 1996, a federal judge ruled them in violation of the Endangered Species Act and we lost bait and hound hunting in much of the State and North Cascades recovery zone, which is a pretty substantial chunk. In the fall of that year, Initiative 655 passed and we lost it statewide. There are other things going on out there. I think part of the issue we need to be talking about too, is that wildlife departments are still pointed primarily at hunting and consumptive issues. We end up at the ballot box because there is a huge segment of the population out there who doesn't participate in these issues. They also don't participate in the Commission meetings. We need to bring all the players to the table. Polarization is immense on these issues. The only way to end it, in my opinion, is to find ways to get everybody at the table and dealing with it in a more logical fashion.

Question: (Sally Nickelson) - Did the Colorado initiative also affect hound hunting for cougar or was it strictly towards bear? If it did affect cougar, do you have similar data for cougar harvest as you did for the bear harvest?

Answer: (Tom Beck) - The initiative affected only bear hunting. One of the consequences of that was the agency lifted our cougar hunting regulations. As an agency we did recommend that we do away with the summer hunt because that was the first place the people who were critical of what we were doing looked. We did away with the summer hunt and have not had a serious challenge to our cougar hunting.

Question: (Teresa DeLorenzo) - What are some of your thoughts about eliminating some of the polarization? What kind of processes do you see that might get everybody to the table or reduce the level of conflict?

Answer: (Tom Beck) - Timing is the only hope in my opinion. You have to see these issues far enough in advance and be willing to move. You draw a line in the sand and that increases polarization, then it is doomed. Your point is that when you bring people in, they have got to believe sincerely that they not only have an ear, but that they can affect change. If you are just going through the motions of listening, but as a commission has no intention of change, these people will look for alternatives. We saw that in the trapping issue when the two polarized positions participated actively and openly with the agency. When those two groups didn't get what they wanted, one group immediately went to the legislature, which passed a bill and took away the authority of the Department. The other group used that as their springboard to fight trapping. Another point is that most of these initiatives are statutory. Legislatures are intrigued by the idea of collecting what the poor dumb public didn't know to start with. There is a consequence to that legislative, and its called constitutional ballot initiatives. In 1993, Colorado legislature introduced a bill to overturn Amendment 10, and it was killed in committee. We have to know these issues far enough in advance, start discussing them, with people on all sides to find some middle ground. If you wait too long, you don't know where it's going to go. It doesn't matter who wins, because it can come back again.

Answer: (Don Koch) - I echo everything that Tom said. In California there are a couple of things: one is the failure of our Department to effectively communicate good information over the long-term. We are so reactionary to these things, even now as we look at a ballot issue in 1998. It's way too late to be talking and getting people to the table and getting out factual information. We are trying to recover, basically, from 20 years of polarization. Tom and I were talking at the break. They basically believe you can take little bitty steps or you can take real big steps. Most of the states recently have taken some real big steps. We don't like those steps. So, I think, that getting people to the table and making sure that, especially from the agency perspective, that we sit back and listen and keep our mouths shut for a while. Give people some ownership in the process and also make sure that they know that they can affect change. I think that too often people attempt to get involved in the commission process or some other forum and they are basically shut out and polarization continues. We have a lot of work ahead of us. I'm basically a cynic, and I'm not so sure that we are going to fix this real quick because we have allowed it to simmer for so long. Getting people to the table and making sure that they have some ownership will make a difference. Agencies should keep their mouths shut for a while.

Answer: (Don Whittaker) - From Oregon's standpoint, we don't utilize the public press in an effective manner. We bend over backwards and schedule all these public meetings. Anytime we make, especially a major management change, we have to go through this public process. We solicit all this input. We do this. We do that. And I think it was brought up earlier that in that process which is in place through the agency, we have just frighteningly poor participation by the general public. I mean, if we propose a major management change to say, elk hunting regulations, we are lucky if we can get participation where public out-numbers agency personnel at these meetings. It's time from an agency standpoint to be much more proactive in utilizing the public press. There are some dangers in that in these are contentious issues. When you contact the press, it's very difficult to maintain control in how the information is presented. Sound wants 10 seconds; graphics wants something that is going to create an issue or to tease viewers or readers. That does not do a good job of effectively conveying the information that needs to go out. From a proactive standpoint, we have an entire division (Information/Education) that we don't utilize. From my standpoint, we need to get away from what they are doing and train them to better convey this information. Field personnel need to be trained in how to talk to those people when they are standing there with a camera in their face. It's a difficult situation to deal with.

Answer: (Richard Smith) - The important consideration here is that there is concern among some citizens on management issues. But I think that on the whole, most citizens in most states trust the state wildlife

agencies to management wildlife properly. In Michigan, we showed that with a strong support for maintaining our wildlife management within our State agency. In Colorado, there is high public trust that the agencies can do the right thing. I think there is a segment of the public who want to affect changes, and they are responsible for generating a lot of the controversy. Most citizens are satisfied with management, but there always is a group of people who want to affect major changes. In Michigan, the bear management program is excellent. The bear population is increasing. As a bear hunter who is interested in wildlife management, I have participated in bear management in setting regulations for 20-30 years. The public has had that same opportunity, but a lot of people are just now becoming aware or interested in the management. However, most people don't know the history of bear management and most hunters want changes. We used to have wide-open bear hunting in Michigan; anyone could buy a license. Hunters were responsible for changing that in cooperation with our state agency as concerns evolved about too many bear being harvested. The hunters made the choice to limit hunting opportunity in Michigan, and they do that in many other states. It's a matter of these people who are concerned becoming involved in the process and paying attention to and learning from those who have been involved, rather than having a set goal in not being willing to compromise. Steve Pozzanghera asked me during the presentation about bear hunting levels in Michigan. We had 27,000 applicants, but we only issued between 4,000 and 6,000 harvest tags. We have very limited hunting pressure. The Great Bear Foundation was in support of Proposal D in Michigan and was actively involved in trying to ban bait and dogs in Michigan where we have no grizzly bears.

Answer: (Wayne Buchanan) - The Great Bear Foundation has also been active in all sorts of bear issues, including polar bear and the Asian bear issue. We are a bear conservation group. We have a commission system here in Washington, as most of you know, and when I have attended those meetings, they are reasonably well attended. However, all the people there are pretty much hunters or representatives of hunting groups. We have a plethora of wildlife and conservation and environmental groups in Washington and they are not attending these meetings. That is my big concern. That is a big chunk of the population, far exceeding the hunting community and lot of the people who are going to the polls and voting for these initiatives. Any time I bring up these issues when I go to the meetings, it seems to startle a lot of these people who have a strong perception that the Wildlife Department is primarily a hunting agency. Their concern is not hunting, so they don't see a reason to come and speak with you. They take other avenues: Sierra, Audubon, etc., meetings. Perhaps the agencies should go out and take active recruitment in attending these agency meetings. The public needs to know how the Commission meetings work. It took me nearly a year before I understood how the Commission worked. I must say that agency personnel were always available to listen and to any questions or concerns I had, and took time to explain.

Answer: (Steve Pozzanghera) - One of the things that was mentioned was that we need to listen more. I think that one of the things we are struggling with is that a lot of the issues are listening and working with the Commission and learning to understand the process. The one thing the state agencies are struggling with is who to listen to. From that standpoint, I mean we are not capable of doing that. We've not been able to in the past, and I don't think we've figured it out yet. We need to know how to talk to the public. We can talk to hunters, fishers, and focused groups, but what we haven't figured out is that we are a business and we haven't treated ourselves as a business. We are a business with a message and a lot of different responsibilities, one of which happens to be the hunting programs. Another is habitat protection and enforcement. We don't treat ourselves as a business. So from the standpoint of looking in from the outside and trying to understand what a state agency does, and providing information to the general public, is what we struggle with. In Michigan, the informed public has been able to prove that the general public wants to know and can make a difference by getting involved. Washington and a number of other states are behind the curve on long-term credibility and respect within the state. It goes hand-in-hand with trying to provide information, not to the hunting public or fishing public, but to the public. Also, in that same sense, being able to receive input from the public is very important. The anti-hunting organizations and pro-hunting organizations all have comments that need to be received and understood, but yet we are still incapable of receiving input from that very broad segment.

Answer: (John Beecham) - Obviously, this whole issue of polarization is very complex and has a lot of components, most of which have been mentioned in the discussion in the last couple of minutes. One that hasn't been mentioned, and I don't think it's necessarily more important than the others but is certainly is

an important part of the process, is the whole perspective of wildlife management and how it has occurred in this country. What we have in many states is a situation where sportsmen have been involved in funding, almost entirely, in our wildlife program and responsible through an evolutionary process in setting the regulations and rules for hunting, how that occurs in the state, what is allowed, what is not allowed. Now we have at least two other groups, if you will, the non-hunting public (and I make a distinction between those folks who generally support hunting at some level) and the anti-hunting groups who really don't tolerate hunting at all. We also have two groups who want a voice in the process in setting regulations, and they're challenging the historical process that we've been involved for the last 50-60 years, at least in Idaho, where hunters have had that responsibility for pushing for changes in rules and regulations. They are being challenged by those other groups who want to participate in that process. I think they have a problem with giving up some of that responsibility, and they have a real rub, whether real or perceived, that these other groups have any valid standing because they paid for the programs. Part of the polarization process revolves around the attitude of hunters of who should have a say and how we manage wildlife. I think wildlife agencies, I know certainly my agency, play a significant role in perpetuating that gap between non-hunters and hunters. But I think also that hunters need to accept some responsibility for that polarization as well because they haven't reached a point yet where recognize the legitimacy of the non-hunting public and their role in making decisions about we manage wildlife. I think it's a very complex issue. I don't think, Teresa, there is a real simple answer on how to reduce polarity, but we need to be thinking about all the aspects that the panel members mentioned here.

Answer: (Richard Smith) - An example that I think is relevant is from the eastern United States. In Maryland, non-hunters and those who are opposed to hunters had an opportunity to contribute finance for the protection of bear and bear management; bears have been increasing in Maryland, moving in from Pennsylvania and other states. A season was proposed due to increase in bear damage in that state. A group of non-hunters, anti-hunters, and animal rights were vocal about establishing a program to pay for damage. Maryland approved a bear stamp to sell for $5 a piece to raise revenue to pay for damage caused by bears to avoid establishing a hunting season. Here you have a perfect opportunity for non-hunters, who are opposed to hunting, to manage bears.

Answer: (Wayne Buchanan) - I fully agree with that, and I see it as a definite issue with the non-hunting community that they need to recognize that we've relied primarily on hunter fees for doing all our wildlife management for decades. It's time to step up to the counter and put some money on the counter and be imaginative as to how you do it. I personally favor general fund. I think wildlife is a public resource that belongs to all of us, and we benefit from it. It ought to come out of everybody's pocket. That's a tough thing to sell to the legislature these days, but nonetheless that's my personal point of view. Whenever I speak with groups, I try and bring that issue up. I think it's something that I should be pounding on a lot more. Groups need to look for ways to pony up.

Question: (Sam Wasser) - Looking at the ways the initial comments of the panelists and some people were talking that we should block initiatives from occurring, and talking about the political issues, remember this is a democracy and a political world. It's quite a reality that these issues are always going to be politicized. As a good example, right now a lot of opponents to the Endangered Species Act are arguing that politics should be driving the listing of species, not biology. This is something that, hopefully, everybody in this room is scared to death about. I think that one of the key issues right now is that what we have to do as biologists here is to make sure that we get accurate data on what are the consequences of our management actions, and to make sure that this information is out to the public before these issues comes to the table for the voters to address. That's partly the irresponsibility of all of us. We wait until it's the last minute and then we go and try to put the issues out. There is so much inaccurate information that nobody really knows what direction to go in. It is not the case that management has been perfect. Management has done a lot of good things, but it's also made an awful lot of mistakes. We've tended to focus things on managing populations through hunting, and we often ignore options of doing things that might help facilitate nature to do what it has evolved millions of years to do to manage its own populations. We probably need to do both. I'm just making a comment here that there are alternatives available. I think Wayne's point about having a common fund where it's not just hunting fees that are driving management issues or the management that is making these decisions. That is a very important option. There are a lot of ways of looking at these things that can potentially accommodate everyone. The sooner we move away from polarization the sooner we will have more effective and sustainable management of our wildlife.

Answer: (Don Whittaker) - First of all, a little background on initiatives to help set some kind of a stage here. In preparation for the symposium in the fall, I've been discussing with Scott Williamson with the Wildlife Management Institute who has provided some interesting statistics. First of all, in 1996, there were more initiatives on the ballot for that one-year than there were for the entire history of voter initiative processes. Second, in only 26 states is it legal to use the voter initiative process, so that is not even all 50 states. This stuff is not going to go away. We need to be proactive. Because of last year, as managers, scientists, and researchers if we take a different perspective, we are in the middle of a very large experiment. What we need to do and learn from this process is that we've had some major, major changes in statewide management programs. We need some time to evaluate what the implications of those changes mean, both biologically and socially. Given some time and expertise, and we might need some help from the social sciences, we can learn from this process. We just need to be allowed to do that.

