Spring 2013

Using Landscape-Scale Habitat Suitability Modeling to Identify Recovery Areas for the Louisiana Black Bear (Ursus americanus luteolus) in East Texas

Dan J. Kaminski
Stephen F. Austin State University

Christopher E. Comer

International Bear News

Quarterly Newsletter of the International Association for Bear Research and Management (IBA) and the IUCN/SSC Bear Specialist Group
Spring 2013 Vol. 22 no. 1

Americas

Using Landscape-Scale Habitat Suitability Modeling to Identify Recovery Areas for the Louisiana Black Bear (*Ursus americanus luteolus*) in East Texas

Dan J. Kaminski
Arthur Temple College of Forestry and Agriculture
Stephen F. Austin State University
Nacogdoches, TX
Email: danjkaminski@yahoo.com

Christopher E. Comer
Arthur Temple College of Forestry and Agriculture
Stephen F. Austin State University
Nacogdoches, TX
Email: comerce@sfasu.edu

By the beginning of the twentieth century, the Louisiana black bear (Ursus americanus luteolus) had become rare in east Texas and by the 1940s, was considered extirpated from the state. Beginning in the late 1970s, reliable black bear sightings have been recorded in east Texas with increasing frequency. In 1987, the black bear was listed as a threatened species on the state endangered species list and in 1992, the Louisiana black bear subspecies was similarly listed under the Endangered Species Act. Reports indicated that east Texas contained some of the largest blocks of forested habitat suitable for, but currently unoccupied by, black bears in the southeast. Research in the 1990s confirmed that suitable habitats existed in portions of east Texas. However, despite reliable bear sightings and the existence of suitable habitat in the region, stable breeding populations apparently do not exist.

In 2009, Stephen F. Austin State University in partnership with the Texas Parks and Wildlife Department (TPWD) and the East Texas Black Bear Task Force, began a 3-year study researching the suitability of habitats for the Louisiana black bear in the 19- county south black bear recovery zone (43,553 km2) in east Texas. Previous research in Texas utilized established habitat suitability index (HSI) models to quantify habitats for specific political or administrative boundaries. However, in order to assess habitat throughout the region, we incorporated components from three established HSI models to develop a landscape-scale HSI model (Van Manen 1991, Bowman 1999, Mitchell et al. 2002). Habitat suitability index models

have been used since the early 1980s to quantify wildlife habitat based on known life requisite variables for a given species. Habitat variables (e.g., food availability) are evaluated on an index scale from 0 (unsuitable habitat) to 1 (optimum suitability). Final HSI scores are typically the weighted mean of the multiple suitability index (SI) scores calculated according to the hypothesized relationship between variables. Because of the coarseness of most geographic information systems (GIS) data, HSI models are well suited for habitat generalists and species with large spatial requirements such as black bears. Because of the large spatial requirements and increasing confirmed reports of black bears throughout east Texas, our objective was to develop a landscape-scale HSI model that we could use to evaluate the year-round habitat requirements of black bears and direct conservation efforts region-wide. Research suggests that more simple habitat models consisting of food and cover components better reflect habitat selection at a population level than complex models consisting of abiotic components. Our model thus incorporated food, cover, and human-impact components.

