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FINAL PERFORMANCE REPORT

FEDERAL AID GRANT NO. T-45-P-1

SUBREGIONAL MAPPING OF THE OZARK AND ARKANSAS VALLEY REGIONS

OKLAHOMA DEPARTMENT OF WILDLIFE CONSERVATION

December 31, 2006 through December 30, 2009

FINAL REPORT

State: Oklahoma **Grant Number:** T-45-P-1

Grant Program: State Wildlife Grants Program

Grant Title: Subregional Mapping of the Ozark and Arkansas Valley Regions

Grant Period: 31 December 2006 - 30 December 2009

Principal Investigator: Bruce Hoagland

A. Abstract:

The integration of regional habitat and vegetation maps with geospatial databases is an important tool for conservation biologists and wildlife managers. The objective of this project was to map the current distribution of white oak-hickory mesic forest, shortleaf pine-oak woodland or savannah, oak-hickory bottomland hardwood forest, and gravel (hard)-bottom streams and associated riparian forest habitats in the Ozark and Arkansas Valley regions. To achieve this objective, we employed a three phase approach; 1) acquisition and processing of existing spatial data, 2) field verification, and 3) editing and completion of the Ozark Highlands/Arkansas Valley geospatial database. Existing digital data sources that were used included the Oklahoma GAP Analysis vegetation layer, the Nature Conservancy's Untilled Landscapes (UTL) map, Digital Orthophoto Quarter Quads (DOQQ) and National Agriculture Imagery Program (NAIP) County Mosaic. The total area for each habitat type, in descending order, was white oak-hickory mesic forest (677,842 acres), shortleaf pine-oak woodland (14,767 acres), gravel (hard)-bottom streams with associated riparian forest (7,855 acres), and bottomland hardwood forest (2,984 acres). At the county level, the greatest area of white oak-hickory mesic forest and shortleaf pine-oak woodland occurred in Adair, Cherokee, and Delaware counties. The spatial distribution of bottomland hardwood forest and gravel (hard)-bottom streams and associated riparian forest differed somewhat from their upland counterparts. Adair, Cherokee, and Wagoner counties had the greatest extent of bottomland hardwood forest, and Adair, Cherokee, and Sequoyah counties had the greatest spatial extent of gravel (hard)-bottom streams with associated riparian forest.

B. Objective:

To map the distribution of white oak/hickory mesic forest, shortleaf pine/oak woodland or savannah, oak/hickory bottomland hardwood forest, and gravel (hard)-bottom streams and associated riparian forest habitats in the Ozark and Arkansas Valley regions, as defined by the OCWCS.

C. Introduction:

The integration of regional habitat and vegetation maps with geospatial databases is an important tool for conservation biologists and wildlife managers. The rapid development of geospatial technologies has enhanced the capacity of conservation planners to devise state-level conservation actions through the analysis of species' ranges in conjunction with landcover data. The resulting maps, generated from "layers" of spatial data residing in a Geographic Information System (GIS), can also be used to measure the change in remnant native habitats over time.

The OCWCS identified the Ozark region as one of six regions within the state at which species of greatest conservation need management will take place. Inadequate data concerning species of greatest conservation need and their habitats was the main Conservation Issue identified for each habitat type within each region in the OCWCS. Mapping very high priority habitats within each region, in order to evaluate their condition, is one of the Conservation Actions identified in the OCWCS that will address this issue. This project was undertaken to assess the current and historic distributions of white oak (*Quercus alba*)-hickory (*Carya* spp.) mesic forest (WOH), shortleaf pine (*Pinus echinata*)-oak (*Quercus* spp.) woodland or savannah (SPOW), oak (*Quercus* spp.)-hickory (*Carya* spp.) bottomland hardwood forest (BHW), and gravel (hard) bottom streams with associated riparian forest habitats (RIP). The number of Tier I and Tier II species of greatest conservation need in the Ozark and Arkansas Valley regions total 138, of which 50 species are common to both regions. The results of this project will provide wildlife managers with a dynamic tool for analyzing past habitat conditions and developing management plans for the conservation of species of greatest conservation need.

