March 2001

EFFECT OF FEEDING STATIONS ON THE HOME RANGES OF AMERICAN BLACK BEARS IN WESTERN WASHINGTON

Philipp Fersterer
Astenstrasse 33, A-5112 Lamprechtshausen, Austria

Dale L. Nolte
USDA-APHIS-Wildlife Services, Dale.L.Nolte@aphis.usda.gov

Georg J. Ziegltrum
Washington Forest Protection Association

Hartmut Gossow
Institute for Wildlife Biology and Game Management

EFFECT OF FEEDING STATIONS ON THE HOME RANGES OF AMERICAN BLACK BEARS IN WESTERN WASHINGTON

PHILIPP FERSTERER, Astenstrasse 33, A-5112 Lamprechtshausen, Austria, e-mail: philippfers@yahoo.com
DALE L. NOLTE, USDA Animal and Plant Health Inspection Service, Wildlife Services, National Wildlife Research Center, Olympia Field Station, 9730-B Lathrop Industrial Drive SW, Olympia, Washington 98512, USA, e-mail: dale.l.nolte@usda.gov
GEORG J. ZIEGLTRUM, Washington Forest Protection Association, 724 Columbia Street NW, Suite 250, Olympia, Washington 98501, USA, e-mail: gziegltrum@wfpa.org
HARTMUT GOSSOW, Institute for Wildlife Biology and Game Management; Peter-Jordan-Strasse 76, A-1190 Vienna, Austria

Abstract: Forest managers establish feeding stations throughout coniferous forests in western Washington that are vulnerable to American black bear (*Ursus americanus*) damage in the spring. This study was conducted to determine whether the home ranges of bears in areas with supplemental feeding were smaller than the home ranges of bears in similar adjacent areas without supplemental feeding. Home range sizes varied among bears. However, the home range sizes of bears in feeding areas did not differ ($P > 0.35$) from home ranges of bears in non-feeding areas. Male bears had larger ($P = 0.0002$) home ranges than female bears, but this difference was consistent across both treatments ($P > 0.35$). Bear home ranges were reduced ($P = 0.029$) during the feeding period relative to the non-feeding period, but this reduction was not related to treatment ($P = 0.261$). Although the supplemental feeding program did not affect home range sizes, the telemetry study data, supported by data collected through video-monitoring of feeding sites, indicated that feeding stations may attract and concentrate bears at specific locations.

Ursus 12:51–54

Key words: American black bear, home range, supplemental feed, *Ursus americanus*

Black bears commonly forage on Douglas-fir (*Pseudotsuga menziesii*) trees during the spring (Ziegltrum and Nolte 1996). They strip the bark to feed on the newly forming vascular tissue, which may contain 4–5% carbohydrates (Kimball et al. 1998). These vascular tissues are primary staples in the diet of some bears (Noble 1993). 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 15–30 years of age (Ziegltrum 1994). Any age tree, however, is vulnerable, and bears occasionally strip bark from the entire trunk of a tree. A single bear can peel bark from as many as 70 trees/day. Thus, if preventive measures are not implemented, damage within a stand can be extensive (Schmidt and Gourley 1992).

Damage inflicted through this behavior can be extremely detrimental to the health and economic value of a timber stand. Complete girdling is lethal to the tree, while partial girdling reduces growth rates and provides avenues for insect and disease infestations (Kanaskie et al. 1990). Economic loss is compounded because bears tend to select the most vigorous trees within 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).

Historically, bear damage management to protect timber resources generally required lethal removal of bears. Control agents or professional hunters were hired to trap and hunt bears throughout the counties where damage was occurring (Poelker and Hartwell 1973). Private timber mangers began investigating alternative damage control techniques, particular non-lethal methods, during the mid-1980s. The first directed effort to provide bears an alternative food to reduce girdling of trees was attempted during 1985 (Ziegltrum 1994). That year, approximately 2,250 kg of pellets were distributed through 10 feeders. During 1999, nearly 288,500 kg of pellets were offered through about 850 feeders across western Washington, with a few feeders in Oregon and California. Pellets fed to bears are produced under the direction of the Washington Forest Protection Association. These pellets contain fats, proteins, vitamins, and minerals to provide a balanced diet for bears, although the high sugar content is regarded by program managers as the most important ingredient to alleviate damage to trees (Ziegltrum 1994).

Overall, the supplemental feeding program appears to be an effective means to reduce bear damage in timber stands (Ziegltrum and Nolte 1997). Bears generally peel fewer trees once they begin eating pellets. Some anecdotal evidence, however, suggests that success of feeding programs declines as population densities increase. This suspected decline in the program's efficacy occurs because of increased competition among bears or because some bears, particularly females with cubs, stop using feeders to avoid antagonistic encounters with other bears.