Question: (Tony Allen) - I'm interested in the bear parts trade. I think there is a plausible connection between the hounding and baiting issues and bear parts. The public is very worried about poaching. We hear time and time again about the so-called rule of thumb that there isn't very much deer, elk, or bear shot by poachers as there are taken legally. When you talk to enforcement people, you say, "Hey, you guys know. What's the score?" I've had at least half a dozen of these conversations with these guys, and they always say to me, "Well, we really don't know, but it's not a big problem. Trust us." That's probably an honest answer, and maybe just plain true. I don't know. But there is a lot of worry about this. It's not clear whether the bear parts issue will develop into a major crisis on this continent. Whether the Asian bears are gone or not, it's a good chance it won't be a crisis here, but there's a reasonable chance to plan for it now. We need to close loopholes in the laws for bear parts before illegal things occur. Work with the locals who know where poaching occurs because they know where the stuff is. My question is: Is there a real connection between bear parts and the efficient ways of finding bears?

Answer: (Richard Smith) - As you mentioned Tony, surely someone who is interested in poaching bears will do it the most efficient way possible. However, the bear parts issue, I believe, is a different question. Poaching certainly goes on. There are bears poached for parts. I think the trend is going in the opposite direction it should. I see more and more states and provinces making it illegal to sell bear parts from illegally taken bears. What this is doing is increasing the price for black market bear parts. It's making it more difficult to get parts from bears, so to totally close the sale of bear parts makes the price go sky high. This, in turn, increases the inclination to poach bears. I think we should be going in the opposite direction using parts taken from legally taken bears, providing a market for those legally taken bears. This will drive the price down and reduce illegal taking of bears. If you've got parts available from legally taken animals, those parts would help reduce poaching. It does occur in Michigan. We've had some poaching of bears, but I don't think it's a major problem. However, the more states that allow the use of parts from legally taken bears will help.

Answer: (Don Koch) - I'm not going to get into the market economy because I failed personally there a lot, but in California we've looked at this issue. It's kind of like that line from the movie, "show me the money". The poaching is completely over-sensationalized in terms of the parts business. When we look at the cases that are very active that undercover agents make, they are typically parts that are obtained from legally obtained or reported by legal sportsmen. It is illegal to sell parts in California no matter how you got them. So it's a violation, even though that bear was killed within legal bounds; but we receive biological information from that bear. The other interesting thing, at least in California, is that typically when we make a major bust, the only real bear gall bladders that this guy has in his possession are the ones that undercover officers have sold them. All the rest are pig galls. There again, it's just a failure of the agencies to get out in front and tell the truth because it's easy to remember. Get this issue out and let people have dialogue around it. Certainly, it offends everybody in terms of illegal killing of any wildlife, but again it's an issue that is highly sensationalized in California. We just don't have any evidence to support the claims that are being made.

Answer: (Dan Lay) - I was involved in both ends of the bear part industry. As a conservation officer for the Province of British Columbia, I worked undercover for approximately three years. Part of that was on animal parts and the marketing. This was prior to the black bear gall program being built up and kind of blown out of proportion. The prices that you read and hear about may have happened some place at some

time. The other end of the industry, I also worked for the Dominion Fur Company, and we shipped black bear galls to the auctions to be sold on the world market. At that time, it was legal; and in Canada it is still legal to auction them through the fur industry. The gall from my last check was a large percentage going unsold, and they are probably averaging between $100 and $150 each. For example, British Columbia is saying they are being poached for their gall to be sold. If someone is going out and breaking the law already by harvesting the bear and selling the gall, by making it illegal to use a hound in order for them to break the law, what he is going to do is breaking two laws. If he's already breaking one by harvesting the bear and selling the gall, that's one thing. But by putting in another law that's going to stop them from using a hound which, if you are going to go poach something, you want to do it quietly, unseen, unheard, go in, and get out. It would be like going to rob a bank and showing up with a machine gun and shooting it off before you walked in. It's the same idea. By poaching using a hound, you can't be all that smart unless they don't bark. I've worked at both ends, and I think the black bear gall or black bear parts scenario has been put in there to try to get people involved and excited in thinking there is a problem because there has been a problem world-wide in animal parts. Be a little careful on some of these numbers and prices they say they are getting and how much of a problem it really is.

Comment: (Ralph Turner) - The only worrisome thing about the black bear parts is the burgeoning population in China. There have been a lot of studies that have been done that show an increase in traditional medicine, so I think the demand is going to be there for some time. What I want to address on this initiative is the marked difference between two states, Colorado and Washington. When I listen to you, Tom of Colorado, basically a western state with a large pro-hunter constituency, a lot of cattle and sheep associations which have never historically have had any love for any predator, at least as you say, they have pretty much accepted this initiative and there have not been a lot of problems since it has been enacted. In the state of Washington, the initiative was passed with 228,000 signatures, and it's unfair to say that basically most of them were animal rights people since a lot of them were biologists. Some that signed it were from the Department of Fish and Wildlife. It's a cross-section of people. There are a number of reasons why that passed, not only because a lot of people thought that it was unfair and unsporting but because of some of the bear management scientific information that was given to the public. I happened to attend, Steve, one of your environmental impact statement forums to gather information from the public. I realize that it's just kind of a formality. I was up in Snohomish County, and from a layman's standpoint, when we were going over that environmental impact statement the public was asked to participate. When they hear statements like this: "Washington Department of Wildlife is recommending it be unlawful to shoot a female black bear with cubs." This is what you proposed in 1996. Now just think on how that went over to the public. Something that should have been in effect 15 or 20 years ago that is so important to the population dynamics, that there is absolutely no protection for a female black bear with cubs, and you are just introducing that in 1996. We went through that environmental impact statement, a lot of the population dynamics were done in the 1960s. And the density figures, the most recent one in that environmental impact statement was done in 1973. I can quote it. A lot of that density information did not come from the state of Washington. It came from Idaho and Oregon. I'm not trying to put you on the spot, but I'm telling you.....what kind of interpretation are people to take out of that? The data was outdated. It was not current, and you tell me you want to run the Fish and Wildlife Department like a business. I work for a business, and for anyone looking at that would see a bunch of biologists sitting behind a computer going to business lunch meetings and not doing their fieldwork and up-to-date studies out in the field. My question is: If you asked the most sophisticated biologists and asked them what the demise of bears are around the world, they're going to say that it's habitat. In your proposed environmental impact statement, habitat is not a limiting factor for black bears in Washington. No modified or new strategies are proposed that would provide additional black bear habitat. That comes in western Washington with a U.S. Department of Census that says there will be 100,000 new people in western Washington in the next 4 years. Let me tell you that they are just eating up black bear habitat in Snohomish County, Arlington, Monroe and as close as they can get to Stevens Pass. What I'm telling you is that when you say these statements are made for the public, and you have a population graph, which shows 41,000 bears in 1974. In 1983 there are only 21,000 bears. Obviously, it is not real scientific as to how many bears are in the state of Washington. I don't think you have a clue as to how many bears are in the state of Washington. It's good for public consumption. You know, there's 42,000 bears here or 25,000 bears here, but it's not scientific. I'm saying this because when you ask for public input, and we have an environmental statement and this is what we read, and this is the latest and it's outdated, this is part of the problem.

Question: (speaker not identified) - I don't have a specific question. What's important is to gap the credibility issue. We need somehow an explanation on how we can get better data in the state of Washington when they are asking for public input. How is that done?

Answer: (Steve Pozzanghera) - That's really frustrating. I'll take a deep breath here. Relative to the issue of the recommendation that it be unlawful to take a sow with cubs, that's a carry-over recommendation that has been on the books for approximately 15 years. The environmental impact statement was saying that we are going to retain that. We are going to make no change to that. The final environmental impact statement, which I'm not sure you have a copy of, suggests that the Fish and Wildlife Commission also wanted to make sure that, if necessary, not only would we recommend that it be unlawful to take a sow with cubs, but that should the Commission decide, and should the agency recommend, based on biological information, that it be necessary to protect the female adult segment of the population, then we would move to make it unlawful to take a sow with cub or cubs. Those have been in place for over 15 years now, and apparently you just did not understand that in the context of the EIS. Relative to the habitat, the habitat issue for black bear in Washington compared to some other species is less significant despite our observation curve. We have a primary landbase of black bear range. Approximately 75 percent of that is on either U.S. Forest Service or private industrial timberlands. So the statements relative to the EIS were given limited resource and personnel within state agencies. Where do we prioritize those management activities? Habitat does not rise to the top for black bear as an issue that receives a high priority at this point. These documents are designed to be revised and revisited. We are proposing a 5-year schedule. So the statements relative to habitat were based on the fact that we have 75 percent of bear range in, at this point, we believe to be a relatively secure situation. Lastly, in regards to your statements about old data and no new data. We now have new information, which we can relate to new habitats in Washington. The entire EIS compiled, summarized, and analyzed over 20 years of data in Washington had never been looked at. While I can appreciate the timing and recognize the fact that we are behind the times, I apologize for that. But we are certainly recognizing the deficiencies and trying to move forward.

Answer: (Wayne Buchanan) - For the 4 years I have been involved in the bear issues, I've got to say that I also had some concerns about the EIS. They had to deal with the older data. But a phone call to Steve would have got you that information. Again, the communication lines need to be improved, and that works on both ends. It takes two people to communicate. Both sides have to be willing to pick up the phone. I've always gotten answers from Steve and other people in the department. The information is there, but you have to work at it some. That's part of learning the process. But also what I looked at is that I reviewed the draft EIS and could see a clear-cut movement forward in improvement on multiple levels, and that the process of change that was needed and way overdue is starting. It's real frustrating to see how slow it goes. I can guarantee that, but our whole processes are designed to go slow. It will drive you crazy when you are dealing with wildlife issues and you are sure that something is going to disappear off the face of the map if something is doesn't soon. That's life. Things are improving. I can see a lot of movement in that direction by the Department of Wildlife here in Washington.

Question: (Jack Mortenson) - This question is for any of the panel members. It's in relation to an annual report in an effort to reduce the polarization, in an effort to educate the general public, as to what tools you need as agencies and what tools you may not need in an effort for the general public to know what agencies are doing and your management techniques. I think you've incorporated public hearings into that process well, and it sounds like it's mixed results from the general public. I'm curious to know how you review an annual report from your agency? Probably some of you already do that. Something that is easily digested by the public, not a 300-page detailed report on every species. Something that people can learn from. Something that can be used to teach the public on a yearly basis about issues that are important in the state to be considering.

Answer: (Tom Beck) - In our long-range plan we promised the public that we would give them an annual report. We gave them two. It took tremendous effort by two individuals to make the agency do what it had promised the public it would do. Part of that is because when you are in a profession you get the glass half full, the glass half empty mix, and you get the managers to perhaps hedge a little bit. They want to focus on the positive things. Then you get the other people who a little more critical, and they see the half-empty glass. If things are presented to the public in an easily digestible form, the public will see things

differently. Our agency is not growing in terms of FTEs, but the demands keep getting bigger and bigger. We want to make sure it is a wise investment of time.

Question: (Ainslie Willock) - Our goals are to stop the trade in bear parts and to ban the spring hunt and use of bait and dogs. Presently in Ontario, we are involved stakeholder meetings with the Ontario Ministry of Natural Resources. What we all agree on is a ban on the sale of bear parts, regardless of their origin. That is something that everyone feels very strongly about as a preventative measure to protect the population as a whole. Because we all support that, the Ontario Ministry of Natural Resources has gone ahead banned the sale of bear parts regardless of origin, and we are very hopeful that we will soon outlaw possession as well. We are also involved in discussions with the traditional Chinese medicine practitioners, along with the Canadian Wildlife Service to deal with issues around that. I would really encourage everyone in this room to support a ban on the international trade in bear parts. Also as a preventative measure only, I think that it needs long-term education for all those involved. I'd like to ask all the panelists, which one of you would support a spring hunt of bears? Just two of you? Do you believe that you could have a spring hunt and not have orphaning? I would agree with the majority of you that the public is not opposed to hunting. Our organization does because basically the animals are our clients, so we are not going to support that kills them. But the public has reasonably strong opinions about hunting methods. And when it comes to any orphaning, they are opposed. When it comes to the use of bait and dogs, they are clearly opposed. I look forward to Ontario being able to resolve all these issues. I hope it happens really soon.

Answer: (Richard Smith) - Some orphaning does occur. I think we are all aware of that. It's a small percentage. This is an issue that needs to be considered. It certainly doesn't need to be ignored. I understand your concern with using bait and dogs. It is a concern in Michigan as well. Much of that opinion is based on a lack of understanding of what is involved in those methods. As a non-hunter, do you support methods that result in humane kills with hunters clearly identifying what they are shooting?

Comment: (Ainslee Willock) - In Ontario, there are 7,000 bears killed. On top of that, there is recorded a 1,000 wounded, and that's a baited hunt. So I don't buy the argument that this is a more humane method of killing. The percentage of females killed in spring and fall in a baited hunt is 30 percent. I'm absolutely opposed to these hunting methods.

Comment: (Richard Smith) - Your polls seem to indicate that a lot of the public is opposed to these hunting methods. I feel that if there were an education campaign in Ontario, like Michigan, there would be a greater level of acceptance.

Comment: (Ainslee Willock) - Immediately prior to the vote, everyone I asked in the general public were very very supportive of stopping bait and dogs in Michigan, but they were confused by the information. There was a lot of confusion in that campaign just like in many states. I think there was a lot of rhetoric on both sides. The bottom line is that the public was confused and I hope that it comes up again in Michigan, and that they win.

Question: (Al LeCount) - I think that Richard made a good comment that the general populace does not get involved in wildlife issues because they trust the professionals in the organizations to make those decisions. I wonder if we're not seeing more initiatives because, as professionals, we are beginning to lose that trust. We are losing that trust because we are our own worse enemies. We are sending the public mixed signals. Some good examples were just expressed with baiting, with using hounds with spring hunts. We are willing to say that these are okay for bears, but then we turn around and say that you can't bait waterfowl or hunt deer with dogs or you can't hunt elk in the spring when they have calves. So the public begins to wonder if these people know what they are talking about. How come it's okay for one species and not okay for another species? I'd like to hear some of the panel members address that issue.

