

Female American black bear use of managed forest and agricultural lands in coastal North Carolina

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Abstract: American black bear use of intensively managed forestry and agricultural environments in the southeastern United States is poorly understood. During 1992–94, we radiomonitored female black bears (*Ursus americanus*) to determine home range and habitat use characteristics in 2 managed agroforestry environments in the North Carolina coastal plain. These areas represented opposite ends of the land-management spectrum. The Big Pocosin (BP) area was dominated by loblolly pine (*Pinus taeda*) plantations and human activity and development. The Gum Swamp (GS) area contained larger and more numerous remnants of unmanaged forests including bottomlands, mixed hardwoods, upland hardwoods, and pocosins. These unmanaged forests were interspersed with pine plantations and had relatively low human activity. Home range and habitat analyses were conducted seasonally and annually using land use–land cover data in a geographic information system (GIS). Spring, summer, and fall home ranges of black bears were larger in the BP than the GS, and GS home ranges were among the smallest reported in the United States. Pocosins, clearcuts, and marshes were frequently preferred over managed pine plantations. Collared bears did not spend large amounts of time in agricultural areas, but evidence from a companion study suggests that bears depended heavily on crops for food obtained during short feeding forays. Changes in crop rotation patterns from corn, soybeans, and wheat to cotton may reduce agricultural food resources for bears. The continued loss of pocosins and marshes to human development may exacerbate the effects of reduced food crops. Black bears appear to benefit from early-succession habitats created by logging operations. We recommend the development of a coalition of state and federal wildlife agencies, the forest industry, and the agricultural community to discuss landscape effects on black bears in the Atlantic Coastal Plain and implement strategies to address future black bear habitat management in the region.

Key words: agriculture, American black bear, Atlantic Coastal Plain, forest industry, geographic information system, GIS, habitat use, home range, North Carolina, *Ursus americanus*

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Most populations of American black bears on the Atlantic Coastal Plain are considered imperiled (Wooding et al. 1994). However, occupied black bear range in eastern North Carolina increased from approximately 6,670 km² in 1971 to 22,000 km² in 1991 (Jones et al. 1998), and 47% from 1981 to 1991 (Fig. 1). Eastern North Carolina has the largest contiguous bear population in the southeastern coastal plain. Approximately 21% (10,000 km²) of the eastern North Carolina

landscape is agricultural cropland (North Carolina Department of Agriculture 1994), and 23% of the forests (35,000 km²) are owned by the forest industry (Johnson 1990, Thompson 1990). The increase in black bear range in this intensively managed landscape has surprised wildlife officials and stimulated interest in the mechanisms responsible for the expansion.

The majority of occupied bear habitat in North Carolina and the rest of the Atlantic Coastal Plain is concentrated on managed, private lands (Wooding et al. 1994). However, previous bear studies in the region have concentrated on public lands (Landers et al. 1979, Smith 1985, Hellgren et al. 1991, Lombardo 1993). Little information on black bear responses to intensive

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management in the southeastern United States existed before our work. However, grizzly bear (*Ursus arctos*) responses to intensive industrial and human activity have been well documented by Mattson et al. (1987) and McLellan (1990, 1998). These researchers found a negative response of grizzlies to human presence, and they associated human activity with higher mortality rates and lower productivity in intensively managed areas. Subsequent grizzly population growth rates were negative. The black bear range and population expansion in eastern North Carolina is evidence that black bears in the region are more adaptable to human activities than grizzlies. Based on this evidence, we hypothesized that the more adaptable black bear could tolerate human activity as long as food and cover requirements were met. Our main goals were to identify what those requirements were in 2 intensively managed southeastern coastal environments and to provide habitat management recommendations to ensure future population viability in the region.

We compared 2 study areas representing different levels of management. Both study areas contained higher amounts of agricultural cropland, industrial forestland, and human development than early study areas centered on public lands in the Southeast. Our objectives were to (1) describe black bear home ranges; (2) describe black bear habitat use patterns; (3) analyze preference–avoidance behavior and rank uses associated with habitat features; and (4) compare 2 distinct study areas representing opposite ends of the land-management spectrum in the region.