D. Methods:

Data Collection

The process of creating the habitat map and resulting GIS geodatabase was accomplished in three phases: 1) acquisition and processing of existing spatial data, 2) field verification, and 3) digitizing and editing of the geodatabase. Phase 1 was accomplished by using existing spatial data to determine the location of remnant native habitats within the Ozark and Arkansas Valley regions. The two data layers used in this phase were the Oklahoma GAP Analysis (OKGap) vegetation layer and the digital raster graphic (DRG) of the scanned images of U.S. Geological Survey (USGS) topographic maps for the region.

The OKGap vegetation layer was used to create a draft map of remnant habitats within the region. The draft map was created through a concatenation of the CWCS habitats identified in the CWCS with comparable landcover units mapped in the OKGap vegetation layer. These data were then transformed from a raster layer (The OKGap layer was derived from Landsat Thematic Mapper imagery, a raster dataset with pixels measuring 30 x 30 m) to a vector layer. The resulting draft map could be augmented with additional data sources and serve as a guide for ground verification. For example,

vegetation units comparable to the CWCS white oak/hickory mesic forest type (WOH) were identified in the OKGap vegetation raster layer, and then a new GIS coverage was created and converted to a vector layer. Initially, only tracts of mesic forest that were greater than 2,000 acres were digitized within this new layer, but toward the end of the project we re-evaluated the region and digitized tracts that were larger than or equal to 320 acres but smaller than 2,000 acres. This same process was completed for each habitat type within the project based on each habitat's specific criteria. The DRGs were used to locate physical features on the landscape, such as perennial gravel bottom streams. These layers were later refined in Phase 3 with finer resolution imagery to create the final remnant habitat maps.

The focus of phase 2 was field verification and editing of the draft habitat map. Given that the preponderance of sites in the study area are in private ownership, precedence was given to ground verification sites located on public land.

Phase 3 was completed following production of the draft map and completion of ground verification. Digital Orthophoto Quarter Quads (DOQQ) and National Agriculture Imagery Program (NAIP) County Mosaic images were used to identify and precisely map habitat types. Habitat patches identified on the NAIP images were digitized on-screen into a preliminary geodatabase.

E. Results:

Summary data from the Ozark geospatial database

As expected, the WOH habitat type covered the greatest extent in the study area, regardless of whether the two forest size classes are analyzed separately or combined (Table 1, Figure 1). The digitizing of the WOH was completed for all patches greater than 2,000 acres, as outlined in the project statement. While the distribution of this habitat type is thought to be more restricted than it was prior to statehood, large tracts of this habitat type persist throughout the region (Figure 2). The mesic white oak/hickory forest habitat type was found in every county in the study area. Cherokee County had the greatest total area (Table 2) and number of patches (Table 3), followed by Delaware and Adair counties

The Shortleaf Pine-Oak Woodland habitat type could be distinguished easily from the White Oak-Hickory Forest type due to the dark crown color of the pines visible when examining leaf-off DOQQ images. In the County Mosaic images, the SPOW had a pronounced blue-green cast that also aided in delineation. The SPOW also has a preference for ridge tops and xeric locations (Figure 3). Occurrences of this habit type meeting the mapping criteria were found in six of the eight counties in the study area. The greatest extent of SPOW was in Adair, Cherokee, and Delaware counties. It is not surprising that SPOW was absent in Wagoner County, but the absence from Muskogee County reflects the fact that occurrences exceeded the mapping criteria.

The Bottomland Oak-Hickory Hardwood Forest was patchily distributed throughout the study area (Figure 4) and associated with linear features such as the

Grand/Neosho River. This corresponds to one of the locations where bottomland forests were found for the Tallgrass Prairie habitat mapping project. There were few tracts of bottomland hardwood forests within the region, and it appears that the majority of this habitat occurs along the Grand/Neosho River and along a few of the larger streams within the region.