Answer: (Wayne Buchanan) - I believe it's definitely part of the issue, especially dealing with carnivores. Their hunting techniques are remnants from when they were all considered vermin. That's why a lot of those hunting techniques are there and okay for them but not other forms of wildlife. Now that they have gained different status in the public's mind, in many cases the hunting techniques have not come around to match those of others. In some cases, there is some direct conflict that has been my primary concern about baiting. Bear management is primarily garbage and food management. We've got a couple of posters back here about it, and somehow a hunter can go out and their garbage magically is not harmful. There is a

terrible inconsistency there that I've never found a satisfactory explanation for. It is something I have addressed again and again with the Wildlife Commission.

Answer: (Richard Smith) - There is a very significant difference between bait for hunting and feeding of bears in areas frequented by people. The important consideration is that you don't feed bears where you don't want them to return. In areas frequented by people (homes and campgrounds) it is obviously not a good idea to feed bears there. They are adapted to using seasonal food sources. Where they find food, they return to look for more. Utilizing bait for hunting situations, that food is placed in the animal's natural habitat. In most cases, this is in areas where they are already utilizing the natural food resources. Without human use in that area, it is not a problem. They become used to return to that area for feeding. Supplemental feeding in their natural habitat can reduce problems, rather than make them. There have been a lot of claims that bears that utilize these stations become nuisances. In some states, live traps are used to collar bears. In Michigan, many bears, which are caught in traps and then collared, do not become nuisance animals. There is plenty of evidence that there is no correlation between bait in the bear's natural habitat creating nuisance animals.

Question: (Al LeCount) - I'm not questioning the baiting of bears. I'm questioning the signals we give to the public. If we want to separate that issue out, if it's okay to bait bears, why don't we then make it okay to bait deer or bait waterfowl?

Answer: Wayne Buchanan - Is it ethical for people involved in research to do those very same things once the public in that state has voted. In Oregon they said it was okay and I believe that sent some mixed signals. These people can't do it, these few people here can even if it means killing a nuisance bear or putting a collar on an animals.

Answer: Richard Smith - The public does get mixed signals on varying regulations. In Michigan it is usual to bait deer as well as bear. There is a major controversy over that as well. In a series of public hearings across the state, the majority of the people who participated supported the use of bait for deer as well as for bear. In the case of bear seasons, it does increase the availability of the animals for harvest, and that is a major part of what hunting is about. In regard to baiting for deer in Michigan, it increases the opportunity for harvesting that part of the population. It all comes back to education and using the media. As a member of the media, I've spent a lot of time writing on the subject. However, states need more contact with the media, establish relationships with the media to get the information out explaining the differences. You are not going to reach everyone in the public, but you're going to help get the message across. The panel probably agrees that state agencies are not using the media as well as they could, and do not have a good relationship there.

Answer: John Beecham - Specifically to Al's point. I think we, as professionals, are horribly guilty of never being explicit on the assumptions that we manage on. We get defensive when we are challenged. In one state it's legal to do something, in a neighboring state it's not legal. There is no biological discussion there. These are basically social values that may have to do with traditional methods of hunting. We need, as professionals, to be very careful about explicitly identifying the real causes behind some of these things. If we were more explicit, in our state the issue of live targets is a big one, the public would understand that we were not going out to see them "pop off the rock" and see if you're a good marksman. Most of the professionals are real uncomfortable challenging the assumptions that we operate on in challenging the philosophy we operate on. We need to take a real serious look, as a profession, internally. Otherwise, we are going to keep blundering.

Question: (Wayne Kasworm) - Montana is one of those few western states that has never had hound hunting or bear baiting, at least in recent history. I also might add that in several places in Montana we have been able to successfully depress our black bear populations without either of those techniques. The question I have is for John Beecham. Did you do some polling in the state of Idaho relative to the initiative that failed, and is there some information about why people voted the way they did? Or did other groups poll people in Idaho? Whether there has been or not been a poll, what is the fish and game commission in Idaho and the Department at doing? Sure, the initiative failed by 60:40, but undoubtedly it will come back again. What is the department's tact in either going to

look at existing polls or conducting some polls themselves to get on top of the issue and deal when it undoubtedly comes up again?

> *Answer: (John Beecham)* - Actually, we did not do official polling post-election. Basically, there were a couple of messages that played very well, and played a very significant role in the initiative in not passing in Idaho. A couple of those were that the Humane Society of the United States was financing the initiative out-of-state. That's where most of the funding came from. The people who were promoting the initiative were described as animal right activitists that were trying to take turkey off your table at Thanksgiving. Out-of-state interests and persons played very well in Idaho where our politics lie just little bit to the right of Attila the Hun so we don't key much to outside interests. That worked very well. The other thing that played a significant role is the issue that Al just mentioned, and that's public trust. We have just done a survey on public trust as far as the Fish and Game Department was concerned, and came out at about 93 percent of the people supported the department and felt good about the job they were doing. So we had a high level of public support, and that was an issue that the folks who opposed the initiative used to their benefit. They basically said to leave the management up to the professionals. It was kind of interesting because one of the real arguments was that we shouldn't be making wildlife management decisions at the ballot box. We should let the professionals do it. Once the initiative passed, the Commission invited spokespersons from both groups to address the Commission at our December Commission meeting. The message that we got from the hunters groups was basically that the people have spoken. Listen to what they said at the ballot box, and you shouldn't do anything in terms of changing how we manage bears. Prior to the election, it was "don't manage at the ballot box". After the election, it was "listen to what the people have to say". Last week I was asked to put together a task force of people who are on both sides of the initiative issue, and see if we can find some common ground. Certainly there is common ground to be found. That process will at least be started. It's a very polarized issue and not going to be an issue where we will find much common ground. Where it leads, I have no idea. I can assure you that if we don't establish a mechanism or find a way to let people participate in the process of making decisions on how we manage wildlife, we're going to continue to fight this battle. We will see another initiative in Idaho, and the next time it will probably pass, especially if the Commission continues to avoid addressing the issues that were raised. They are very valid issues. A lot of people voted against the initiative not because they liked baiting or hound hunting, but because they thought professionals ought to do the job of managing wildlife. To walk away from it and not make any decisions or not address those issues is going to lead us right back to the ballot box.

Comment: (Katherine Bragdon) - I find the issue of wildlife commissions very interesting, especially the situation in Colorado. In 1991, at the wildlife commission there was an outpouring of sentiment against the spring bear hunt. Even the Division of Wildlife recommended an end to the bear spring hunt. So actually the Wildlife Commission, not only didn't stop the bear hunt, they extended it. Hence, there was Amendment 10. I commend the Division of Wildlife and the Commission for post-Amendment 10 activities when they hosted a Governor's Symposium to invite public input. Talking about wildlife commissions, it seems to me that the best way to alleviate the problem of polarization is to have a wildlife commission that reflects the public. It's no secret that the majority of almost all the wildlife commissions nationally are predominantly made up of hunters. It seems to me that if genuinely want to stop this polarization, then we need to have wildlife commissions that truly represent the public that have a hunter on there, that have a biologist, an animal welfare activitist, environmentalist, citizens from the community. What I would like to hear are just your comments on this issue of why wildlife commissions currently don't really reflect the population.

> *Answer: (John Beecham)* - I think it goes back to the point that I made earlier. You have to look at the history of wildlife management in this country, and how the agencies are funded and who the primary constituents are. That's true also for the forest service. If you look at the parks service and who their constituents were historically, and who they are today, it's a much different picture. The process is evolving and there are commissions now around the country who have people on the commissions who represent those non-hunting interests. It's an evolutionary process, and part of the stumbling block is the inertia within the agencies to stand up and say that our constituency is not just hunters but the public at large. They have a reluctance to do that because the paycheck comes entirely from hunters. Hunters feel that since they pay the entire bill, why should someone who is not part of that process, i.e., paying their way, have an equal say with hunters. Those are the arguments they hear. As to whether they are valid or

not depends on your perspective. We are moving more towards recognizing that our constituency is broader based than just hunters. We are making an ethic move with most agencies providing support for international fish and wildlife agencies.

Question: (Julie Tolman) - I'm a bit confused about disseminating accuracy of information. With the scientific methods and processes that we go through, it generates uncertainty. How do you think it's best to give out your information when that information is uncertain or don't know what the population dynamics are?

Answer (John Beecham) - In the last issue of Discover, there was an article about Carl Sagan being denied membership in the Academy of Sciences because his publications tended to be oriented toward the public and more popular forms of presentation of scientific material. It made a very eloquent argument that we need more people like Carl in the community. I couldn't agree more. We are trained as scientists and trained to deal with those uncertainties, but that is no excuse for not putting out that information to the public in a form that they can read and understand. Our entire training basically directs us to use very direct and short phrases; we just are not trained to communicate with the public. We need to make an extraordinary effort to learn to write in a different style and be able to mix between the two audiences.

Answer: (Wayne Buchanan) - I'd like to add that part of the challenge relies with the citizen groups themselves. You have to get out there and be at the meetings regularly and keep your finger on the pulse. That is the part that concerns me the most when I go to Commission meetings because I'm virtually the only non-hunter representative there. You can't be informed on the subject if you wait until its time for a ballot issue. You miss the history, you miss what's going on, and you miss what's going on, and miss a lot of the information sessions. Long-term involvement is a big part of it too.

Answer: (Don Whittaker) - From my desk, the uncertainty question is a good question because it is something that we have to deal with. My biggest uncertain fear, and I think it was brought up earlier, is related to the demographics of the user groups that we have to deal with. Those are changing at a rate that is much faster than we can even quantify, where they live, how they live, what their demands are, the mobility and, more importantly, is we are uncertain and cannot quantify what the impacts to resources are going to be. I think both sides of the coin are going to have to bite the bullet and say "okay, based on our best information at this point, given our fiscal and logistic ability, this is our best shot at what is going to happen" and then accept that uncertainty. It takes us 2-10 years to come up with a good solid piece of information with this level of uncertainty, but the environment that we are going to study can change dramatically in less than a year. It's something we have to deal with, and we have to present it as best we can and move on.

Answer: (Tom Beck) - I have a wonderful slide that says "Objectivity is a myth as great as the cowboy", and I think we need to understand that science is conducted by scientists who are people who work for agencies. People have vested interest, agencies have vested interest, none of us is pure, all of us are biased, and we all need to confront those biases. At the same time, however, realize that it's a business of people, and we are going to have all the warts, ugliness, and egos involved with the people business.

Comment: (Laurel Kagan Wiley) - We share these management concerns that are being expressed. As a result of that, in cooperation with the international division of federal aid, we are trying to develop proactive strategies to deal with these very issues. It's premature, but I would like to extend an invitation to all those who are seriously interested and committed to give me a contact, or your regional federal aid office a call, because one of the initiatives that we are trying to develop is bring together the management people to identify and define these issues in order to start developing some strategies and how to deal with them. This is a new initiative and it's just beginning to get started, so it may be a premature invitation, but I would certainly encourage you to be in touch with myself or your regional federal aid office or the Washington office in regards to this. We could certainly use the help. All we are trying to do is provide a forum for that.

Question: (Laurel Kagan Wiley) - I have a question for Oregon or Washington. One thing that I noticed from the presentations earlier was that following the initiative, the first thing that the agency did was extend the season and possibly extend the number of hunters that could go out there. I was wondering if that was a fiscal decision, a decision based on providing opportunities for hunters, or if it was based on biology.

Answer: (Don Whittaker) - It was based on all those that wind up in one ugly word called "politics". In Oregon, throughout the whole thing we've got individuals on all sides of the issue that say the bear population is going to explode, or do this, or do that, damaging is increasing, or number of complaints is increasing. In the initiative process we expected we a fair minimum or short-term decrease in license sales and harvest success. As a business, and I think it has been brought up that we are a business, we have a product that we provide to our user groups. That just happens to be, in a lot of cases, wildlife or game species. When our success rate drops for a particular species that enables us to provide more licenses, more income, more opportunity to pursue a species. So it does a little bit of everything, or did in the state of Oregon. At the same time, we tried to direct as many of the increased licenses into areas surrounding what we call "hot spots" of damage to try to reduce or control populations in areas where we do have a problem, and the citizens are concerned about their safety whether real or perceived. As an agency, we have to react to that. It's not okay to sit here and say mountain lions are cool, and I have examples in my office where voters who voted for Measure 18 thought it was just an incredibly good idea to make that stuff against the law. But when a mountain lion shows up under the foyer of an elementary school, probably 5 miles downstream from the urban wildland interface, they don't think it's a good idea to protect them. So those issues are real. We have to deal with our income, human safety issues, livestock industry, protection industry, forestry industry, economic losses in areas, and so on. We have no choice as an agency to not deal with those. At the same time we are mandated to provide opportunity. We were mandated to provide recreational opportunity. So we do.

SESSION FOUR: BLACK BEAR DAMAGE AND HUMAN / BLACK BEAR INTERACTIONS

Session Lead: Gary Olson, Montana Department of Fish, Wildlife and Parks

THE WASHINGTON ANIMAL DAMAGE CONTROL PROGRAM (ADCP) - A COLLABORATIVE EFFORT TO ADDRESS CONSTRAINTS TO REDUCE BLACK BEAR AND OTHER ANIMAL DAMAGE

GEORG ZIEGLTRUM AND DALE NOLTE, Washington Forest Protection Association, and USDA/APHIS National Wildlife Research Center

Question: (speaker not identified) - Have you concretely demonstrated that you have less peel damage in areas where you have the supplemental feeders?