Study area

The BP and GS study areas were located on the Neuse–Pamlico Peninsula (NPP) and encompassed parts of Beaufort, Craven, and Pamlico counties (Fig. 2). The NPP is bounded by the Pamlico River on the north, the Neuse River on the south, and the Pamlico Sound on the

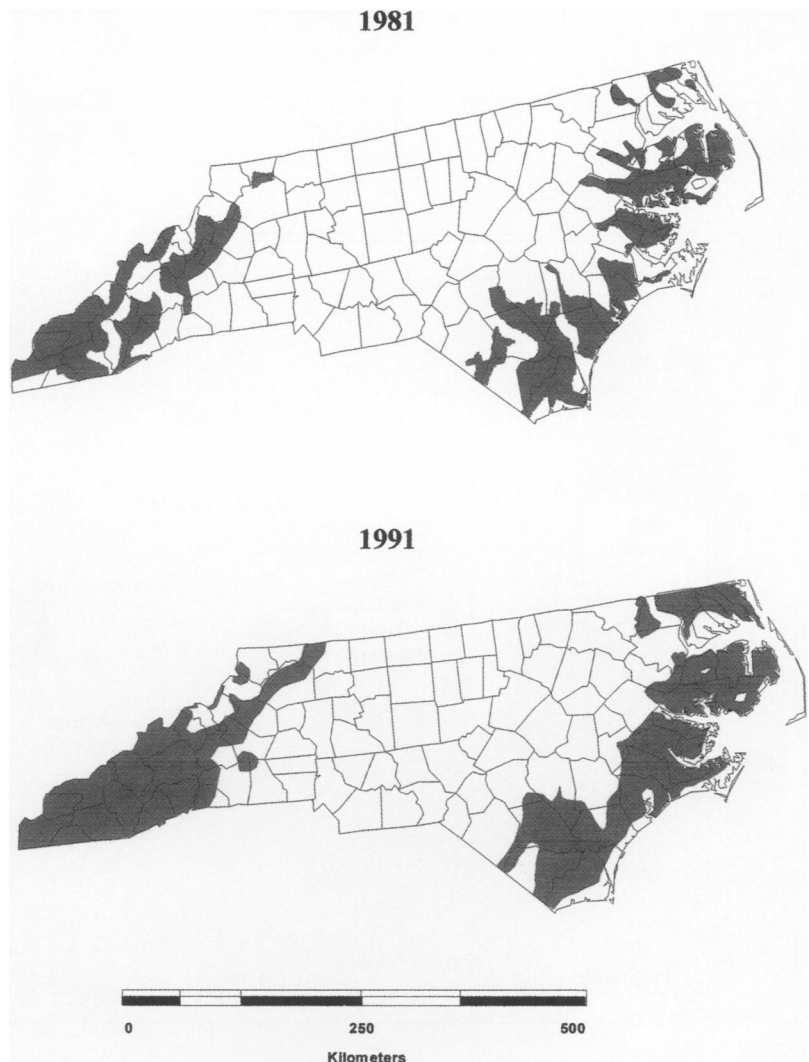


Fig. 1. Occupied black bear habitat (shaded) in North Carolina, 1981 and 1991 (Jones et al. 1998).

east. The NPP encompasses 150,000 ha with approximately 70% forests and 30% agricultural lands and urban–suburban environments. The commercial forest and phosphate mining industries own approximately 80% of the forested sections of the Peninsula. The NPP is a mosaic of agricultural areas, hardwood forests, pocosins, Carolina bays (structurally similar to pocosins), pine plantations, and wetlands (Table 1). The largest remaining areas of contiguous forest are concentrated on managed industry lands. Future habitat loss is a concern in the study areas due to urban sprawl and a growing demand for rural homes.