The gravel bottom streams were digitized as linear features, as outlined by the project statement (Figure 5). This is due to the narrow width of most streams in the region. The adjacent riparian forest habitats were digitized as polygon features. These features were included in the layer if the patch size was a minimum of 100m in width adjacent to the gravel bottom stream as discussed with ODWC staff.

F. Significant Deviations:

The original 40 acre grid blocks of 50-100% intact high priority habitat, was changed to minimum of 320 acre patches of White Oak Hickory Forest to be digitized. Grid blocks would have been more appropriate if a raster file were being created. As most habitat remnants are not uniform vector polygons, a minimum size of 320 acres was more appropriate for this mapping project. Due to turn-over in grant personnel, only the portion of the Arkansas Valley Region was digitized and included in the geospatial database.

G. Prepared by: Dr. Bruce Hoagland and Melissa A. Hinten

Oklahoma Biological Survey

H. Date: February 24, 2010

I. Approved by: _____

Alan Peoples, Wildlife Division Chief, ODWC

_____

John D. Stafford, Federal Aid Coordinator, ODWC

Table 1: Occurrences and area occupied by habitat types of concern in the Ozark State Wildlife Action region. WOH =White Oak-Hickory Forest, SPOW = Shortleaf Pine-Oak Woodland, BHF = Bottomland Hardwood Forest, and Riparian = Riparian Forest.

Habitat Type	Number of Patches	Mean Patch Size (acres)	Median Patch Size (acres)	Total Area (acres)
WOH (2 K acre)	56	9,246.94	4,597.39	517,828.88
WOH (320 acre)	118	1,356.05	810.51	160,013.55
SPOW	1,222	12.08	7.47	14,767.71
BHF	90	33.16	21.78	2,984.77
Riparian	411	19.11	12.27	7,855.91

Table 2: Area (acres) occupied by county for each CWCS habitat type remnants in the Ozark State Wildlife Action region. WOH =White Oak-Hickory Forest, SPOW = Shortleaf Pine-Oak Woodland, BHF = Bottomland Hardwood Forest.

County	WOH2000	WOH 320	SPOW	BHF	RIP
Adair	110,212.80	38,457.41	2,536.02	632.06	1,157.09
Cherokee	141,657.09	45,138.43	4,603.24	306.76	3,209.38
Delaware	86,189.89	35,095.01	3,668.53	174.50	1,098.97
Mayes	42,052.69	85,37.88	893.75	906.98	188.62
Muskogee	17,934.06	0.00	0.00	186.60	258.96
Ottawa	24,682.69	6,519.13	0.00	521.34	320.37
Sequoyah	88,029.92	26,168.88	3,001.34	0.00	1,620.30
Wagoner	6,740.70	0.00	39.83	256.52	0.00

Table 3: Number of patches of each CWCS habitat type in the Ozark Region. WOH =White Oak-Hickory Forest, SPOW = Shortleaf Pine-Oak Woodland, HBF = Bottomland Hardwood Forest.

County	WOH2000	WOH320	SPOW	BHF	RIP
Adair	17.00	30.00	192.00	32.00	78.00
Cherokee	23.00	31.00	476.00	13.00	126.00
Delaware	19.00	43.00	269.00	6.00	95.00
Mayes	11.00	10.00	179.00	25.00	22.00
Muskogee	2.00	0.00	0.00	7.00	17.00
Ottawa	4.00	12.00	0.00	13.00	29.00
Sequoyah	7.00	7.00	135.00	0.00	57.00
Wagoner	4.00	0.00	8.00	6.00	0.00

Figure 1: Location of the Ozark Region with mapped remnants of each habitat type.

