Bottomland Hardwood Forest Management for Black Bears in Louisiana

Keith M. Weaver, *U.S. Fish and Wildlife Service, Tensas River National Wildlife Refuge, Tallulah, LA 71282*

Daniel K. Tabberer, *U.S. Fish and Wildlife Service, Tensas River National Wildlife Refuge, Tallulah, LA 71282*

Lawrence U. Moore, Jr.,[1] *U.S. Fish and Wildlife Service, Tensas River National Wildlife Refuge, Tallulah, LA 71282*

George A. Chandler, *U.S. Fish and Wildlife Service, Tensas River National Wildlife Refuge, Tallulah, LA 71282*

John C. Posey,[2] *U.S. Fish and Wildlife Service, Tensas River National Wildlife Refuge, Tallulah, LA 71282*

Michael R. Pelton, *Department of Forestry, Wildlife, and Fisheries, University of Tennessee, Knoxville, TN 37901*

Abstract: We studied habitat use by 32 radio-collared black bears (*Ursus americanus luteolus*) in the Tensas River Basin of Louisiana during April 1988–90. Preliminary data from telemetry and field observations were combined with a literature review to develop bottomland hardwood forest management guidelines for bears on Tensas River National Wildlife Refuge. Logged areas provided feeding, resting, denning, and escape opportunities for bears. Bears used bald cypress (*Taxodium distichum*), brushpiles, and ground nests for winter dens. Wooded drainages that traversed agricultural expanses were used as travel corridors. Even-aged management with a 100-year rotation, and selective cutting techniques were recommended to balance timber age classes, enhance habitat diversity, and provide stable food sources, denning sites, and cover. Other recommendations included creation of old-growth timber stands, maintenance of forest openings, preservation of habitat linkages, and reforestation of old agricultural lands.

Proc. Annu. Conf. Southeast. Assoc. Fish and Wildl. Agencies 44:342–350

---

[1] Present Address: USDA Forest Service, FSO, Jackson, MS 39269.

[2] Present Address: Department of Biology, Southwest Texas State University, San Marcos, TX 78666.

Habitat destruction is a serious factor affecting the black bear resource in the eastern United States (Pelton 1985, Rogers and Allen 1987). Black bears currently occupy only 5%–10% of their former range in the Southeast (Maehr 1984, Pelton 1985). The Louisiana black bear once inhabited eastern Texas, Louisiana, and southern Mississippi (Hall 1981), but extensive habitat modification, particularly land clearing for agriculture, reduced its available habitat >80% by 1980 (Neal 1990). This subspecies is currently proposed in the Federal Register for threatened listing under the Endangered Species Act due to its vulnerability to habitat loss and illegal killing (Neal 1990). The principal areas now inhabited by the Louisiana black bear are the bottomland hardwood forest (BLH) habitats of Louisiana in the Tensas River Basin in the northeast and the Atchafalaya River Basin in the southeast (Weaver et al. 1990).

Concern over the future of the Louisiana black bear and a petition to list the subspecies as endangered prompted the U.S. Fish and Wildlife Service (FWS) to initiate bear research in the Tensas Basin in 1987 (Weaver 1988). One objective of the study was to document biological and ecological data for use in the development of management strategies for black bears in Louisiana. This research is still continuing and data collection and analysis are not complete; however, due to impending listing action and development of a recovery plan, potential Section 7 consultations (Neal 1990), and preparation of the Forest Habitat Management Plan (Tabberer and Moore 1990) for Tensas River National Wildlife Refuge (TRNWR), it seems appropriate to publish preliminary findings on black bear habitat use in the Tensas Basin and their associated management implications on TRNWR. This paper outlines recommendations for bear habitat management based on a review of the literature and preliminary evidence from ongoing studies that were developed in concert with the TRNWR Forest Habitat Management Plan (Plan).

We thank D. H. Arner, E. P. Hill, C. R. McLaughlin, and S. R. Aycock for their helpful comments on the initial draft of this manuscript and T. Martin for typing and editing.