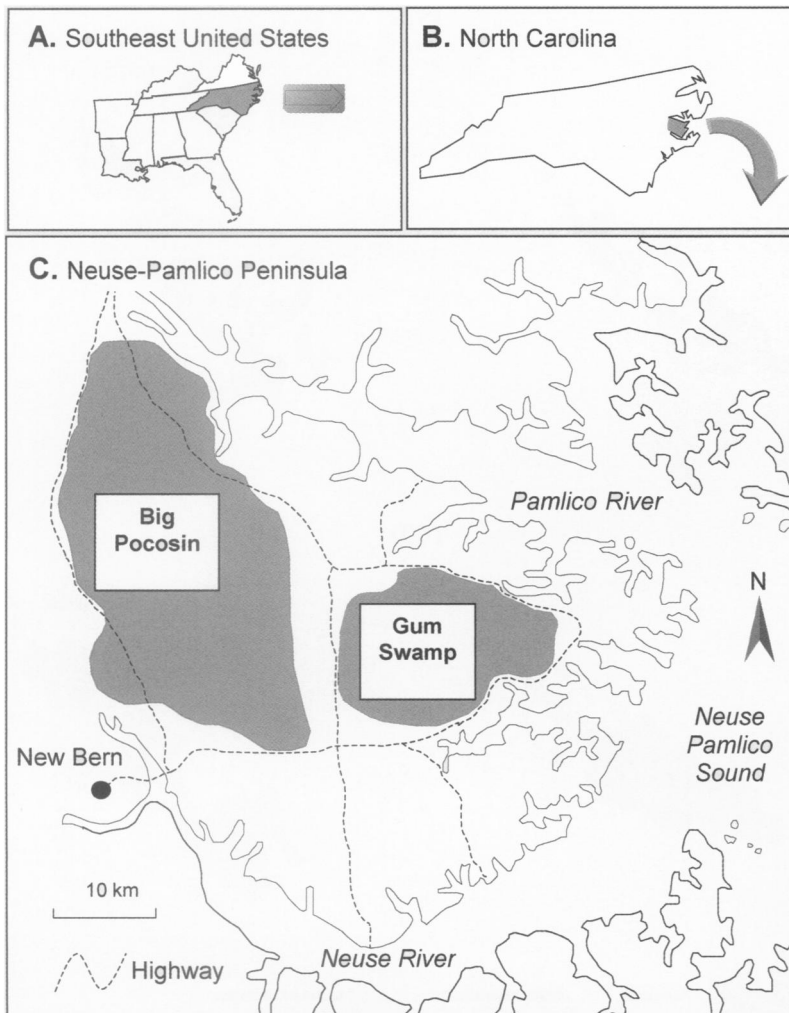


Fig. 2. Big Pocosin and Gum Swamp black bear study areas on the Neuse-Pamlico Peninsula, North Carolina, 1992-94.

The GS covered (~)29,000 ha on the eastern portion of the Peninsula. It was remote compared to other areas of eastern North Carolina, contained few human dwellings, and was composed of large commercial farms and forested areas. The GS contained extensive areas of unmanaged forests including bottomlands, mixed hardwoods, upland hardwoods, and pocosins. These unmanaged forests, owned by both non-industrial private landowners and the forest industry, were interspersed with pine plantations and relatively low human activity and development compared to the BP. Many areas of these unmanaged forests were converted to pine plantations after the study. The BP covered ~47,000 ha on the western portion of the NPP. The majority of the

BP has been intensively managed as a pine monoculture since the 19th century. Areas of unmanaged forests were smaller than in the GS.

Methods

Capture and radio-telemetry

Bears were trapped between May 1992 and September 1993 using snares as described by Johnson and Pelton (1980). We concentrated trapping efforts around areas of abundant bear sign, usually adjacent to agricultural fields or travel corridors. We attached radiocollars to the 4 males and 8 females initially captured in each study area and to subsequent bears as needed to maintain 12 collared bears. Males were monitored but excluded from our home range and habitat analyses due to dropped collars and low numbers of telemetry locations.