The effect of the supplemental feeding program on bear behavior is largely unknown. Interest in long-term consequences has increased as the supplemental feeding program has grown and has become more widespread across western Washington. Questions asked by timber managers have led to a series of studies conducted by the National Wildlife Research Center's Olympia (Washington, USA) Field Station to assess the effects of supplemental feeding on the nutritional status and behavioral characteristics of black bears. This study was conducted to determine whether the home ranges of bears in areas with established supplemental feeding were smaller than the home ranges of bears in similar adjacent areas without a supplemental feeding program.

STUDY AREA

The study area was approximately 80 km southwest of Olympia, Washington, between 123°37'–123°00'W longitude and 46°42'–47°02'N latitude. Elevation ranged from 30 m along the Chehalis River to 798 m on Larch Mountain. Bears on timber stands where the supplemental feeding program has been practiced for several years were used to identify home range size of supplemental-fed bears. Bears on nearby timber stands where the supplemental feeding program has not been practiced were used to identify home range size of non-fed bears. Supplemental feed areas were owned by the Weyerhauser Company, while the non-feeding areas were located on the Capitol State Forest and the Lower Chehalis State Forest.

METHODS

We used radiotelemetry to monitor bear locations. Adult bears were captured and collared during spring of 1998 and 1999. Bears captured near (<1 km) feeding stations were considered to be using the supplemental feed. Bears captured on nearby timber stands without feeding stations were monitored to assess home ranges of bears without access to supplemental feed. These stands had sustained recent bear damage and were similar in age and habitat characteristics to stands with supplemental feeders. Between mid-July and late October, 4 bears in supplemental feeding areas and 5 bears outside of supplemental feeding areas were monitored at least every other day to assess home range size outside the feeding period. Additional bears were incorporated into the study during the spring of 1999 for a total of 17 bears in supplemental feeding areas and 8 outside the supplemental sites. Locations of all bears were monitored every other day from 1 May to 30 June, when bears were actively feeding at stations. Home range sizes of bears outside the feeding period were determined by monitoring bear locations every other day from mid July until late September.

Bear locations were identified by triangulating telemetry points. Efforts to locate bears were repeated until all locations were within an 0.125 km^2 on a map. Timber roads throughout the study area enhanced our ability to locate bears. Usually, all telemetry points used to triangulate a bear's location were collected within 10 minutes of each other, and when the observer was within 1 km of the bear. Home range size for each bear was estimated by the minimum polygon method with a 5% reduction of the area (Kenward 1987). A similar number of locations were used to estimate home range size for each bear within and outside the feeding period.

A three-factor analysis of variance was used to compare home range size differences among bears. The factors were treatment (area with and without supplemental feed), gender (male and female), and period (during and outside the feeding period). Home range size was the dependent variable. All 2-way interactions and the 3-way interaction among factors were considered significant at $P = 0.05$.

RESULTS

Home range sizes varied among bears. However, the home range size of bears in feeding areas did not differ ($P > 0.35$) from that of bears in non-feeding areas (Table 1). Male bears had larger ($P = 0.0002$) home ranges than female bears, but this difference was consistent across both treatments ($P > 0.35$). Bear home ranges were reduced ($P = 0.029$) during the feeding period relative to the non-feeding period (Table 1), but again this difference did not interact with treatment ($P = 0.262$), nor was there an interaction between period and gender ($P = 0.112$). The 3-way interaction among treatments, periods, and gender was not significant ($P = 0.098$).

Table 1. Mean sizes (km^2) and statistical comparisons of home ranges for male and female black bears from areas with and without supplemental feeding in western Washington, 1998–99.

		n	Home range (km^2)	S.E.	*P values*
Treatment	feed	17	11.3	2.4	> 0.35
	no-feed	8	13.9	3.8	
Gender	male	9	21.4	3.7	0.0002
	female	16	7.0	1.1	
Period	feeding	16	8.6	1.5	0.0286
	no feeding	9	18.5	4.3	

DISCUSSION

These data suggest that the supplemental feeding program did not significantly affect the home range size of black bears in western Washington. Bear home ranges were similar regardless of their proximity to supplemental feed. The finding that males had larger home ranges than females is consistent with other studies (Amstrup and Beecham 1976, Lindzey 1977, Young and Ruff 1982, Koch 1983).

Home ranges were not as large during the feeding period (1 May–30 Jun) as they were after the supplemental feeding program was halted. However, this response was similar on areas with and without feeders, suggesting that bears were not merely remaining close to feeders. Expanding home ranges coincided with the ripening of the berry crop. For example, one male covered more than twice the area during the first few weeks of June, when salmonberry (*Rubus spectabilis*) was ripe, that he had previously. This particular bear moved to an adjoining area to feed on ripening berries and returned only once to a feeder during the last 2 weeks that supplemental feed was available.