Methods

Study Area

The 22,647-ha TRNWR is located in northeast Louisiana in Madison and Tensas parishes, approximately 97 km east of Monroe, Louisiana, and 40 km west of Vicksburg, Mississippi. TRNWR and the adjacent 8,000-ha Big Lake Wildlife Management Area (BLWMA) comprise approximately 80% of the contiguous system of BLH that remains in Tensas River Basin. Approximately 5,260 ha of privately-owned BLH adjoin the TRNWR/BLWMA complex. Agricultural lands entirely surround this forested complex. The remainder of BLH in the Tensas Basin is located mainly within 32 km of the TRNWR/BLWMA complex and exists as severely fragmented tracts ranging in size from <32–5,050 ha.

Elevations on TRNWR range from 18–23 m. The majority of soils are classified in the Sharkey series. Habitat is composed of approximately 20,509 ha of BLH, 1,674 ha of agricultural/moist soil management units, and 464 ha of direct-seeded (Haynes and Moore 1987) hardwood plantations. The present condition of the forest is 6,345 ha (31%) heavily logged (diameter cut, ≥41 cm logged, 1982–1988) and 14,164 ha (69%) in the 40- to 80-year age class.

The TRNWR forest is interspersed by the Tensas River, cypress sloughs, bayous, natural lakes, trails, pipelines, and gravel roads. The Tensas River is the only major stream in the Louisiana floodplain of the Mississippi River that has not been extensively altered by channelization. Major forest overstory components include sweetgum (*Liquidambar styraciflua*), willow oak (*Quercus phellos*), water oak (*Q. nigra*), Nuttall oak (*Q. nuttallii*), sugarberry (*Celtis laevigata*), green ash (*Fraxinus pennsylvanica*), elm (*Ulmus* spp.), overcup oak (*Q. lyrata*), and bald cypress. Predominant understory plants include palmetto (*Sabal minor*), switchcane (*Arundinaria gigantea*), greenbriar (*Smilax* spp.), blackberries (*Rubus* spp.), and poison ivy (*Rhus radicans*).

Techniques

Twenty-two bears (10 males, 12 females) were live-trapped with Aldrich foot snares in the Tensas Basin during April 1988–December 1989. Bears were ear-tagged, instrumented with radio-collars, and released at their capture sites. Telemetry and observation during April 1988–90 were used to study bear habitat use in the Tensas Basin. Scats (N = 140) were collected, visually examined for initially recognizable food items, and frozen for later food habits analysis. A literature review was conducted to obtain information on black bear habitat requirements, silvicultural techniques, and forest management practices that benefitted black bears. Preliminary research data were combined with information from the literature review to formulate bear habitat management recommendations for the TRNWR Plan.

Results and Discussion

Foods

Timbered areas in the Tensas Basin provided feeding opportunities for bears as evidenced by the presence of scats and foraging sign. Preliminary examination of scats and/or observation of foraging sign indicated that bears consumed a variety of understory plants including the fruits of blackberries (*Rubus* spp.), pokeweed (*Phytolacca americana*), elderberry (*Sambucus canadensis*), devil's walking stick (*Aralia spinosa*), French mulberry (*Callicarpa americana*), red mulberry (*Morus rubra*), grapes (*Vitis* spp.), dogwoods (*Cornus* spp.), and paw paw (*Asimina triloba*). Growth of these plants was stimulated by increased light penetration from canopy openings created by timber harvest. In addition to increased vegetative production in timbered areas, rotting wood from decomposing logging slash harbored beetles, grubs, and other invertebrates that are protein-rich food sources for bears (Landers

et al. 1979, Beeman and Pelton 1980, Eagle and Pelton 1980, Maehr and Brady 1984). Beetle fragments commonly were found in bear scats. Decayed logs torn apart in search of insects were observed in most areas of bear activity. Many of the food items noted above also were used by bears in other southeastern habitats (Landers et al. 1979, Beeman and Pelton 1980, Eagle and Pelton 1980, Clark et al. 1987, Hellgren and Vaughan 1988).

Bears in the Tensas Basin fed on acorns in late fall and early winter prior to denning, and acorn fragments also were observed in spring scats. Black bears depend largely on hard mast crops to build sufficient fat reserves to survive the period of winter dormancy (Beeman and Pelton 1980, Eagle and Pelton 1980, Maehr and Brady 1984, Smith 1985, Clark et al. 1987, Rogers and Allen 1987). A 100-year timber rotation length as proposed in the TRNWR Plan is compatible with suggested peak acorn yield periods for water oak (50–125 years) and willow and cherrybark (*Quercus falcata* var. *pagodaefolia*) oaks (50–80 years) (Anon. 1981), and with timber management recommendations for black bears in other southeastern habitats (Pelton 1985), Hillman and Yow 1986, Brody and Stone 1987). Pelton (1985) noted that increased acorn yields resulted in reduced fall feeding movements and reduced mortality, increased natality, and increased bear numbers.