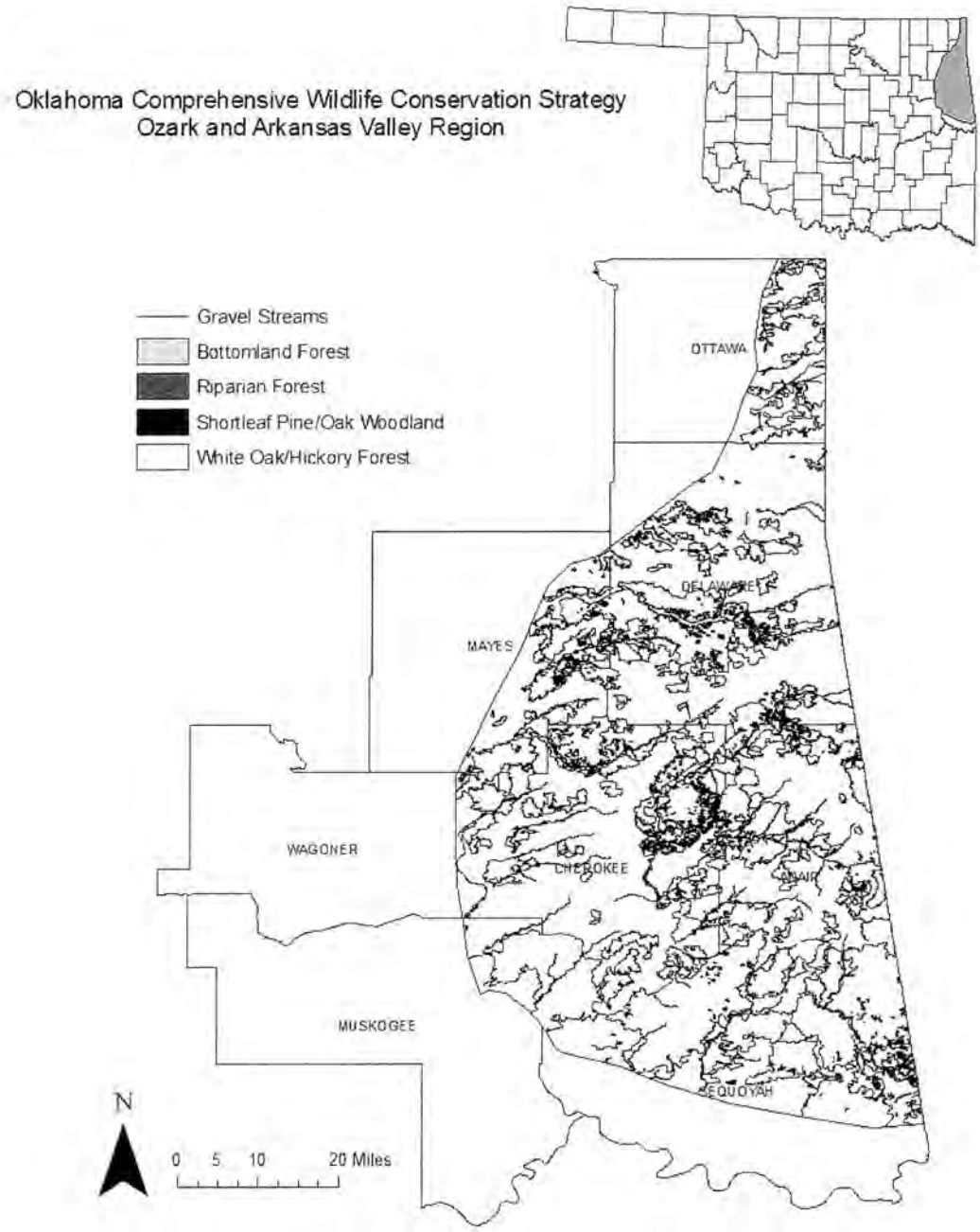


Figure 2: Distribution of mesic white oak-hickory forest remnants in the northern Ozark State Wildlife Action region (southern portion of the region is omitted from this figure)