We used triangulation and the loudest signal method (Springer 1979) to obtain the locations of collared bears 1-4 times per week. Locations were taken on a schedule allowing for an even representation of activity during all four 6-hour time periods during a 24-hour day (0001-0600, 0601-1200, 1201-1800, and 1801-2400). We used a 2-element H antenna or 4-element truck-mounted antenna. Only locations with bearings separated by $>45^\circ$ were used, and 90% of locations were obtained within 5 minutes with bearings separated by 60° - 120° for maximum accuracy. We entered the universal transverse Mercator (UTM) coordinates of all telemetry stations and all azimuths meeting established criteria into program TELEM (Koeln 1980), which estimated bear locations. All locations collected <20 hours apart were eliminated from habitat analyses to minimize autocorrelation (Swihart and Slade 1985).

Home range

Winter (1 Jan-31 Mar), spring (1 Apr-30 Jun), summer (1 Jul-30 Sep), and fall (1 Oct-31 Dec) seasons were based on food availability and bear diet, movements,

Table 1. Description of land use and cover classification for black bear habitat analyses in the Big Pocosin (BP) and Gum Swamp (GS) regions of the Neuse–Pamlico Peninsula, North Carolina, USA.

Land cover type	Description	BP (%)	GS (%)
Farmed (73%) ^a	cropland–pasture–grass agricultural lands	17.9	15.3
Low density vegetation (87%)	vegetation—not forested, includes fallow fields and clearcuts	2.8	7.6
Pine (91%)	medium and high density conifer stands—primarily loblolly (<i>Pinus taeda</i>)	45.3	16.9
Bottomland hardwood (83%)	hardwoods primarily in floodplains dominated by black gum (<i>Nyssa sylvatica</i>), maple (<i>Acer</i> spp.), oak (<i>Quercus</i> spp.), and associated riverine trees	4.8	16.4
Upland hardwood (91%)	hardwoods in upland areas or in dry lowland areas dominated by oak, hickory (<i>Carya</i> spp.), elm (<i>Ulmus</i> spp.), and maple	14.2	0
Pine–hardwood (71%)	mixed conifer and deciduous hardwoods—neither >75% of crown density	8.1	6.6
Low pocosin (76%)	thick evergreen hardwood shrubs and trees, vines, briars, and cane, often with low density, widely spaced pine (<i>Pinus</i> spp.) component	6.2	12.1
Marsh (86%)	Regularly and irregularly flooded marshes dominated by cordgrass (<i>Spartina</i> spp.), bulrushes (<i>Scirpus</i> spp.), black needlerush (<i>Juncus</i> spp.), cattail (<i>Typha</i> spp.), and reeds (<i>Phragmites</i> spp.)	0	7.9

^aPercent probability that an area which has been classified as N on the image is actually class N.

and denning habits. Seasonal home ranges were calculated for each bear located ≥ 10 times per season. Annual home ranges were calculated for bears located ≥ 10 each season (spring, summer, and fall). For seasonal home ranges, the average number of locations per bear was 20 and 27 for BP and GS bears, respectively. For annual home range calculations, the average number of locations per bear used was 59 and 80 for BP and GS bears, respectively. Home ranges were calculated by program CALHOME with the 95% minimum convex polygon method (MCP; Michener 1979) and the 95% harmonic mean (HM; Dixon and Chapman 1980) method. Because home range sizes were not normally distributed (Shapiro-Wilk tests, Schlotzhauer and Littell 1987), we used the Wilcoxon Rank Sum test to test for differences in annual and seasonal home range sizes between study areas (Sokal and Rohlf 1981). The alpha level was set at $\alpha = 0.10$.