The Plan recommended that oak species be favored in silvicultural treatments on TRNWR. Treatments will be directed toward maintaining a diversity of oak species and producing high acorn yields. Bears in the Tensas Basin feed on the nuts of pecan (*Carya illinoensis*); thus, in order to increase its availability as a hard mast food source, pecan will be exempt from logging on TRNWR. In addition, TRNWR foresters will have the flexibility to implement silvicultural treatments that protect soft mast such as persimmon (*Diospyros virginiana*), sassafras (*Sassafras albidum*), red mulberry, dogwood, and blackgum (*Nyssa sylvatica*).

Bears foraged in forest openings in the Tensas Basin, particularly following spring den emergence, as indicated by feeding sign and scats composed almost entirely of succulent vegetation that grew in these openings. Thus, approximately 2% of the forest on TRNWR will be maintained in a system of widely-dispersed openings $\leq$1 ha. Disking or mowing will be performed on 1- to 5-year rotation to maintain openings in early successional stages (Hellgren and Vaughan 1988). Most openings on TRNWR are scheduled for periodic planting with wheat, oats, rye, chufa (*Cyperus esculentus*), brown-top millet (*Panicum ramosum*), or bahia grass (*Paspalum notatum*). Edge plants such as blackberries, pokeweed, and elderberry that proliferate around these openings increase habitat diversity and feeding opportunities to an even greater extent.

Forest management practices should ensure stable and adequate food supplies for black bears by providing habitat diversity, a wide variety of food sources throughout the year, and high yields of hard and soft mast (Landers et al. 1979, Pelton 1985, Hillman and Yow 1986, Brody and Stone 1987, Rogers and Allen 1987, Hellgren and Vaughan 1988). These objectives will be attempted on TRNWR by managing the BLH using the even-aged system with a 100-year rotation and a 15-year management cycle (Tabberer and Moore 1990). A management cycle, as

defined in the TRNWR Plan, is the interval between consecutive entries into a management compartment for the purpose of writing a prescription. During the first management cycle (1990–2005), management will be prescribed on approximately 10,000 ha. A prescription may or may not call for silvicultural treatment during that particular cycle.

Initial prescriptions will be based primarily on improvement thinnings by pulpwood removal to upgrade species composition and improve stand integrity. Irregularly-shaped, scattered clearcuts (<8 ha, Rogers and Allen 1987) may be used for regeneration or salvage treatments. Similar clearcuts are planned for GDSNWR to maintain openings in pocosin habitat (USFWS 1986). We recommend that silvicultural treatments maintain a diversity of age classes, stand types, and vegetative composition to provide favorable conditions for black bears (Rogers and Allen 1987).

Denning Sites

Nine of 22 (41%) radio-collared bears in the Tensas Basin (3 subadult males, 2 subadult females, 2 adult males, and 2 adult females) used brushpile or open nests for winter dens during 1988–90. The 2 adult females used brushpiles for natal dens. Brushpile and open nests were located in thick vegetation, usually logged within the past 1–5 years. Brushpile dens were created by felled tops and other logging slash. Open ground nests and nests under brushpiles were scooped out depressions that were bare or lined with vegetation bitten off around the nest. The use of dense understory areas for ground den sites has been reported in other southeastern habitats (Landers et al. 1979, Hamilton and Marchinton 1980, Johnson and Pelton 1981, Carlock et al. 1983, Hellgren and Vaughan 1989). The use of logged areas for ground denning sites also has been reported in Massachusetts (Elowe 1984), Arkansas (Smith 1985), and Virginia (Hellgren and Vaughan 1989).