Although the supplemental feeding program did not affect home range sizes, there were indications that some bears altered their travel patterns to use feeding stations. In one case, a female swam a river and traveled several kilometers to frequent a feeding station every 3 or 4 days. After a brief feeding bout, she returned to her original location and confined herself to a relatively small area.

The study did not include a sufficient number of females with young cubs to confidently state the effect of feeding stations on their behavior. Only 2 females with newborn cubs were included in the telemetry study. These females, however, did not avoid areas with feeders. A female with triplets remained close (<0.5 km) to a feeder throughout the spring. Video monitoring of this feeder for another study showed this female visiting the feeder with her cubs toward the end of the feeding period (Nolte et al. 2001). The other female and her cubs were recorded at supplemental feeding stations throughout the feeding period.

The telemetry study data, supported by data collected through video-monitoring of feeding sites, indicated that feeding stations attracted and concentrated bears at specific locations. Numerous bears used the same feeders, and home ranges often overlapped at the feeding stations. Video recordings demonstrated that 18 bears used one feeding site during the study (Nolte, et al. 2001). Bears also were recorded using numerous feeding sites, often moving from one feeder to the next within a single day. These results suggest that potentially damaging bears are being encouraged to frequent specific locations most vulnerable to damage. This may be problematic if the feeding program is interrupted while trees within these areas remain most vulnerable to bear damage or if bear populations continue to increase. The supplemental feeding program generally becomes less effective as bear populations increase (Ziegltrum 1994), and high populations are likely to correspond to increased damage regardless of whether supplemental feed is available.

LITERATURE CITED

AMSTRUP, S.C., AND J.J. BEECHAM. 1976. Activity patterns of radio-collared black bears in Idaho. Journal of Wildlife Management 40:340–348.

KANASKIE, A., J. CHETOCK, G. IRWIN, AND D. OVERHUSLER. 1990. Black bear damage to forest trees in Northwest Oregon 1988–1989. Pest Management Report 90-1, Oregon Department of Forestry, Salem, Oregon, USA.

KENWARD, R. 1987. Wildlife radio tagging: equipment, field techniques and data analysis. Academic Press, New York, New York, USA.

KIMBALL, B.A., D.L. NOLTE, R.M. ENGEMAN, J.J. JOHNSTON, AND F.R. STERMITZ. 1998. Chemically mediated foraging preferences of free ranging black bear (*Ursus americanus*). Journal of Mammalogy 79:448–456.

KOCH, D.B. 1983. Population, home range, and denning characteristics of black bears in Placer County, California. Thesis, California State University, Sacramento, California, USA.

LINDZEY, F.G. 1977. Home range and habitat use by black bears in southwestern Washington. Journal of Wildlife Management 41:413–425.

MASON, A.C., AND D.L. ADAMS. 1989. Black bear damage to thinned timber stands in Northwest Montana. Western Journal of Applied Forestry 4:10–13

NOBLE, W.O. 1993. Characteristics of spring foraging ecology among black bears in the central coast range of Oregon. Thesis, Oregon State University, Corvallis, Oregon, USA.

NOLTE, D.L., T.J. VEENENDAAL, G.J. ZIEGLTRUM, AND P. FERSTERER. 2001. Bear behavior in the vicinity of supplemental feeding stations in western Washington. Western Black Bear Workshop 7:106–111.

POELKER, R.J., AND H.D. HARTWELL. 1973. Black bear of Washington. Washington State Game Department, Olympia, Washington, USA.

SCHMIDT, W.C., AND M. GOURLEY. 1992. Black bear. Pages 309–331 *in* H.C. Black, editor. Silviculture approaches to animal damage management in Pacific Northwest forests. USDA Technical Report PNW-GTR-287.

YOUNG, B.F., AND R.L. RUFF. 1982. Population dynamics and movements of black bears in east central Alberta. Journal of Wildlife Management 46:845–860.

ZIEGLTRUM, G.J. 1994. Supplemental bear feeding program in western Washington. Proceedings of the Vertebrate Pest Conference 16:36–40.

———, AND D.L. NOLTE. 1996. The Washington ADCP—A private collaborative effort to address biological, economical and social constraints to reduce wildlife damage. Proceedings of the Vertebrate Pest Conference 17:158–159.

———, AND ———. 1997. Black bear damage management in Washington state. Proceeding of the Eastern Wildlife Damage Management Conference 7:104–107.