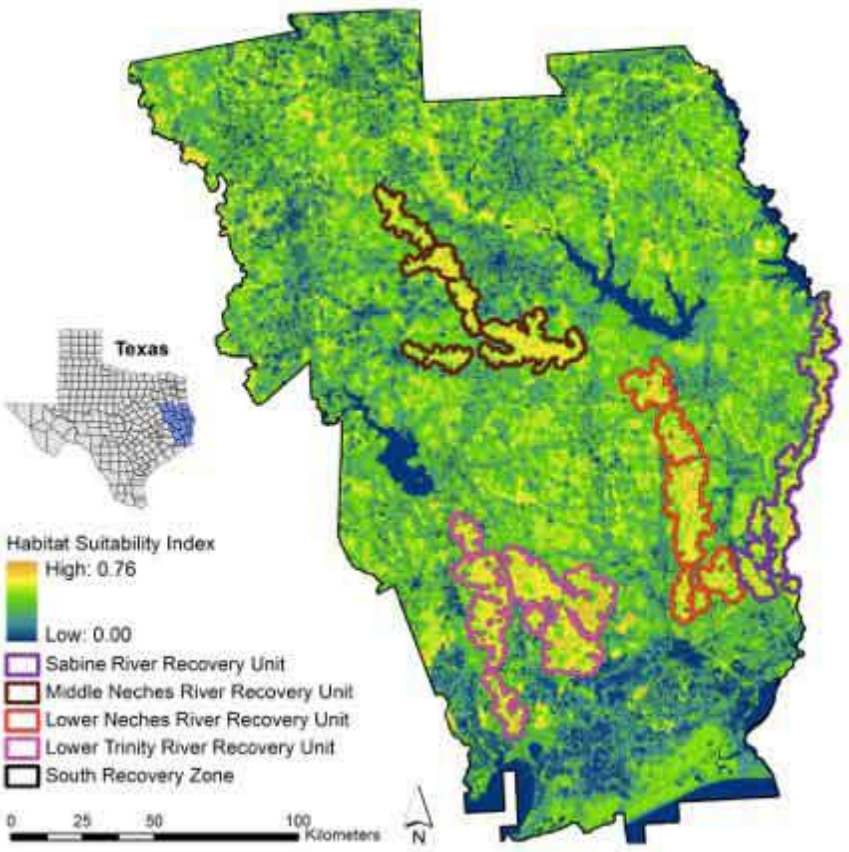

Fig. 2. East Texas habitat suitability index model and potential Louisiana black bear recovery units in the south recovery zone.

In 2009, the TPWD released a GIS-based (10 m resolution) habitat classification model consisting of 98 habitat classes within the south recovery zone. We stratified random survey points by habitat class and measured hard and soft mast production, understory vegetation density, and tree den availability at 516 survey points in 38 habitat classes (82% of the total land cover in the region).

Using empirical habitat data, we estimated SI scores for summer food availability, fall food availability, diversity, and productivity, protection cover, and tree den availability for each surveyed habitat class. We pooled data by generalized cover-types (i.e., pine or hardwood) and estimated scores for un-surveyed habitat classes. We assigned suitability scores to habitat classes and generated GIS-based food and cover component models in ArcGIS 9.3 (Figure 1).

We developed a human impact component model by buffering all state and county roads (1.6 km) and low (1.1 km) and high (3.9 km) density urban development. We based buffer sizes on existing HSI model calculations and the mean female home range size for established Louisiana black bear populations. We combined food, cover, and human impact models and calculated HSI scores per pixel in a continuous dataset (Figure 2). Habitat suitability index scores ranged from 0.00-0.76 throughout the region. We considered scores ≥0.75 as highly suitable, 0.50-0.74 as moderately suitable, and <0.50 as marginal or unsuitable. Our model indicated that highly (<1%) and moderately (16%) suitable habitat existed in the south recovery zone although the majority of the areas (84%) was classified as marginal or unsuitable habitat. Using our model we isolated areas >20,234 ha in size and ≥0.50 in mean HSI score as being capable of sustaining minimum viable populations of black bears. We identified 4 recovery units primarily located in bottomland forests along major river basins. Recovery units ranged in size from 31,583-74,285 ha and 0.58-0.60 in mean HSI scores. Our recovery unit scores were comparable to scores previously reported in the southeast U.S. and the acreages of suitable habitat for all recovery units exceeded those reported to support existing populations of the Louisiana black bear.

Literature Cited

Bowman, J.L. 1999. An assessment of habitat suitability and human attitudes for black bear restoration in Mississippi. Dissertation, Mississippi State University, Starkville, MS, USA.

Mitchell, M.S., J.W. Zimmerman, and R.A. Powell. 2002. Test of a habitat suitability index for black bears in the southern Appalachians. Wildlife Society Bulletin 30:794-808.

Van Manen, F.T. 1991. A feasibility study for the potential reintroduction of black bears into the Big South Fork Area of Kentucky and Tennessee. Tennessee Wildlife Resources Agency Technical Report No. 91-3:1-158, Knoxville, TN, USA.