Thirteen of 22 (59%) radio-instrumented bears in this study (7 adult females, 4 adult males, 1 subadult male, and 1 male yearling) denned in hollow cypress trees over water in sloughs, cypress lakes, or bayous during 1988–90. Four of the adult females used hollow cypress as natal dens and 3 used them to den with yearlings. Bears had to wade or swim to reach den trees. Cavities were located approximately 5–15 m ($\bar{x}$ = 12 m) above the water surface depending on flood conditions. Cavities were created by limb breakages at the bole or by broken trunk tops. Cypress tree dens have been reported in the Atchafalaya Basin (Taylor 1971) and on the White River NWR in southeast Arkansas (Smith 1985) and in North Carolina (Hamilton and Marchinton 1980) and Virginia (Hellgren and Vaughan 1989) wetlands.

Timber recommendations for black bears in other southeastern habitats suggest that potential den trees should be protected from logging and that a minimum of 5%–10% of the forest be maintained in ≥250-year age class to ensure adequate supplies of den trees (Pelton 1985, Hillman and Yow 1986). Under the Plan, no cypress will be logged on TRNWR, and approximately 18% of the forested habitat will be exempt from logging. The no-cut areas include 2 tracts totalling 2,823 ha

and 847 ha of no-logging buffer zones along major waterways and sloughs. No silvicultural treatments will be prescribed for these areas.

Escape Cover

Radio-collared and uncollared bears in the Tensas Basin used areas of thick cover, often logged within the past 1–5 years, for daybed sites and as escape cover when disturbed. Escape cover is an important component of bear habitat, particularly as forests become smaller and more fragmented and as human encroachment and disturbance in bear habitat increases (Pelton 1985, Landers et al. 1979, Rogers and Allen 1987, McLaughlin et al. 1988). Black bears are adaptable and opportunistic and can thrive in close proximity to man if afforded areas of retreat that ensure little chance of close contact or visual encounters with humans (Pelton 1982).

The switchcane/palmetto/shrub understories that predominate in many areas of the refuge provide natural cover. However, when logging slash and vegetative regrowth of briars, vines, and saplings, which result from timber cutting in BLH areas, are combined with this natural understory, the quality of escape cover can be increased. Heavily timbered areas in the Tensas Basin that were logged 3–10 years ago are now practically impenetrable. Numerous unsuccessful attempts to closely approach and observe radio-collared bears in cutovers in the Tensas Basin indicate that cover which limits visibility, slows foot travel, and creates considerable noise when traversed, provides security for bedding, denning, or fleeing bears.

Travel Corridors

The presence of radio-collared bears and bear sign in uncleared drainages, ditches, bayous, and river banks indicate bears in the Tensas Basin used these areas to traverse open land when moving from 1 forested tract to another. Drainage ditches as narrow as 10 m and lined with trees and brush were used by bears to pass through agricultural areas. Bayou and river bank tops in the Tensas Basin are often thick with brush and are used by bears for feeding, resting, and denning, and as travel corridors. A 60-m, no logging buffer zone along major waterways and sloughs as recommended in the TRNWR Plan will leave potential bear habitat undisturbed.

Travel corridors may facilitate the movements of bears through agricultural lands in the Tensas Basin, particularly when bears reside in fragmented tracts of forest. Maintenance of travel corridors within and among Louisiana, Mississippi, and Arkansas may enhance genetic diversity and population viability by facilitating juvenile dispersal and interbreeding among populations (Pelton 1985, Hillman and Yow 1986, Noss 1987). Research is needed to document the characteristics a corridor must possess to make it suitable for use by bears as a habitat link.

Reforestation

An important aspect of forest management in the TRNWR Plan is the restoration of forests on open lands through direct-seeding (Haynes and Moore 1987). Reforestation in the Tensas Basin can provide potential habitat for bear in the future. Nuts of

pecan and the acorns of willow, water, cherrybark, Nuttall, and overcup oak are planted according to site condition, elevation, and moisture regime. Germination in direct-seeded plantations can average up to 50%, no vegetational control is necessary, and direct-seeding operations can be performed for approximately 25% the cost of transplanting seedlings (Haynes and Moore 1987). Under ideal conditions $\geq$4 ha/hour can be planted for costs of <$28/ha. Over 465 ha of direct-seeded plantations have been established on TRNWR since 1985. We recommend that cypress seedlings be planted along ditches, sloughs, and moist-soil management units to re-establish bald cypress in sites where it was eliminated.