Seasonal habitat use

We used a geographic information system (GIS), employing land use and cover (LC) thematic mapper (TM) data (Khorram et al. 1992) and program ArcInfo (Environmental Systems Research Institute, Redlands, California, USA) to determine macrohabitats associated with telemetry locations. Land cover data were collected and evaluated for accuracy through ground truthing by the North Carolina Center for Geographic Information and Analysis (NCCGIA) in Raleigh. All classifications were verified by NCCGIA using 0.4-ha sample plots

($n = 1,931$) located on the TM imagery and on aerial photography. Class accuracies were $\geq 73\%$ for all non-developed categories within the coverage area. Digital TM data were classified into 18 LC types, but 6 types were excluded from the habitat analyses due to the near absence of bear locations in these areas. The remaining 12 categories were grouped into 8 LC types representing areas that bears commonly used on the NPP (Table 1). Most classification error occurred in low-, medium-, and high-density developed classes or in areas of bare sand that were excluded from analyses.

Classifications we used had a combined mean accuracy of 82% (71–91%). We measured the effects of this habitat classification error using the same technique we used to estimate bear habitat utilization (see Telemetry and habitat classification error).

We used ArcInfo to determine proportions of available habitats and assess landscape-scale habitat selection. Harrison (1958), VanWinkle et al. (1973), and VanWinkle (1975) equated the geometric activity center with an animal's arithmetic mean center of activity. Therefore, to determine activity centers, each bear's arithmetic mean center of activity was determined by season using CALHOME and used as the center point for the buffering procedure in ArcInfo. Next, 95% MCP and 95% HM home range sizes were developed seasonally for all bears. Because 95% MCP and 95% HM home ranges were not significantly different, the radius for buffering all activity centers was determined by averaging the MCP and HM home range sizes (GS

females = 1,373 m, BP females = 1,896 m). The mean radius for each study area groups' home range was determined based on a circle of equal area as the home range, and the same mean radius was then placed around each animal's arithmetic mean center of activity. One overall available study area habitat was determined by combining the individual buffered areas of all bears. We then used the ranking method described by Johnson (1980) to analyze habitat use annually and seasonally (spring, summer, and fall) for each bear in each study area. This method ranks use of habitat components from greatest to smallest and therefore reduces biases that could arise from including questionable habitat components. We used program PREFER (Frank 1985) to compare the proportions of use to availability and rank the LC types from most to least preferred. This program uses the calculations described in Johnson (1980) and tests the hypothesis that all components are equally preferred using the multiple comparison procedure of Waller and Duncan (1969).

Thus, all bears in each study area were considered to have same available habitat. The composite study area approach assessed second-order selection and pertained to the use of habitats within the local environment (Johnson 1980). Multiple comparisons were used to determine if higher ranked components were used more ($P \leq 0.10$) than lower ranked components.

Telemetry and habitat classification error

We attempted to measure the combined effects of telemetry and habitat classification error. First, we estimated telemetry error during August and December 1993 by placing radiocollars randomly throughout the study area. Tests were conducted with both antennas used during radiotelemetry and during periods representative of all 6-hour periods of the 24-hour day. The mean distance from hidden transmitters to estimated locations was 180 m (SE = 102 m, $n = 51$). We then generated a set of random points based on the exponential distribution of the telemetry error distances. For 18% of these random points, we assigned a randomly chosen LC (with all 8 equally likely) rather than the mapped LC for that point (because mean accuracy of the LC map was 82%, with no discernible pattern among the 18% in error). We then ranked bear use of the LC components using PREFER (Frank 1985). We repeated the random procedure to provide 2 tests of the combined effects of telemetry error and LC classification error for each study area. Our intent was only to provide some idea of the effects of telemetry and habitat classification error and goes farther than most studies in assessing this

problem. However, several authors provide detailed analyses of these issues that authors may wish to consider in future studies (Nams 1989, Samuel and Kenow 1992, McKelvey and Noon 2001).

Results

Home range analyses

Annual 95% MCP and 95% HM home ranges did not differ between areas in 1993, and mean summer and fall 95% MCP home ranges did not differ between areas in 1992. However, in 1993, spring, summer, and fall home ranges were larger in the BP than the GS (Table 2). Also, annual 50% MCP home ranges were larger in the BP than the GS.