> *Answer: (Georg Ziegltrum)* - Yes.

Question: (speaker not identified) - Over the 10 years that you've been doing the supplemental feeders, what sort of population increase or decrease have you observed with the bear population?

> *Answer: (Georg Ziegltrum)* - This is a pretty tough question. As you know, it is pretty difficult to come up with population estimates in the first place. As far as black bear are concerned, it's only indirect count methods. These count methods are highly questionable, so the information you have is nearly meaningless. But it's the best way that we've got.

Question: (Bob Stafford) - Have you seen this in other tree species other than Douglas fir or heard of it in any other literature?

> *Answer: (Dale Nolte)* - In Clallam County is where the first damage reports are coming in because hemlock is usually about 3-4 weeks earlier than on the Douglas fir. But as soon as the damage is noticed, the bears switch to Douglas fir. Douglas fir, hemlock, and cedar seem to be the ones that are damaged. In southern parts of Oregon and California, it is redwood.

Question: (Mark Henjum) - When would you begin to wean these bears off this in terms of the life of the tree stand itself? Could you possibly be maintaining a population of bears that once you do that cannot be supported by the native vegetation?

> *Answer: (Dale Nolte)* - The frame for blatant damage is between 15 to 25-30 years.

Question: (Wayne Buchanan) - I have occasionally heard some third-hand reports about some of these bait stations not being pulled when they are past their point of use, being maintained all year, and occasionally even being used for hunting in the fall. I know this is against your basic protocols and recommendations. There never was enough information pinned down as to where these places were; but if I were to get such information, what would you recommend to do?

> *Answer: (Georg Ziegltrum)* - Get the baiting stations out of the woods quickly. The goal is to have them removed by the end of June. When I hear about something like this, I call someone and have them out in the woods to remove the station immediately.

Question: (Ted Orr) - Do you find male or a female bear kills more trees than the other would? Why?

> *Answer: (Dale Nolte)* - Over the 30 years' experience of WPA, we found that the major problem we have is a sow with cubs. The home range of these bears is relatively small, only about 4-5 square miles. Sows with cubs are our problems; so when we see a situation like that, we put in a feeding station immediately to

make sure that if a boar is stalking one of the feeding stations that the sow will go to another feeding station.

AN INVESTIGATION OF BLACK BEAR DAMAGE TO CONIFERS IN WESTERN WASHINGTON

WILLIAM STEWART, USDA/APHIS National Wildlife Research Center, Washington State University

No questions

PROPOSED MECHANISMS FOR THE OBSERVED DOUGLAS FIR VASCULAR TISSUE PREFERENCES OF BLACK BEAR

BRUCE KIMBALL, USDA/APHIS National Wildlife Research Center

Question (speaker not identified) - Do you have any ideas towards moving towards practical application in the field other than genetics of trees, or is it too early in the process to look at the process that might actually be used on the ground to deal with the issue?

> *Answer (Bruce Kimball)* - I would hesitate to jump into something like that. Our initial look into this was to find out what's going on. Before we proposed all these grand ideas to improve things, we wanted to know what's happening. There's a lot of ideas there: pruning looks to be very good; it's not stopping damage but at least its able to spread the damage around to avoid these huge pockets of losses. The genetic thing may work out very well to put in different seed sources in the same plot that may spread the damage around.

Question: (Julie Kohlman) - If you assume the hypothesis about female bears with cubs feeding more often on these stands is true, is it a home range question because they have smaller home ranges, or is it a nutritional bias?

> *Answer (Bruce Kimball)* - I don't know. I can't answer that directly. I'm just a chemist. But I would say that nutritionally sows, particularly with cubs, are going to be more subject to having to make these choices than males would be. They're going to probably be in the nutritive state that makes it more imperative that they maximize intake of carbohydrates and minimize the turpine intake.

THE USE OF FECAL DNA AS A MANAGEMENT TOOL AND ITS APPLICATION TO BLACK BEAR BARK-STRIPPING BEHAVIOR

CHRISTINE HOUSTON AND SAM WASSER, Center for Wildlife Conservation

Question: (Sam Ziegltrum) - If, through random harvest in the control areas, if you take the boar out of this area and give the sows the opportunity to feed on the feeding stations, is this a solution to the problem?

> *Answer (Sam Wasser)* - One thing is that management no longer becomes non-invasive because hot-spot hunting becomes an important component of it. We will hopefully able to test that idea as well. At this point we are just trying to say that we have the technology that can help to this. Also, if it is females that are doing the damage, there are a number of other options that can be potentially implemented to resolve the problem. For example, condition taste aversion is something is very possible to work on these kinds of problems. Contraceptive implants, where you take the physiological incentive away from the female to strip away the bark and at the same time are able to get your population back under control. The point that we are trying to make is that if you're spending half a million dollars a year on this problem, it's very important to know that that's addressing the problem effectively and it's the best way to do it.

Comment: (Gary Koehler) - During the feeding times, we've been monitoring male and female movements. It generally coincides with a period of estrus in the females. At that time, the males are bouncing around like popcorn on a hot skillet looking for some excitement. During that period, any single male is not necessarily confining its

activity to a feeder. A male is going from feeder 1 to feeder 2 to feeder 3. This is in contrast to what we've observed with the females. They have very localized movements. I guess that we don't know enough yet. There are a lot of questions that need to be resolved, and I'm thinking that DNA is going to provide a lot of those insights. As to the question of moving that male, I'm not sure that's necessarily to present an opportunity for that resident female to come in since there will be another male right there. I think that the DNA analysis will shed more light on the subject and how we can best manage this issue.

Question (speaker not identified) - It has been several years since I've run electrophoresis. It is so time-consuming that it won't be a technique that we can have annual estimates in a particular because we wouldn't get quick enough turn-around? What would the turn-around time be on a large set of samples submitted to a lab? Are there enough labs to handle that? What would be the approximate cost per sample?

> *Answer: (Sam Wasser)* - The persons having the most experience with having samples completely analyzed from start to finish would be John Woods and John McClellan. As far as the numbers of people doing this sort of thing, there is not that many. It depends on the equipment. You can buy the most expensive DNA equipment there is and have them done in a couple of weeks. Or, if you don't have access to that kind of resource, things may be a little slower. It is technology-driven. As far as cost per-sample analysis: the best thing to do is contact is to some of those various places and find out. It's not cost-prohibitive.

Comment (speaker not identified) - We are operating on a tight budget right now and it's not that we have spent an enormous amount of time with the samples in hand yet. We have been working very hard to do both studies. If you run 20 samples, and in a few days have your answers for all your different micro-satellites for all those 20 different individuals, it's time-prohibitive or very expensive.

Question: (Gary Koehler) - I heard one or two speakers talk about habitat, and some of the photos I've seen today are shocking. We also talked about ethics in bear management, and I was wondering how ethical it is to manage forests in the manner we've seen on the screen. How ethical is it to artificially feed bear or kill bear in damaged hot spots given the fact that we are managing these forests in this manner? Should we be spending public money towards this effort to subsidize the kind of management we are seeing?

> *Answer: (Georg Ziegltrum)* - We are not talking about public money. This is money that is brought forward by industrial people who are interested in managing wildlife in cooperation with forest management. If the public didn't demand our product, we wouldn't cut one tree.

Question (speaker not identified) - The DNA sample size you were using is real small, but the conclusions were kind of great. Do you know that females defecate at feeding sites with the same frequency as males? You were taking data from peel sites using one set of information, and then data from feeding sites using different information.

> *Answer: (Christine Houston)* - We have over 100 scat samples that have been collected from peel locations, but we don't have the data yet in-hand. We have it to analyze and extract; it just hasn't been done yet due to time-constraints. As I said earlier, the data is preliminary.

Question: (Wayne Buchanan) - Is the zoo example a good comparison to a wild example when comparing female/male feeding sites, peel sites, and marking territories?

> *Answer: (Christine Houston)* - Yes. They do the markings too. It's just a smaller territory.

Comment: Steve Pozzanghera - We may be looking at females that are feeder-shy, especially those with young-of-the-year. It's not comparable to a caged bear, and defecation rates and behavior at a feeding station would probably be very different.

Question: (Wayne Buchanan) - Part of the reason that there might be a bias towards males is because a lot of these feeders are put in place at the end of road or in a road where males, unconstrained by movements, are going to be hitting them all during estrus. Females have very restricted movements and small home range areas, and the feeders are not providing access for those females. Do you agree?

Answer: (Christine Houston) - Right now I'd say yes, but we'll know more after we have looked at the data.

Question: (Trevin Taylor) - Is there any way to tell whether those 10 males you hit on the peel sample were cubs or the ages of each?

Answer: (Sam Wasser) - Yes. We can tell mother offspring from the microsatellite DNA. We can't do age unfortunately.

MANAGEMENT PLAN TO REDUCE NEGATIVE HUMAN / BLACK BEAR INTERACTIONS: LIARD RIVER HOTSPRINGS PROVINCIAL PARK, BRITISH COLUMBIA

LANA CIARNIELLO, Edmonton, Canada

No questions

UPDATE ON BLACK BEAR-HUMAN FATILITY INFORMATION DATABASE

LANA CIARNIELLO in cooperation with STEPHEN HERRERO

Question:(Michelle Tirhi) - Do you have any numbers on the decline in human-bear encounters since management strategies have changed?

Answer: (Lana Ciarniello) - Some of the management strategies were implemented; unfortunately, others were not. I didn't recommend when they closed the landfill that all the bears using it be destroyed, and that's what happened.

Question: (Speaker not identified) - Did you notice any trends in time of day or night when encounters occurred?

Answer: (Lana Ciarniello) - Both encounters were during the day. But during the peak in August, we were woke up all hours of the night.

Question: (Wayne Buchanan) - Was there any experience with the pepper sprays as a deterrent?

Answer: I had one bear that I sprayed so much I named him Cayenne. It doesn't seem to be working very well with the males who are used to human interaction. It does work well with wild bears.

OBSERVATIONS OF DIFFERING PREDATION OF CALF ELK BY BLACK BEARS AND COUGARS IN SOUTHEAST WASHINGTON: OR WHO EATS THE MOST WHEN?

WOODROW MYERS, Washington Department of Fish and Wildlife

Question: (Larisa Harding) - What are your speculations are on those years that your mortality evened out? Do you attribute that to the bears hibernating or to the cougars killing less?

Answer: (Woody Myers) - One factor could be a function of sample size. By the time we hit December-January, the number of marked animals is down to 15 as a result of the actual deaths that have occurred, radio failures, and radio sheds. The radio shed and failures were not presented here, but there have been some years when that has been substantial.

Comment: (Al LeCount) - Just a comment. You bring up a good point that with some of the DNA work being done, identifying individuals who are doing the killing is possible. Another thing we need to look at is relationships

between animals doing killings. In other words, are mothers teaching offspring strategies since some bears and lions are not participating?

> *Answer: (Woody Myers)* - I'm really excited about it and wish that we had known about it 2 years ago. There is something to what you said.

Question: (Sally Nickelson) - Do we have any data on cougar and bear populations in the early 80s compared to now? Did last year's hunting initiative cause an increase in cougar populations?

> *Answer: (Woody Myers)* - We don't have a good idea as to what the cougar populations were in the early 80s. There is enough empirical evidence to suggest that cougar numbers are higher now than 10 years ago. In the Blue Mountains, the cougar harvest was low into the mid-80s. After the permit system in 1987, harvest has been larger.

Question: (Michelle Tirhi) - Talking about the small percentage of bears that actually taking calves, what are your thoughts of the incidental nature of that, i.e., bears incidentally coming upon or using elk calving grounds vs. the stalk that is a learned behavior?

> *Answer: (Woody Myers)* - This brings up some self-criticism that we have debated. Looking at the losses between when we collect herd composition ratios and polls, those losses don't coincide with survivability of radio-marked animals. There is a discrepancy that runs about 15 to 20 percent. That could be some loss that occurring by black bears early that we are not picking up on. In terms of is it a learned behavior vs just some chance encounter, I'm not sure. I'm fairly comfortable in saying that there are some bears that do hunt calves specifically.

*Question: (Tom McCall)*_- Could you describe the control study that you would recommend to try to determine whether predators are controlling the elk population?

> *Answer: (Woody Myers)* - At the end of this season, we will have had 5 years of baseline information on calf survival under a fairly broad range of environmental conditions. Conceptually, I would propose that we somehow divide up the present study area and in the treatment area make every effort possible to reduce predator numbers. In the control area we leave everything status quo.

Question: (Scott McCorquodale) - Do you have a sense of predation on adults? What about predation on deer?

> Answer: Don't have a good feel for what predation rates are on deer. In terms of adults, 8 percent of the documented mortalities of 52 adult elk were predator-caused and 52 percent were hunting-caused. I believe it is insignificant in the adult population.

PLANNING FOR WILDLIFE VIEWING AMONG A HOSE OF CONFOUNDING ECOLOGICAL VARIABLES: AN ADAPTIVE MANAGEMENT APPROACH

DANIELLE CHI, Utah State University

Question: (John Hechtel) - You noticed some males splitting right away when you observed them at the falls. Did they come back, or did they seem to avoid you? If some avoided the researchers, that could be reflected in the data. Are brown bears using the lower falls or just the upper falls?