Human Access

Preliminary telemetry and observation data indicate that bears do not avoid minor asphalt roads, gravel roads, or trails in the Tensas Basin. Roads provide human access into bear habitat, and human activity including poaching, overharvest, disturbance, and highway mortality may be incompatible with bear management (Carlock et al. 1983, Hillman and Yow 1986, Brody and Stone 1987, Rogers and Allen 1987, Hellgren and Vaughan 1988, McLaughlin et al. 1988). Hillman and Yow (1986) suggested a maximum density of 1.6 km of open roads or ORV roads/ 1,012–1,295 ha of forestland in the southern Appalachians. Pelton (1985) suggested that bears on National Forest lands in the southern Appalachians may begin to avoid areas when road density is 0.5 km road/1 km^2 of forest.

Some positive aspects of roads are increased resource management potential, fire suppression capability, and feeding opportunities (Carr and Pelton 1984, Smith 1985, Hillman and Yow 1986, Rogers and Allen 1987, Hellgren and Vaughan 1988). Gravel roads and ATV trails probably present no barriers to movements or habitat use by bears in protected populations (Carr and Pelton 1984, Smith 1985).

Controlling access into bear habitat, particularly on large tracts of public land, is imperative (Hillman and Yow 1986). Sound habitat management practices for bears may be negated by undesirable human activities such as hunting trespass (particularly with dogs), baiting, timber trespass, and arson. These activities can be especially detrimental during denning and cub rearing. Illegal kill can be a problem in remote tracts of bear habitat where human access is uncontrolled and violators face little threat of apprehension. Three bears were illegally killed in the TRNWR/ BLWMA complex area in 1988 (Weaver et al. 1990). Existing access roads into bear habitat should be gated and/or effectively patrolled, and the construction of new roads should be planned carefully to minimize possible negative impacts of human disturbance on bears. Roads no longer in service should be closed and reseeded to serve as potential feeding areas (Hillman and Yow 1987, Rogers and Allen 1987).

Summary

Bears can coexist with humans in BLH areas if habitat is available that satisfies their life requirements. BLH management for black bears should be directed toward providing habitat diversity, stable and diverse food supplies, suitable denning sites,

escape cover, reforestation programs, travel corridors, and access management. Responsible forest management can accommodate the needs of visitors, recreationists, consumers, and bears.

As with any wildlife population, objectives and attitudes of land owners, land managers, resource users, and the general public will determine if bears are considered a positive or negative benefit, and ultimately, if bears can survive. Continued research into bear ecology and the effects of habitat management on bear populations should provide wildlife managers better information with which to accomplish the goal of perpetuating a viable bear resource. Public education should be directed toward the concept of maintaining high-quality bear habitat as the foundation for preserving a unique wildlife heritage. Increasing public awareness about the biology, ecology, and management of bear populations should encourage acceptance of conservation programs.

Literature Cited

Anonymous. 1981. Wildlife Habitat Management Handbook. Southern Region. U.S. For. Serv. (Not numbered).

Beeman, L. E. and M. R. Pelton. 1980. Seasonal foods and feeding ecology of black bears in the Smoky Mountains. Proc. Intl. Conf. Bear Res. and Manage. 4:141–147.

Brody, A. J. and J. N. Stone. 1987. Timber harvest and black bear population dynamics in a southern Appalachian forest. Proc. Intl. Conf. Bear Res. and Manage. 7:243–250.

Carlock, D. M., R. H. Conley, J. M. Collins, P. E. Hale, K. G. Johnson, and M. R. Pelton. 1983. The tri-state black bear study. Tenn. Wildl. Resour. Agency Tech. Rep. 83–9. 286pp.

Carr, P. C. and M. R. Pelton. 1984. Proximity of adult female black bears to limited access roads. Proc. Annu. Conf. Southeast. Assoc. Fish and Wildl. Agencies 38:70–77.

Clark, J. D., W. R. Guthrie, and W. B. Owen. 1987. Fall foods of black bears in Arkansas. Proc. Annu. Conf. Southeast. Assoc. Fish and Wildl. Agencies 41:432–437.

Eagle, T. C. and M. R. Pelton. 1980. Seasonal nutrition of black bears in the Great Smoky Mountains National Park. Proc. Intl. Conf. Bear Res. and Manage. 5:94–101.

Elowe, K. D. 1984. Home range, movements, and habitat preferences of black bears (*Ursus americanus*), in western Massachusetts. M.S. Thesis, Univ. Mass., Amherst. 112pp.