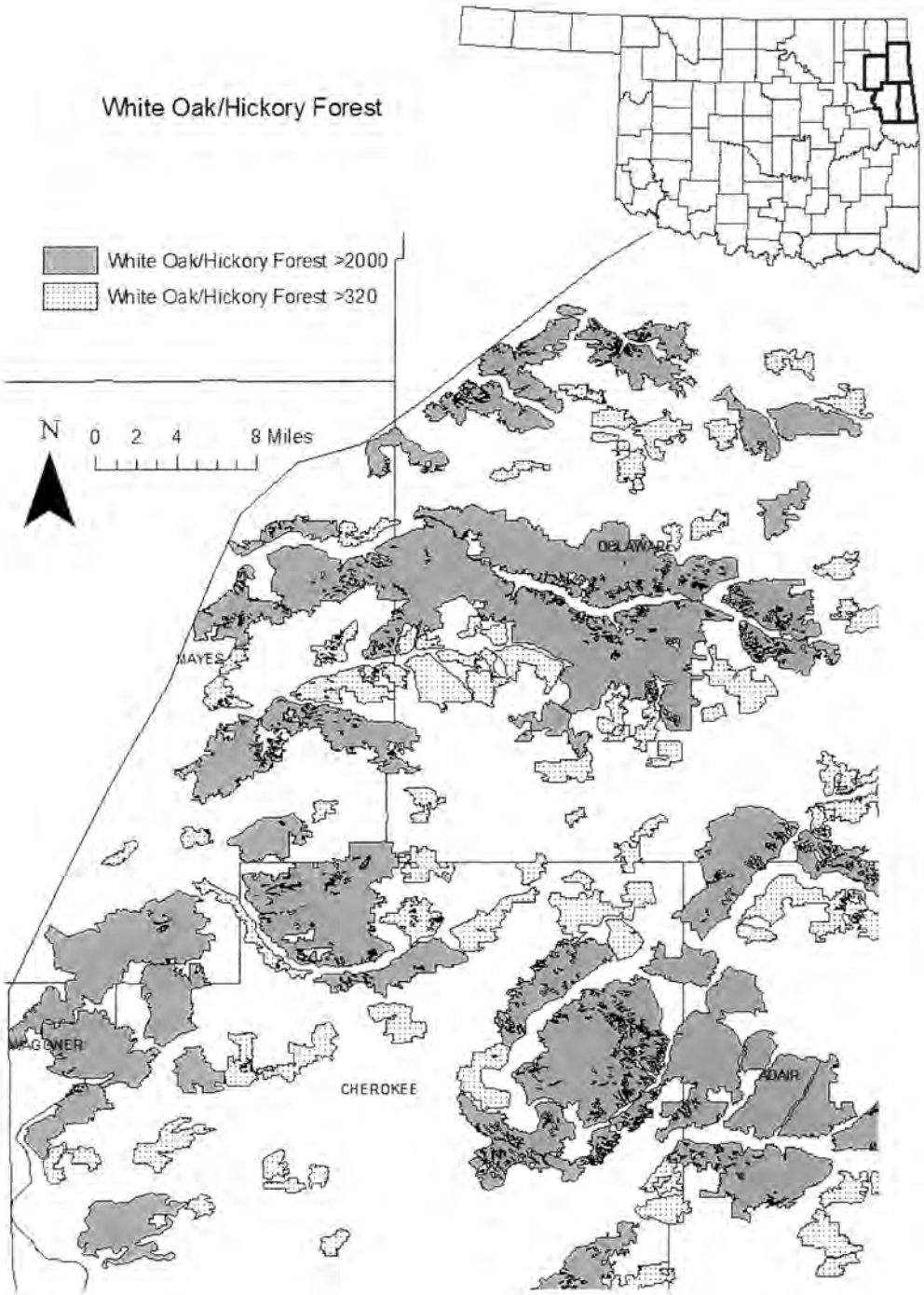


Figure 3: Distribution of shortleaf pine-oak woodland remnants in the northern Ozark State Wildlife Action region.