> *Answer: (Danielle Chi)* - We noticed that most in 1993, the first year of the study, because we didn't have a blind around the elevated tree platform. It seemed like we were creating more of a distraction effect than anything else. After the blind was put around the platform (in 1994), the avoidance occurred only when we arrived. A lot of them did come back. The brown bears are using the falls in both areas, but they're actually using the estuary a lot, and using the area between the upper and lower falls, which is a lot more open and flat.

Question: (Scott McCorquodale) - You didn't mention in your focal animal sampling whether you had gathered information on actual harvesting of fish. What information do you have regarding the impact of visitor levels on the bears' fishing efficiency?

Answer: (Danielle Chi) - We haven't been able to do that yet.

Question: (speaker not identified) - Is there a hunting season there? If so, do you think any effect of that on the habituation?

Answer: (Danielle Chi) - The drainage is protected to black bear hunting. Beyond the drainage, it's hard to say how much these bears are exposed to hunting because they are not protected on the beach. They have a brown bear hunting season, so I'm wondering if they may be more impacted than the black bear.

Question: (Andrea Bruns) - Did you notice if certain bears used the upper or lower falls?

Answer: (Danielle Chi) - That was one of the difficulties of the study because we were interested in looking at individual responses of bears to people at the lower falls. Most of the large males seem to go to the upper falls. A lot of times in the beginning, females with cubs used the lower falls. However, in the last year of the study, it seemed to even out more.

SESSION FIVE: ECOLOGY AND RESEARCH

Session Lead: Dave Moody, Wyoming Game and Fish Department

NOCTURNAL ACTIVITIES OF BLACK BEARS IN NORTH CENTRAL WASHINGTON CASCADES

WILLIAM GAINES, United States Forest Service, Leavenworth, Washington

Questions: (Gary Witmer) - It's been my experience with a number of species, both omnivores and carnivores, that it's pretty easy to move them around at night. Would you comment on that? The shift in the activity pattern later in the season is when a lot more people are in the woods. Could that have caused a shift?

> *Answer: (Bill Gaines)* - In answer to the second question. That may be a factor. As part of the road study, we are looking at traffic counts. It's incredible the increase you see in the fall. As far as animals moving around at night, we try to locate our monitoring stations ½ mile or so away from the animal. Usually we have some sort of topographic feature between us. I haven't detected where we are actually pushing an animal around. We used some information from other studies that suggest a kind of "zone of influence of about .3 mile" that bears react to roads.

Question: (John Hechtel) - Are you doing any daytime activity?

> *Answer: (Bill Gaines)* - We are conducting 12-hour monitoring sessions during the daytime.

DENNING ECOLOGY OF BLACK BEAR IN THE BLUE MOUNTAINS OF NORTHEAST OREGON

JAMES AKENSON, Oregon Department of Fish and Wildlife

Question: (Richard Smith) - With the microchips, what distance do you need to be to scan? Also, your pictures seemed to be either old-growth habitat or stands of half-grown trees. Did you look at any areas where you didn't have large trees? If so, would the bears travel a good distance to get to trees, or did they tend to use stands they were located in?

> *Answer: (Jim Akenson)* - You have to be right on top of the microchips. We wish the technology was far enough along so a distance of 15 feet could be used. Regarding the old-growth aspect, we have quite a mix. Bears that are tree-oriented obviously are going to be sucked toward components of old growth. We have seen instances, particularly with excavated dens, where they have been in clearcuts. But the clearcuts are deceiving in that they have some other element of security, such as big blocks of private where the bears are not going to be disturbed. One thing we are really curious about is this localization process prior to bears going into the den and post-denning. They seem to be in a gradual slow-down phase. They are doing their last feeding. It seems like it drags on for 2-3 weeks, where they are right in the den vicinity, perhaps excavating the site. But they are very fixed to that place, and security is extremely important to them at that time.

Question: (Richard Smith) - Was that biggest cub you had a single cub or from an older mother?

> *Answer: (Jim Akenson)* - No, in most cases. That cub had a sibling, which was close to 9 pounds. They were two whoppers. We had collared the mother as a young subadult, so we knew she was 5 years old.

Question: (John Hechtel) - Why are you going to the dens in November? I've always been of the philosophy that is the worst time for potentially disturbing and moving them around.

Answer: (Jim Akenson) - Part of the reason is purely logistics. We've had as many as 40 bears we've had to locate. It takes us quite a while to get around on snowmobiles, snowshoes, and be able to get to those den sights. If we waited until later on, we wouldn't get it all done. Also related to logistics, in November we can drive a lot of our roads; by late winter it's a snowmobile operation. In some cases that is 20-30 miles and 20 below zero temperatures.

Question: (Gary Koehler) - I have a comment for the gentleman who asked the question about den sites on younger-aged forests. We are finding that in intensively managed forests by Weyerhaeuser in the Snoqualmie area, bears denning in stands that are from recent clearcuts probably not more than 2 years, two stands that are approximately 30 years old. The structure they seem to be selecting for is some kind of old-growth component. I'm referring to one of the old stumps from one of the initial stand entries in the early part of the century, or downed logs, or in some of the stands where there is an old-growth component burrowing into a hollow tree stump or downed hollow log.

Answer: (Jim Akenson) - That is pretty similar to our situation, although we have seen exceptions, and we have actually seen instances of what would be categorized an old-growth tree that's basically surrounded by the clearcut.

Question: (Scott McCorquodale) - How specific in subsequent years do you have any information on how specific your animals are to den types, not just re-using the same den? Do you have any information on subadult den types relative to the dens they were raised in?

Answer: (Jim Akenson) - We are still doing the analysis as to bears per type per year. We haven't fully completed that. I'd say there is a tendency towards bears that are tree-oriented will continue to be tree-oriented, at least there's that trend in 3 out of the 4 winters. As related to the subadult aspect, we don't have enough information. That is one reason why we microchipped these cubs, as we were hoping to be able to obtain that specific piece of information. We are not going to be able to continue this project. We are basically at the end our funding, but we did have hopes of doing just that.

BLACK BEAR HABITAT USE AND HOME RANGE ECOLOGY

MADELEINE VANDER HEYDEN, Oregon Cooperative Wildlife Research, Oregon State University

Question: (Scott McCorquodale) - I have a question about the underutilization of grass forbs because of the lack of tree cover. Have you been assessing permanently resting behavior in the bears?

Answer: (Madeleine Vander Heyden) - I've given a lot of thought to this. There are a couple of things that might be going on. Grass forbs may be an important foraging item, especially in the spring.

Question: (Wayne Kasworm) - Do you know of any potential effects from doing ground telemetry in your ability to detect differences related to roads? Is there any road management going on in your study? If so, could you detect any differences in bear response related to road management?

Answer: (Madeleine Vander Heyden) - The road disturbances are something we had to pay attention to. Vehicles did startle bears in denser cover. We tried to minimize disturbance by listening to the signal. If it was loud or if the bear was close by, we parked vehicles and walked up the road to the location. There had been a large arson fire in the area and, consequently, roads were closed to prevent vehicle disturbance. I did not look at the effect of closed vs. open roads. I would like to look at the difference between primary and secondary roads. Offhand, my feeling is I didn't see much of a difference. In contrast to several other Western Washington bear studies, these bears seemed to be further from roads than the other studies, averaging over 200 m from the nearest road.

THE USE OF DOGS TO STUDY BLACK BEAR HABITAT UTILIZATION, MOVEMENT PATTERNS AND FORAGING BEHAVIOR

MARC SEID and ROBB GARDNER, Brigham Young University

Question: (Michelle Tirhi) - Do you or did you investigate using other types of tracking devices other than leaving string line, for example a paint line?

> *Answer: (Marc Seid)* - No, we didn't. The only problem we had was the string would break, so we had to be careful to wrap it around bushes. In dense brush and rough terrain, such as you have here in Washington, I would recommend a paint line.

Question: (Patrick Ryan) - You suggested that bears were foraging in the sagebrush. How do you know they weren't just simply traveling through?

> *Answer: (Marc Seid)* - All the ant mounds were found in sagebrush habitat.

Question: (Danielle Chi) - How frequently did you actually end up treeing bears? In a state where there is a hound-hunting season, do bears become less wary of the hounds, which would make them more vulnerable to harvest?

> *Answer: (Robb Gardner)* - We never tree or even see bears during the study. We are always going backwards. If we do lose a scene going backwards, we will turn and go frontward and follow the bear. If there are any indications that we are pushing the bear, we terminate the transect.

USING PURSUIT HOUNDS TO FACILITATE BLACK BEAR POPULATION RESEARCH

MARK HENJUM, Oregon Department of Fish and Wildlife

Question: (Al LeCount) - You said you had 54 percent success from tracks that you had struck to successful captures. Is that right? Are you using radio collars?

> *Answer: (Mark Henjum)* - Yes. We had a 54 percent success rate. There is telemetry on the dogs in most cases.

Question: (Al LeCount) - Of untagged bears that you tree, do you have any information how often you could correctly identify the sex of the bears in the trees?

> *Answer: (Mark Henjum)* - It can be done. If you spend time at it with a pair of binoculars, maybe 75-90 percent of the time you can correctly identify the sex of the bear.

Question: (Jack Mortenson) - Could you estimate what you think it costs with pursuit hounds to get a collar on a bear, that is, per-bear cost? How much would it have cost if snaring had been used?

> *Answer: (Mark Henjum)* - I'm not sure I can answer that since I never thought of it in that way. I do know that in a certain study they had one person doing nothing but run a bait line and did snaring which worked quite effectively for them. We would have liked to have done that, but was a person we didn't have. It came down to a people issue. We got $140,000 federal aid money, and the budget that came to the field was about $88,000. If we had had to do snaring, we wouldn't have been able to do it.

Question: (Darlene DeGhelto) - Do you ever have a problem of the hounds actually catching the bear or mountain lion? Are they trained to not interact with the bear?

> *Answer: (Mark Henjum)* - With mountain lion, it is not an issue. In all the captures I've been involved with, in only one instance the cat actually jumped out of the tree and attempted to climb another tree. One of the dogs broke off the leash, but we were able to get the dog away before the dog or lion was injured. In terms of black bear, many of the older males will not tree. They don't run; they just walk. So the dogs do come in contact with the bear. There is some fighting that occurs, but eventually everybody gives up.

PANEL DISCUSSION: BLACK BEAR RESEARCH, A LOOK AT CURRENT AND FUTURE FIELD TECHNIQUES (DISCUSSION EMPHASIS ON CAPTURE METHODS AND WINTER DEN INVESTIGATIONS

TOM BECK, Colorado Division of Wildlife; JOHN BEECHAM, Idaho Fish and Game; MIKE PELTON, University of Tennessee; JAMES AKENSON, Oregon Department of Fish and Wildlife, BRUCE MCLELLAN, British Columbia Forest Service; WAYNE KASWORM, U.S. Fish and Wildlife Service; DAVE MOODY, Wyoming Game and Fish Department

Comment: (Bruce McLellan) - We began experimenting with drop-aways in 1979, and we've never put a collar on a bear since 1980 without a drop-away. Now we put it on all animals, even caribou. I've seen moose and caribou that were collared 15 years ago that are still collared.

Comment: (Dave Moody) - I think that's typical. In Wyoming we have not put a static collar on a bear in years. We have cotton spacers that are designed to rot away and fall off within a 2-year time period. We have done some experimentation with developing sub-adult collars, primarily for grizzly bears. We use cotton thread that breaks away. As the bear grows, the collar stays with him. We don't have the issue relating to the collar falling off or becoming snagged.

Comment: (Wayne Kasworm) - One of the things we have tried is using cotton spacers and putting a spool and using two of them. The collar expands a couple of inches, and then there is a second cotton spacer that takes over at that point. The second spacer has not been trimmed or cut in any way; therefore, you might gain 2-3 inches in terms of circumference of the collar. You still have a spacer in there that will eventually deteriorate and the collar will fall off.

Comment: (Richard Smith) - A couple of issues that I think need more research that I raised yesterday is answering questions regarding the two controversial hunting methods that are generating a lot of these referendums - primarily the use of bait and dogs. I'm pleased to hear the reports on dogs being used for research in this part of the country. That generates some information on the value of the use of hounds. One of the major questions about hunting with bait is that it helps generate problem-bears. A lot of people think there is no difference between that and bears being fed in campgrounds. I'd like to see some research help answer that question. Does using bait for hunting generate nuisance animals?

Comment: (Mike Pelton) - We've been working with black bears in the Smokies since 1969, and we've been using bait to catch these animals. Over 1,000 individuals have been caught and tagged backcountry wild bears. At the same time, the National Park Service has dealt with a lot of nuisance problems, probably 400-600 nuisance animals. It's always been interesting to me that of the 1,000 individuals that we have dealt with were caught at bait sites, and the 100s they have dealt with in front country; there have been only 23 crossovers. I think that tends to argue the point that you made that the backcountry bait sites for almost 30 years simply do not create nuisance animals.

Question: (Ray Blacken) - What is the, in addition to the methods that have been taken away, wildlife departments' feelings of the agenda of some people who want to do away with all hunting and fishing?