LONG DISTANCE MOVEMENT OF A FLORIDA BLACK BEAR IN THE SOUTHEASTERN COASTAL PLAIN

MARTY R. STRATMAN,[1] Department of Forestry, Wildlife and Fisheries, University of Tennessee, 274 Ellington Hall, Knoxville, TN 37996, USA
C. DAVID ALDEN, Department of Wildlife Ecology and Conservation, University of Florida, 303 Newins-Ziegler Hall, Gainesville, FL 32611, USA
MICHAEL R. PELTON, Department of Forestry, Wildlife and Fisheries, University of Tennessee, 274 Ellington Hall, Knoxville, TN 37996, USA
MELVIN E. SUNQUIST, Department of Wildlife Ecology and Conservation, University of Florida, 303 Newins-Ziegler Hall, Gainesville, FL 32611, USA

Abstract: A male Florida black bear (*Ursus americanus floridanus*) traveled a minimum of 507 km from Eglin Air Force Base (Eglin AFB), Florida, to Baton Rouge, Louisiana, between 28 May and 1 July 1996. The bear moved at an average rate of 14.9 km/day (range = 1–123 km/day) and crossed a minimum of 4 interstate highways and 22 other major highways. Occasional long-distance movements by black bears may help explain the persistence of some disjunct populations and the potential for connecting other isolated bear populations in the Southeastern Coastal Plain.

Ursus 12:55–58

Key words: black bear, corridor, dispersal, Florida, fragmentation, Louisiana, movement, Southeastern Coastal Plain, *Ursus americanus floridanus*

In the southeastern United States, nearly 80% of the former range of American black bears has been lost (Pelton and van Manen 1997). Increasing human population densities and associated development have increased the isolation of several southeastern bear populations (Maehr 1984, Pelton 1990). Pelton (1990) stated that at least 30 relatively disjunct populations existed in 13 southeastern states, with varying degrees of isolation and vulnerability. Because roads may isolate habitats and further fragment the landscape, bears may alter movement patterns to minimize risks associated with road traffic (Brody and Pelton 1989). This isolation may decrease genetic variability and increase the probability of extinction due to stochastic events (Hellgren and Maehr 1993, Burkey 1995). The viability of these disjunct populations may ultimately rely on movements by bears between populations. Our objective was to document the unusual long-distance movement of an adult male Florida black bear in the Southeastern Coastal Plain.

BACKGROUND

Researchers from the Florida Fish and Wildlife Conservation Commission (FFWC) initially captured adult male black bear X3 in Apalachicola National Forest (ANF), Florida, on 28 March 1991 (Seibert 1993). The bear was ear-tagged, lip-tattooed, and released at the capture site. Bear X3 was 6 years old (Eagle and Pelton 1978) and weighed 161 kg at first capture. He was recaptured 3 times during the next 2 years on ANF; the last recapture on ANF occurred on 21 April 1993. Bear X3 moved 111 km west between 21 April 1993 and 26 May 1996.

On 26 May 1996, FFWC personnel immobilized bear X3 near Tyndall Air Force Base, Florida, because of concern the bear might cross the highway or enter the adjacent residential development that separated it from occupied bear habitat (A. Kane, FFWC, Panama City, Florida, USA, personal communication, 1996). The bear was transported approximately 88 km northwest to Eglin AFB, Florida, radiocollared, and released. At this time, bear X3 was 11 years old, weighed 147.7 kg, and was in excellent condition. We used ground triangulation (White and Garrott 1986) and confirmed sightings to locate the bear. The bear was located 1–4 times per week with the exception of 13 days (5 June–17 June) when no confirmed location was collected.

RESULTS

The bear remained near the Eglin AFB release site for 2 days before starting his extensive move. Between 28 May and 1 July 1996, bear X3 traveled a minimum of 507 km based on cumulative straight-line distances between locations (Table 1, Fig. 1). The bear moved at an average rate of 14.9 km/day (range = 1–123 km/day). The most extensive movement occurred between Santa Rosa County, Florida, on 2 June and George County, Mississippi on 4 June when he traveled 228.2 km in <60 hr ($\bar{x}$ = 3.9 km/hr). During a 10-hr period (0100–1100) on 2 June, the bear traveled 123 km.

On 1 July, personnel from the Louisiana Department of Wildlife and Fisheries trapped bear X3 in a residential area of Baton Rouge, Louisiana, because of concern it would enter a business district with high traffic volume. Personnel from the FFWC were contacted and they subsequently returned bear X3 to ANF. The bear again be-

[1] Present address: Stillwater-Ohio Creek, 430 Tincup Drive, Gunnison, CO 81230, USA, email: stratman@frontier.net