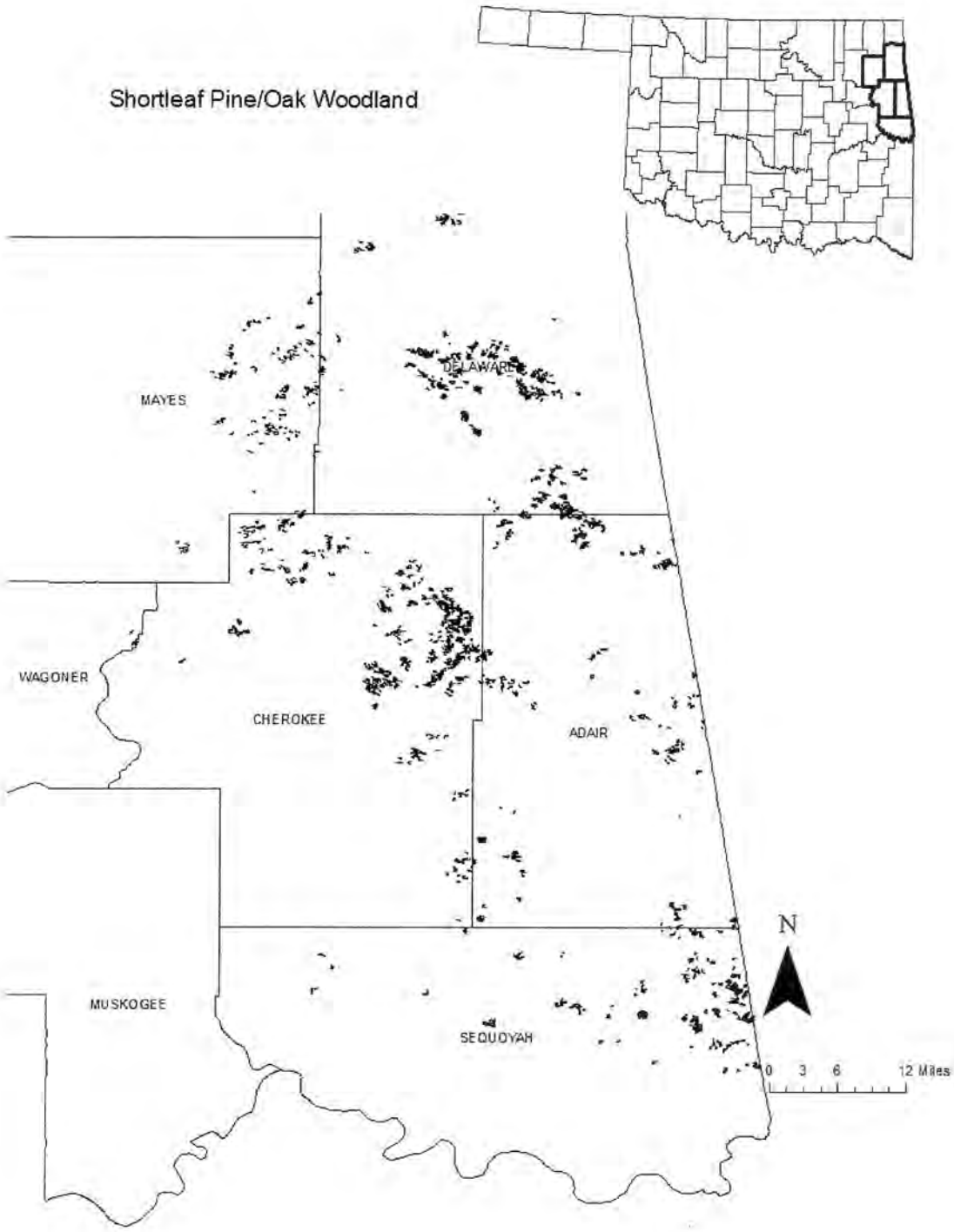


Figure 4: Distribution of Oak-Hickory Bottomland Hardwood Forests in the Ozark State Wildlife Action region.