Habitat analyses

The analyses of telemetry and habitat classification error revealed that the top-ranked LC type in 4 error tests did not change between our data and randomization tests (Table 3). In 3 of the 4 error tests, the lowest-ranked component remained constant. Overall, higher-ranked components from data ranked high in error tests, and lower-ranked components from data ranked low in error tests. The results of our error analyses indicate that the influence of telemetry and LC classification error usually changed the rank of mid-level LC components by 1 or 2 rankings, but overall effects on habitat analyses were minor.

In the GS, marsh habitats were preferred over all others during all 3 seasons (Table 4). Additionally, farmed, pocosin, and clearcuts were preferred over managed pine habitats in all seasons. All habitat types except bottomland were preferred over pine in summer and fall. Bottomlands and pine were not preferred habitats in any season.

In the BP, no comparisons during spring were significant. However, pocosin and clearcuts were preferred over all other components in summer and over all other components except mixed forest in fall (Table 5). All components were preferred over farmed areas in fall. No annual analyses were significant in either study area.

Discussion

Home range

Home range size of female bears has been linked to habitat quality (Armstrup and Beecham 1976, Lindzey and Meslow 1976). Comparisons of home ranges between the BP and GS may indicate differences in habitat quality within the NPP. Because GS females use a smaller area to meet daily requirements in each season,

Table 2. Annual and seasonal home range sizes for female black bears in Big Pocosin (BP) and Gum Swamp (GS) study areas on the Neuse–Pamlico Peninsula, North Carolina, USA, 1992–94, and significant differences between the study areas.

Home range type	Area	Average (km ²)	Range	n	P	
Annual	95% harmonic mean	BP	11.6	2.6–33.5	5	0.56
		GS	6.6	2.5–12.4	8	
	95% convex polygon	BP	11.0	2.6–23.0	5	0.11
		GS	5.3	2.5–14.7	8	
	50% convex polygon	BP	4.2	0.4–6.5	5	0.06
		GS	0.8	0.3–1.6	8	
1992	Summer 95% convex polygon	BP	3.6	1.6–6.2	3	0.13
		GS	1.8	1.1–2.6	3	
	Fall 95% convex polygon	BP	5.2	1.7–7.5	5	0.14
		GS	3.1	0.5–8.7	8	
1993	Spring 95% convex polygon	BP	6.9	3.6–10.8	4	0.01
		GS	2.0	0.5–3.9	10	
	Summer 95% convex polygon	BP	6.6	1.4–15.9	11	0.02
		GS	2.4	1.0–4.5	10	
	Fall 95% convex polygon	BP	7.5	1.2–22.0	9	0.02
		GS	3.0	1.1–8.7	11	

we speculate that the diverse forested landscape of the GS provides more of the daily requirements of bears than the large-scale loblolly pine plantations in the BP. The GS contained more remnants of pocosin, marsh, and remote commercial farmlands than the BP. Bear densities were estimated to be 1.35 bears/km² in the GS compared to 0.53 bears/km² in the BP (Martorello 1998). While either of these densities is evidence of a productive black bear environment compared to some areas of North America, the more productive GS landscape allowed higher bear densities and may account for smaller home ranges. Results from this research may provide insight into future trends in bear home range requirements in the coastal region because areas like the GS are currently undergoing rapid conversion to loblolly plantations. Given the rate of development in North Carolina's Atlantic Coastal Plain, the BP may represent the future of bear habitat in the region.