> *Answer: (John Beecham)* - I'll take this on since I've been dealing with it fairly recently, so I've had an opportunity to look at and talk to a lot of people who are involved on both sides of the issue. It's clearly that you can't paint all these people with the same paintbrush. Their agendas vary considerably. There are the extremes of people who are truly anti-hunters and have no use or feel like hunting has no place in our society. On the other hand, there are a lot of people that were involved in the initiative process who were truly supportive of hunting but firmly believed that some of the methods that are being used were not appropriate anymore. To try to categorize everyone as having a single agenda or a single point of view is a mistake. You need to recognize that people have differing opinions and differing agendas, and you need to deal with those separately and not put them in one basket. There are a lot of people out there that genuinely support hunting programs and hunting agencies that simply do not like baits, hounds, or spring hunting.
>
> *Answer: (Tom Beck)* - I haven't given a lot of thought to this, but over the past 7-8 years one of the things that I've noticed is that if you went back to the first western black bear meeting in 1979 it was a white male

meeting. What we are seeing is a transition in our profession in our profession that mirrors the transition of American society. I'm an avid hunter, support hunting, love it, and don't know what I'll be do when I'm too old and crippled to keep doing it. The fact is that it is a minority activity. Our job has always been to regulate hunting with a broader picture of wildlife management. The profession has to understand that not only are we managing for a minority activity, but historically we have been parts of that minority.

Answer: (Jim Akenson) - I agree with the first two speakers, but it's also important to recognize that wildlife conservation management in this state is being supported by hunters and fishermen. It's important that we don't turn our backs on those folks. Every time we turn around we are dealing with a sensitive issue. We need to keep things in perspective and look at the legacy the sportsmen have laid down for wildlife conservation.

Question (speaker not identified) - Right or wrong, a lot of the agencies we all work for are interested in population estimates, what's going on in the population, etc. Over the last couple of days we've seen a lot of really good potential in some of the techniques discussed. From my desk, I'm interested in what some of the panelists and/or agencies foresee in taking these from a research standpoint and putting them into a tool that I can use and district biologists can apply, and then provide the numbers to the people who are screaming to have. How can we track these populations that we have historically done a very poor job of doing?

Answer: (Mike Pelton) - From a practical standpoint, economically and every other way, an agency needs something that is quick and dirty that will give them a trend that will then give them some ballpark estimate of what the population is doing. We started, for instance, testing the bait station idea in the 70s in the Smokies. We went from a testing mode into actual application mode in 1980. Now that system is being applied to over 6 million acres in four states and several national forests. Our group meets twice a year and not only looks at bait stations, but also tracking food, harvest depredation actions, as well as roadkills. All that is put together into one package on a regional scale, and it seems to be working quite well. I'm a proponent for an indices concept and using every bit of information you can. A couple of things that have been exciting to me that have not been mentioned at this workshop is the use of tetracycline markers that have been used in Michigan and Minnesota on a statewide level as a population estimating method. It's pretty simple and non-intrusive. There was a flurry of activity about infrared sensing that I haven't heard mentioned that is a kind of futuristic thing that might be something to look at.

Answer: (Wayne Kasworm) - We went through an exercise at the grizzly bear recovery coordinator's office to develop some techniques, or at least look at the opportunities, for using DNA analysis to estimate the northern Continental Divide grizzly bear population. We went through a discussion with several researchers, and put out a bit of a white paper on that where we compared some DNA techniques and listed at least some of the concerns in sampling using hair at that time, with the development of scats, and the ability identify DNA in scats. There might be some other opportunities there. But we also compared that to traditional radio-collar sampling in attempting to establish a population trend based on population modeling and survival in different age-classes. I don't have any of those numbers here, but the discussion we went through was more interesting. Some interest that is developing in the DNA technique and maybe some euphoria about it was exciting. There are major questions out there about sampling. The DNA is great and wonderful, but there are serious concerns about sampling and getting to numbers that can be used.

Answer: (Bruce McLellan) - I'm trying to figure out how to answer this one for British Columbia because we are unique compared to most of the states. It is an enormous area with very few biologists, and it's very diverse. I compare it to the northern Continental Divide, mostly grizzly bear people. We have gone to trying to, based on research in certain areas, link it to both the different types of habitat and type of human activities. Hopefully, we will be able to predict the number of bears in an area we haven't censused using habitat and, what we call the step-down, test it with DNA combined with conventional methods.

Answer: (Tom Beck) - Why do we need all these numbers? I think we need to seriously question ourselves, do we really need all that we say we need. Problems are often artifacts by desire, so if you change a desire the problem goes away. Maybe we want to change fundamentally how we measure. For instance, in Colorado my biggest concern is how to teach people how to live with bears and share that habitat. That's the big bomb I see coming down the road. It's not, do we want to kill 5 percent more this year, 8 percent

more next year, and so on? I don't need numbers on that. I need to know behavior issues, not only on bear but people.

Comment: (David Bostick) - I agree that we need research on baiting, but I don't think there are a lot of different aspects we need to look at. Baiting is not one thing. This is half the argument. The people who are very much in favor of baiting point to the highest ethical standards of baiting; the other side points to the slobs who dump a bunch of stuff right off the trailer. Hunters have very different attitudes on what they are doing. We've got a program now where somebody that wants to bait in Alaska has to take a 2-1/2 hour course where we try to teach them a little bit about techniques and ethics. It would be nice to radio-collar some females and see how often they bring their cubs to a baiting station if there is a lot of other bear activity. Another thing is the density of bait stations. We get some places where, because of limited access, you may have 1 bait station per square mile. Mike, about your comment: there is also this concept of capturing bears in a situation where you are baiting vs. hunting; you need to be careful about extrapolating that. There might be some high-ethic baiters who are close to some of the researchers, but it is a different dynamic. In some of the stuff you have been doing in the Smokies there is somewhat of a deterrent to a bear by being captured and handled. So even if they are coming into bait at one point but, as a result of that, they get trapped and collared, you could see that they are less likely to into trouble.

Comment: (Mike Pelton) - Just a quick comment. It was mostly in response to the fact that our sites in backcountry, out-of-the-way settings in contrast to the front-country situations.

Comment: (Sam Wasser) - I want to make a comment about the non-invasive technology of DNA and other kinds of techniques available. My lab started developing non-invasive technologies in 1985, and we developed them initially to look at stress and reproductive hormones. At the time, it was "oh, my God, we have a new way of getting this technology" and everybody was jumping on the bandwagon to apply this prematurely. We kept saying to wait a minute; we need to go slow; we need to validate this technology to make it useful. Now it's become extremely valuable in many arenas. The DNA issue is the same kind of thing. It's an extremely exciting technology that is undoubtedly going to take off, but we have to be careful about letting the excitement of it cause us to apply it prematurely before we work out the validation. All the methods we are using have problems. There is no question about it. To use one by itself is simply naive. We are working very carefully with WDFW of setting out grids and comparing the kind of population estimates you get from using DNA vs. marked animals that are being radio-tracked. The bottom line is to get the samples non-invasively. In Africa there are three proposals to lift the ivory ban. One of the big issues is that if the ban is lifted, how are we going to tell if ivory being sold is legal. Elephants defecate in the woods all the time, so frequently that people use dung counts to census elephants. We are using fecal DNA technology to be able to get huge numbers of samples from huge numbers of individuals from all over Africa so that we have extremely accurate maps of gene frequencies. We take the DNA from the root, or cuticle, of the tusk and match it to our very accurate map, and say there is a one in a billion chance that tusk came from South Africa; there is a one in a hundred that it came from a poached area. Now we have to be careful to not jump the gun, and make sure we validate it appropriately before we apply it full-bore. If you apply it prematurely, then people start complaining about your methods. Then you damn the technology. It's going to be incredibly powerful, but we just have to make sure that we don't jump the gun.

Comment: (Bruce McLellan) - We have been doing this DNA thing for 2 years, and a year ago we gave a talk to the Fish and Wildlife Branch in B.C. Our recommendation at that time was to wait. There are so many "ifs" involved with this. A lot of them took the message, while some didn't. People are jumping to get at it.

Question: (Bill Mytton) - Concerning Dick's question on research on baiting and hound hunting. Other than it would be nice and support another graduate student, I think we could turn to the young lady from Ontario and ask her briefly the question that if we did a research project and it indicated there were no effects on bears, by question to her would this change her mind in one way as to whether there should be spring hunting, baiting, and/or hounds. If it was beneficial to focus on the individual and not the species, would you go along with the practice?

Answer: (Lana Ciarniello) - I think that wildlife managers have so focused on the population as a whole, that when they look at the sizes they see the population not the individual, while the public sees individuals. That's something that managers are trained to do: see the population *not* the individual. We need to be more responsive to individual animals.

Comment: (Bill Mytton) - In most cases we, here in Wisconsin, don't have any evidence to indicate those things can be supported. In Wisconsin we have a very healthy bear population. We have a long hound season, and we have not been able to document any effect on hibernating bears as to them going into the den in poor condition, having lower cub survival. We simply don't have that kind of precision, for one thing. But again, we are making suppositions in many of the cases. My real point is: all the research in the world on hounds and bait is not going to change the attitude correctly of people who know nothing about it, and will know nothing about it. They will oppose you regardless of what our data says. Typically, as biologists, we sit here and quite often try to come down to the most minute answer, and the general public doesn't even want the gross answer. We are trying to come down to this little tiny pod, and we'll never get there because the general public is looking at individuals.

Comment: (Lana Ciarniello) - The public doesn't see it as fair. They want to see that the bear as a chance. They don't see that the bear has a chance with dogs or baits.

Comment: (Bill Mytton) - We are talking about bears. And some of the same people who will oppose tracking collars on bears will be the first ones to get in their boat with a fish finder, GPS locator, run out there and catch fair. I don't know if we can really answer the issue here with the precision and data that we are trying to get from many of you when it is really a social question. It is not are numbers great or poor. Our numbers are greater than anyone's who are challenging us right now. It is the social side of this that we are not addressing. We have to address that social side or we will fail.

Comment: (Tom Beck) - Bill, you are quite right. Why do we keep looking through a microscope when we fail to look at the entire horizon? The fact that we are in a minority-type profession, we are comfortable with our social values, at least 20 years ago we were. I've read a lot of the fisheries science stuff and, indeed, some of the things you point as an example with the fish finders, we are probably catching 90 percent of the fish in some of the lakes in Colorado each year. People are starting to ask those questions now. The use of appropriate technology levels in pelagic fisheries brought up questions 10 years ago that if you cut back on the technology and use more permanent methods, you can support a heck of a lot more families. If we keep looking at too small a detail, we will lose the big picture.

Comment: (Wayne Kasworm) - I come from a state that does not allow either hound hunting or baiting in the hunting of black bears. We also have grizzly bears, and we have an extensive campaign in Montana, both in grizzly and black bear habitat, to secure garbage. We spend thousands in dollars in the county from where I come from to purchase bear-proof dumpsters. Coming from that sort of background, the whole baiting issue is a little for me to understand. However, on the other side of the coin, you can argue, as a researcher, "yeah, I'm out there it doing it too". We can talk about the types of bait that are used but, basically, you are trying to separate garbage and people from bears. It seems to run counter to that.

Comment: (Lee Wolf) - We haven't had a spring bear hunter since I've been hunting that last 8-10 years. I understand that the spring season was one they are complaining we take the mothers. We don't have that.

Comment: (Cecily Costello) - I agree with the people that have said that we need to start looking at the social aspects of wildlife management. From the comments that have been made, it's obvious still in this room that the people who are trying to discuss it are the people that can't see the "animal rights view". But I believe that we have the other dynamic going on. What I noticed when we had this discussion on the referendums that happened in these different states, is that the people from the state agencies were basically giving us ways that we could fight them. It was an automatic decision that the people from the agencies were defending hound hunting or they were defending bait hunting. Why is that an automatic thing? The truth of the matter is, if the public is asking questions about the ethics of hunting with baits or hounds, we, as an agency, have to ask those questions too. We should be evaluating that ourselves. The questions of whether or not cubs are being orphaned in the spring have not been quantified. We really need to start doing that sort of work so that it can be talked about in realistic terms because some people want to pretend that it never happens. Then the other people know that it does. We do need the scientific research because people, and the people that are voting in these referendums, want to know what is really happening.

Comment: (Jim Akenson) - She makes some good points. I don't necessarily agree with them all. When you are working for a state agency, and you have a number of oversight levels above you, and you have a state attorney who determines your capability to speak on specific issues such as ballot measure issues, and then you have a whole

supervisory echelon above you, you don't have a lot of freedom to distribute to specific groups. We just went to Measure 18 in Oregon. I think we were as fair as possible to provide information and biological data that we had available to us to people on both sides of the fence. I differ with you, Cecily, in that we are just providing information to the pro-hunting side.

Comment: (Cecily Costello) - I wasn't necessarily saying that you are only providing that information. I'm talking more about the impression that I got from the people on the panel and the presentations that have been given on how to fight these referendums. Was it the proper thing to automatically fight the referendum? Or is the proper thing to do to evaluate them? Do we need to evaluate those so that we know how to do it the best way possible in order to address the concerns that people have?

Question: (Gary Koehler) - An observation that we from western Washington have played with crying on Steve Pozzanghera's shoulder, prompted the panel discussion here in the first place. I have questions concerning the techniques used in doing den investigations, and trying to get reproductive data and productivity of populations. Typically, and this is airing some dirty laundry, the activity to monitor and get a handle on productivity, is to do den investigations. We found here in western Washington the first year, that attempts of going in on dens of females with cubs of the year that we got the mom out of the den, and she abandoned the cubs. She never came back and the cubs died. We tried that again the following year on one occasion and failed. This is a topic that really concerns me. How do you get at this Holy Grail of bear information? As a result of this, we have stopped doing den investigations on females with cubs of the year. This doesn't seem to be a problem in eastern Washington, just western Washington. Has anybody else found this to be a significant problem?