Hall, E. R. 1981. The mammals of North America. Vol. 2. John Wiley and Sons, New York, N.Y. 1181pp.

Hamilton, R. J. and R. L. Marchinton. 1980. Denning and related activities of black bears in the Coastal Plain of North Carolina. Proc. Intl. Conf. Bear Res. and Manage. 3:121–126.

Haynes, R. J. and L. U. Moore. 1987. Re-establishment of bottomland hardwoods within National Wildlife Refuges in the Southeast. Proc. Conf. Increasing Our Wetland Resour. Nat. Wildl. Fed. 1:95–103.

Hellgren, E. C. and M. R. Vaughan. 1988. Seasonal food habits of black bears in Great Dismal Swamp, Virginia-North Carolina. Proc. Annu. Conf. Southeast. Assoc. Fish and Wildl. Agencies 42:295–305.

——— and ———. 1989. Denning ecology of black bears in a southeastern wetland. J. Wildl. Manage. 53:347–353.

Hillman, L. L. and D. L. Yow. 1986. Timber management for black bear. Proc. East. Workshop Bear Res. and Manage. 8:125–136.

Johnson, K. G. and M. R. Pelton. 1981. Selection and availability of dens for black bears in Tennessee. J. Wildl. Manage. 45:11–119.

Landers, J. L., R. J. Hamilton, A. S. Johnson, and R. L. Marchinton. 1979. Foods and habitat of black bears in southeastern North Carolina. J. Wildl. Manage. 43:143–153.

Maehr, D. S. 1984. Distribution of black bears in eastern North America. Proc. East. Workshop Black Bear Res. and Manage. 7:74.

——— and J. R. Brady. 1984. Food Habits of Florida black bears. J. Wildl. Manage. 48:230–235.

McLaughlin, C. R., G. J. Matula, Jr., and J. H. Hunt. 1988. A draft habitat suitability index model for black bears in the conifer-deciduous forests of New England: its application in Maine. Proc. East. Workshop Black Bear Res. and Manage. 8:137–167.

Neal, W. A. 1990. Proposed threatened status for the Louisiana black bear. Federal Register, 21 June 1990. 50 CFR Part 17. 55(120):25341–25345.

Noss, R. F. 1987. Corridors in real landscapes: a reply to Simberloff and Cox. Conserv. Biol. 1(2):159–164.

Pelton, M. R. 1982. Black bear. Pages 504–514 *in* J. A. Chapman and G. A. Geldhammer, eds. Wild Mammals of North America: biology, management, and economics. Johns Hopkins Univ. Press, Baltimore, Md.

———. 1985. Habitat needs of black bears in the East. Pages 49–53 *in* D. L. Kulhavy and R. N. Conner, eds. Wilderness and natural areas in the eastern United States: a management challenge. Center for Appl. Studies, Stephen F. Austin State Univ., Nacogdoches, Texas.

Rogers, L. L. and A. W. Allen. 1987. Habitat suitability index models: black bear, Upper Great Lakes Region. U.S. Fish Wildl. Serv. Biol. Rep. 82(10.144). 54pp.

Smith, T. R. 1985. Ecology of black bears in a bottomland hardwood forest in Arkansas. Ph.D. Diss., Univ. Tenn., Knoxville. 209pp.

Tabberer, D. K. and L. U. Moore. 1990. Tensas River National Wildlife Refuge (NWR) forest habitat management plan. U.S. Fish and Wildl. Serv., Tallulah, La. 152pp.

Taylor, E. F. 1971. A radio-telemetry study of the black bear (*Euarctos americanus*) with notes on its history and present status in Louisiana. M.S. Thesis, La. State Univ., Baton Rouge. 87pp.

USFWS. 1986. Draft environmental impact statement for the Great Dismal Swamp National Wildlife Refuge Master Plan. U.S. Dep. Int., Fish and Wildl. Serv., Region 5, Newton Corner, Mass. 230pp.

Weaver, K. M. 1988. Louisiana status report. Proc. East. Workshop Black Bear Res. and Manage. 9:24–30.

———, J. C. Posey, and M. D. Esters. 1990. Louisiana black bear status report. Proc. 10th East. Workshop. Black Bear Res. and Manage. 10: In press.