Habitat use

Numerous authors have documented the importance of mature forests containing oak, hickory, and blackgum for providing fall mast for bears preparing for winter denning (Landers et al. 1979, Hellgren and Vaughan 1988, Seibert 1993). Bottomland hardwoods were not more important in our analyses, but clear patterns existed in landscape-scale habitat use patterns. This

landscape-scale selection pertains to what areas an animal chooses from the local environment and provides insight into habitat needs in a large geographical area. Bears' extensive use of marsh areas, a habitat component only found in the GS, may have been related to several factors. Marsh areas may allow escape from hounds chasing deer (*Odocoileus virginianus*) and bear and other human disturbances common to eastern North Carolina. In addition, they may provide areas for feeding on invertebrates and plants and secure travel corridors between bottomlands, pocosins, and other inaccessible wetlands. The preference of pocosin and clearcuts over managed pine habitats in both areas may be related to the superior cover and food provided by these cover types. This has been reported for pocosins (Landers et al. 1979, Hellgren and Vaughan 1988, Hellgren et al. 1991, Lombardo 1993), but is newly reported for clearcuts and may be related to the paucity of research performed in managed forestry environments in the southeastern United States. We speculate that clearcuts were important due their thick, relatively inaccessible structure and their soft mast production that may mimic pocosins. It seems that the intensive timber management in our study area provides important, inaccessible early-succession habitat for bears. Both pocosins and clearcuts may provide sanctuaries from human activity by providing areas of impenetrable escape and hiding cover.

Table 3. Ranked preference (Johnson 1980) of land cover types, comparing data from annual habitat analyses (study area method) to 2 randomization tests based on telemetry error and the mean accuracy of habitat classification data on the Neuse–Pamlico Peninsula, North Carolina, USA, 1992–94.

Rank	Big Pocosin			Gum Swamp		
	From sample	Test 1	Test 2	From sample	Test 1	Test 2
1	Pocosin	Pocosin	Pocosin	Marsh	Marsh	Marsh
2	LowVg ^a	Mixed	Mixed	Farmed	Farmed	Pocosin
3	Mixed ^b	LowVg	LowVg	LowVg	Mixed	LowVg
4	BtmHrd ^c	Pine	Pine	Mixed	LowVg	Mixed
5	Pine	UpHwd	UpHwd	Pocosin	Pine	BtmHrd
6	UpHwd ^d	BtmHrd	BtmHrd	BtmHrd	BtmHrd	Farmed
7	Farmed	Farmed	Farmed	Pine	Pocosin	Pine

^aLowVg = low vegetation.^bMixed = mixed pine–hardwood.^cBtmHrd = bottomland hardwood.^dUpHwd = upland hardwood.

Crops were rarely preferred over other components based on our telemetry analyses. However, a companion study documented heavy use of crops in both study areas based on food habits analyses. Wheat and corn were primary spring and summer foods, respectively, whereas corn and soybeans were important fall foods (Maddrey 1995). There also exists a plethora of anecdotal evidence supporting the importance of agricultural crops as food for bears in eastern North Carolina (North Carolina Wildlife Resources Commission, Raleigh, North Carolina, USA, unpublished data). The lack of a demonstrated preference from telemetry data may be related to patch size of landscape components, road densities, and human disturbance of agricultural areas. GS cropland consisted of 212 blocks averaging 13.8 ha compared to 1,016 blocks in the BP averaging 8.2 ha. GS road densities were 1.1 km/km² compared to 1.3 km/km² for the BP. Areas with such a patchwork of cropland and high levels of human activity may force bears to make many short forays into fields. Because of

the short times involved, these forays may not easily register in telemetry analyses. This would be supported by observations we collected during limited 24-hour telemetry monitoring when bears frequently moved to and from agricultural areas.

Management implications

Increases in population and distribution of bears in eastern North Carolina over the last 30 years cannot be explained by improving landscape conditions. On the contrary, important forested land-cover types identified in this study, such as pocosin and marsh, declined in the 1990s (North Carolina Wildlife Resources Commission, unpublished data). Conservative harvest management practices and approximately 450,000 ha of black bear sanctuaries have certainly played a role in the bear expansion (North Carolina Wildlife Resources Commission, unpublished data). However, we speculate that the adaptation of bears to an abundant agricultural food

Table 4. Habitat use rankings for female black bears in the Gum Swamp, North Carolina, USA, 1992–94. Each habitat component in the row heading that is used more ($P \leq 0.10$) than a component in the column heading is represented by the appropriate season (S = spring, U = summer, F = fall) for which it was significant.