> *Answer: (Mike Pelton)* - Yes, we've found it to be a problem under certain circumstances not all the time. Assessing female reproduction is a very important parameter and is something we will try to do. We are in an area where there is no permanent snow cover, warm temperatures, low latitude, and our bears do not reach the degree of lethargy that they do in more northern areas. We have found ourselves asking several questions before we go into a den in terms of whether to even go into the den. One of them has to do with the level of security that den provides to the female. If she's 80 feet up in a tree or 15 feet down inside a hole, she has a pretty high level of security. Obviously, she's unavailable to us too, but using a tape recorder we can get vocalizations and get some idea of the cub production indirectly. In our coastal studies, we gave up. We witnessed the same thing you did. They abandoned with the slightest provocation. So we don't even go in on coastal or swamp kinds of dens where there are open nests. We also noticed that the age and experience of the female are a factor. We ask the questions: how old, has she had cubs, is she experienced? The younger ones show a tendency to abandon quicker than the older, more experienced females. The other things whether there is any ongoing disturbance going on in the area. If it is a situation where there hasn't been, we feel that is another factor. The age of the cubs is important too. If they are newborn, we stay away from her.
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> *Answer: (Bruce McLellan)* - We've had very similar experiences. When winters are severe and the snow is deep, the females seem to be really "out". But some winters when it is quite mild, there are problems. We have had one case of abandonment.

Question: (Lisa Whatne) - I've got a few comments on the use of hounds for research. The few limited pursuits I've been on using hounds I noticed that we spent considerably more time locating lost hounds than as or more time researching. What types of techniques are people using hounds coming up with to diminish the spent locating lost hounds? Is it safe to say that if anybody is considering hounds for research that a criteria be set about the houndsmen they are going to be using since locating lost hounds equals lost man-hours equals lost money?

> *Answer: (Jim Akenson)* - Related to time spent pursuing lost hounds, our hounds are radio-collared so our houndsmen can keep track of them. It's not a big factor. Related to the issue of houndsmen, quality control is basically the answer. It's very important. We are very fortunate that the primary houndsman we utilize has been working with us for about 15 years, and is as familiar with our research objectives as are our researchers.

Question: (speaker not identified) - One of the areas that seem to be really advancing technologically is the use of GPS collars. Has anybody had any experience in deploying GPS on either black or brown bears in forested or semi-forested environments?

> *Answer: (Dave Moody)* - We are going to do a study this summer looking at the use of potential applicability of GPS in Yellowstone grizzly population, but it's still pretty much in its infancy. There has been some initial work in northern Canada.
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> *Answer: (Bruce McLellan)* - I haven't personally done it. I'm just waiting until I'm confident it's going to work since they are quite expensive. But the guys I work with in B.C., not on bears but caribou, have used low-tech GPS collars and they have problems with some, while others work very well. They get enormous amounts of information. When you talk to the guys who are using GPS collars, they say that it's not perfect yet.

Comment (speaker not identified) - I work for the Oregon Fish and Wildlife Department and wanted to comment on the GPS collars. I just recently deployed two collars on cougars; that's about all you can afford because of the cost. I don't want really bad-mouth them, but we are getting about 40 percent of the locations. Unfortunately, the areas that we are not getting locations are the ones you can't get locations from the ground either. The only thing that is happening is that we are getting more locations than we could while on the ground. Our transmitters are presently scheduled for every 13 hours, and averaging about one every day and a half. For animals that cover 200 square miles in a day and a half, that is pretty good information to have.

Question: (speaker not identified) - I'm hearing that habitat is not a real big concern for black bears. Ecologists are telling us that we need to get away from the single-species issues. Are there any researchers on the panel or in the room who have thought about how we can use our knowledge of black bear habitat relationships to assist these new ideas of about conservation, biology, landscape, etc.? The grizzly bear has been used as a so-called keystone species for some time now. Do people feel there is any kind of a potential for using black bear to also assist in implementing this new thinking?

> *Answer: (Mike Pelton)* - You brought up a very critical issue. I don't think there's been enough addressing of the habitat issue. That's one reason why we selected to do the objectives in our bear research that we have, with the focus on the den site and feeling that probably is the most critical habitat for black bears. We've really been alarmed and concerned the loss of structure for dens, particularly tree dens in the Blue Mountains. It has really become the ending focus of our research, and obviously we produced this brochure along those lines. Our goal is to get the word related to that. We've had some pretty positive feedback from the timber industry that wants to cooperate with us.

Comment: (Trevin Taylor) - I'd like to comment on that issue too. I'm a biologist so habitat issues are what I deal with everyday. If the timber companies I work with come across a bear den or a hollowed-out tree, 80 percent of the time they wouldn't have a problem working around that habitat. That helps us get things on the map so we know where they area; that way I can work that logging unit around the area.

Comment: (Ted Orr) - I want to touch back to the animal rights movement. Most of the people that run the animal rights groups across the United States have a hard-core leadership just like you are hard-core managers. You are not going to convince them any differently in their thinking no more than they are going to convince you to think differently. It's the people that are underneath those people that concern me. We need to, as wildlife managers (and I can't include myself in that because I don't have a degree and I don't know anything) somehow educate the people throughout the United States to the proper way of doing things and why we do them that way. Get the statistics out to them. Our governments in the different states have made it so difficult with their constitutional changes and legislators and so forth that they have bound the fish and wildlife departments in the states. The departments can't speak out. The truth can be in the office in paperwork, but the average citizen in the states, in Canada too, is not going to go search for the truth. They're going to hear and pay attention to the organization they belong to. Some way, as wildlife managers, you have to find a way to beat the legislative system, or the constitutional system, to get the information out about how you need valuable certain tools to do your job. In the near future, you will not have any tools to use as long as they keep using the ballot box.

Comment: (speaker not identified) - As a real outsider here being a commercial entity with an opportunity to show our wares, I really appreciate being here. I think it's extremely interesting from an outsider's point of view that this is not a closed session. It's not just fish and game wildlife biologists, including such folks as the animal advocates, the houndsmen, and hunters. It's been a wide-open process. That's very healthy, and I appreciate seeing that. It's fun to listen to the debates, as an outsider, and to see folks and fish and game types, the educators, etc., whose dollars really come from the hunting public and have some prejudice in that direction. On the other side of the coin, the folks who are the advocates for the groups who show a prejudice to the side where there money comes from. I like to imagine if all the effort and all the funds and all the work I see represented here could all be put towards one common goal of education and habitat separation, etc. Thank you for letting us join you.

Question: (Dave Moody) - I would like to ask the panel where they think we are going in the future? What are the priorities they see related to bear research? What are the things we should be focusing on? What's important? What's not important?

Answer: (Tom Beck) - It's a treat for me teaching people how to live with bears or how to get along with them in the same physical space. We have a lot of basic physiology we could be looking at in terms of just what the hearing range of bears. Is there a chance that we can take some kind of device to deter bears from coming on porches? There is a lot of basic understanding about the individual organisms that we don't know. I think we ought to go that way. There are a lot of educational tools and demonstration projects that we should be investigating those into how effective they are.

Answer: (John Beecham) - The needs are different for different parts of the country. I'm fortunate to come from a state that is almost 70 percent public lands; so some of the habitat issues aren't quite as critical in terms of fragmentation as they are in some other areas. Certainly that's going to be a continuing concern for people interested in long-term survival of bear populations across the country. There are some biological facets of bear biology that still need some investigation. Obviously, some of the new techniques that have been discussed here over the last several days will help us get down that particular road. One facet that Cecily mentioned earlier today, the social dynamics of bear management, is in its infancy in terms of thorough research efforts. I see that looming on the horizon, particularly in light of what is going on with the larger debate about we manage bears and how we will manage bears in the future. State agencies are going to have to develop new ways of gathering public input, and evaluating and using that input in their management programs. Historically we have viewed hunters as our major constituent. The reality is that the entire public is our constituency because they all have an interest in wildlife, and we want them to have an interest if we intend to have them place a value on wildlife. I see some interesting things going on in the social aspect of it, some major evolution that will occur in the next several years.

Answer: (Mike Pelton) - The comments have been good from Tom and John; it's one of my pets too, and you mentioned in John in terms of long-term survival of bears, that we need a greater commitment on the part of the agencies involved of research of long-term research. I see too many 2, 3, or 4-year studies that die on the vine and nothing of substance comes from it. I would like to see greater emphasis on long-term commitments in terms of research. I'm really keying in on the non-invasive kinds of activity that DNA offers, remote-camera systems, etc. There is good potential for the future in good information on these bears. From a practical standpoint, this monitoring business on a long haul over large landscapes has proven to be inexpensive and capable of being used over a long period of time. There are some real advantages there.

Answer: (Jim Akenson) - I agree with everybody who has spoken so far, although I do think that we should not forget some of the tried and proven methods of obtaining information, such as the application of hounds. Some houndsmen are some of the most skilled outdoorsmen left on our continent. I want to utilize these resources. We need to integrate the old and the new. We need to try and blend together as many methods as we can to help validate them, such as DNA sampling, etc. We need to approach the future with an open mind. I also agree with Cecily concerning the need for education. Tom Beck also made mention of that. Education is the key. We need to work together and communicate with each other. We need to breach some gaps, and need to investigate incorporating social scientists into our research data. We get myopic and tend to just have biologists and geneticists involved in these programs. There are a lot of

people out there in the world that have some outstanding contributions that can help us achieve our goals towards management and research on black bear populations.

Answer: (Bruce McLellan) - I work for the Forest Service so we don't deal with the hunting issues; mainly habitat issues. What we are trying to work at is developing, based on telemetry data and DNA data, a good look at habitat, its availability to bears, the dynamics of habitat, and then integrate that into spatially explicit timber harvesting models (this is not just for bears, but we are linking caribou into it) so that we can use, through a computer, the harvesting of a forest by looking at the supply of not only the forest but the habitat for various species over time.

Comment: (Wayne Kasworm) - I agree with everything that the panel has said. I would like to touch on either the adequacy or sensitivity of some of the existing parameters we use to manage harvests. Typically we heard a lot of discussion yesterday about median ages, about percentage of females in the harvest, and another question that enters in is our harvest data sufficient to manage populations, either at a hunting district level or statewide levels. What are the sensitivities of some of these factors? Is that good enough? What can we do to move ahead with some of those kinds of things?

Comment: (Georg Ziegltrum) - I would also recommend that whatever we can do to support your goals and objectives, start talking to us. There's lots of stuff we can do. It's proved to be successful in the past, i.e., with the bald eagle management in Washington, which is a great success story for the eagle and us. Whatever we can do to support your goals, let us be part of it. Work with the landowners, and you will have another very powerful management tool in your hands.

POSTER PRESENTATIONS

INTERACTIONS BETWEEN BLACK BEARS AND OTHER CARNIVORES AND SCAVENGERS: A SURVEY OF BIOLOGISTS AND HOUNDSMEN

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Abstract: Participants at the Fifth Mountain Lion Workshop and houndsman organizations of Utah were asked to complete a questionnaire dealing with the interactions between black bears, mountain lions, and other carnivores and scavengers. Nearly 100 professional biologists and 90 houndsmen constitute the survey. While many responses were similar between the two groups, differences related to professional training, years of experience, and the number of observations of specific interactions varied.

CONSERVATION THROUGH CONFLICT PREVENTION IN THE NORTH CASCADES

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Abstract: Prevention of bear-human conflict has not traditionally influenced most human activities in the North Cascades. The Cascade Mountains between Interstate 90 and the international border were designated as the North Cascades Ecosystem Grizzly Bear Recovery Zone in 1991. The necessity of preventing human-grizzly bear conflict in order to minimize human-caused grizzly bear mortality over the long term has provided impetus to agencies to improve solid waste management on public lands, and to promote "bear-aware" practices by recreationists and residents. Measures taken toward this end also constitute an improvement of black bear management. We first present examples of existing problem areas. We then present a variety of approaches taken by the US Forest Service and the National Park Service during the past five years toward reducing and preventing bear-human conflict in the North Cascades. These include: improving intra- and inter-agency communication regarding when and where problems occur; replacing solid waste receptacles on public lands with bear-resistant dumpsters and trash cans, targeting known problem areas as first priority; installing bear-resistant food storage lockers at some campsites; providing bear-specific information to recreationists; and instituting loan programs for providing backpackers with portable food storage containers. Financing these actions has been and will continue to be from a mix of agency funds and partnerships. Some programs have and will use volunteer labor and/or other creative efforts to bring about positive changes in bear management. The overall intent is to stimulate discussion regarding proactive management among workshop attendees.

TRAPABILITY OF BLACK BEARS USING TWO DIFFERENT TRAP TYPES

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Abstract: In 1991 we began trapping black bears (*Ursus americanus*) to assess population dynamics and structure in the Book Cliffs in east-central Utah. "Barrel" type traps were used exclusively until the summer of 1996 when large "box" type traps, borrowed from T. Beck of the Colorado Division of Wildlife, were used in conjunction with barrel traps to compare trap success and test the possibility that our study bears were becoming trap shy. Overall trap success did not differ between trap type, nor was one trap type more effective for any sex or age class. We conclude that changing trap type did not significantly change the trapability of bears in our study area. Tests for significant relationships among different age and sex classes of the bears captured shows some evidence that there are few females being recruited into the population. The majority of new bears captured this year and in previous years are young males 2-3 years of age.