Oak/Hickory Bottomland Forest

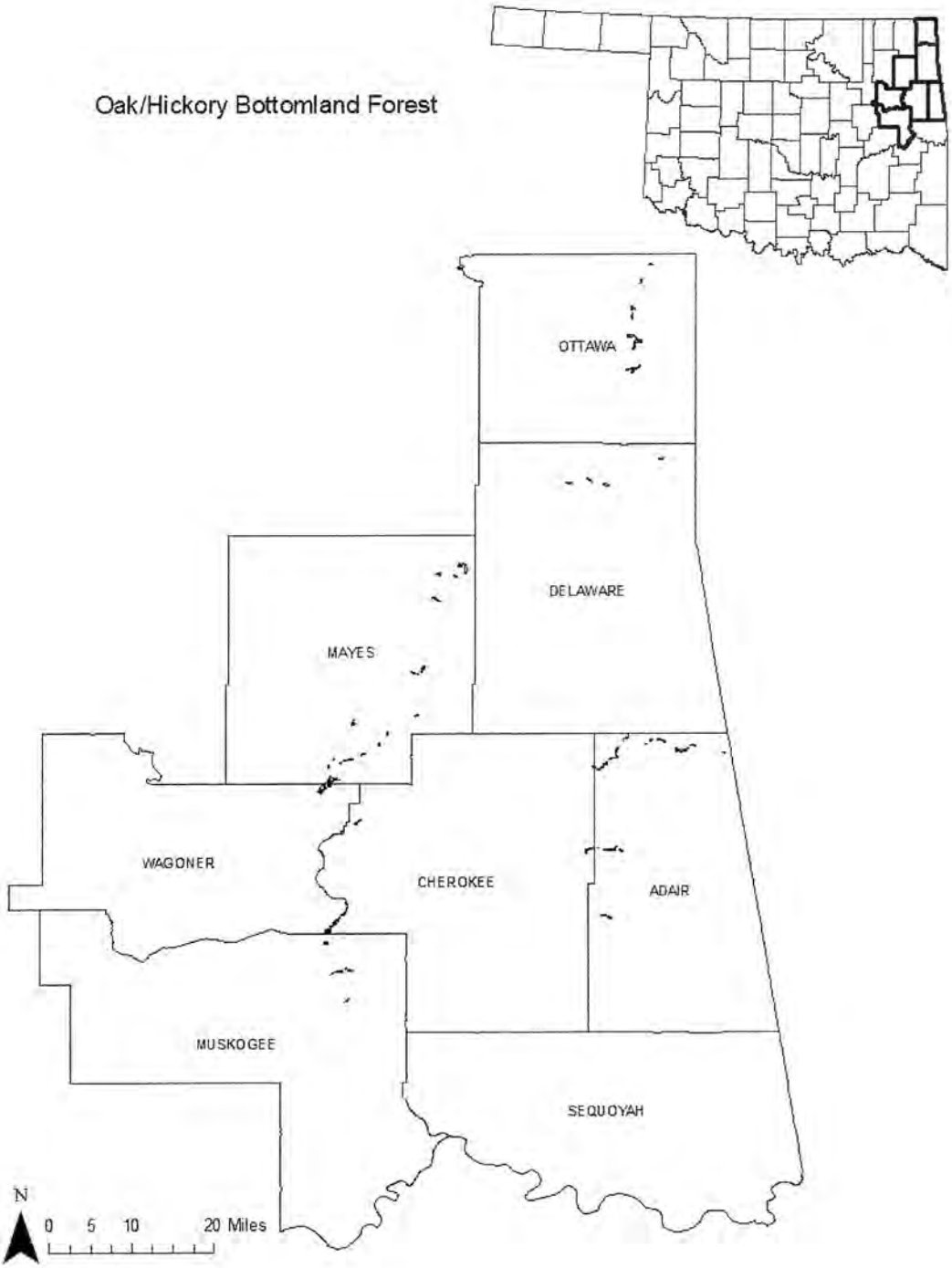
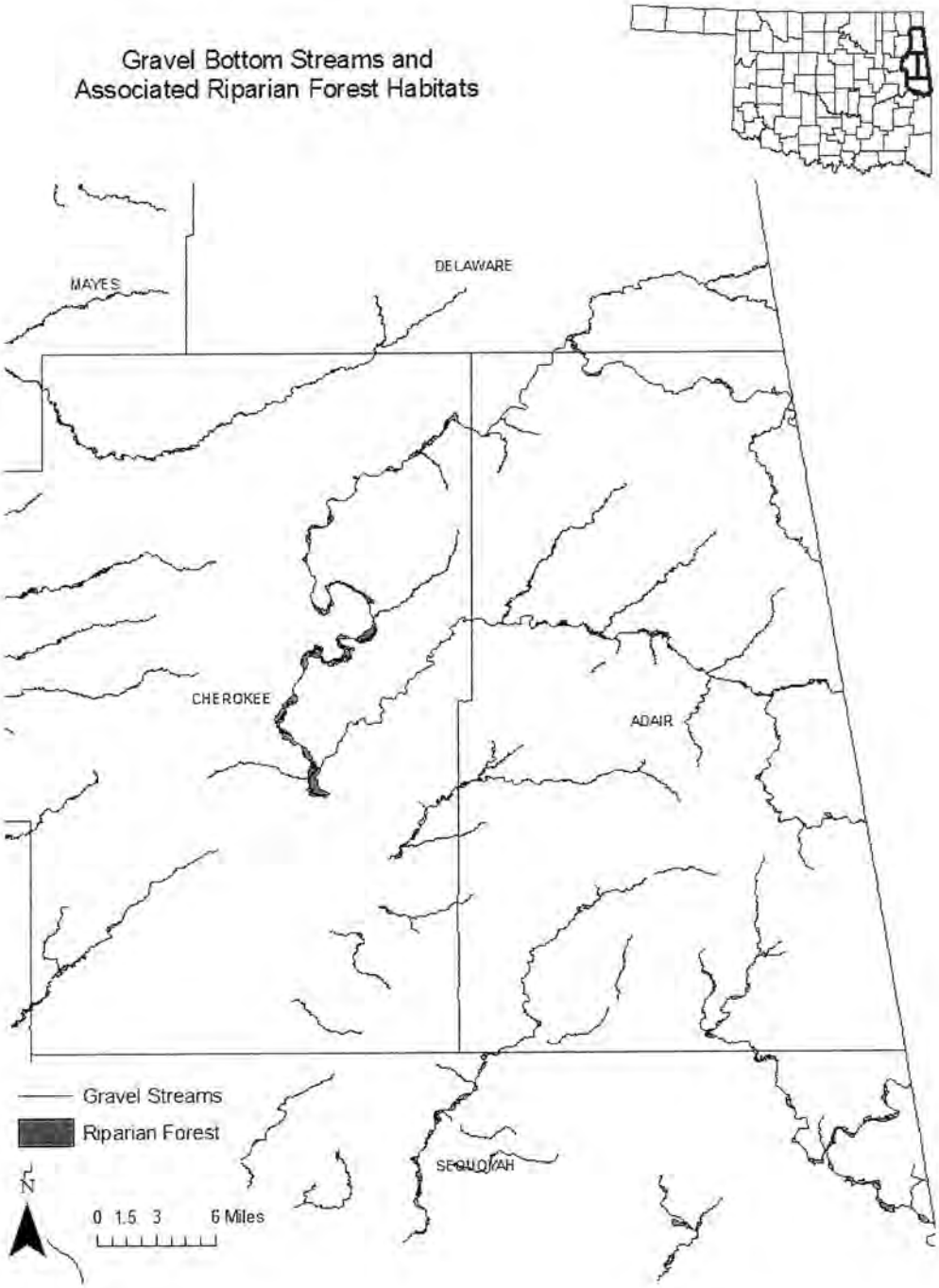


Figure 5: Distribution of gravel bottom streams in the Ozark State Wildlife Action region.



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