Ranked order	BtmHrd	Farmed	LowVg	Marsh	Mixed	Pine	Pocosin
BtmHrd ^a							
Farmed	S, U, F					S, U, F	
LowVg ^b	U, F					S, U, F	
Marsh	S, U, F	S, U, F	S, U, F		S, U, F	S, U, F	S, U, F
Mixed ^c	F					U, F	
Pine							
Pocosin	F					S, U, F	

^aBtmHrd = bottomland hardwood.^bLowVg = low vegetation, primarily clearcuts.^cMixed = mixed pine–hardwood.

Table 5. Habitat use rankings for female black bears in the Big Pocosin, North Carolina, 1992–94. Each habitat component in the row heading that is used more ($P \leq 0.10$) than a component in the column heading is represented by the appropriate season (S = spring, U = summer, F = fall) for which it was significant.

Ranked order	BtmHrd	Farmed	LowVg	Mixed	Pine	Pocosin	UpHwd
BtmHrd ^a		F					
Farmed							
LowVg ^b	U, F	U, F		U	U, F		U, F
Mixed ^c		F					
Pine		F					
Pocosin	U, F	U, F		U	U, F		U, F
UpHwd ^d		F					

^aBtmHrd = bottomland hardwood.

^bLowVg = low vegetation, primarily clearcuts.

^cMixed = mixed pine/hardwood.

^dUpHwd = upland hardwood.

base, interspersed with an extensive, diverse mosaic of woodlands, is also an important aspect of the bear population and range expansion.

Quality and quantity of habitats are not static, and our research provides evidence of differences in habitat quality between contrasting study areas. Since the study began in 1992, most of the remaining pocosin in the GS ($\approx 90\%$) has been harvested and converted to loblolly pine (personal observation). The landscape changes occurring in the GS illustrate the dilemma faced by many bear populations in the Atlantic Coastal Plain. Forest industry representatives expect continued conversion to managed pine on private lands in the coastal region (Hughes 1990). Crop patterns also are changing as cotton strains are developed that will grow in areas of the coastal plain that were formerly inhospitable. The conversion of grain crops to cotton may remove an important food resource in many areas and exacerbate the effects of the decline in pocosin, marsh, and other non-pine forests. The conversion of hardwood and pocosin forest types to pine plantations may force bears to become increasingly dependent on clearcuts, disturbed pine plantations, tree peeling, and agricultural grain crops for food. Our study indicates that bears are capable of adapting to some level of disturbance in managed areas and agricultural croplands. The response of black bears to the additional loss of grain crops and increased rural housing and development is uncertain. Careful harvest and habitat management for coastal bear populations will be critical under these circumstances.

There is a critical need for landscape-scale management of black bears in the Atlantic Coastal Plain. Bear management plans should focus on maintaining areas of large blocks of habitat relatively free from human development. Habitat management efforts should focus

on maintaining or restoring pocosin and other wetlands forest types. These areas will provide habitat for female bears and provide high quality habitat identified in this study. Core areas with high bear densities such as the Albemarle–Pamlico and Neuse–Pamlico Peninsulas (North Carolina Wildlife Resources Commission, unpublished data) are ideal areas to begin managing on a landscape scale.

Due to the predicted continued decline in bottomlands and pocosins throughout the southeastern United States and increases in pine management and forest industry ownership (Hughes 1990), the future of black bears in the coastal plain may be determined by the management of forest industry woodlands and adjacent farmlands. Coordination of management efforts among wildlife managers, the forest industry, and farmers will become increasingly important to ensure long-term black bear viability in the region. We recommend the development of a coalition of state and federal wildlife agencies, the forest industry, and the agricultural community to discuss landscape effects on black bears in the Atlantic Coastal Plain and to implement strategies to address future black bear habitat management in the region.

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