ABDOMINAL IMPLANT TRANSMITTERS FOR TRACKING BLACK BEARS

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Abstract: In 1995 and 1996 we tested implant radio transmitters (Advanced Telemetry Systems, Inc. Isanti MN 55040) for telemetry studies of 25 male and 23 female black bears (*Ursus americanus*) in Washington. The objectives were: (1) to equip bears with radio transmitters that bears would retain longer than the 17 month retention of break-away radio collars used during 1994 and 1995 and (2) to obtain more reliable hunter harvest data than provided by collars which were sometimes destroyed or discarded to conceal identification and location of harvested bears. Implant procedures were conducted by veterinarians P.B.H and M.H.N. Surgery required approximately 20 to 30 minutes during which time morphological data was recorded concurrently. Bears were anesthetized with Telezol (Fort Dodge Laboratories, Incorporated, Fort Dodge, Iowa, 50501) in dosages of 5.1 mg/kg body weight for females (n = 11) captured in snares and 6.3 mg/kg for females (n = 4) captured by helicopter during April-June and 10.2 mg/kg for females (n = 4) captured by helicopter during September-October. Dosages were 4.6 mg/kg for males (n = 11) captured by snares and 4.8 mg/kg for males (n = 4) captured by helicopter during April-June and 7.5 mg/kg for males (n = 5) captured by helicopter during September-October. Implant transmitter marked males (n = 4) were located on 24 to 31 occasions by fixed-wing aircraft from April-December 1995 and was similar to the 20 to 35 locations for males (n = 8) marked with transmitter collars during the same time period. Radio signals could be received by aerial telemetry from bears in dens at a distance of 1.5 km and 250 m above ground, a distance less than provided by transmitter collars. For bears equipped with a radio collar and an implant transmitter, ground telemetry indicates that the transmitter collar could be received up to 1.5 km distance whereas telemetry signal reception for the implant transmitter may be limited to <100 m.

SEROLOGICAL SURVEY OF INFECTIOUS DISEASE AGENTS OF BLACK BEARS IN OREGON AND NORTHERN CALIFORNIA

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Abstract: The causes of natural mortality and disease in free ranging black bears (*Ursus americanus*) in Oregon and Northern California are poorly known. The goal of this study is to estimate the prevalence rates of exposure to selected infectious disease agents in black bears found in the central Cascade Mountains of Oregon, and the Klamath and Shasta National Forests of Northern California. Bears in these study areas were immobilized for radio-collar fitting in 1993-1996. During that time, blood samples from 84 bears were taken and stored as frozen serum. Serum was tested for selected infectious disease agents. Of 84 sera tested for antibodies, 5 (5.9%) were positive for *Ehrlichia equi*, 3 (3.6%) for *Francisella tularensis*, 2 (2.4%) for *Trichinella spiralis*, 3 (3.6%) for canine infectious hepatitis virus, 7 (8.3%) for canine distemper virus, 27 (32.1%) for *Toxoplasma gondii,* and 8 (9.5%) for *Yersinia pestis*. There were no positive samples for *Borrelia burgdorferi*, *Brucella abortus*, or *Dirofilaria immitis*. We are expanding this study to other populations of Oregon black bears.

Key words: black bear, *Ursus americanus*, serologic survey, Ehrlichiosis, *Ehrlichia equi*, Tularmia, *Francisella tularensis*, Trichinosis, *Trichinella spiralis*, canine infectious hepatitis, canine distemper, Toxoplasmosis, *Toxoplasma gondii*, plague, *Yersinia pestis*, Lyme's disease, *Borrelia burgdorferi*, Brucellosis, *Brucella abortus*, Heartworm, *Dirofilaria immitis*, prevalence

A COMPARISON OF DRUG DELIVERY SYSTEMS FOR IMMOBILIZING BLACK BEARS

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Abstract: Three systems commonly employed to deliver immobilizing drugs to captured and free-ranging black bears (*Ursus americanus*) are pole syringes, powder-charged rifles with powder-charged darts, and CO_2-powered guns. I compare these delivery systems with an adjustable pressure air-powered rifle with air-charged darts for use from helicopters, during snaring operations, and other situations. Pole syringes are inexpensive and readily available but require close contact with the animal. Powder-charged rifles and CO_2-powered guns enable darting personnel to be further away from the animal, and are useful in a wide range of situations. Although expensive and not widely known, an adjustable pressure air-powered rifle offers similar advantages yet inflicts less trauma and injury, reduces time lost observing an animal for drug effect, and may curtail unneeded subsequent injections.

Key words: adjustable air-powered rifle, black bear, drug delivery systems, helicopter darting, pole syringe, powder-charged rifle, *Ursus americanus*

THE ROLE OF ANTS IN THE DIET OF THE AMERICAN BLACK BEAR: COLONIES UNDER ROCKS

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Abstract: Ants are an important part of the diet of the American black bear as evident by large quantities of adult ants found in their scat. Ant brood (eggs, larvae, pupae) are rarely evident in bear scat. Ant colonies located under rocks were sampled to determine the ratio of adults to brood for rock turning bears. Five thousand and two hundred rocks were turned with 591 ant colonies found (8.8%). Brood to adult ratios were as high as 17:1 (= 2:1). Thus, scat analysis probably underestimates the importance of brood in the diet of black bears. Discriminate function analysis was able to predict for 68% of the rocks sampled the presents or absents of ants. Large rocks (over 2500 cm^2 in surface area) were more likely to have ant colonies under them. Fourteen genera were found to nest under rocks. Two of the most common genera found, *Formica* and *Camponotus,* comprised 53% of the ants sampled. These are two genera commonly found in bear scat.

BLACK BEAR MOVEMENTS AND SURVIVAL IN THE BOW VALLEY OF BANFF NATIONAL PARK

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Abstract: The Bow Valley (BV) of Banff National Park contains a major transportation corridor, which includes the Trans-Canada Highway, Canadian Pacific Railway, and the 1A scenic highway. These linear developments have the potential to fragment habitats and populations, and they are a source of direct mortality in terms of vehicle-wildlife collisions. Using radio telemetry, this project examines the effects that different linear features have on black bears (*Ursus americanus*) by testing the following hypothesis: (1) black bear crossing rates differ between various linear features; (2) crossing rates differ when compared to the spatial simulations of a null (random movement) model; (3) crossing rates differ when compared to the simulations of a habitat explicit model. I am also using DNA fingerprinting to obtain a minimum estimate of bears in the BV, using barbed wire collection stations. These data will be used to relate mortality figures to the minimum numbers of bears present. The second of two field seasons started in April 1997.

HOW WELL CAN TRACK SHAPE BE DESCRIBED IN BLACK BEARS?

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Abstract: Principal components analysis was performed on measurements of black bear front pads, traced from tracks, to determine if individuals could be identified by their front pad shape. Size seems to play the largest role in identifying individual bears, while there appears to be little variation in pad shape. Front pad shapes did not differ between bears. The front pad's position (left or right), the soil depth the track was made in, and the terrain's slope do not affect the track's shape. Analyses that include track size may be better able to identify individuals or bear subgroups than analyses that use track shape alone.

REPRODUCTIVE CHARACTERISTICS OF AN EAST-CENTRAL UTAH POPULATION OF BLACK BEARS

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Abstract: Bears were observed from 1991 to 1996 to determine reproductive characteristics of an east-central population of black bears in Utah. Twenty-two females were surveyed in a total of 52 dens. Cub production compares well to similar geographic areas, however cub mortality and natality were atypical. Although not statistically significant, several sex biased trends existed. Male biased natality was observed in all 5 years. Not only was sex ratio biased at natality, but survival was also biased towards males. One year, 1996, was characterized by low productivity and high mortality. Speculation about nutritional and intraspecific associations as selective pressures resulting in sex biased natality and mortality is presented.

TOOLS IN BEAR MANAGEMENT

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Abstract: The problem of food conditioning and human habituation in bears has led to the development of several innovative designs for bear-proof food storage lockers and bear-proof solid waste collection systems. Among the most widely used designs are those developed by Haul-All Equipment Systems in Lethbridge, Alberta, and their American licensee McClintock Metal Fabricators in Woodland, California. Recognizing that bears will forage not only in trash cans but in cars, dumpsters and landfills as well, Haul-All Equipment Systems and McClintock Metal Fabricators advocate a systematic, comprehensive approach to bear-proof food containment. Their Bear Management System includes bear-proof food storage lockers, refuse/recycling receptacles, dumping containers, regional transfer stations, and a recently introduced bear-proof residential trash enclosure.

POST-RELEASE SURVIVAL OF CAPTIVE REARED BLACK BEAR CUBS

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Abstract: There is controversy regarding rehabilitation of black bears (*Ursus americanus*) because they have the potential to pose a threat to human safety. In fact, several states do not allow the rehabilitation of bears based on the belief that captive-reared bears will not survive and are likely to become a danger or nuisance to people. Information gathered from post-release studies conducted on 7 captive-reared bears released from HOWL Wildlife Rehabilitation Center from 1990 - 1996 indicates that, when raised with minimal human contact, bears can be successfully returned to the wild. Post-release studies were conducted with the use of radio and satellite telemetry to monitor movements and survival. Mean known survival was 283 days. Tracking of three bears continues, with one having survived > 842 days.

BLACK BEAR USE OF FOREST ROADS IN WESTERN WASHINGTON

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Abstract: Radiolocations (108) of 20 black bears were used to assess use or avoidance of 3 forest road types in western Washington. Distances of bears to each type of road were compared to distances of 108 random points using t-tests. Females and males avoided 2-lane roads, while only males avoided 1-lane roads, the most common road type in the area. Females, but not males, were located closer to overgrown, spur roads than expected. This road type has substantial cover of grasses, forbs, and berry-producing shrubs along with protective tree cover. This situation may provide easy travel for females along with security cover and a relatively abundant source of high-energy foods that could favor high reproductive success.

Keywords: black bear, forest management, roads, *Ursus americanus*, wildlife management.

FOREST CARNIVORE CONSERVATION AND MANAGEMENT IN THE INTERIOR PACIFIC NORTHWEST: THE BLACK BEAR

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Abstract: The black bear (*Ursus americanus*) is one of twelve medium to large-sized mammalian carnivores (canids, felids, mustelids, and ursids) occupying the Interior Columbia River Basin. These carnivores have widely varying status in the region with some harvested in regulated furbearer seasons, some taken for depredations, and some protected because of rarity. The black bear falls in the first two categories. Unlike the black bear, populations of many of the species have declined for a number of reasons. Black bears are widespread in the region except for parts of the open, semi-arid Columbia River Basin Plateau and the Snake River Plain. Black bears use a variety of foods and habitats. They are fairly adaptable and can co-exist with humans if they are not overharvested. Careful monitoring of populations and harvest levels is important because of their low reproductive potential. Populations and harvests have been relatively stable over the last decade in eastern Oregon, eastern Washington, Idaho, and western Montana. The needs of bears can be met by providing a mix of habitats, large woody debris and snags, and by minimal intrusions by roads or human activities. Humans must exercise caution with garbage dump sites, food storage in the backcountry, and with recreational development site location. Recent voter initiatives restricting bear harvest seasons and methods may result in increased population densities and increased conflicts with humans. Long-term preservation of large carnivores in the region is problematic unless we reduce forest fragmentation and conflicts with humans and improve our ability to quantitatively integrate population dynamics with landscape level habitat requirements.

BLACK BEAR DAMAGE IN FORESTS OF THE 21ST CENTURY

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Abstract: The poster presentation discusses modern forest management and tree planting, as well as black bear damage management and wildlife management on private industrial forestlands. It highlights non-lethal damage control tools for bears and focuses on objectives for the supplemental feeding program. Integration of general wildlife management goals in forest operations is shown.

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WESTERN BLACK BEAR WORKSHOP BYLAWS

ORGANIZATION AND FUNCTION
OF THE
WESTERN BLACK BEAR WORKSHOP

BYLAWS

Designation:

This organization shall be known as the "Western Black Bear Workshop" hereafter referred to as the "Workshop". The official publication of the Workshop shall be known as the *Proceedings of the Western Black Bear Workshop* hereafter referred to as Proceedings.

Goal:

The goal of the Workshop is to provide information relative to and encourage the perpetuation of bear populations as an ecological, aesthetic, and recreational natural resource in western North America consistent with other proper land uses for public and private lands.

Objectives:

- To provide an opportunity for all persons interested in bears to meet and discuss current research and management of bears and their habitat.
- To provide a vehicle for disseminating research and management finding to various agencies and organizations concerned with bear management.
- To promote research for development of new information on all aspects of bear ecology, life history, and management in western North America.
- To identify particular problems associated with bear management and to formulate recommendations and resolutions to the appropriate agency or organization, including the Western Association of Fish and Wildlife Agencies.
- To promote cooperation among all agencies and organizations concerned with bear management and research, particularly among the various provincial, state, and federal agencies with primary responsibilities of managing bears and their habitats.

Organization:

The Workshop will be open to any person interested in bears and their management.

Voting:

Voting members shall consist of one representative from each of the following:

- Western states, provinces, and countries where bears are present including: Alaska, Alberta, Arizona, British Columbia, California, Colorado, Idaho, Mexico, Montana, Nevada, New Mexico, North Dakota, Northwest Territories, Oklahoma, Oregon, Texas, Utah, Washington, Wyoming, and the Yukon.
- Federal Agencies: U.S. Bureau of Land Management, Canadian Wildlife Services, U.S. Forest Service, U.S. Fish and Wildlife Service, U.S. National Park Service, U.S. Natural Resources Conservation Service, Parks Canada, and the Director General de Fauna Silvestre.
- Universities, Colleges, and Research Institutions: The chair may appoint up to three people to represent colleges, universities, and research institutions. Appointees shall come from any college, university or research institution actively conducting bear research.

Voting representatives for all the states, provinces, countries, or organizations shall be appointed by the agency directly responsible for wildlife management within the above named states, provinces and countries.

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